CONTRACT DOCUMENTS

AND

SPECIFICATIONS

FOR

PROJECT NO. 147400
TULSA PARKS DEPARTMENT LACY POOL RECONSTRUCTION

ATTENDANCE AT PRE-BID CONFERENCE IS MANDATORY

PREPARED BY:
GH2 Architects, LLC
320 S. Boston Ste 100
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Brian Thomas, AIA

CITY OF Tulsa
A New Kind of Energy.

PAUL D. ZACHARY, P.E., DIRECTOR
ENGINEERING SERVICES DEPARTMENT

Account Numbers: 6014-5452101-005011147100
6966-5451101-840040048006

Engineering Services Department
2317 South Jackson Avenue
Tulsa, Oklahoma 74107
(918) 596-9565

VOLUME II – TECHNICAL SPECIFICATIONS

PROJECT MANUAL
VOLUME 2 OF 3
FOR

TULSA PARKS DEPARTMENT
LACY POOL RECONSTRUCTION

PROJECT NO. 147400
ACCOUNT NO. 6014-5455302-005011147400

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT
24 OCTOBER 2016

ARCHITECT:
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320 S. BOSTON, SUITE 100
TULSA, OK 74103
918.587.6158

CIVIL:
WALLACE ENGINEERING STRUCTURAL CONSULTANTS, INC.
200 E. BRADY STREET
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STRUCTURAL, MECHANICAL, AND PLUMBING:
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
4150 S. 100TH EAST AVENUE, SUITE 401
TULSA, OK 74146
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ELECTRICAL:
D.W. GATES ENGINEERING SERVICES
616 SOUTH MAIN STREET, SUITE #112
TULSA, OK 74119
918.583.6905

POOL:
COUNSILMAN-HUNSAKER
10733 SUNSET OFFICE DRIVE 4TH FLOOR
ST. LOUIS, MO 63127
314.894.1245

DOCUMENT 00 0001 – PROJECT DIRECTORY

OWNER:	City of Tulsa, Oklahoma Engineering Services Department Tulsa, Oklahoma
ARCHITECT:	GH2 Architects, LLC 320 South Boston Avenue, Suite 100 Tulsa, Oklahoma 74103
CIVIL ENGINEER	Wallace Engineering Structural Consultants, Inc. 200 East Brady Tulsa, Oklahoma 74103
LANDSCAPE ARCHITECT:	GH2 Architects, LLC 320 South Boston Avenue, Suite 100 Tulsa, Oklahoma 74103
STRUCTURAL ENGINEER:	Professional Engineering Consultants, P.A. 4150 S. 100th East Avenue, Suite 401 Tulsa, Oklahoma 74146
ELECTRICAL ENGINEER:	D.W. Gates Engineering Services 616 South Main Street, Suite #112 Tulsa, Oklahoma 74119
MECHANICAL ENGINEER:	Professional Engineering Consultants, P.A. 4150 S. 100th East Avenue, Suite 401 Tulsa, Oklahoma 74146
FIRE PROTECTION ENGINEER:	Professional Engineering Consultants, P.A. 4150 S. 100th East Avenue, Suite 401 Tulsa, Oklahoma 74146
POOL CONSULTANT:	Counsilman-Hunsaker 107333 Sunset Office Drive, 4th Floor St. Louis, Missouri 63127

END OF SECTION 00 0001

00 0003 – SPECIFICATION INDEX LIST

Architectural Specifications Index List

Prepared by:

GH2 Architects, LLC.
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320 South Boston Avenue, Suite 100
Tulsa, Oklahoma 74103

STATE OF OKLAHOMA
MICHAEL RAY HALL
No 3381
TULSA
OK
LICENSED ARCHITECT

Date: 10-24-16

Division 1
Division 2
Division 3 Section 03 3510
Division 4 except Section 04 2200
Division 5 Sections 05 5000, 05 5213
Division 6
Division 7
Division 8
Division 9
Division 10
Division 12 Section 12 2413
Division 31 Section 31 3116

END OF ARCHITECTURAL INDEX LIST

Civil Specifications Index List

Prepared by:

Wallace Engineering Structural Consultants, Inc.
Jordan Rodich, P.E.
200 East Brady
Tulsa, Oklahoma 74103

LICENSED PROFESSIONAL ENGINEER
JORDAN RODICH
26548
OKLAHOMA

Date: 10.24.16

Division 22 Sections 22 1113, 22 1313
Division 31 Sections 31 1000, 31 2000
Division 32 Sections 32 1216, 32 1313, 32 1373
Division 33 Sections 33 4100

END OF CIVIL INDEX LIST

Landscape Specifications Index List

Prepared by:

GH2 Architects, LLC.
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Tulsa, Oklahoma 74103

STATE OF OKLAHOMA
MICHAEL RAY HALL
No. 3381
TULSA, OK
LICENSED ARCHITECT

Date: 10-24-16

Division 12, Section 12 9300
Division 32, Sections 32 9200

END OF LANDSCAPE INDEX LIST

Structural Specifications Index List

Prepared by:

Professional Engineering Consultants, P.A.
Geoff Bliss, P.E.
4150 S. 100th East Avenue, Suite 401
Tulsa, Oklahoma 74146

LICENSED GEOFFREY K. BLISS 24966 ENGINEER

Date: 10/24/16

Division 0 Section 00 3132
Division 3 Section 03 3000
Division 4 Section 04 2200
Division 5 Sections 05 1200, 05 2100, 05 3100, 05 4000

END OF STRUCTURAL INDEX LIST

Mechanical, Plumbing, and Fire Protection Specifications Index List

Prepared by:

Professional Engineering Consultants, P.A.
Jessica McFarland, P.E.
10017 South Pennsylvania Avenue, Building C, Suite A
Oklahoma City, Oklahoma 73159

Date: _____

Division 21
Division 22, Except Sections 22 1113, 22 1313
Division 23

END OF MECHANICAL INDEX LIST

Electrical Specifications Index List

Prepared by:

D.W. Gates Engineering Services
Derek W. Gates, P.E.
616 South Main Street, Suite #112
Tulsa, Oklahoma 74119

Date: 10-24-2016

Division 26
Division 27
Division 28

END OF ELECTRICAL INDEX LIST

Pool Specifications Index List

Prepared by:

Counsilman-Hunsaker
Darren Bevard, P.E.
107333 Sunset Office Drive, 4th Floor
St. Louis, Missouri 63127

LICENSED PROFESSIONAL ENGINEER
DARREN THOMAS BEVARD
24491
OKLAHOMA

Date: 10/24/2016

Division 13 Section 13 1100, 13 1101, 13 1102, 13 1413

END OF POOL INDEX LIST

DOCUMENT 00 0010 – TABLE OF CONTENTS

VOLUME 2

DIVISION 0 – BIDDING REQUIREMENTS AND CONTRACT FORMS

00 0001	PROJECT DIRECTORY
00 0003	SPECIFICATION INDEX LIST
00 0010	TABLE OF CONTENTS
00 3132	GEOTECHNICAL DATA
	Geotechnical Engineering Report (Available at the Architect's Office)

DIVISION 1 – GENERAL REQUIREMENTS

01 1000	SUMMARY
01 2100	ALLOWANCES
01 2200	UNIT PRICES
01 2300	ALTERNATES
01 2500	SUBSTITUTION PROCEDURES
	Substitution Request Form
01 2600	CONTRACT MODIFICATION PROCEDURES
01 2900	PAYMENT PROCEDURES
01 3100	PROJECT MANAGEMENT AND COORDINATION
	Electronic Document Disclaimer and Indemnity Agreement
01 3200	CONSTRUCTION PROGRESS DOCUMENTATION
01 3233	PHOTOGRAPHIC DOCUMENTATION
01 3300	SUBMITTAL PROCEDURES
01 4000	QUALITY REQUIREMENTS
01 4200	REFERENCES
01 5000	TEMPORARY FACILITIES AND CONTROLS
01 5639	TEMPORARY TREE AND PLANT PROTECTION
01 6000	PRODUCT REQUIREMENTS
01 7300	EXECUTION
01 7419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 7700	CLOSEOUT PROCEDURES
01 7823	OPERATION AND MAINTENANCE DATA
01 7839	PROJECT RECORD DOCUMENTS
01 7900	DEMONSTRATION AND TRAINING

DIVISION 2 – EXISTING CONDITIONS

02 4119	SELECTIVE STRUCTURE DEMOLITION

DIVISION 3 – CONCRETE

03 3000	CAST-IN-PLACE CONCRETE
03 3510	POLISH CONCRETE FINISHING

DIVISION 4 – MASONRY

04 2200	UNIT MASONRY

DIVISION 5 – METALS

05 1200	STRUCTURAL STEEL FRAMING
05 2100	STEEL JOIST FRAMING
05 3100	STEEL DECKING
05 4000	COLD-FORMED METAL FRAMING
05 5000	METAL FABRICATIONS
05 5213	PIPE AND TUBE RAILINGS

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES
06 1000 ROUGH CARPENTRY
06 1600 SHEATHING
06 4013 WOOD SOFFIT

DIVISION 7 – THERMAL AND MOISTURE PROTECTION
07 1700 BENTONITE WATERPROOFING AND SLAB INSULATION
07 1900 WATER REPELLENTS
07 2100 THERMAL INSULATION
07 2500 WEATHER BARRIERS
07 4113 METAL ROOF PANELS
07 5216 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING
07 6200 SHEET METAL FLASHING AND TRIM
07 9200 JOINT SEALANTS

DIVISION 8 – OPENINGS
08 1113 HOLLOW METAL DOORS AND FRAMES
08 3113 ACCESS DOORS AND FRAMES
08 7100 DOOR HARDWARE
Hardware Schedule
08 8000 GLAZING
08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08 9119 FIXED LOUVERS

DIVISION 9 – FINISHES
09 2216 NON-STRUCTURAL METAL FRAMING
09 3213 SWIMMING POOL TILE
09 6513 RESILIENT BASE AND ACCESSORIES
09 8000 SPECIAL COATINGS
09 9113 EXTERIOR PAINTING
09 9123 INTERIOR PAINTING

DIVISION 10 – SPECIALTIES
10 1400 SIGNAGE
10 1710 COMPARTMENTS AND CUBICLES
10 2800 TOILET AND BATH ACCESSORIES
10 5200 FIRE PROTECTION SPECIALTIES

DIVISION 11 – EQUIPMENT
NOT USED

DIVISION 12 – FURNISHINGS
12 3616 STAINLESS STEEL COUNTERTOPS
12 9300 SITE FURNISHINGS AND EQUIPMENT

DIVISION 13 – SPECIAL CONSTRUCTION
13 1100 SWIMMING POOLS
13 1101 SWIMMING POOL CAST-IN-PLACE CONCRETE
13 1102 SWIMMING POOL SHOTCRETE
13 3410 PRE-FABRICATED SHADE STRUCTURES

DIVISION 14 – CONVEYING EQUIPMENT
NOT USED

VOLUME 3

DIVISION 21 – FIRE SUPPRESSION
21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION
21 1313 WET-PIPE SPRINKLER SYSTEMS
21 1316 DRY-PIPE SPRINKLER SYSTEMS

DIVISION 22 – PLUMBING
22 0500 COMMON WORK RESULTS FOR PLUMBING
22 0519 METERS AND GAGES FOR PLUMBING PIPING
22 0523 GENERAL-DUTY VALVES FOR PLUMBING PIPING
22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 0553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
22 0700 PLUMBING INSULATION
22 1113 FACILITY WATER DISTRIBUTION PIPING
22 1116 DOMESTIC WATER PIPING
22 1119 DOMESTIC WATER PIPING SPECIALTIES
22 1313 FACILITY SANITARY SEWERS
22 1316 SANITARY WASTE AND VENT PIPING
22 1319 SANITARY WASTE PIPING SPECIALTIES
22 3300 ELECTRICAL DOMESTIC WATER HEATERS
22 4000 PLUMBING FIXTURES
22 4500 EMERGENCY PLUMBING FIXTURES
22 4700 DRINKING FOUNTAINS AND WATER COOLERS

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING
23 0500 COMMON WORK RESULTS FOR HVAC
23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
23 0593 TESTING, ADJUSTING AND BALANCING FOR HVAC
23 0700 HVAC INSULATION
23 3113 METAL DUCTS
23 3300 AIR DUCT ACCESSORIES
23 3416 CENTRIFUGAL HVAC FANS
23 3713 DIFFUSERS, REGISTERS AND GRILLES

DIVISION 26 – ELECTRICAL
26 0000 BASIC MATERIALS AND METHODS, ELECTRICAL
26 0519 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 2416 PANELBOARDS
26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 5100 BUILDING LIGHTING
26 6010 SHOP DRAWINGS AND SUBMITTALS

DIVISION 27 – AUDIO-VIDEO COMMUNICATIONS
27 5123 INTERCOMMUNICATIONS AND DATA SYSTEMS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
NOT USED

DIVISION 31 – EARTHWORK
31 1000 SITE CLEARING
31 2000 EARTH MOVING
31 3116 TERMITE CONTROL

DIVISION 32 – EXTERIOR IMPROVEMENTS
32 1216 ASPHALT PAVING
32 1313 CONCRETE PAVING
32 1373 CONCRETE PAVING JOINT SEALANTS
32 9200 TURF AND GRASSES

DIVISION 33 – UTILITIES
33 4100 STORM UTILITY DRAINAGE PIPING

END OF SECTION 00 0010

DOCUMENT 00 3132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA AND GEOTECHNICAL INVESTIGATION REPORT

A. This Document with its referenced attachments provide Owner's information for sole purpose of guidance and recommendations for design purposes only. They are made available for Bidders' reference only. This Document and all referenced attachments are not part of the Contract Documents.

B. A geotechnical investigation report with soil-boring data for Project, prepared by Aimright dated April 6, 2016, is available for viewing at the Architect's or Engineer's offices.
   1. Contractor is expected to examine the site and decide for himself the character of the materials to be encountered. Contractor may employ a consultant qualified to investigate and provide their own geotechnical evaluation and report for this Project.
   2. The Owner, Tenant, Architect, and Architect's Consultants disclaim any responsibility for the accuracy, true location and extent of any geotechnical data and investigation reports that have been prepared by others.

END OF SECTION 00 3132

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.

B. Related Requirements:
1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Tulsa Parks Department Lacy Pool Reconstruction; Project No. 147400
1. Project Location: Lacy Park, 2134 North Madison Place, Tulsa, Oklahoma, 74106

B. Contract Documents were prepared by GH2 Architects and include the following:
1. Specifications: Volume 2 and Volume 3 dated 24 October 2016
2. Drawing Set: 10/24/2016

C. Owner: City of Tulsa

D. Project Information Management Software: Architect's Project Information Management Software may be used for purposes of transferring project documentation including Submittals, RFI's and photographs until Final Completion. Upon award of Contract, the contractor will be provided with access to and instructions for use of the system.
1. See Division 01 Section "Project Management and Coordination" for requirements for using the software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Site demolition, improvements and utilities, landscape, irrigation, building demolition, architectural, structural, mechanical, electrical, plumbing, and a new pool house building addition and outdoor swimming pool.

B. Type of Contract:
1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in two phases, with each phase substantially complete as indicated:
   1. Office, Hallway, Fitness Area Phase: Will consist of demolition of existing building as needed to construct renovations with Fitness 140, Office 141, and Hallway 150 within a maximum construction duration of 30 calendar days to begin the first calendar day of December.
   2. All other Work: The remaining Work shall be substantially complete and ready for occupancy at time of Substantial Completion for the Work.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates, and move-out and move-in dates of Owner's personnel for all phases of the Work.

1.6 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Construction of Tulsa Parks Department Lacy Park Master Plan – Phase 1 Project No. 147180 which includes site demolition, improvements and utilities, landscape, irrigation, building demolition, architectural, structural, mechanical, electrical, plumbing, and fire protection for a new addition (south) and renovation to the existing Lacy Community Center. Project Substantial Completion is scheduled for approximately June 18, 2017.

C. Subsequent Work: Owner will perform the following additional work at site. Completion of that work will depend on successful completion of preparatory work under this Contract.
   1. Installation of furniture, artwork, data, communication, security, audio and visual components.

1.7 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Construction of Tulsa Parks Department Lacy Park Master Plan – Phase 1 Project No. 147180 which includes site demolition, improvements and utilities, landscape, irrigation, building demolition, architectural, structural, mechanical, electrical, plumbing, and fire protection for a new addition (south) and renovation to the existing Lacy Community Center. Project Substantial Completion is scheduled for approximately June 18, 2017.

C. Subsequent Work: Owner will award separate contract(s) for the following additional work to be performed at site. Completion of that work will depend on successful completion of preparatory work under this Contract.
   1. Installation of furniture, artwork, data, communication, security, audio and visual components.

1.8 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:
   1. As indicated on drawings.

1.9 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated below and on the Site Access Exhibit included within the Bid Package. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to areas in which the Work is to be performed.
   2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.10 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Refer to "GC-38 Partial Occupancy and Use" of the General Conditions of Contract. Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
   2. Office, Hallway, Fitness Area Phase: Perform the Work within the areas of Fitness 140, Office 141, and Hallway 150 within a maximum construction duration of 30 calendar days to begin the first calendar day of December. Work begins with interior demolition, and all Work for Substantial Completion of this portion of the Work. Owner equipment and furnishings will remain within these areas and shall be protected during the entire construction period. Perform the Work so as not to interfere with Owner's operations in other parts of the facility. Maintain existing exits unless otherwise indicated. Provide not less than 30 calendar day notice to Owner prior to start of this portion of the Work. Indicate this portion of Work as a Phase activity within the Contractors Construction Schedule.

B. On-Site Work Hours: Refer to "GC-19 Saturday, Sunday, Holiday, and Night Work" of the General Conditions of Contract.
   1. Early Morning Hours: Limit by regulations by authorities having jurisdiction for restrictions on noisy work.
   2. Hours for Utility Shutdowns: Coordinate with Owner. Provide not less than 72 hours' notice to Owner.
   3. Hours for Core Drilling and Interior Demolition: Coordinate with Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than two weeks in advance of proposed utility interruptions.
   2. Obtain Owners written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking on Project site is not permitted.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products may be identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to bid proposal form for additional information.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Allowances.

1.3 WORK COVERED BY ALLOWANCES

A. An Allowance as listed on the Bid Proposal Form has been provided in the contract for Work not identified in the Bidding Documents.

B. The Allowance shall be used for the cost of materials, labor, installation, and overhead and profit for additional work required or requested by the Owner, which is not identified in the Construction Documents, and not included in the Base Bid.

C. The Allowance shall be used only at the discretion of the City of Tulsa.

D. Provide, to the City of Tulsa Representative, a written request for the use of the allowances, with a schedule of values, and associated backup information.

E. Proceed with Work included in the allowances only after receiving a written order, from the City of Tulsa Representative, authorizing such work. Proceeding with Work in the allowance without a written order from the City of Tulsa Representative will be at the Contractor's cost.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2100

SECTION 01 2200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to bid proposal form for additional information.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit costs.

1.3 DEFINITIONS

A. Unit cost is an amount proposed by bidders, stated on the Bid Proposal Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit costs include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to Bid Proposal Form for description of Work that requires establishment of unit costs. Methods of measurement and payment for unit costs are specified on the Bid Proposal Form.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit costs and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Costs: A list of unit costs is included on the Bid Proposal. Specification Sections included in the Project Manual contain requirements for materials and systems described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT COSTS

A. Refer to Bid Proposal Form.

END OF SECTION 01 2200

SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of Alternate.
   2. Include as part of each alternate, all modifications and adjustments of adjacent Work as necessary to completely and fully integrate Alternate into the project.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included within the Summary of Pay Quantities on the Drawings. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
1. Division 01 Section "Alternates" for products selected under an alternate.
2. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
3. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions during Bidding will be reviewed by the Architect up to ten (10) calendar days prior to the bid date. Substitutions must be made using the Substitution Request Form located at the end of this Section.
2. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
3. A request constitutes a representation that the Contractor:
   a. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   b. Will provide the same or greater warranty for the Substitution as for the specified Product.
   c. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to the Owner.
   d. Waives claims for additional costs or time extension which may subsequently become apparent.
   e. Contractor shall reimburse Owner for costs of additional architectural services necessitated by proposed substitutions submitted after Award of Contract.
   f. In the event substitutions are proposed after Award of Contract, the Architect will bill for all time used by the Architect and Architect's consultants in evaluating each such proposed substitution whether or not Architect approves a proposed substitution.
4. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit each request individually for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use facsimile of form provided in Project Manual.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.
   g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
   j. Cost information, including a proposal of change, if any, in the Contract Sum.
   k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
   l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Architect will notify Contractor of acceptance or rejection of proposed substitution.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time indicated in the Invitation to Bid.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 working days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

b. Requested substitution is consistent with the Contract Documents and will produce indicated results.

c. Requested substitution provides sustainable design characteristics that specified product provided.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.

g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.

i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

Advancement of Construction Technology

Print Form

SUBSTITUTION REQUEST
(During The Bidding Phase)

Project: _____ Substitution Request Nbr: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted By: _____

Signed By: _____

Firm: _____

Address: _____ Telephone: _____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.

☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed By: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports

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September 1996
CSI Form 1.5C

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner or Architect-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Owner will issue a Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Owner at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
   3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Name of subcontractor.

d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of all labor, materials, and equipment as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a column in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. Include photographs of stored materials and evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. General overhead and profit, temporary facilities, and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the schedule of values.
9. Schedule Updating: Update and submit the schedule of values with the next Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Owner the same day of each month. The period covered by each Application for Payment is one month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as photographs of the materials in their stored location and paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
   c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Submittal schedule (preliminary if not final).
   5. Certificates of insurance and insurance policies.
   6. Performance and payment bonds.

J. Application for Payment at Substantial Completion: Prior to the Architect's issuance of the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   5. AIA Document G707, "Consent of Surety to Final Payment."

6. Evidence that claims have been settled.
7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Requests for Interpretation (RFIs).
   3. Project Information Management Software.
   4. Project meetings.

B. Related Requirements:
   1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. Requests for Interpretation: A formal process used during the bidding and construction phases to facilitate communication between the Contractor and the Architect with regard to requests for additional information and clarification of the intent of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Prior to starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list office and cellular telephone numbers and e-mail addresses.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Digital Data Files: Architect and his consultants can provide digital data files to the Contractor for use by the Contractor. Contractor shall submit a request for files using the Electronic File Release Form included at the end of this Section including all drawings requested. Upon receipt of the completed Electronic File Release Form and payment, arrangements will be made to transfer the requested files to the Contractor.
   1. Architect will furnish Contractor one set of digital data files of Drawings via the Architect's Project Information Management software for use in preparing coordination digital data files.
      a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI on a form that includes the content of the RFI indicated in this Section.
   1. Architect will not respond to requests for interpretation unless this format is utilized and all appropriate information is provided.
   2. Where RFI form does not provide adequate space for complete information, additional sheets may be attached.
   3. Submit one request per form. Each request will be provided a number by the Architect.
   4. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   5. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
   6. Architect's response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Sum or Contract Time.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor submitting the RFI.
   5. RFI subject.
   6. Specification Section number and title and related paragraphs, as appropriate.
   7. Drawing number and detail references, as appropriate.
   8. Field dimensions and conditions, as appropriate.
   9. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   10. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's Action: Architect will review each RFI, determine action required, and respond with reasonable promptness.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response may be affected.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, the Architect shall be notified in writing.

D. On receipt of Architect's action, Contractor shall immediately distribute the RFI response to affected parties. Review response and notify Architect within seven calendar days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT INFORMATION MANAGEMENT SOFTWARE

A. Architect's Project Information Management Software may be used for purposes of transferring project documentation including Submittals, RFI's and photographs until Final Acceptance. Upon award of Contract, the contractor will be provided with access to and instructions for use of the system. The Project Information Management Software includes the following functions:
   1. Project directory.
   2. Meeting minutes.
   3. Contract modifications forms and logs.
   4. RFI forms and logs.
   5. Photo documentation.

6. Submittals forms and logs.
7. Payment application forms.
8. Drawing and specification document hosting, viewing, and updating.

1.9 PROJECT MEETINGS

A. General: Owner will schedule and conduct meetings and conferences at Project site monthly unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
   2. Agenda: Owner will prepare the meeting agenda and will distribute the agenda to all invited attendees.
   3. Minutes: Owner shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned.

B. Preconstruction Conference: Owner will schedule and conduct a preconstruction conference before starting construction.
   1. Owner will conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner and Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.
      y. Security.
      z. Progress cleaning.
   4. Minutes: Owner shall record and distribute meeting minutes.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Architect, Contractor and its superintendent and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for delivery of material samples, attic stock, and spare parts.
   f. Requirements for demonstration and training.
   g. Preparation of Contractor's punch list.
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   i. Submittal procedures.
   j. Owner's partial occupancy requirements.
   k. Installation of Owner's furniture, fixtures, and equipment.
   l. Responsibility for removing temporary facilities and controls.
4. Minutes: Contractor shall record and distribute meeting minutes.

D. Progress Meetings: Owner will conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: Representatives of the Owner, Architect, and Contractor shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Progress cleaning.
      10) Quality and work standards.
      11) Status of correction of deficient items.
      12) Field observations.
      13) Status of RFIs.
      14) Status of proposal requests.
      15) Pending changes.
      16) Status of Change Orders.
      17) Pending claims and disputes.
      18) Documentation of information for payment requests.

4. Minutes: Owner shall record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3100

ELECTRONIC DOCUMENT DISCLAIMER AND INDEMNITY AGREEMENT

The Electronic Documents listed below are furnished by GH2 Architects, LLC. (GH2) for the convenience of **<CONTRACTOR COMPANY NAME>**. As consideration for GH2's agreement to release the Documents, Recipient, by execution of this Agreement or by using the Electronic Documents in any manner, including but not limited, to copying or using the Electronic Documents for reference, agrees to be bound by the terms of this Disclaimer and Indemnity Agreement. If Recipient does not agree to be bound, Recipient shall immediately return the Documents to GH2 and shall make no use of them.

Recipient's use is at its own risk. GH2 shall have neither a duty nor responsibility for the acts, errors, or omissions of Recipient or other consultant. It is the responsibility of the Recipient to independently determine, verify, and check the accuracy of all building code requirements, engineering calculations, measurements, quantities, dimensions and elevations prior to construction.

The Documents are furnished without warranty or guarantee, express, implied, or statutory, as to the accuracy, reliability, suitability, or fitness for a particular purpose. No Documents released under this Agreement will be signed or sealed. GH2 reserves the right to remove the title block. The Documents may vary from any printed documents previously or subsequently released. GH2 shall have no duty to identify variances with any printed, issued documents or update the Documents. GH2 is not responsible for any errors caused by the transmission or by the Recipient's software or computer systems or use of the Documents.

The Recipient agrees, to the fullest extent permitted by law, to indemnify and hold harmless GH2, its officers, directors, employees and subconsultants against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising from or alleged to arise from the use of the Documents, including without limitation, damages, liabilities or costs (including reasonable attorneys' fees and defense costs) alleged to result from GH2's negligent acts, errors or omissions in connection with the Documents. In no event shall GH2 be liable for, and Recipient expressly waives, the right to recover indirect or consequential damages as a consequence of the use or reuse of the Documents.

The Documents are and shall remain GH2's intellectual property and are not products. Delivery of the Documents shall not be deemed a transfer of GH2's intellectual property, including without limitation, any copyright. Under no circumstances shall delivery of the Documents to Recipient be deemed a sale by GH2, and no warranties, either express or implied, of merchantability and fitness for any particular purpose is given. Transfer of the Documents does not transfer any license to use the underlying software.

List of Documents for the 147400 (20140022.01) / Tulsa Parks Department Lacy Pool Reconstruction:

<A0XX>
<A1XX>

<CONTRACTOR COMPANY NAME>

By: _____ Date: _____

Printed Name: _____

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Construction schedule updating reports.
   3. Daily construction reports.
   4. Material location reports.
   5. Site condition reports.
   6. Special reports.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
   2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format using the Project Information Management Software defined in Section 01 3100:
   1. PDF electronic file.
   2. Up to three (3) paper copies may be submitted if the Contractor does not have the means by which to transmit electronic submittals.
      a. One copy will be retained by the Architect and one copy will be retained by the Architect's Consultant. Other copies will be returned to the Contractor.
      b. Number of copies exceeding three (3) will not be marked.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Contractor shall maintain reports at the jobsite and have them available for review by the Owner and Architect upon request.

E. Material Location Reports: Contractor shall maintain reports at the jobsite and have them available for review by the Owner and Architect upon request.

F. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than the actual duration of the activity, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for long lead items and major items as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Acceptance: Include not more than 30 days for completion of punch list items and final acceptance.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Partial occupancy before Substantial Completion.
   c. Use of premises restrictions.
4. Construction Areas: Identify each major area of construction for each major portion of the Work.
5. Weather Delays: Refer to City of Tulsa document "WDC-1 Working Days".
6. In the event that progress of the Work is delayed by adverse weather conditions, the Contractor shall notify the Owner at the end of each month in which delay occurs. If the number of days exceeds the number of days listed, the Contractor may submit a claim for an extension of Contract Time. Adverse weather delay may only be claimed until the building is dried in. Adverse weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within one 24-hour period and prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day.
   a. Precipitation (rain, snow, or ice) in excess of one-tenth inch liquid measure.
   b. Temperatures which do not rise above 32 degrees F by 10:00 am.
   c. Standing snow in excess of one inch (1.0").
   d. Adverse weather may include, if appropriate, "dry-out" or "mud days" if there is a hindrance to site access; work on the envelope of the building such as masonry or roofing; sitework such as excavation, backfill, and footings; site improvements such as paving.

D. Milestones: Include milestones in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final acceptance.

E. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit a comprehensive, fully developed, horizontal, bar-chart-type, Contractor's construction schedule within 10 days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to durations, actual starts and finishes, and activity durations.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION 01 3200

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting photographic documentation.
   2. Division 01 Section "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
   3. Division 02 Section "Selective Structure Demolition" for photographic documentation before selective demolition operations commence.
   4. Division 31 Section "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Contractor shall document pre-existing conditions and construction progress using a digital camera.
   1. Photograph Submittals: The Architect may request that photographs of conditions be submitted on occasion or to supplement a Request for Interpretation. Individual photographs may be electronically transmitted. Multiple photographs may be submitted using the Architect's Project Information Management Software.
   2. Identification: Provide the following information when submitting photographs for review:
      a. Name of Project.
      b. Name of Contractor.
      c. Date photograph was taken.
      d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Date and Time: Include date and time in file name for each image.
   2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
   1. Flag construction limits before taking construction photographs.
   2. Take an adequate number of photographs to show existing conditions on and adjacent to the property including existing buildings on or adjoining property to accurately record physical conditions at start of construction.
   3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

C. Periodic Construction Photographs: Document construction progress weekly by taking an adequate number of photographs to demonstrate progress and show sequencing of Work. Select vantage points to show status of construction and progress since last photographs were taken.

END OF SECTION 01 3233

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
   1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Project Information Management Software: Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. The Architect's Project Information Management system is a password protected software that allows internal and external users the ability to transfer and access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.

c. Name of subcontractor.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings for Contractor's use in preparing submittals may be obtained from the Architect.
   a. Contractor shall submit an Electronic File Release Form contained in this Section including drawings requested and digital format required.
   b. Architect's consultants may require additional file transfer agreements from the Contractor.
   c. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Resubmittal Review: Allow 10 business days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
   1. Up to three (3) paper copies may be submitted if the Contractor does not have the means by which to transmit electronic submittals.
      a. One copy will be retained by the Architect and one copy will be retained by the Architect's Consultant. Other copies will be returned to the Contractor.
      b. Number of copies exceeding three (3) will not be marked.
   2. Indicate name of firm or entity that prepared each submittal on label or title block.
   3. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   4. Include the following information for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Name of subcontractor and supplier/manufacturer.
      f. Submittal number or other unique identifier, including revision identifier.
      g. Number and title of appropriate Specification Section.
      h. Drawing number and detail references, as appropriate.
      i. Location(s) where product is to be installed, as appropriate.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling and submit using a transmittal form. Architect will return without review submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of Contractor.
      7) Names of subcontractor, manufacturer, and supplier.
      8) Category and type of submittal.
      9) Submittal purpose and description.
      10) Specification Section number and title.
      11) Remarks.
      12) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed PDF file incorporating submittal requirements of a single Specification Section.
   2. All requirements for paper submittals apply to electronic submittals.
   3. Electronic submittals may be submitted using the Architect's Project Information Management Software.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Electronic Submittals: Submit electronic submittals as PDF electronic files and may be submitted via Architect's Project Information Management Software
      a. Architect will return annotated file and retain one copy of file as an electronic Project record document file.

2. Paper Submittals: Submit five paper copies of each submittal unless otherwise indicated. Anything in excess of five copies will be returned to the Contractor unmarked. Architect will return three annotated copies to the Contractor.
3. Informational Submittals: Submit one copy of each submittal unless otherwise indicated. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Applicable color charts.
   c. Statement of compliance with specified referenced standards.
   d. Testing by recognized testing agency.
   e. Application of testing agency labels and seals.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Compliance with specified standards.
   c. Notation of coordination requirements.
   d. Notation of dimensions established by field measurement.
   e. Relationship and attachment to adjoining construction clearly indicated.
   f. Seal and signature of professional engineer if specified.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
3. Where electronic submittals are utilized, provide physical samples where material sample submittals are required. Photocopies of material and color samples are not acceptable.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Reviewed: When Architect marks a submittal "Reviewed", the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents. Final payment depends upon that compliance.
   2. Furnish as Corrected: When the Architect marks the submittal "Furnish as Corrected", the Work covered by the submittal may proceed provide it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends upon that compliance.

3. Revise and Resubmit: When the Architect marks a submittal "Revise and Resubmit", "Rejected", or "Submit Specified Item", do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark. Do not use, or allow others to use, submittals marked "Revise and Resubmit", "Rejected", or "Submit Specified Item" at the Project Site or elsewhere where Work is in progress.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents will be returned by the Architect without action.

END OF SECTION 01 3300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:
   1. Section 012100 – Summary
   2. Section 017300 – Execution

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Shop Drawings: For integrated exterior and laboratory mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to determine their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
      e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
      f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Owner, with copy to Contractor and to authorities having jurisdiction. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Special Inspector: Special Inspectors shall meet the more stringent of the qualifications listed in this section and the requirements listed in the Statement of Special Inspections submitted to the Authority Having Jurisdiction on this site or otherwise required by the Authority Having Jurisdiction.

L. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made by Owner.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: It will be the owner's responsibility to contract for special inspections to conduct special tests and inspections required by authorities having jurisdiction as follows:
   1. Verifying manufacturer's certification by submittal of documentation.
   2. Notifying Architect, Owner and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Owner, with copy to Contractor and to authorities having jurisdiction.
   4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   5. Retesting and reinspecting corrected work.
   6. Submitting a final report of special tests and inspections at Substantial Completion, which shall include descriptions of satisfactory resolutions achieved for all previously reported deficiencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
   2. Protect construction exposed by or for quality-control service activities.
   3. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

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

1. Work will not be considered for Substantial completion until all systems and equipment are operational; all designated or required governing agency inspections and certifications have been made and posted, including the Certificate of Occupancy; instruction of designated Owner's personnel in operation of systems and equipment has been completed; operation and maintenance data has been satisfactorily turned over to Owner; and finishes are in place. In general, the only remaining portion of Work shall be minor in nature, such that Owner may occupy or utilize Work or designated portion thereof, and completion or correction of Work by Contractor would not materially interfere or hamper Owner's intended business use or operation.
2. Contractor shall certify that all remaining Work will be completed within 30 consecutive calendar days following date of identified Substantial Completion, or as agreed to in writing, and failure to do so shall automatically reinstate provisions for damages due Owner as contained elsewhere in Contract Documents, or a provided by law for such period of time as may be required by Contractor to fully complete Work whether Owner has occupied Work or not.

C. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

H. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

I. "Provide": Furnish and install, complete and ready for the intended use.

J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized entities.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized entities.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized names of the standards and regulations.

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean recognized entities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.

1.3 DEFINITIONS

A. Adequate ventilation: Ventilation, including air circulation and air changes required to cure materials, dissipate humidity, and prevent accumulation of dust, fumes, vapors, or gases.

B. Environmental pollution and damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

C. Hazardous materials: Includes pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. Interior final finishes: Materials and products, that will be exposed at interior, occupied spaces including flooring, wallcovering, finish carpentry, and ceilings.

E. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging including carpets, resilient flooring, ceiling tiles, and insulation.

F. Wet products: Materials and products installed in wet form including paints, sealants, adhesives, and special coatings.

1.4 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities and utilities shall be included in the Contract Sum unless otherwise indicated.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Provide and maintain temporary water service for drinking and construction purposes for all parts of the Work. Provide potable water approved by local health authorities.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Toilets: Use of Owner's existing toilet facilities is prohibited.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using filter-equipped vacuum equipment.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.
   1. Provide a dedicated telephone line or cellular phone.

3.3 SUPPORT FACILITIES INSTALLATION

A. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Owner's existing parking areas is not allowed for construction personnel.

D. Temporary Signs: Provide temporary project signage as detailed on City of Tulsa document "PS-1 COT Project Sign". Install at location approved by Owner and maintain until Final Acceptance.
   1. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings , requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

I. Occupant Protection: Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
   2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

E. Indoor Air Quality:
1. Interior final finishes: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.
2. Temporary ventilation: As specified in this Section, and as follows:
   a. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.
   b. Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free

from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degrees F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by the Owner.

3. Pre-occupancy ventilation: After final acceptance and prior to initial occupancy, provide adequate ventilation for a minimum of 5 days. Pre-occupancy ventilation procedures:
   a. Use supply air fans and ducts only;
   b. Temporarily seal exhaust ducts;
   c. Temporarily disable exhaust fans;
   d. Provide exhaust through operable windows or temporary openings;
   e. Provide temporary exhaust fans as required to pull exhaust from deep interior locations. Stair towers may be used for exhausting air from the building during temporary ventilation.
   f. After pre-occupancy ventilation and prior to final testing and balancing of HVAC system, replace air filters and make HVAC system fully operational.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor.
   2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction, or to original condition, whichever is more stringent.
   3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 5000

SECTION 01 5639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Sections:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary site fencing.
   2. Division 31 Section "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4-inch size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
   1. Use sufficiently detailed photographs or videotape.
   2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other nonsoil materials.
   1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.
   2. Stockpiled topsoil stripped from the building site may be used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE- AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area.

B. Maintain protection zones free of weeds and trash.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

D. Maintain protection-zone fencing in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

3.4 EXCAVATION

A. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

3.5 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.6 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 01 5639

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1.
   2. Division 01 Section "Alternates" for products selected under an alternate.
   3. Division 01 Section "Substitution Procedures" for requests for substitutions.
   4. Division 01 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.
   7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with the specification requirements to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Where Specifications name a single manufacturer and product and accompanied by the term "or Equal" as defined above, provide product that complies with requirements.
   2. Where Specifications include a list of names of two or more manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 EQUAL PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for equal product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.
   9. Correction of the Work.

B. Related Requirements:
   1. Division 01 Section "Summary" for limits on use of Project site.
   2. Division 01 Section "Submittal Procedures" for submitting surveys.
   3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   4. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a Request for Interpretation to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

END OF SECTION 01 7300

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:
   1. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
   2. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
   3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 7419

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final acceptance procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Division 01 Section "Execution" for progress cleaning of Project site.
   2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
   5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
      a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item

and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   3. Complete startup and testing of systems and equipment. Change out all HVAC temporary filters used during construction.
   4. Perform preventive maintenance on equipment used prior to Substantial Completion.
   5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
   6. Advise Owner of changeover in heat and other utilities.
   7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   8. Complete final cleaning requirements, including touchup painting.
   9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE PROCEDURES

A. Submittals Prior to Final Acceptance: Before requesting final inspection for determining final acceptance, complete the following:
   1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures" and as set forth in the General Conditions, Paragraph GC-29.
   2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Page number.
   4. Submit list of incomplete items in the following format:
      a. PDF electronic file.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties for designated portions of the Work where commencement of warranties other than date of Final Acceptance is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit removing all tape, stickers, dirt, dust, stains and smears. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep and power wash paved areas. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   g. Sweep and wet mop concrete floors in unoccupied spaces.
   h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
   i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
   j. Remove labels that are not permanent.
   k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
   m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
   n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
   o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
   p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Operation manuals for systems, subsystems, and equipment.
   3. Product maintenance manuals.
   4. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. Three paper copies and in PDF format on three DVD's. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion.
   1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual to Owner prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Construction Manager.
   7. Name and contact information for Architect.
   8. Name and contact information for Commissioning Authority.
   9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Indicate project title on the binder spine and cover. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.

5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

B. Related Requirements:
   1. Division 01 Section "Execution" for final property survey.
   2. Division 01 Section "Closeout Procedures" for general closeout procedures.
   3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one sets of marked-up record prints.

B. Record Specifications: Comply with the following:
   1. Number of Copies: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Significant dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

B. Format: Submit record Product Data as paper copy.
1. Include record Product Data directory organized by Specification Section number and title.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 7839

SECTION 02 4119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference(s): Contractor shall organize and conduct conference(s) at Project site with appropriate subcontractors at appropriate stages or phases of demolition. Owner and Architect to be present as required.

1.4 SUBMITTALS

A. Schedule of Selective Demolition activities indicating the following:
   1. Detailed sequence of selective demolition work with start and end dates for each activity. Ensure that Owner's on-site operations are uninterrupted.
   2. Indicate if and how long utility services will be disrupted.
   3. Coordination for shut off, capping and continuation of utility services.
   4. Locations of proposed dust and noise control temporary partitions and means of egress.
   5. Use of existing elevator(s) and stairs.
   6. Coordination of Owner's continuing occupancy of portions of the existing building and of Owner's partial occupancy of completed work.
   7. Means of protection for items to remain and items in path of waste removal from building.

B. Predemolition Photographs or Video: Record preexisting conditions of adjoining construction and site improvements including finish surfaces, Submit before Work begins.
   1. Comply with requirements specified in Division 01 Section "Photographic Documentation."

C. After demolition is complete, submit a list of items that have been removed or salvaged.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      c. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      d. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal

operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Store items in a secure area until delivery to Owner.
3. Transport items to Owner's storage area designated by Owner.
4. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean removed items to be reinstalled.
2. Store items in a secure area until they are reinstalled.
3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 4119

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls, above-grade stem walls and grade beams.
   3. Slabs-on-grade.
   4. Miscellaneous concrete.
   5. Equipment pads and bases.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast- furnace slag, and silica fume; subject to compliance with requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Waterstops.
   6. Curing compounds.
   7. Floor and slab treatments.
   8. Bonding agents.

9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Owner will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least 2 edges and 1 side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, ¾- by ¾-inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class F or C.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/8-inch nominal maximum aggregate size.

D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   3. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   4. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete,
   ¾- by 1 inch.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
      b. CETCO; Volclay Waterstop-RX.
      c. Concrete Sealants Inc.; Conseal CS-231.
      d. Greenstreak; Swellstop.

e. Henry Company, Sealants Division; Hydro-Flex.
f. JP Specialties, Inc.; Earth Shield Type 20.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Fortifiber Corporation; Moistop Ultra A or 15.
      b. Inteplast Group; VB-350.
      c. Raven Industries Inc.; Vapor Block 15.
      d. W. R. Meadows; Perminator, 15 mil.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, provide the following:
      a. L&M Construction Chemicals, Inc.; Seal Hard.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Conspec by Dayton Superior; Aquafilm.
      b. Euclid Chemical Company (The), an RPM company; Eucobar.
      c. L&M Construction Chemicals, Inc.; E-CON.
      d. Meadows, W. R., Inc.; EVAPRE.
      e. Sika Corporation; SikaFilm.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Conspec by Dayton Superior; W.B. Resin Cure.
      b. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
      c. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
      d. L&M Construction Chemicals, Inc.; L&M Cure R.
      e. Meadows, W. R., Inc.; 1100-CLEAR.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8-inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8- to 1/4-inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4,100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from ¼-inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8- to 1/4-inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

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

B. Cementitious Materials: As indicated on structural drawings.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4,000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Slump Limit: 4 inches, plus or minus 1 inch.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4,000 psi at 28 days, 550 psi flexural at 28 days.
   2. Slump Limit: 3 inches, plus or minus 1 inch.
   3. Maximum Water-Cementitious Materials Ratio: 0.42.

2.14 FABRICATING REINFORCEMENT

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

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

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

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

   1. Class A, 1/8-inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

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

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

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

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

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

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one- fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than ½-inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to 1 side of joint.

3.8 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 degrees F for 3 successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than 1 day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one- half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8-inch.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in- place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: 4,000 psi at 28 days.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
   6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2-lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer, unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

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

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½-inch in any dimension to solid concrete. Limit cut depth to ¾-inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼-inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain 1 composite sample for each day's pour of each concrete mixture exceeding 5 cubic yards, but less than 25 cubic yards, plus 1 set for each additional 50 cubic yards or fraction thereof.
2. Testing Frequency: Obtain at least 1 composite sample for each 100 cubic yards or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than 5 compressive-strength tests for each concrete mixture, testing shall be conducted from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
3. Slump: ASTM C 143/C 143M; 1 test at point of placement for each composite sample, but not less than 1 test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; 1 test for each composite sample, but not less than 1 test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; 1 test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and 1 test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; 1 test for each composite sample, but not less than 1 test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure 2 sets of 2 standard cylinder specimens for each composite sample.
   b. Cast and field cure 2 sets of 2 standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 set of 2 laboratory-cured specimens at 7 days and 1 set of 2 specimens at 28 days.
   a. Test 1 set of 2 field-cured specimens at 7 days and 1 set of 2 specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of 2 specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory- cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

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

END OF SECTION 03 3000

SECTION 03 3510 - POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section specifies polished concrete.

1.2 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:
1. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
2. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.
3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

C. National Floor Safety Institute (NFSI):
1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
2. Reflectivity: Increase of 35% as determined by standard gloss meter.
3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.
4. High Traction Rating: NFSI 101-A, non-slip properties.

B. Design Requirements:
1. Hardened Concrete Properties:
   a. Minimum Concrete Compressive Strength: 3500 psi (24 MPa).
   b. Normal Weight Concrete: No lightweight aggregate.
   c. Non-air entrained.
2. Placement Properties:
   a. Natural concrete slump of 4 1/2 inches - 5 inches (114 - 127 mm). Admixtures may be used.
   b. Flatness Requirements:
      1) Overall FF 40.
      2) Local FF 20.
3. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5

floor.

4. Curing Options:
   a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure).
      1) Acrylic curing and sealing compounds not recommended.
   b. Sheet membrane (ASTM C171); polyethylene film not recommended.
   c. Damp Curing: Seven day cure.

1.4 ACTION SUBMITTALS

A. General: Submit listed action submittals in accordance with Contract Conditions and Section 01 3300 - Submittal Procedures.

B. Shop Drawings: Indicate information on shop drawings as follows:
   1. Plan view of floor and joint pattern layout.
   2. Hardener, sealer, densifier in notes.

C. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.

1.5 INFORMATION SUBMITTALS

A. Quality Assurance:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in 1.03 Performance Requirements.
   2. Certificates:
      a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
      b. Current contractor's certificate signed by manufacturer declaring contractor as an approved installer of polishing system.
   3. Manufacturer's Instructions: Manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Submit warranty documents specified.

B. Operation and Maintenance Data: Submit operation and maintenance data for installed products in accordance with Section 01 7823 - Closeout Submittals.
   1. Include:
      a. Manufacturer's instructions on maintenance renewal of applied treatments.
      b. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   2. Installer trained and holding current certification for FGS PermaShine installation.
   3. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Regulatory Requirements.
   1. NFSI Test Method 101-A Phase Two Level High Traction Material.

C. Mock-Ups:
   1. Construct mock-ups in accordance with Section 01 4000 - Quality Requirements
   2. Mock-Up Size: 4 foot x 4 foot sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement.
   3. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine.
   4. Allow 24 hours for inspection of mock-up before proceeding with work.
   5. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

D. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Environmental requirements.
   1. Scheduling and phasing of work.
   2. Coordinating with other work and personnel.
   3. Protection of adjacent surfaces.
   4. Surface preparation.
   5. Repair of defects and defective work prior to installation.
   6. Cleaning.
   7. Installation of polished floor finishes.
   8. Application of liquid hardener, densifier.
   9. Protection of finished surfaces after installation.

1.8 DELIVERY, STORAGE & HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery:
   1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.

C. Storage and Protection:
   1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   2. Protect concrete slab.
      a. Protect from petroleum stains during construction.
      b. Diaper hydraulic power equipment.
      c. Restrict use of pipe cutting machinery.
      d. Restrict placement of reinforcing steel on slab.
      e. Restrict use of acids or acidic detergents on slab.

D. Waste Management and Disposal:
   1. Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.9 PROJECT AMBIENT CONDITIONS

A. Installation Location: Comply with manufacturer's written recommendations.

1.10 SEQUENCING

A. Sequence With Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.11 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

C. Warranty: Commencing on date of acceptance by Owner]

1.12 MAINTENANCE

A. Comply with manufacturer's written instructions to maintain installed product.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.

2.2 POLISHED CONCRETE FINISHING PRODUCTS

A. Manufacturer: Subject to compliance with requirements provide the listed products before by L & M Construction Chemicals, Inc. 800.362.3331 or approved equals.

B. Proprietary Products/Systems:
   1. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
      a. Acceptable Material: L & M Construction Chemicals, Inc., FGS Hardener Plus.
   2. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
      a. Acceptable Material: Metzger/McQuire Spal-Pro RS 88
      b. Color: Unless noted otherwise all other joint color to match concrete.
   3. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.
      a. Acceptable Material: L & M Construction Chemicals, Inc., Aquapel Plus
   4. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI).
      a. Acceptable Material: L & M Construction Chemicals, Inc., FGS Concrete Conditioner.
   5. Finish: Standard Medium gloss (MG-2), 800 grit.

2.3 SOURCE QUALITY CONTROL

A. Ensure concrete finishing components and materials are from single manufacturer.

PART 3 EXECUTION

3.1 MANUFACTURERS INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and L & M Construction Chemicals, Inc., SPEC-DATA sheets.

3.2 EXAMINATION

A. Site Verification of Conditions:
   1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.

B. Verify Concrete Slab Performance Requirements:
   1. Verify concrete is cured to 28 day psi strength as indicated in Drawings..
   2. Verify concrete surfaces received a hard steel-trowel finish (3 passes) during placement.

3.3 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

B. Examine surface to determine soundness of concrete for polishing.

C. General Contractor to remove surface contamination.

D. Saw cuts to be done prior to concrete curing product application or saw cut after the curing product has dried.

3.4 INSTALLATION

A. Floor Surface Polishing and Treatment:
   1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
   2. Apply floor finish prior to installation of fixtures and accessories.
   3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine grit using dry method.
      a. Comply with manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall match that of approved mock-up.
      b. Expose aggregate in concrete surface only as determined by approved mock-up.
      c. All concrete surfaces shall be as uniform in appearance as possible.
   4. Apply FGS Hardener Plus, Hardener, Densifier As Follows:
      a. First coat at 250 ft^2/gal (6.25 m^2/L).
      b. Second coat at 350 ft^2/gal (8.75 m^2/L).

c. Follow manufacturer's recommendations for drying time between successive coats.

6. Remove defects and repolish defective areas.
7. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

3.5 ADJUSTMENTS

A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.

B. Fill joints flush to surface.

3.6 FINAL CLEANING

A. Do cleanup in accordance with Section 01 7419 - Cleaning and Waste Management.

B. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution.

C. Upon completion, General Contractor must remove surplus and excess materials, rubbish, tools and equipment.

3.7 PROTECTION

A. Protect installed product from damage during construction.

B. Protect with EZ Cover™ by McTech Corp., or comparable product.

3.8 SCHEDULE

A. Optional Finish Medium Gloss MG-2.

END OF SECTION 03 3510

SECTION 04 2200 - CONCRETE UNIT MASONRY

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Steel reinforcing bars.
   4. Masonry joint reinforcement.
   5. Miscellaneous masonry accessories.

B. Related Sections: Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
   1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
   2. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
   3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Reinforcing bars.
   6. Joint reinforcement.
   7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for each type of exposed unit masonry construction in sizes approximately 72 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
      a. Include a sealant-filled joint at least 16 inches long in each mockup.
      b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
      c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
   2. Protect accepted mockups from the elements with weather-resistant membrane.
   3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
      a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
      b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,800 psi.
   2. Density Classification: Lightweight.
   3. Size (Width): Manufactured to dimensions 3/8-inch less than nominal dimensions.

2.3 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91.

E. Mortar Cement: ASTM C 1329.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4-inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.

H. Aggregate for Grout: ASTM C 404.

I. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized, carbon steel.
   3. Wire Size for Side Rods: 0.148-inch diameter.
   4. Wire Size for Cross Rods: 0.148-inch diameter.
   5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
      b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
      c. Hohmann & Barnard, Inc.; No. RB or No. RB-Twin Rebar Positioner.
      d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. For reinforced masonry, use portland cement-lime mortar.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For reinforced masonry, use Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2,000 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2-inch or minus 1/4-inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2-inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4-inch in a story height or 1/2-inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4-inch in 10 feet, or 1/2-inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4-inch in 10 feet, or 1/2-inch maximum.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to 1/2-inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8-inch or minus 1/4-inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches unless otherwise indicated.

3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8-inch on exterior side of walls, 1/2-inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches on center.
   2. Space reinforcement not more than 8 inches on center in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in- plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install preformed control-joint gaskets designed to fit standard sash block.

2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.8 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Frequency: One set of tests for each 5,000 square feet of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
   1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2200

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Grout.

B. Related Requirements:
   1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
   2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other steel items not defined as structural steel.
   3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for surface-preparation and priming requirements.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, and shop-painting applicators.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

F. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50.

E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

F. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
   1. Configuration: Straight.
   2. Nuts: ASTM A 563 heavy-hex carbon steel.
   3. Plate Washers: ASTM A 36/A 36M carbon steel.
   4. Washers: ASTM F 436, Type 1, hardened carbon steel.
   5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
   1. Nuts: ASTM A 563 heavy-hex carbon steel.
   2. Plate Washers: ASTM A 36/A 36M carbon steel.
   3. Washers: ASTM F 436, Type 1, hardened carbon steel.
   4. Finish: Plain.

F. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.3 PRIMER

A. Primer: SSPC-Paint 25, Type I, Type II, zinc oxide, alkyd, linseed oil primer.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for

Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.
   4. Galvanized surfaces.
   5. All structural steel that is not exposed to view.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply 2 coats of white shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
   3. Primer shall be equal to SW-KEN Bond HS Universal Metal Primer B50W24.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Ultrasonic Inspection: ASTM E 164.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Ultrasonic Inspection: ASTM E 164.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.6 REPAIRS AND PROTECTION

A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 1200

SECTION 05 2100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. Joist accessories.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 042200 "Unit Masonry" for installing bearing plates in unit masonry.
3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.2 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings and Calculations:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists per SJI specifications.

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds ¼-inch per 12 inches.

2.3 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard white shop primer complying with performance requirements in SSPC-Paint 15. Primer shall be equal to SW-KEN Bond HS Universal Metal Primer B50W24.

2.4 JOIST ACCESSORIES

A. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within ½-inch of finished wall surface unless otherwise indicated.

D. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

   1. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

   1. Finish: Plain.

F. Welding Electrodes: Comply with AWS standards.

G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than 1 piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:

   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Ultrasonic Testing: ASTM E 164.

C. Visually inspect bolted connections.

D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 05 3100 - STEEL DECKING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof deck.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Section 099113 "Exterior Painting" for repair painting of primed deck and finish painting of deck.
   5. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Epic Metals Corporation.
   2. Nucor Corp.; Vulcraft Group.
   3. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard, white, equal to SW-KEN Bond HS Universal Metal Primer B50W24.
   2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
   3. Deck Profile: Type WR, wide rib.
   4. Profile Depth: 1-1/2 inches and 3 inches.
   5. Design Uncoated-Steel Thickness: As indicated.
   6. Span Condition: Triple span or more.
   7. Side Laps: Overlapped.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of

same material and finish as deck, and of thickness and profile recommended by SDI Publication 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747-inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747-inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members per structural general notes.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels

between supports per structural general notes, and as follows:
1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least 1 fastener at each corner.
1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 3100

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Ceiling joist framing.
4. Soffit framing.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. ClarkWestern Building Systems, Inc.
2. Dietrich Metal Framing; a Worthington Industries Company.
3. Nuconsteel; a Nucor Company.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

   a. Exterior and Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
   b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure,

connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F.

4. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

B. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H.
2. Coating: G60.

2.4 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 1-5/8 inches.
3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Match steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: Match steel studs.
2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 2 inches, minimum.
3. Section Properties: As indicated.

2.6 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 2 inches, minimum.
3. Section Properties: As indicated.

2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Stud kickers and knee braces.
7. Joist hangers and end closures.
8. Hole reinforcing plates.

9. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon- steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, ¼-inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than 3 exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of- square tolerance of 1/8-inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than ¼-inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16-inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in 1-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal ladders
   2. Miscellaneous steel trim.
   3. Steel framing and supports for countertops.

1.2 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
      a. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Provide allowance for trimming and fitting at site.

1.4 COORDINATION

A. Coordinate installation of anchorage for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for Work of another Section. Deliver such items to Project Site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast curing, lead- and chromate-free, universal modified-alkyd primer complying with Division 09 Painting section.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Cap ends of tube steel countertop supports unless otherwise indicated.

2.7 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3 unless otherwise indicated.
   2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:
   1. Space siderails of ladders 18 inches apart unless otherwise indicated.
   2. Provide nonslip abrasive surfaces on top of each rung.
   3. Galvanize exterior and interior ladders, including brackets and fasteners.
   4. Prime ladders, including brackets and fasteners, with primer specified in Division 09 Painting section.
   5. Comply with OSHA standards.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer specified in Division 09 Painting section.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS

A. Fill bollards solidly with concrete and allow concrete to cure seven days before installing metal caps.

B. Anchor bollards in concrete in formed or core-drilled holes. Fill annular space around bollard solidly with nonshrink, nonmetallic grout.

C. Where bollards are indicated to have concrete caps, mound top surface to shed water unless otherwise shown.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5000

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel pipe tube railings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
      b. Infill load and other loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.
   3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

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

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed).

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).
   1. Style Designation: 3/4 number 13

F. Woven-Wire Mesh: Intermediate-crimp, diamond square pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

C. Etching Cleaner for Galvanized Metal: Complying with Division 09 Painting sections.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Shop Primers: Provide primers that comply with Division 09 Painting sections.

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with Division 09 Painting sections..

H. Epoxy Intermediate Coat: Complying with Division 09 Painting sections and compatible with primer and topcoat.

I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

J. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
   2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
   3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Do not apply primer to galvanized surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Anchor posts in concrete by inserting into preset metal pipe sleeves and grouting annular space.

D. Anchor posts to metal surfaces with oval flanges unless otherwise indicated.

E. Attach railings to wall with wall brackets, except where end flanges are used. Use type of bracket with predrilled hole for exposed bolt anchorage unless otherwise indicated.

F. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5213

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood blocking, cants, and nailers.
   2. Wood furring and grounds.
   3. Plywood backing panels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.

E. Complete treatment of treated items before treatment where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Wood Screws: ASME B18.6.1.

D. Lag Bolts: ASME B18.2.3.8M.

E. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Contractor shall provide and install blocking, framing and incidental support for all buuit-in and surface mounted items. Locations shall coordinated with work of other trades.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Attach wood grounds, nailers, blocking and sleepers to substrate to support applied loading. Recess bolts and nuts flush with wood surfaces, unless otherwise indicated. Build into masonry during the installation of masonry work. Where possible, anchor to formwork before concrete placement.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1000

SECTION 06 1600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall sheathing.
   2. Sheathing joint and penetration treatment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.".

2.2 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where plywood is indicated, use fire-retardant treated materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.4 WALL SHEATHING

A. Plywood Wall Sheathing: Thickness as indicated.

B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
   1. Type and Thickness: As indicated or to match thickness of adjacent gypsum board products.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Coordinate wall roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
   1. Combination Subfloor-Underlayment:
      a. Glue and nail to wood framing.
      b. Screw to cold-formed metal framing.
      c. Space panels 1/8 inch apart at edges and ends.
   2. Wall and Roof Sheathing:
      a. Nail to wood framing.
      b. Screw to cold-formed metal framing.
      c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing or wood framing with screws.
   2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 1600

SECTION 06 4013 – WOOD SOFFIT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior wood soffit and suspension system.

B. Related Requirements:

   1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.

1.2 SUBMITTALS

A. Product Data: For each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:
   1. Lumber and panel products for transparent finish, for each species and cut, finished on one side and one edge. Submit two samples, 12 inch long.

D. Mockups:
   1. Submit mock-up of wood systems approximately 2 foot by 2 foot showing installation fastener method, and component connections.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.

B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 WOOD SOFFIT

A. Exterior Wood Soffit:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
   a) Product Configuration: Exterior hardwood soffit/decking by Advantage Lumber or equivalent manufacture.
   b) Wood Species: Garapa (Brazilian Ash)
   c) Size: 5/4 x 6
   d) Reveal: Tongue and Groove (Decking)
   e) Finish: Satin Clear
   f) Fasteners: Deckwise Hidden Fasteners

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
1. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
2. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

C. Suspension Systems: The suspension system shall consist of a manufacturer approved system for an exterior application.

2.4 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

   1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

C. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long.
   1. Tongue and groove at end-to-end joints.
   2. Stagger end joints in adjacent and related members.
   3. Miter corners.

4. Fill joints to provide continuous level surfaces.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install flat-grain lumber with bark side exposed to weather.

B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

E. Align fasteners.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 2013

SECTION 07 1700 - BENTONITE WATERPROOFING AND SLAB INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bentonite waterproofing of walls below grade including equipment pits (walls and pit slab).
   2. Exterior perimeter insulation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Material certificates.

C. Product test reports.

D. Sample warranty.

1.3 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer and Installer agree(s) to repair or replace components of bentonite waterproofing system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to the following:
   1. Water penetrating the building or structure.
   2. Deteriorated or displaced waterproofing materials.

B. Warranty Period: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 BENTONITE WATERPROOFING MEMBRANE

A. Standard Waterproofing Membrane: Interlocked geotextiles encapsulating a minimum 1.10-lbs per square foot (5.37 kg/sqm) of granular sodium bentonite. Composite shall consist of one woven and one nonwoven polypropylene geotextile, interlocked using a needle-punching process that produces several interlocks per square inch (6.5 sq cm) over the entire area of the product.
   1. Basis-of-Design Product: Subject to compliance with requirements provide the following:
      a. CETCO; Voltex or equal as approved by Architect.

2.2 INSTALLATION ACCESSORIES

A. General: Manufacturer's standard accessories recommended for intended use and compatible with bentonite waterproofing.

B. Perimeter Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged.
   1. Type VI, 40-psi minimum compressive strength.
   2. Thickness: 2 inches.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Prepare substrates to be waterproofed, install waterproofing and accessories, and protect waterproofing from damage and wetting according to manufacturer's written instructions.

B. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.

C. Install waterproofing and accessories according to manufacturer's written instructions, standard details, and recommended practice.

D. Install wall-to-footing bentonite continuously at base of wall waterproofing (on footing against wall) according to manufacturer's written instructions.

3.2 BENTONITE WATERPROOFING MEMBRANE INSTALLATION

A. SLAB / BACKFILLED WALL FOOTING EDGE TRANSITION COURSE

1. Inside the slab/footing form edge, secure waterproofing sheet horizontally oriented (white geotextile side down; dark gray geotextile side up) to the top inside edge of the exterior slab/footing form with the sheet conforming to the interior form surfaces and then extending out onto the horizontal slab substrate a minimum 12" (300 mm). Overlap edges of adjacent waterproofing sheets a minimum 4" (100 mm) and secure to prevent sheet movement during construction or concrete placement. Retain subparagraph below if substrate is subject to hydrostatic pressure of 33 feet of water column (100 kPa) or more.

B. UNDER SLAB INSTALLATION

1. Install waterproofing under all footings, elevator pits and grade beams when hydrostatic conditions exists or are anticipated per the historical high ground water elevation reported in the project's geotechnical documents.

2. Install waterproofing membrane (white geotextile side down; dark gray geotextile side up) extending to interior edge of footing/slab edge, fully overlapping the 12" (300 mm) horizontal tail of the waterproofing slab edge sheet installed in Section 3.04B. Overlap edges of adjacent waterproofing sheets a minimum 4" (100 mm) and secure to prevent sheet movement during construction or concrete placement.

3. Place waterproofing directly on properly prepared substrate (white geotextile side down; dark gray geotextile side up facing installer) with adjoining edges overlapped a minimum of 4" (100 mm). Stagger sheet end seams a minimum of 24" (60 cm). Mechanically fasten or staple waterproofing as required to prevent movement from construction operations or concrete placement. When the slab is poured in sections, extend waterproofing a minimum 12" (300 mm) beyond the slab edge to enable proper overlapping.

4. Install waterproofing system at all grade beams, pile caps, and other detail areas in accordance with manufacturer's detail for specific project condition(s).

C. BACKFILLED CAST-IN-PLACE CONCRETE WALLS

1. Place Hydrobar Tubes along the wall/footing intersection with ends "butted" tightly together to form a continuous installation.

2. Trowel 3/4" (18 mm) thick, continuous Bentoseal fillet at all inside wall corner transitions. Trowel Bentoseal form-tie pockets/patches and any slightly irregular concrete surface honeycomb areas.

3. Starting at the base of the wall, install waterproofing sheet horizontally (dark gray geotextile side against the wall; white geotextile side facing installer) covering the Hydrobar Tubes and extending onto the footing a minimum of 6" (150 mm). For hydrostatic conditions, cover the entire footing and overlap waterproofing membrane from underslab work a minimum of 6" (150 mm). Attach waterproofing sheet using washer-headed mechanical fasteners maximum 24" (600 mm) on center. Overlap all adjacent sheet edges a minimum 4" (100 mm). Stagger all vertical overlap seams a minimum of 12" (300 mm).

4. After the bottom horizontal course, waterproofing sheets can be installed either vertically or horizontally oriented. Continue waterproofing installation up wall to finished grade elevation detail, staggering all sheet roll ends of adjacent courses a minimum 12" (300 mm). Do not allow horizontal waterproofing overlap joints to run at same elevation as the concrete pour lift joints. Overlap all adjacent waterproofing sheet edges a minimum 4" (100 mm) and secure with washer-head fastener maximum 24" (600 mm) on center.

5. Terminate waterproofing membrane 12" (300 mm) below finished grade elevation secured with washer-head fasteners maximum 12" (300 mm) on center to exterior surface of concrete wall. Per manufacturer's detail for specific project condition(s), install GS-40SA grade flashing to primed concrete substrate with bottom edge overlapping top edge of waterproofing membrane minimum 4" (100 mm). Overlap all roll ends a minimum 4" (100 mm) to form a continuous flashing. Height of flashing shall be per project details and specifications. Install a rigid termination bar along the top edge of GF-40SA; fastened maximum 12" (300 mm) on center. Complete grade termination detail with tooled bead of CETSEAL along the top edge, at all penetrations through the flashing, and all exposed overlap seams.

D. Penetrations: For all pipe, rebar, structural and other penetrations install waterproofing system in accordance with manufacturer's detail for specific project condition(s).

E. Inspect finished waterproofing system installation and repair any damaged material prior to slab and backfill placement. Assure that waterproofing system is not displaced during backfill placement or soil compaction.

3.3 INSULATION INSTALLATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

END OF SECTION 07 1700

SECTION 07190 – WATER REPELLENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes clear water-repellent coatings for the following vertical and nontraffic horizontal surfaces:
   1. Interior Concrete (unpainted).
   2. Concrete unit masonry (unpainted and unglazed).

1.2 PERFORMANCE REQUIREMENTS

A. Provide water repellents with the following properties based on testing manufacturer's standard products, according to test methods indicated, applied to substrates simulating Project conditions using same materials and application methods to be used for Project.
   1. Absorption: Minimum 90 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.
      a. Concrete Unit Masonry: ASTM C 140.
      b. Hardened Concrete: ASTM C 642.
   2. Water-Vapor Transmission: Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, per ASTM E 96.
   3. Water Penetration and Leakage through Masonry: Maximum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E 514.
   4. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 53.
   5. Permeability: Minimum 80 percent breathable in comparison of treated and untreated specimens, per ASTM D 1653.
   6. VOC content: In accordance with applicable rules and regulations.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

B. Applicator Certificates: Signed by manufacturer certifying that the applicator complies with requirements.

C. Material Test Reports: Indicate and interpret test results for compliance of water repellents with requirements indicated.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who employs only persons trained and approved by water repellent manufacturer for application of manufacturer's products.

B. Testing Agency Qualifications: An independent testing agency with experience and capability to conduct testing indicated in "Performance Requirements" Article without delaying the Work, per ASTM E 548.

C. Mock Up Samples: Architect will select one representative surface, including joints, for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed. Comply with application requirements of this Section.
   1. Obtain Architect's approval of mock-ups before applying water repellents.
   2. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.5 PROJECT CONDITIONS

A. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:
   1. Ambient temperature is less than 40 deg F (4.4 deg C).
   2. Concrete surfaces and mortar have cured for less than 28 days.
   3. Rain or temperatures below 40 deg F (4.4 deg C) are predicted within 24 hours.
   4. Application is earlier than 24 hours after surfaces have been wet.
   5. Substrate is frozen or surface temperature is less than 40 deg F (4.4 deg C).
   6. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

1.6 WARRANTY

A. Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch (1.5 mm) wide, fire, vandalism, or abuse by maintenance equipment.
   1. Warranty Period: 5 years from date of Final Acceptance.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products: Provide the following products for substrates as indicated or equal as approved by Architect:
   1. Concrete: Enviroseal 20.
   2. Concrete Masonry Units: Enviroseal PBT.

2.2 WATER REPELLENTS

A. Low-Solids Acrylic: Water-clear, breathing coating of acrylic resins; water-based, solvent- based, or acrylic emulsion solution containing less than 15 percent solids by volume.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.
   1. Formed Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.

B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

C. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
   1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

3.2 APPLICATION

A. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized technical service representative to inspect and approve the substrate before application and to instruct the applicator on the product and application method to be used.

3.4 CLEANING

A. Protective Coverings: Remove protective coverings from adjacent surfaces and other protected areas.

B. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Foam-plastic board insulation.
   2. Glass-fiber blanket insulation.
   3. Vapor retarders.
   4. Masonry foamed in place insulation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire Performance Characteristics: Provide insulation with fire performance characteristics indicated per ASTM E 119, ASTM E 84 and E 136, as applicable, and which correspond to products listed in UL "Fire Resistance Directory" or "Building Materials Directory".
   1. Except as otherwise specified or required by code, insulation materials, including facings and components shall have a flame-spread rating not to exceed 25, and a smoke density not to exceed 450.

C. Unless otherwise indicated, provide R-19 insulation at walls and R-30 insulation at roof.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   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. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.

2. Type X, 15 psi.
3. Thickness: As indicated.

2.2 BLANKET INSULATION

A. 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:
1. CertainTeed Corporation.
2. Johns Manville.
3. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Safing insulation: Mineral fiber; UL approved, non-combustible when tested in accordance with ASTM E 84, having flame spread of 15 and smoke development of 0. Provide with Code approved galvanized steel closures, clips, and ties to secure safing insulation and conform to Code.

2.3 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm when tested by ASTM E 96.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.4 MASONRY INSULATION (FOAMED IN PLACE INSULATION)

A. Manufacturers: Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Core-Fill 500; by Tailored Chemical Products, Inc.; Hickory, NC; (704) 322-6512.
2. Tripolymer Foam Insulation; by C.P. Chemical Co., Inc.; White Plains, NY.; (914) 428-2517.
3. Rapco Blue; by JESCO, Inc.; Florence, SC; (803) 665-5350.
4. R-501 Polymaster Plastic Foam Insulation; by PolyMaster, Inc.; Knoxville, TN; (615) 966-3005.
5. Thermco Foam; by Thermal Corp. of America; Mt. Pleasant, IA; (319) 385-1535.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

E. Examine areas which receive insulation to insure protection against inclement weather during and after installation.

F. Examine space allocated for insulation for proper depth to receive material. Verify that depth of space available can accommodate thickness of insulation necessary to achieve required R value.

G. Correct unsuitable conditions before proceeding with installation.

3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Sill Plate Gasket: Install in accordance with manufacturer's written instructions. Install in longest lengths possible. Coordinate placement with work of other trades. Install at all exterior framed walls.

3.3 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to

insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.4 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
   1. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.5 INSTALLATION OF MASONRY INSULATION

A. Install insulation in masonry unit cores at all exterior walls for Concrete Masonry Unit block exterior walls unless otherwise noted.

   1. Confirm that selected foam insulation material is compatible and non-detrimental to referenced fire resistance assemblies before use.

   2. Installer shall be certified and/or approved by manufacturer of insulation. Install foam insulation in accordance with manufacturer's published instructions.

   3. Drill holes on interior face; holes on exterior face will not be permitted. Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely

END OF SECTION 07 2100

SECTION 07 2500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Building paper.
   2. Building wrap.
   3. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Chemical Company; Styrofoam Weathermate Plus Brand Housewrap.
      b. DuPont; Tyvek CommercialWrap.
      c. Ludlow Coated Products; Barricade Building Wrap.
   2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
   1. Products: Subject to compliance with requirements, provide one of the following :
      a. DuPont; DuPont Flashing Tape.
      b. Grace Construction Products; Vycor Butyl Self Adhered Flashing.
      c. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier as follows:
   1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
   2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.
   1. Seal seams, edges, fasteners, and penetrations with tape.
   2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
   1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
   2. Lap flashing over water-resistive barrier at bottom and sides of openings.
   3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 07 2500

SECTION 07 4113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standing-seam metal roof panels.

1.2 PERFORMANCE REQUIREMENTS

A. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

C. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail Resistance: SH.

D. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
   1. Wind Loads: Determine loads based on the following minimum design wind pressures:
      a. Uniform pressure as indicated, acting inward or outward.
   2. Snow Loads: As indicated.
   3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.

E. Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

C. Samples: For each type of exposed finish required.

D. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Combustion Characteristics: ASTM E 136.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Final Acceptance.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
   2. Surface: Smooth, flat finish.
   3. Exposed Coil-Coated Finish: Galvalume Plus/
   4. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish.

B. Panel Sealants:
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; as recommended in writing by metal roof panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 FIELD-INSTALLED THERMAL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60-lb/cu. ft. minimum density unless otherwise indicated; with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

2.3 UNDERLAYMENT MATERIALS

A. Ice and Water Shield: Tamko TW Metal and Tile Underlayment, self-adhering silicone treated

release sheet on adhesive side.

2.4 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
   2. Manufacturers: Subject to compliance with requirements, provide Peterson Aluminum Corporation Snap-Clad product or an equal from one of the following :
      a. Architectural Building Components
      b. Berridge Manufacturing Company.
      c. MBCI; a division of NCI Building Systems, L. P.
      d. McElroy Metal, Inc.
   3. Profile: Vertical-rib, snap-joint, as indicated on Drawings.
   4. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch nominal thickness.
      a. Exterior Finish: As indicated on Drawings.
      b. Color: As indicated on Drawings.
   5. Clips: Floating to accommodate thermal movement.
      a. Material: Metallic coated steel.
   6. Joint Type: As standard with manufacturer.
   7. Panel Coverage: 16 inches.
   8. Panel Height: 1 ½ inches to 2 inches

2.6 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
   2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
   3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Gutters & Downspouts: Refer to Specification Section 07 6200 Sheet Metal Flashing and Trim.

2.7 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Ice and Water Shield Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.

B. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.2 THERMAL INSULATION INSTALLATION

A. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 07 Section "Thermal Insulation."
   1. Erect insulation and hold in place with Z-shaped furring members spaced 24 inches o.c. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches o.c.

3.3 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   3. Provide elbows at base of downspouts to direct water away from building.
   4. Install snow guards per manufacturer's recommendations at locations indicated.

3.5 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 07 4113

SECTION 07 5216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.

1.2 PERFORMANCE REQUIREMENTS

A. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For membrane cap sheet and flashing sheet, of color specified.

C. Shop Drawings: Produced or approved by manufacturer. Include plans, sections, details, and attachments to other work, for the following:
   1. Base flashing, cants, and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strip, including slopes.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to receive the standard roofing manufacturer's warranty.

E. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency. Indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

F. Sample copy of warranty.

G. Maintenance data.

H. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roof installation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

B. Source Limitations: Obtain components for membrane roofing system from same manufacturer as

membrane roofing or approved by membrane roofing manufacturer.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency.

1.5 WARRANTY

A. Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 20 years from date of Final Acceptance.

B. Special Warranty: Submit roofing installer's warranty, signed by installer, covering the Work of this Section, including membrane roofing, base flashing, roofing insulation, fasteners, vapor retarders, if any, for the following period.
   1. Warranty Period: 5 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A. SBS-Modified Bituminous Membrane Roofing:
   1. Manufacturers: Provide one of the following systems:
      a. Ruberoid MOP Plus / Ruberoid MOP FR / Ruberoid ULTRACLAD base flashings by GAF Materials Corporation.
      b. Dynaply / DynaGlas FR / Dynaclad base flashings by Johns Manville.
      c. Paradiene 20 / Paradiene 30 FR / Aluminum Veral base flashing by Siplast, Inc.
      d. 602 ULTRA Base / 625 ULTRA Cap / 1020 ESHAlum base flashing by Malarkey Roofing Products

2.2 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Asphalt Primer: ASTM D 41.

C. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by roofing system manufacturer for application.

D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to

roofing system manufacturer.

G. Catalyzed Acrylic Resin Flashing System: The flashing system consistsof a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the flashing system shall be specifically approved in advance by the membrane manufacturer for each application.

2.3 COVER BOARDS

A. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick over roof insulation and 1/2 inch thick at parapets.
   1. Products:
      a. Georgia-Pacific Corporation; Dens Deck Prime
      b. Other similar roof system manufacturer approved glass-mat product.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.4 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289-13e1, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Minimum Thermal R-Value: R-20 unless otherwise noted. LTTR value of 5.56 per inch.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to create a slope of 1/4 inch per 12 inches unless otherwise indicated.

2.5 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Cold-Applied Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

C. Insulation Cant Strips: ASTM C 728, perlite insulation board.

D. Wood Nailer Strips: Comply with requirements in Division 06 Section "Rough Carpentry."

E. Tapered Edge Strips: ASTM C 728, perlite insulation board.

2.6 WALKWAYS

A. Modified bitumen sheet material designed to be used as a protective course in roof areas with anticipated high pedestrian traffic or mechanical abuse potential., composed of an asphalt impregnated, puncture resistant polyester fabric core, coated with a polymer modified bitumen and topped with a ceramic-coated granule wearing surface.;
   1. Granule Color: Manufacturer's contrasting color.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Comply with roofing system manufacturer's written instructions for installing roof insulation.

B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

F. Mechanically Fastened Insulation: Install polyiso insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches in each direction from joints of insulation below. Loosely butt cover boards together and adhere in low rise insulation adhesive.

H. At the lower roof vestibule location, install insulation and cover board with low rise insulation adhesive direct to a cleaned and prepared metal deck, per roof membrane manufacturer's instructions.

3.2 ROOFING MEMBRANE INSTALLATION, GENERAL

1. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing

B. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.3 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane base ply and cap sheet ply with cold adhesive or hot asphalt applied within temperature range and according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps.

C. Install roofing membrane sheets so side and end laps shed water.

3.4 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation upon completion and submit report to Architect.
   1. Notify Architect at least 48 hours in advance of the date and time of the inspection.

3.6 PROTECTING AND CLEANING

A. Protect roof membrane from damage and wear during remainder of the construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report.

B. Correct deficiencies or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair base flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 5216

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured reglets and counterflashing.
   2. Formed roof drainage sheet metal fabrications.
   3. Formed low-slope roof sheet metal fabrications.3:12 pitch or less
   4. Formed wall sheet metal fabrications.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop and field assembled work.
   1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

C. Samples: Submit one 12 inch long sample of each metal type for each pre-finished color.

D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.4 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; finish.

C. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
   2. Surface: Mill phosphatized surface where indicated for field painting.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
   3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
   1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
   2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Concrete Splash Blocks: 24 inch by 12 inch by 2 inch thick precast concrete.

2.4 REGLETS

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions with interlocking counterflashing on exterior face, of same metal as reglet.
   1. Material: Galvanized steel, 0.022 inch thick or as indicated.
   2. Finish: Match adjacent wall color and gloss with manufacturer's standard color coating or as indicated.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Obtain field measurements for accurate fit before shop fabrication.
   2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

C. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Accessories: Wire ball downspout strainer.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Fabricate from the following materials:
      a. Galvanized Steel: 0.022 inch thick.

C. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates. Fabricate from the following materials:
   1. Galvanized Steel: 0.0239 inch thick.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight. Fabricate from the following materials:
   1. Galvanized Steel: 0.040 inch thick.

C. Base Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.0299 inch thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following materials:
   1. Galvanized Steel: 0.0239 inch thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.0239 inch thick.

F. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

2.9 FINISHES

A. Galvanized Steel: High-Performance Organic Coating Finish. Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.
   1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat thermocured system composed of inhibitive primer and fluoropolymer topcoat containing not less than 70 percent polyvinyldene fluoride resin by weight; complying with AAMA 605.2.
   2. Color and Gloss: Match adjacent wall color and gloss unless otherwise indicated.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
   1. Coat back side of uncoated stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance .

E. Seal joints as shown and as required for watertight construction.

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
   1. Do not solder metallic-coated steel sheet.
   2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
   3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

G. Rivets: Rivet joints where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Install gutter with expansion joints not exceeding 50 feet apart, or as otherwise indicated. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
   1. Install concrete splash blocks where downspouts discharge on low-slope roofs and at-grade downspouts unless otherwise indicated.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper gutter discharge.

F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
   2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

C. Reglets: Installation of reglets is specified in Division 03 Section "Cast-in-Place Concrete" and Division 04 Section "Unit Masonry".

D. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07 6200

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Sealants and caulking of all new exterior and interior joints as indicated and as required to maintain total waterproof integrity of joints.
   2. Acoustical joint sealants.

B. Sealants and caulking of all new exterior and interior joints as indicated and as required to maintain total waterproof integrity of joints.

1.2 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

D. Product test reports.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.4 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: One year from date of Final Acceptance.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Suitability for Immersion in Liquids. Where sealants are indicated for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

A. Mildew-Resistant Neutral-Curing Silicone Joint Sealant: ASTM C 920.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
      a. BASF Building Systems.
      b. Dow Corning Corporation.
      c. GE Advanced Materials - Silicones.
      d. Pecora Corporation.
      e. Tremco Incorporated.
   2. Type: Single component (S).
   3. Grade: Nonsag (NS).
   4. Class: 25.
   5. Uses Related to Exposure: Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
      a. BASF Building Systems.
      b. Bostik, Inc.
      c. Pecora Corporation.
      d. Tremco Incorporated.
   2. Type: Multicomponent (M).
   3. Grade: Pourable (P) or Nonsag (NS).
   4. Class: 25.
   5. Uses Related to Exposure: Traffic (T) or Nontraffic (NT).

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

a. BASF Building Systems.
b. Bostik, Inc.
c. Pecora Corporation.
d. Tremco Incorporated.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
      a. Pecora Corporation; AC-20 FTR.
      b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      c. USG Corporation; SHEETROCK Acoustical Sealant.
   2. Apply acoustical joint sealants where indicated and as specified in other Division 09 Sections.

2.7 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

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

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
   1. Remove laitance and form-release agents from concrete.
   2. 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 sealants.

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

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

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 CURING

A. Cure sealants in accordance with manufacturer's printed instructions to obtain high early bond strength, internal cohesive strength, and durability.

B. If finished sealant has bubbles or other defects, replace sealant and backing.

3.4 PROTECTION AND CLEANING

A. Protect adjacent surfaces against stains, smears, and other damage during the sealant application.

B. Immediately clean and remove droppings, smears, and other soiling caused by sealant application. Use solvents and cleaning agents recommended by sealant manufacturer. Use in accordance with solvent and cleaning agent manufacturer's instructions. Leave no stain, damage, or discoloration on surfaces.

3.5 SCHEDULE

A. Exterior Joints:
   1. Joints in vertical surfaces:
      a. Multicomponent Nonsag Urethane Sealant.
      b. Color: To match adjacent material.
   2. Joints in horizontal surfaces subject to traffic:
      a. Multicomponent Pourable Urethane Sealant.
      b. Color: To match adjacent material.
   3. Joints at glazed openings to be in accordance with recommendation of glazing and frame manufacturer's and as follows:
      a. One-Part Nonacidic Curing Silicone Sealant.

B. Interior Joints:
   1. Joints in vertical surfaces, except in areas exposed to moisture:
      a. Latex Sealant.
      b. Color: To match adjacent material.
   2. Joints in areas exposed to moisture and where plumbing fixtures meet adjacent floor and wall finishes:
      a. Silicone-Emulsion Sealant.
      b. Color: To match adjacent material.
   3. Joints in horizontal surfaces subject to traffic:
      a. Multicomponent Pourable Urethane Sealant.
      b. Color: To match adjacent material.

END OF SECTION 07 9200

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hot dip galvanized standard hollow metal doors and frames.
   2. Fire-rated metal doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.

C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

D. Test Reports: Certified laboratory reports, performed in accordance with ASTM E90 and ASTM E 413, from independent testing laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) supporting compliance of assemblies to specified requirements.

1.3 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 .
   1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amweld Building Products, LLC.
   2. Ceco Door Products; an Assa Abloy Group company.
   3. Curries Company; an Assa Abloy Group company.
   4. Steelcraft; an Ingersoll-Rand company.
   5. Neoporte
   6. Brombal

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I.

H. Glazing: Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Comply with ANSI/SDI A250.8.
   1. Design: Flush panel.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, or mineral-board, with vertical steel stiffeners.
      a. Fire Door Core: As required to provide fire-protection ratings indicated.
      b. Thermal-Rated (Insulated) Doors: R-value of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
         1) All exterior doors unless otherwise noted.
   3. Vertical Edges for Single-Acting Doors: Beveled edge, 1/8 inch in 2 inches.
   4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.
   5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) Model 2 (Seamless).
   2. Fabricate doors from 18 gauge steel sheets.
   3. Galvanize.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) Model 2 (Seamless).
2. Fabricate doors from 18 gauge steel sheets.
3. Galvanize.

D. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated. Knock down frames are not acceptable.
3. Fabricate frames from 16 gauge steel sheet.
4. Fabricate with hospital stops.
5. Galvanize.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated. Knock down frames are not acceptable.
3. Fabricate frames from 16 gauge steel sheet.
4. Fabricate with hospital stops.
5. Galvanize.

D. Hardware Reinforcement: ANSI/SDI A250.6.

E. Bituminous Coating: Provide bituminous coating on backs of frames mounted in masonry or concrete construction.

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

B. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, same material as frames.

C. Terminated (Hospital) Stops: Terminate stops 4 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
   1. Doors specified with smoke or sound seals shall have standard full length stops.

2.7 LOUVERS

A. Provide sightproof louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch thick steel frame.

2.8 FABRICATION

A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

B. Hollow Metal Doors:
   1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.
   2. Glazed Lites: Factory cut openings in doors.
   3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.

C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
   2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   3. Provide countersunk, flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
   5. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Two anchors per jamb up to 60 inches high.
         2) Three anchors per jamb from 60 to 90 inches high.
         3) Four anchors per jamb from 90 to 120 inches high.
         4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
      b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Three anchors per jamb up to 60 inches high.
         2) Four anchors per jamb from 60 to 90 inches high.
         3) Five anchors per jamb from 90 to 96 inches high.
         4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
         5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
   6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
      a. Single-Door Frames: Three door silencers.
      b. Double-Door Frames: Two door silencers.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with electrical Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow metal work.
   5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
   1. Shop Primer: ANSI/SDI A250.10.

B. Galvanized Steel Doors, Louvers, Panels, and Frames: As indicated fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable glazing stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

D. Testing: Issue certified report documenting compliance of installed door and frame assemblies to specified acoustical performance requirements.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 1113

SECTION 08 3113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

C. Finish Samples: Provide manufacturer's full range of available baked enamel colors.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 for vertical access doors and frames.
   2. ASTM E 119 for horizontal access doors and frames.

1.4 COORDINATION

A. If retaining this Article, also retain "Schedule" Paragraph in "Submittals" Article.

B. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Factory-Primed Finish: Manufacturer's standard shop primer.
      a. For use at drywall ceilings and walls unless otherwise noted. Field paint to match adjacent painted finish.

2. Baked-Enamel Finish: To be selected by Architect from manufacturer's full range of colors. Minimum dry film thickness of 2 mils.
   a. For use on all prefinished ceilings and walls unless noted otherwise.

C. Drywall Beads: 0.0299-inch zinc-coated steel sheet to receive joint compound.

D. Plaster Beads: 0.0299-inch zinc-coated steel sheet with flange of expanded metal lath.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. J. L. Industries, Inc.
   2. Larsen's Manufacturing Company.
   3. Milcor Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Wall and ceiling.
   2. Door: Minimum 0.060 inch thick sheet metal.
   3. Frame: Minimum 0.060 inch thick sheet metal with 1 inch wide, surface-mounted trim.
   4. Hinges: Spring-loaded, concealed-pin type.
   5. Lock: Manufacturer's standard cylinder.

C. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Wall and ceiling surfaces.
   2. Fire-Resistance Rating: Not less than that of adjacent construction.
   3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
   4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
   5. Frame: Minimum 0.060 inch thick sheet metal with 1 inch wide, surface-mounted trim.
   6. Hinges: Concealed-pin type.
   7. Automatic Closer: Spring type.
   8. Lock: Manufacturer's standard self-latching device with cylinder lock.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 3113

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for punched openings.
3. Exterior and interior manual-swing entrance doors and door frame units.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Provide aluminum storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   1. Engineer shall confirm anticipated deflection of building structure prior to designing storefront system and include head receptors as required to conceal any exposed head joints greater than 1 inch.

C. Wind Loads: Provide storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures, 6.4.2 Analytical Procedure", whichever is more stringent.

D. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
   1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   2. Test Durations: 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to

ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples: For each type of exposed finish required.

D. Other Action Submittals:
   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

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

F. Product test reports.

G. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Final Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
   1. Warranty Period: 10 years anodized Class I Finish and 20 years painted finish from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America or comparable product by one of the following:
   1. EFCO Corporation.
   2. YKK AP America Inc.
   3. Vistawall Architectural Products by OldCastle Glass
   4. Tubelite Inc.
   5. Manko Window Systems, Inc.

B. The Drawings indicate size, profiles, and dimensional requirements of the aluminum storefront system and are based on the specific manufacturer and model indicated. Aluminum storefront systems having equal characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the concept or intended performance as judged by the Architect.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Systems:
   1. Exterior: Trifab VG 451T front set.
   2. Interior: Trifab VG 451 centered set.

B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction: Thermally broken for exterior; Non-thermal for interior.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: As indicated in drawings.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 1 1/2 inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded.
      a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

   2. Door Design: Basis of design is Kawneer 350 Series Medium Stile Entrance Door; 3 1/2-inch nominal width with 12 inch high bottom rail unless otherwise indicated. Refer to Drawings for special top or bottom rail widths.
      a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
   3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware".

2.6 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Refer to drawings for finish locations.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
   1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Test Area: A minimum area of 75 feet by 1 story of aluminum-framed systems .

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

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

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 08 4113

SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Mechanical door hardware for the following:
      a. Swinging doors.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Door Hardware Schedule:
   1. Prepared by or under the supervision of Installer. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
      a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
      b. Content: Include the following information:
         1) Identification number, location, hand, fire rating, size, and material of each door and frame.
         2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
         3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
         4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

C. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC/ANSI A117.1 .
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
      b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
   4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

G. Keying Conference: Conduct conference at Project site with Owner's representative to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Three years from date of Final Acceptance, unless otherwise indicated.
      a. Exit Devices: Two years from date of Final Acceptance.
      b. Manual Closers: 10 years from date of Final Acceptance.
      c. Concealed Floor Closers: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware to comply with requirements in this Section for each door as scheduled on Drawings and in Door Hardware Schedule.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
   2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the "Door Hardware Schedule" in this Section. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the "Door Hardware Schedule" in this Section.
   2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.3 CENTER-HUNG AND OFFSET PIVOTS

A. Center-Hung and Offset Pivots: BHMA A156.4.

2.4 MECHANICAL LOCKS AND LATCHES

A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt with curved lip extended to protect frame; finished to match lock or latch unless otherwise indicated.

B. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

2.5 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

2.6 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.7 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
   1. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.

B. Keys: Nickel silver.
   1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
      a. Notation: "DO NOT DUPLICATE".
   2. Quantity: In addition to one extra key blank for each lock, provide the following:
      a. Cylinder Change Keys: Three.
      b. Great-Grand Master Keys: Five.

2.9 OPERATING TRIM

A. Operating Trim: BHMA A156.6; brass bronze, unless otherwise indicated.

2.10 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.11 CONCEALED CLOSERS

A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.12 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.

2.13 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

2.14 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.15 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.16 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
   a. Wood or Machine Screws: For the following:
      1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
      2) Strike plates to frames.
      3) Closers to doors and frames.
   b. Steel Through Bolts: For the following unless door blocking is provided:
      1) Surface hinges to doors.
      2) Closers to doors and frames.
      3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in Door Hardware Schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors".

C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores.

H. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings.
   1. Configuration: Provide one power supply for each door opening with electrified door hardware.

I. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

N. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 08 7100

MANUFACTURERS LIST

DE	DETEX
CR	CORBIN RUSSWIN
PE	PEMKO
VD	VON DUPRIN
RO	ROCKWOOD
LC	LCN
PB	PBB
IV	IVES
GATE	BY GATE SUPPLIER

HARDWARE SET NO. 1

EACH TO HAVE:

COMPLETE WITH ALL HARDWARE BY GATE SUPPLIER EXCEPT:

1	V40XW-36 WITH WEATHERIZED EXIT ALARM (EBxW); 711 FINISH	DE
1	GTSTKBKT – STRIKE LATCH RECEIVER BRACKET	DE
1	GTPLGRD – GATE LATCH PROTECTOR	DE
1	GTPL – GATE PLATE	DE
1	03GS FUNCTION CYLINDER TRIM	DE
2	SPRING LOADED SELF-CLOSING HOT DIP GALVANIZED CHAINLINK GATE HINGE	GATE
1	EA. CYLINDER 3080-US26D	CR

HARDWARE SET NO. 2

COMPLETE WITH ALL HARDWARE BY GATE SUPPLIER EXCEPT:

1	EA. HEAVY DUTY DEAD BOLT LOCK GALVANIZED	GATE
1	DOUBLE GATE LATCH WITH CENTER DROP PIN	GATE
1	EA. CYLINDER 3080-US26D	CR

HARDWARE SET NO. 3

EACH TO HAVE:

2	EA. CONTINUOUS HINGES CFM-83-HD-D/4	PE
1	EA. EXIT DEVICE 99NL-OP-110MD-630	VD
1	EA. EXIT DEVICE 99EO-630	VD
1	EA. CYLINDER 1080-US26D	CR
1	EA. CYLINDER 3080-US26D	CR
1	EA. MULLION KR4954-SP28	VD
2	EA. PULLS BF158-HD-1-US32D	RO
2	EA. CLOSERS 4040XP-S-CUSH-ALUM	LC
2	EA. KICKPLATES K1050-10" X 2" LDW-US32D	RO
1	EA. THRESHOLD 2746-A-DW	PE
2	EA. SWEEPS 345-CV-DW	PE
1	SET WEATHERSTRIP S88D-H & J	PE

HARDWARE SET NO. 4

EACH TO HAVE:

COMPLETE WITH ALL HARDWARE BY DOOR SUPPLIER.

HARDWARE SET NO. 5

EACH TO HAVE:

3	EA. HINGES BB81-4.5 X 4.5-US26D	PB
1	EA. LOCKSET ML2057-102EZ-630	CR
1	EA. STOP 409/442-US26D	RO
1	SET GASKETING S88D-H & J	PE

HARDWARE SET NO. 6

EACH TO HAVE:

2	EA. CONTINUOUS HINGES CFM-83-HD-1	PE
1	EA. EXIT DEVICE 9975-L-996L-576A-630	VD
1	EA. EXIT DEVICE 9927-EO-630	VD
1	EA. CLYINDER 1080-US26D	CR
2	EA. CLOSERS 4040XP-SH-CUSH-ALUM	LC
2	EA. KICKPLATES K1050-10" X 1" LDW-US32D	RO
1	EA. THRESHOLD 2746-A-DW	PE
2	EA. SWEEPS 545-CV-DW	PE
1	SET WEATHERSTRIP S88D-H & J	PE
1	EA. DRIP CAP 346-A-DW + 4"	PE

HARDWARE SET NO. 7

EACH TO HAVE:

1	EA. CONTINUOUS HINGE CFM-83-HD-1	PB
1	EA. EXIT DEVICE 9975-L-996L-630	VD
1	EA. CYLINDER 1080-US26D	CR
1	EA. CLOSER 4040XP-SH-CUSH-ALUM	LC
1	EA. KICKPLATE K1050-10" X 2" LDW-US32D	RO
1	EA. THRESHOLD 2746-A-DW	OE
1	EA. SWEEP 345-CV-DW	PE
1	SET WEATHERSTRIP S88D-H & J	PE
1	EA. DRIP CAP 346-A-DW + 4"	PE

HARDWARE SET NO. 8

EACH TO HAVE:

2	EA. CONTINUOUS HINGES CFM-83-HD-1	PE
1	LOCKSET ML2059-102EZ-630	CR
2	EA. CLOSERS 4040XP-SH-CUSH-ALUM	LC
2	EA. FLUSH BOLTS FB458-26D	IV
1	EA. THRESHOLD 2746-A-DW	PE
2	EA. SWEEPS 345-CV-DW	PE
1	SET WEATHERSTRIP S88D-H & J	PE
1	EA. DRIP CAP 146-A-DW + 4"	PE
1	EA. ARMOR PLATE K1050-30" X 2" LDW-US32D	RO

HARDWARE SET NO. 9

EACH TO HAVE:

3	EA. HINGES 4B81-4.5 X 4.5-US26D	PB
1	EA. PRIVACY ML2030-102EZ-630	CR
1	EA. CLOSER 1461-RW/PA-ALUM	LC
1	EA. STOP 409/442-US26D	RO
3	EA. SILENCERS 608	RO

HARDWARE SET NO. 10

COMPLETE WITH ALL HARDWARE BY DOOR SUPPLIER EXCEPT:

1	EA. CYLINDER 20-001/20-022-US26D	SC

HARDWARE SET NO. 11

EACH TO HAVE:

1 WEATHERSTRIP

SECTION 08 8000 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Storefront framing.
   4. Glazed entrances.
   5. Interior borrowed lites.

1.2 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.3 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

   1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.4 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Final Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Final Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
   2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

C. Uncoated Clear Float Glass: Class 2, complying with other requirements specified.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries or comparable product by one of the following:
      a. AGC Glass Company, Inc.
      b. Pikington North America
      c. PPG Industries, Inc.
   2. Tint Color: Clear, Low-Iron
   3. Visible Light Transmittance: 85 percent minimum.

2.3 LAMINATED GLASS

A. Manufacturers: Subject to compliance with requirements, provide the following :
   1. AGC Glass Company, Inc.
   2. Pikington North America
   3. PPG Industries, Inc.

B. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

2.4 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide the following :
   1. AGC Glass Company, Inc.
   2. Pikington North America
   3. PPG Industries, Inc.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal.
   2. Spacer: Manufacturer's standard spacer material and construction.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   3. Silicone complying with ASTM C 1115.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene

gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 INSULATING-GLASS TYPES

A. Glass Type G1: Low-E-Coated, Tempered clear insulating glass.
   1. Overall Unit Thickness: 1 inch.
   2. Thickness of Each Glass Lite: 1/4 inch.
   3. Outdoor Lite: Clear fully tempered float glass, sputtered on second surface.
   4. Interspace Content: Air.
   5. Indoor Lite: Clear fully tempered float glass.
   6. Low-E Coating: Solaraban 60 Solar Control, sputtered on second surface.
   7. Provide safety glazing labeling.

B. Glass Type G2: Clear fully tempered float glass.
   1. Thickness: 3/8 inch.
   2. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways

in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding

into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08 8000

SECTION 08 9119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Extruded aluminum stationary louvers with drainable blades.

1.3 REFERENCES

A. AAMA 605.2 - High Performance Organic Coatings on Architectural Extrusions and Panels.

B. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

C. AMCA 511 - Certified Ratings Program for Air Control Devices.

1.4 SUBMITTALS

A. Comply with requirements of Section 01330 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data including performance data.

C. Shop Drawings: Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.

D. Samples: Submit sample of louver to show frame, blades, bird screen, gutters, downspouts, vertical supports, sill, accessories, finish, and color.

1.5 QUALITY ASSURANCE

A. Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Storage: Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Horizontal, Sightproof, Drainable-Blade Louver
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin Manufacturing ELF375DX, or comparable product by one of the following:

      a. Air Balance Inc.; a Mestek company.
      b. Air Flow Company, Inc.
      c. Airolite Company, LLC (The).
      d. All-Lite Architectural Products.
      e. American Warming and Ventilating; a Mestek company.
      f. Arrow United Industries; a division of Mestek, Inc.
      g. Construction Specialties, Inc.
      h. Industrial Louvers, Inc.
      i. Ruskin Company; Tomkins PLC.

2.2 EXTRUDED ALUMINUM STATIONARY LOUVERS

A. Fabrication:
   1. Model: ELF375DX.
   2. Performance Ratings: AMCA licensed.
   3. Frame:
      a. Material: Extruded aluminum, Alloy 6063-T5.
      b. Wall Thickness: 0.081 inch (2.1 mm), nominal.
      c. Depth: 4 inches (102 mm).
      d. Downspouts and caulking surfaces.
   4. Blades:
      a. Style: Drainable.
      b. Material: Extruded aluminum, Alloy 6063-T5.
      c. Wall Thickness: 0.081 inch (2.1 mm), nominal.
      d. Angle: 37.5 degrees.
      e. Centers: 5-3/32 inches (129 mm), nominal.
   5. Bird Screen:
      a. Material: Aluminum,n1/2 inch mesh x 0.063 inch (13 mm mesh x 1.6 mm), intercrimp.
      b. Frame: Removable, rewireable.
   6. Gutters: Drain gutter in head frame and each blade.
   7. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
   8. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches (3,048 mm).
   9. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.
   10. Assembly: Factory assemble louver components. All welded construction.

B. Performance Data:
   1. Based on testing 48 inch x 48 inch (1,219 mm x 1,219 mm) size unit in accordance with AMCA 500.
   2. Free Area: 54 percent, nominal.
   3. Free Area Size: 8.58 square feet (0.80 m^2).
   4. Maximum Recommended Air Flow Thru Free Area: 873 feet per minute (266 m/min).
   5. Air Flow: 7,490 cubic feet per minute (212 m^3/min).
   6. Maximum Pressure Drop: 0.15 inches w.g. (0.04 kPa).
   7. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/m^2) of free area at an air flow of 873 feet per minute (266 m/min) free area velocity when tested for 15 minutes.

C. Design Load: Incorporate structural supports required to withstand wind load per local authorities having jurisdiction and structural design loads.

2.3 ACCESSORIES

A. Blank-Off Panels: 1 inch (25 mm), aluminum skin, insulated core, factory installed with removable screws and neoprene gaskets.

B. Hinged Frame: Continuous piano hinge attached to subframe.

C. Rear Security Bars: Aluminum, 3/4 inch x 1/2 inch (19 mm x 13 mm), welded to louver.

D. Filter Racks: Formed channel racks to accept standard [1 inch (25 mm)] [2 inch (51 mm)] thick filters. Unused bottom portion blanked off with 0.040 inch (1 mm) aluminum sheet.

E. Bird Screens:

F. Insect Screens:

G. Extended Sills: Extruded aluminum, Alloy 6063-T5. Minimum nominal wall thickness 0.060 inch (1.5 mm).

H. Visible Mullions: Manufacturer's standard horizontal or vertical visible mullions for architectural accent as indicated on drawings.

2.4 FACTORY FINISH

A. Standard mill finish.

B. Prime Coat:
   1. Apply alkyd prime coat following chemical cleaning and pretreatment.
   2. Primer preparation for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.

C. Install joint sealants as specified in Section 07920.

D. Apply field topcoat within 6 months of application of shop prime coat. Apply field topcoat as specified in Section 09910.

3.3 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions.

B. Repair minor damaged surfaces as directed by Architect.

END OF SECTION

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for gypsum board assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.

B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

A. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.
   1. Minimum Base-Metal Thickness: Refer to Schedule in this section unless otherwise indicated on Drawings.
   2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
   1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.

C. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.018 inch or as indicated.

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
   1. Depth: 1-1/2 inches or as indicated.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches 0.068-inch thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.018 inch.
   2. Depth: 1-1/2 inches or as indicated.

G. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges.
   1. Depth: 3/4 inch or as indicated .
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch diameter wire.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches or as indicated , wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

1.1 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Sound Attenuation Blankets: As specified in Division 09 Section "Gypsum Board".

C. Acoustical Joint Sealant: As specified in Division 07 Section "Joint Sealants".

D. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation".

PART 2 - EXECUTION

2.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

2.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:
   1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

2.3 NON-STRUCTURAL STUD FRAMING SCHEDULE

A. Unless otherwise noted on drawings or elsewhere in these specifications, the following Schedule provides for minimum gauge/span based on metal studs at the indicated flange width spaced 16 inches o.c.

1-1/4" FLANGE

HEIGHT	1-5/8"	2-1/2"	3-5/8"	4"	6"	8"
8'-0"	22 ga.	25 ga.	25 ga.	25 ga.	22 ga.	18 ga.
10'-0"		22 ga.	25 ga.	25 ga.	22 ga.	18 ga.
12'-0"		20 ga.	25 ga.	25 ga.	22 ga.	18 ga.
14'-0"			22 ga.	22 ga.	22 ga.	18 ga.
16'-0"			18 ga.	22 ga.	22 ga.	18 ga.
18'-0"			16 ga.	18 ga.	22 ga.	18 ga.
20'-0"				16 ga.	22 ga.	18 ga.
22'-0"					22 ga.	18 ga.
24'-0"					18 ga.	18 ga.
26'-0"					18 ga.	18 ga.
28'-0"					14 ga.	18 ga.
30'-0"						18 ga.

1-5/8" FLANGE

HEIGHT	1-5/8"	2-1/2"	3-5/8"	4"	6"	8"
12'-0"			20 ga.	20 ga.	20 ga.	20 ga.
14'-0"			20 ga.	20 ga.	20 ga.	20 ga.
16'-0"			20 ga.	20 ga.	20 ga.	20 ga.
18'-0"			18 ga.	20 ga.	20 ga.	20 ga.
20'-0"			16 ga.	18 ga.	20 ga.	20 ga.
22'-0"				16 ga.	20 ga.	20 ga.
24'-0"					20 ga.	20 ga.
26'-0"					20 ga.	20 ga.
28'-0"					18 ga.	20 ga.
30'-0"					16 ga.	20 ga.

END OF SECTION 09 2216

SECTION 09 3213 - SWIMMING POOL TILE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and General Provisions of the contract, including General and Supplementary Conditions apply to work of this section.

1.02 SUMMARY

A. The painted pool finish shall have ceramic tile deck markings at locations shown and detailed on the contract drawings and in strict accordance with these specifications.

B. The CONTRACTOR shall furnish and install the work of this section.

1.03 RELATED SECTIONS

A. Division 1 – Mock Ups

B. Division 7 - Joint Sealers

C. Division 9 - Ceramic Tile

D. Section 131100 - Swimming Pool

1.04 QUALITY ASSURANCE

A. Reference Standards: Conform to the following standards unless otherwise required herein.

1. American National Standards Institute (ANSI)

a. A108.01 – General Requirements: Subsurfaces and Preparations by Other Trades.

b. A108.02 – General Requirements: Materials, Environmental, and Workmanship.

c. A108.1, Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile installed with Portland Cement Mortar.

d. A108.1C – Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry Set or Latex-Portland Cement Mortar.

e. A108.5 – Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

f. A108.6 – Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy for the Epoxy Grouting Installation Process.

g. A108.10 – Installation of Grout in Tile Work.

h. A137.1 Standard Specifications for Ceramic Tile.

2. American Society for Testing and Materials (ASTM)

a. C144-99, Aggregate for Masonry Mortar

b. C150-00, Portland Cement

c. C171-97a, Sheet Materials for Curing Concrete

d. C206-97, Finishing Hydrated Lime

e. C207-91 (R1997), Hydrated Lime for Masonry Purposes

f. F-1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

g. F-2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes

3. Tile Council of North America (TCNA); 2013 Edition, Handbook for Ceramic Tile Installation.

4. International Standards Organization (ISO)

a. ISO 13007 – Part 1: 2004 Ceramic Tiles – Grouts and adhesives; specifies the value of performance requirements for all tile adhesives.

b. ISO 13007 – Part 2: 2005 Ceramic Tiles – Grouts and adhesives; test method for adhesives.

c. ISO 13007 – Part 3: 2005 Ceramic Tiles – Grouts and adhesives; terms, definitions and specifications for grout.

d. ISO 13007 – Part 4: 2005 Ceramic Tiles – Test methods for grout.

5. American Concrete Institute

a. ACI 302 – Guide for Concrete and Floor Slab Construction

6. International Concrete Repair Institute (ICRI)

a. Concrete Surface Profile (CSP)

B. Tile installers shall have two years experience in similar pool projects which the Owner may require written proof thereof and proper tools to install tile.

1.05 MANUFACTURERS

A. Subject to compliance with requirements provide ceramic tile, mortar and grout of the following manufacturers: American Olean Tile Co. (tile), Dal-Tile Co. (tile), Buchtal (tile), KlinkerSire (tile), Mapei Corp. (thin-set, waterproofing, grout and admixtures), and Laticrete International Inc. (thin-set, waterproofing, grout and admixtures) or approved equal.

1.06 SUBMITTALS

A. Submit shop drawings indicating tile layout, patterns, joint layout, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds and setting details.

B. Submit product data indicating material specifications, characteristics, and instructions for using adhesives and grouts.

C. Samples:

1. Mount tile and apply grout on 24 x 24 inch backerboard to indicate pattern, color variation and grout joint size variations of each pattern. Furnish mounted tile samples as requested by the architect/owner.

D. Submit manufacturer's installation instruction.

E. Submit maintenance data.

1. Include recommended cleaning and stain removal methods, cleaning materials.

1.07 PRODUCT DELIVERY AND STORAGE

A. Deliver tile materials to site in unopened factory containers sealed with grade seals bearing printed name or manufacturer and the words "Standard Grade". Keep the grade seals intact and containers dry until tiles are used. Keep cementitious materials dry until used.

1.08 JOB CONDITIONS

A. Inspect and verify job conditions. Report all defects in base surfaces for correction before proceeding.

B. Maintain a temperature range of 40 degrees Fahrenheit to 90 degrees Fahrenheit during installation of tile and grout materials. Tile installation should cure for a minimum 14 days with average an temperature of 70 degrees, while maintaining the minimum 40 degrees and maximum 90 degrees Fahrenheit, prior to filling pool with water.

C. Vent temporary heaters to outside to avoid carbon dioxide damage to the new tile work.

1.09 COLORS

A. Colors to be selected by the Architect or Interior Designer. Note that swimming pool regulations may dictate color selections within the pool tank. See 2.01 Tile Materials for price group breakdowns.

1.10 WARRANTIES

A. The CONTRACTOR warrants to the Owner that materials and equipment furnished under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements including substitutions not properly approved and authorized, may be considered defective. The CONTRACTOR'S warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation, modifications not executed by the CONTRACTOR or improper wear and tear under normal usage. If required by the Owner, the CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of five years, unless otherwise specified.

B. All setting materials shall be provided by the same manufacturer. All mixing materials and application procedures shall be done in accordance with manufacturer's recommendations and requirements. Documentation shall be provided to this effect by the contractor with verification from the manufacturer. This documentation shall be included in the operations and maintenance manual under warranties as documentation qualifying the project for a 15 Year Systems Warranty by Laticrete International, Inc., Mapei, Inc. or approved equal.

C. The CONTRACTOR shall agree to repair or replace any work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

PART 2 - PRODUCTS

2.01 TILE MATERIALS

A. Standard grade conforming to ANSI A137.1. Provide trimmer units as indicated and specified, including special shapes as detailed or required. Tile patterns and colors shall be as indicated and specified, colors of approved shades. Mesh mounted or perforated paper backed tile is not allowed where the mesh of paper remains as a permanent part of the installation. If dot mounting is used, a minimum of 67% of the depth of the tile shall be free from any dots to ensure proper grout curing.

B. All tile shall be "frost-proof" and suited for an outdoor pool installation in a freeze/thaw climate.

C. Message Tile and Depth Markings

1. Horizontal depth markings and warning signs shall be 6" x 6" with 4" high numbers and letters. All horizontal depth markers shall be slip resistant. Single tile abbreviations shall be used for 'FT' and 'IN'.

2.02 SWIMMING POOL / SPA TILE SETTING MATERIALS AND INSTALLATION (NOTE TO SPECIFIER: Include this section only if no waterproofing is required.)

A. Surface Preparation

1. Surface preparation shall be in accordance with ACI 302. The surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion. Sound and remove all loose concrete to firm substrate. Surfaces shall be roughened to a CSP of 3 to 5 (reference ICRI CSP Standards 7 to 9 for acceptable profile height). Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations.

B. Slurry Bond Coat

C. Mortar & Leveling Beds

1. **Bonded Thick Bed Method (Floor / Horizontal Surfaces)**: Provide a dry pack, thick mortar bed on horizontal surfaces consisting of either Laticrete 3701 Fortified Mortar Bed, or Mapei, 4:1 bag mix with Planicrete AC Additive. Apply over a properly prepared slurry bond coat. Maximum lift thickness not to exceed 2".

D. Tile Thin-Set

1. Use either Laticrete 254 Platinum one-step, polymer fortified, thin-set mortar or Mapei Ultraflex 3 one-step, polymer modified, thin-set mortar, used in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Mapei, Inc., or approved equal.

E. Tile Grout

1. Use either Laticrete PermaColor Grout or Mapei Ultracolor Plus Grout in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Mapei, Inc., or approved equal.

F. Elastomeric Sealant

1. Use Laticrete Latasil sealant for all inside/outside corners, expansion/movement joints, and to seal lighting/plumbing fixture penetrations. Apply sealant over Latasil 9118 primer. All primer and sealant installation shall be in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Inc., or approved equal.

G. All mixing and application procedures shall be done in accordance with the manufacturer's recommendations and requirements. The manufacturer's representative shall visit the site to verify field conditions, confirm materials and application requirements and ascertain that all materials and systems are so installed. Documentation shall be provided to this effect.

PART 3 - EXECUTION

3.01 PREPARATION

A. Complete water tightness test prior to tile installation. Concrete tank shall be watertight per ASTM D5957, the Tile Council of North America, and specification 131100.

B. Clean substrates of dust, dirt, oil, grease and deleterious substances and mechanically roughen concrete and shotcrete for bond. Conform to applicable reference standards and to recommendations of manufacturers of materials used and meeting ICRI, CSP of 3-5.

C. Substrates to Receive Mortar Setting Beds

1. Dampen concrete substrate to receive tile work according to above referenced standards or tile manufacturer's instructions, as required.

D. Substrates to receive thin set tile applications shall meet normal construction tolerances of 1/4" in 10' where competition tolerances do not apply, and shall meet competition tolerances where required elsewhere in these specifications, and shall be free of bumps, dips and surface irregularities that may effect the satisfactory installation of the tile.

E. Tile Wetting

1. Dampen tile according to above reference standards or tile manufacturer's instructions, as required.

F. Screeds

1. Accurately set temporary screeds to control the finish plane of mortar-bed set tile and remove as soon as setting bed is sufficiently hardened. Fill void spaces from screeds with same mortar.

3.02 TILE INSTALLATION

A. Arrange tile according to patterns detailed. Set tile with flush well-fitted joints, finished in true planes, plumb, square, joints of uniform size. Provide approved trimmers as shown or required. Cut tile without marring. Carefully grind and joint tile edges and cuts.

B. Follow Tile Council of North America installation methods P601 and B417 to achieve total tile system thickness for thin or thick-set.

1. Thick Set

a. Apply specified setting bed mortar, up to 2" in thickness, on cured and dried concrete pool shell. Tamp and screed to required planes. Spread no more mortar than can be covered with tile before initial set. Do not use re-tempered mortar. Trowel 3/32" to 1/8" thick bond coat over plastic setting bed mortar just before setting tile or apply bond coat to back of each tile placed. 95% coverage of the back of the tile or tile sheet is required. Set tile in position and beat firmly into the setting bed mortar. Bring tile faces to a true and correct plane. Complete all beating and leveling before mortar sets and in no case later than one hour after first placing. When ready, wet and remove paper and glue avoiding excess water. At this time adjust any out-of-line or out-of-level tile.

2. Thin Set

a. Apply specified bond coat on cured and dried concrete pool shell. Trowel 3/32" to 1/8" thick bond coat over concrete pool shell just before setting tile or apply bond coat to back of each tile placed. 95% coverage of the back of the tile or tile sheet is required. Set tile in position and beat firmly into the setting bed mortar. Bring tile faces to a true and correct plane. Complete all beating and leveling before mortar sets and in no case later than one hour after first placing. When ready, wet and remove paper and glue avoiding excess water. At this time adjust any out-of-line or out-of-level tile.

C. Finished tile surface shall be level and in plane, with no sharp or protruding edges. Tiles out or plane more then 1/16" shall be removed and replaced. Sharp edges shall be stoned smooth.

D. Grout Joint Sizes

1. Unless otherwise approved, install tile with uniform 3/32 inch joint width. A maximum 1/8" joint width may be utilized to meet specific installation requirements, if required.

E. Ceramic Tile Joint Grouting

1. Mix grout to a thick creamy consistency and force into joints for entire thick depth, flush with surface. Clean off all excess and fill skips and gaps before grout sets. Color selection by Architect or Interior Designer. Provide dampness for minimum 3-day curing and polish with clean dry cloths (not required when epoxy grouts are used).

F. Expansion Joints

1. Place expansion joint per applicable TCNA Method P601MB, P601TB, or P602 and conforming to Method EJ171. Provide shop drawings showing backer rod and joint dimensions. All expansion, control, construction, cold, and seismic joints in the pool structure should continue through the tile work, including such joints at vertical surfaces. Movement joints shall be placed at all changes in direction and elevation. Refer to the structural engineer for additional required movement joints. Joint size shall be a minimum of 1/8". Joints through tile work directly over structural joints shall not be narrower than the structural

joint. The Contractor shall use cement compatible coatings when using chalk lines for joint layout purposes.

G. Fill and Empty Rates

1. Use a fill and drain rate of 2 feet per 24 hours to minimize thermal shock and structural movement. Maintain a temperature differential of 10 degrees Fahrenheit or less between the pool water and the substrate during fill and drain cycles.

3.03 TESTING AND INSPECTION

A. Before filling of the pool, and its subsequent provisional acceptance at substantial completion, the tile installation shall be visually inspected and sounded in the presence of the Architects and/or the Owner's representative to verify adhesion of the tile to its substrate as well as its overall compliance with the requirements of this Section.

B. Any and all tile work found to be loose, improperly adhered, out of plane, misaligned or otherwise non-conforming shall be removed and replaced at no additional cost to the Owner.

3.04 CLEANING

A. Upon completion of placement and grouting, clean tile installation as recommended by TCNA and manufacturers of proprietary materials. Tile shall be cleaned with pH neutral solutions, free of both sodium and potassium, in accordance with the tile and grout manufacturer's printed instruction.

B. Leave finished installation clean and free of cracked, chipped, broken, un-bonded or otherwise defective tile work.

C. Protect installed tile work with non-staining Kraft paper, polyethylene sheeting, or other approved heavy covering during the construction period to prevent damage.

3.05 REPLACEMENT TILE

A. Provide Owner with approximately 10% or 25 square feet (whichever is least) of each color and type tile used on the project for Owner's repair and replacement requirements.

END OF SECTION 09 3213

SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Resilient molding accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.3 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.4 EXTRA MATERIALS

A. Furnish extra materials that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Furnish not less than 10 lineal feet for each 500 lineal feet, or fraction thereof, of each type, color, and size of resilient accessory installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong World Industries, Inc.
      b. Johnsonite.
      c. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Straight (flat or toeless) at carpeted flooring; Cove (base with toe) at all other locations.

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed, back cut and bent to conform to corners.

G. Inside Corners: Job formed, back cut and bent to conform to corners.

H. Finish: Matte.

I. Colors and Patterns: As indicated on Drawings.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:
1. Manufacturers: Subject to compliance with requirements, provide products by resilient base manufacturer.

B. Description: Reducer strips for floor finish transitions between carpeted and resilient floor covering.

C. Material: Rubber.

D. Profile and Dimensions: Manufacturer's standard unless otherwise indicated. Thickness to match adjacent materials.

E. Color: Match resilient base.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet resilient floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Cover resilient products until Substantial Completion.

END OF SECTION 09 6513

SECTION 09 8000 – SPECIAL COATINGS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Exterior / Interior coating systems.
      a. Wall.
      b. Floor.
      c. Exposed Structure.
      d. Miscellaneous metals.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each system component required.

B. Samples for Verification: For each system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project. For each system required, demonstrate the full range of color and texture.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Material Test Reports: For each system component.

E. Maintenance Data: For each system to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to system manufacturer.
   1. Engage an installer who is certified in writing by system manufacturer as qualified to apply systems indicated; and, who possesses a minimum of 3 years documented experience on projects with 1/8" epoxy broadcast with similar size and scope.

B. Source Limitations: Obtain primary materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups of Flooring System: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
      a. Include 48-inch (1200-mm) length of integral cove base.
   2. Do not begin installation until Architect has approved mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

4. Approved mock-up shall remain on site until approved completion of the floor and walls.

D. Pre-Application Conference: Prior to making field samples and placing order for materials, the Architect, Contractor, installer and manufacturer's representative shall meet and agree on methods and schedule for application.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects; store as recommended by manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with system manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting system application.
   1. Permanent lighting shall be in place and functional prior to installation of floor and wall system.
   2. Minimum surface and air temperature shall be 60 degrees F.

B. Close spaces to traffic during flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 – PRODUCTS

2.1 COATING SYSTEMS (EXY1 and EXY2)

A. Manufacturer: Tnemec Company 405-755-7040 or equal as approved by Architect.

B. CMU – Humid And Dry Areas – Check-in, Check-in Lobby, Alcove
   1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Allow mortar to cure 14 days. Level protrusions and mortar spatter.
   2. Coating System:
      Block Filler: Tnemec Series 130-6601 Envirofill 60 – 80 sq. ft./gal.
      (use squeegee to provide smooth surface)
      1st Coat: Tnemec Series 66 HB Epoxoline 4.0 – 6.0 mils DFT
      2nd Coat: Tnemec Series 290 CRU 2.0 – 3.0 mils DFT
      Total Thickness Minimum 7.0 mils DFT
   3. 1st and 2nd coat colors shall be different colors so as to verify 2 coat system.

C. CMU – Wet Areas – Family Changing and Mens/Womens:
   1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Allow mortar to cure 14 days. Level protrusions and mortar spatter.
   2. Coating System:
      Block Filler: Tnemec Series 54-660 Masonry Filler 75 – 100 sq. ft./gal.
      (use squeegee to provide smooth surface)
      1st Coat: Tnemec Series 66 HB Epoxoline 4.0 – 6.0 mils DFT
      2nd Coat: Tnemec Series 290 CRU 2.0 – 3.0 mils DFT

Total Thickness Minimum 7.0 mils DFT

3. 1st and 2nd coat colors shall be different colors so as to verify 2 coat system.

B. Exposed Metals – Fascia and Hollow Metal at Pool Equipment, Acid Feed, Chlorine Room:

1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Clean all surfaces as per SSPC-SP1 Solvent Cleaning. Pre pare bare metal or damaged shop primer as per SSPC-SP3 Power Tool Cleaning. Spot prime these areas using Tnemec Series 135 Chembuild applied at 4 to 6 dry mils.
2. Coating System:
   Field Primer: Tnemec Series 135 Chembuild 4.0 – 6.0 mils DFT
   Finish Coat: Tnemec Series 290 CRU 2.0 – 3.0 mils DFT
   Total Thickness Minimum 7.0 mils DFT
3. 1st and 2nd coat colors shall be different colors so as to verify 2 coat system.

C. Guardrails – Ferrous Metal (at Pool Equipment):

1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Prepare all surfaces as per SSPC-SP6 Commercial Blast Cleaning. Prepare bare metal or damaged shop primer as per SSPC-SP3 Power Tool Cleaning. Spot prime these areas using Tnemec Series 135 Chembuild applied at 4 to 6 dry mils.
2. Coating System:
   Shop Prime: Tnemec Series 66 HB Epoxoline 3.0 - 5.0 mils DFT
   Field Prime: Tnemec Series 135 Chembuild 4.0 - 6.0 mils DFT
   Finish Coat: Tnemec Series 290 CRU 2.0 - 3.0 mils DFT
   Total Thickness Minimum 10.0 mils DFT

D. Concrete Floors – Family Changing, Womens and Mens:

1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Allow new concrete to cure 28 days. Perform moisture testing as per ASTM F 1869. If moisture content exceeds 3 pounds per 1,000 sq. ft. in 24 hour period contact Owner/Architect. Prepare concrete surfaces as per SSPC-SP13 or ICRI CSP1-3. Install 4" rolled radius cove base where noted on plans or room schedule.
2. Coating System:
   Primer: Tnemec Series 201 Epoxoprime 6.0 – 8.0 mils DFT
   Broadcast: Tnemec Series 222 Deco-Tread 1/8" DFT
   Seal Coat: Tnemec Series 284 Deco-Clear 10.0 – 12.0 mils DFT
   Topcoat: Tnemec Series 295 Clear CRU 2.0 – 3.0 mils DFT
   (w/ 44-600 UV additive)
   Total Thickness Minimum 1/8 inch DFT

E. Exterior Surfaces Exposed Steel Surfaces:

1. Surface Preparation: All surfaces shall be clean, dry, and free of oil, grease, or other contamination. Prepare all surfaces as per SSPC-SP6 Commercial Blast Cleaning. Prepare bare metal or damaged shop primer as per SSPC-SP3 Power Tool Cleaning. Spot prime these areas using Tnemec Series 135 Chembuild applied at 4 to 6 dry mils.
2. Coating System:
   Shop Prime: Tnemec Series 66 HB Epoxoline 3.0 - 5.0 mils DFT
   Field Prime: Tnemec Series 73 Endura-Shield 2.0 - 3.0 mils DFT
   Clear Coat: Tnemec Series 76 Endura-Clear 1.0 - 2.0 mils DFT
   Total Thickness Minimum 7.0 mils DFT

2.2 ACCESSORY MATERIALS

A. Patching and Fill Material: Resinous product of or approved by system manufacturer and recommended by manufacturer for application indicated.

B. Joint Sealant: As specified in Division 7 and as recommended by system manufacturer for type of service and joint condition indicated.

2.3 MIXING AND TINTING

A. Mix and thin materials in strict accordance with manufacturer's latest printed instructions.

B. Do not use material beyond manufacturer's recommended pot life.

C. Project site tinting will not be allowed.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify surfaces to be coated are dry, clean and ready to accept prime coat in accordance with manufacturer's recommendations.

B. Notify Architect in writing of unacceptable conditions prior to commencing application.

C. Do not begin work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare and clean substrates according to system manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for system application.

B. Protect surrounding and adjacent surfaces in manner recommended by floor coating manufacturer.

C. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with epoxy system.
   1. Allow new concrete scheduled to be coated to cure 30 days at 75° F. prior to application of coating system.
   2. Mechanically abrade concrete after cleaning to provide "tooth and suction". Prepare all horizontal surfaces as per SSPC-SP13 using shot blast equipment.
   3. Repair damaged and deteriorated concrete according to system manufacturer's written recommendations.
   4. Verify that concrete substrates are dry.
      a. Tests: Test concrete surfaces to be coated in accordance with ASTM F 1869 prior to installation of floor coating system. Test should be performed during normal HVAC operation. Report findings to Architect. Floor coating should not commence unless test values are less than 3 pounds.
   5. Verify that concrete substrates have neutral Ph and that epoxy system will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

D. Epoxy Materials: Mix components and prepare materials according to system manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through epoxy system according to manufacturer's written recommendations.

3.3 APPLICATION

A. General: Apply components of system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of system to substrate, and optimum intercoat adhesion.
   2. Cure system components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. Joints: At substrate expansion and isolation joints, provide joint in epoxy system to comply with system manufacturer's written recommendations.
      a. Apply joint sealant to comply with manufacturer's written recommendations.
   4. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
   5. Apply filler and grout coat, of type recommended by system manufacturer to fill voids in surface of final body coat and to produce wearing surface indicated.
   6. Apply topcoat(s) in number of coats indicated for system and at spreading rates recommended in writing by manufacturer.

B. Flooring:
   1. Whenever possible, schedule work to ensure that a wet edge is maintained. Work stoppages should be scheduled so that there is no break during the application of a coat in progress, if possible. Where a break in a coat is made, that area should be sanded smooth so that no line remains.
   2. Exposed Perimeters:
      a. All exposed perimeter edges of the broadcast overlay, including door ways, traffic aisle sides, drains, etc. must be saw cut. Areas that cannot be reached with the saw, or are difficult to saw cut shall be chipped.
      b. Saw cut shall be a minimum of 1/4" deep and 1/4" wide.
      c. Prime saw cut areas with epoxy primer.
      d. Install flooring so that it folds into saw cut.

C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
   1. Cut coves as required for joints

B. Wall System:
   1. Prime coat all surfaces with epoxy primer 30 minutes prior to spray application.
   2. Whenever possible, schedule work to ensure that a wet edge is maintained. Work stoppages should be scheduled so that there is no break during the application of a coat in progress, if possible. Where a break in a coat is made, that area should be sanded smooth so that no line remains.
   3. Spray apply epoxy wall system, let cure a minimum of 12 hours.
   4. Pole sand entire surface to remove any burrs, and tack wipe.
   5. Topcoat entire area with epoxy finish coat.

3.4 FIELD QUALITY CONTROL

A. Initiate and maintain for duration of Project field quality control program using certified calibration and testing devices and to ensure conformance with application requirements.
   1. Furnish and maintain at Project site the following fully calibrated testing and inspection devices:
      a. Wet Mil Gauge
      b. Tooke Gauge
      c. Sling Psychrometer

B. Manufacturer's representative shall visit job site and verify that materials are applied in accordance with specification requirements.

3.5 CLEANING AND PROTECTING

A. Protect epoxy systems from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by system manufacturer.

END OF SECTION

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Galvanized metal.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Acceptable Manufacturers:
   1. Benjamin Moore & Company.
   2. Devoe Paint.
   3. ICI Paints.
   4. PPG Industries.
   5. Pratt & Lambert Paints.
   6. Sherwin Williams Company.

C. Color Schedule: Refer to drawings.

2.2 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.
   1. Solvent based, alkyd type, anti-corrosive primer for use with ferrous metals. Topcoat with alkyd based paint.
   2. VOC Content: E Range of E2.

B. Cementitious Galvanized-Metal Primer: MPI #26.
   1. Solvent based primer composed of linseed oil/alkyd resin and Portland cement for use on cleaned galvanized metal. Topcoat with latex paint.
   2. VOC Content: E Range of E1.

2.3 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).
   1. Alkyd based for use on primed metal surfaces.
   2. VOC Content: E Range of E1.

2.4 FLOOR COATINGS

A. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.
   1. Water based, acrylic co-polymer emulsion type, clear sealer for interior and exterior horizontal concrete floors and walkways.
   2. VOC Content: E Range of E2.

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 work.

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

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. 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.

D. 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.

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

3.3 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:
   1. Alkyd System: MPI EXT 5.1D.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
      c. Topcoat: Exterior alkyd enamel (gloss).

B. Galvanized-Metal Substrates:
   1. Latex Over Water-Based Primer System: MPI EXT 5.3H.
      a. Prime Coat: Waterborne galvanized-metal primer.
      b. Intermediate Coat: Exterior latex matching topcoat.
      c. Topcoat: Exterior latex (semigloss).

END OF SECTION 09 9113

SECTION 09 9123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Steel.
2. Galvanized metal.
3. Wood.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Acceptable Manufacturers:
   1. Benjamin Moore & Company.
   2. Devoe Paint.
   3. ICI Paints.
   4. PPG Industries.
   5. Pratt & Lambert Paints.
   6. Sherwin Williams Company.

C. Color Schedule: Refer to drawings

2.2 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.
   1. Water based latex sealer used on interior plaster, concrete and gypsum wallboard surfaces. Topcoat with latex or alkyd based paint.
   2. VOC Content: E Range of E2.
   3. Environmental Performance Rating: EPR 2.

B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.3 METAL PRIMERS

A. Quick-Drying Alkyd Metal Primer: MPI #76.
   1. Solvent based, modified alkyd, fast drying, anti-corrosive primer for cleaned interior and exterior steel. Topcoat with alkyd based paint.
   2. VOC Content: E Range of E2.

B. Waterborne Galvanized-Metal Primer: MPI #134.
   1. Water based metal primer, composed of anti-corrosive pigments and acrylic resins, for cleaned/etched galvanized metal. Topcoat with latex based paint.
   2. VOC Content: E Range of E3.
   3. Environmental Performance Rating: EPR 3.

2.4 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.
   1. Latex based primer for use on interior wood surfaces such as doors, casings, and trim. Topcoat with latex based paint.
   2. VOC Content: E Range of E2.

3. Environmental Performance Rating: EPR 2.

2.5 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).
   1. Water based latex paint with a flat finish for use on gypsum board ceilings.
   2. VOC Content: E Range of E3.
   3. Environmental Performance Rating: EPR 2.5.

B. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
   1. Water based latex-based paint with a finish between a high side sheen flat and a 'satin-like' finish or a low semi-gloss. Use on primed/sealed interior masonry, plaster and gypsum board walls.
   2. VOC Content: E Range of E3.
   3. Environmental Performance Rating: EPR 3.

C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
   1. Water based latex-based paint with a semi-gloss finish. Use on primed/sealed interior wood and metal trim and doors and plaster.
   2. Use anti-microbial paint on gypsum wallboard at mechanical, toilet, and janitor room walls and ceilings.
   3. VOC Content: E Range of E2.
   4. Environmental Performance Rating: EPR 3.

2.6 ALKYD PAINTS

A. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
   1. Solvent based, gloss alkyd paint for primed interior wood and metal surfaces. Primarily used on trim, doors and frames.
   2. VOC Content: E Range of E2.

2.7 DRY FOG/FALL COATINGS

A. Interior Alkyd Dry Fog/Fall: MPI #55.
   1. Solvent based, fast-setting, alkyd interior paint. For metal ceiling surfaces.
   2. VOC Content: E Range of E2.

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 work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Wood: 15 percent.
   3. Gypsum Board: 12 percent.

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

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. 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.

D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
   1. Mechanical Work:
      a. Uninsulated metal piping.
      b. Uninsulated plastic piping.
      c. Pipe hangers and supports.
      d. Tanks that do not have factory-applied final finishes.
      e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
   2. Electrical Work:
      a. Switchgear.
      b. Panelboards.
      c. Conduits and junction boxes.
      d. Electrical equipment that is indicated to have a factory-primed finish for field painting.

E. 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.

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

3.3 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:
   1. Latex Over Sealer System: MPI INT 3.1A.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (eggshell).

B. Steel Substrates:
1. Alkyd Dry-Fall System: MPI INT 5.1D.
a. Prime Coat: Quick-drying alkyd metal primer.
b. Topcoat: Interior alkyd dry fog/fall.
2. Alkyd System: MPI INT 5.1E.
a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (gloss).

C. Galvanized-Metal Substrates:
1. Latex System: MPI INT 5.3A.
a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (eggshell).

D. Dressed Lumber Substrates: Including architectural woodwork, doors and base.
1. Latex System: MPI INT 6.3T.
a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (semigloss).

E. Wood Panel Substrates: Including medium-density fiberboard.
1. Latex System: MPI INT 6.4R.
a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (semigloss).

F. Gypsum Board Substrates:
1. Latex System: MPI INT 9.2A.
a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat) (eggshell) (semigloss).

END OF SECTION 09 9123

SECTION 10 1400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior Panel Signs.
   2. Interior Specialty Signs
   3. Exterior Building Signs.

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples: For each sign type and for each color and texture required.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

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. APCO Graphics, Inc.
   2. ASI-Modulex, Inc.
   3. Best Sign Systems Inc.
   4. EMG Graphics Systems, Inc.

B. Exterior Signs: Wall mounted vandal resistant aluminum or stainless steel.
   1. Surface Finish: Brushed.

2. Edge Condition: Square cut.
3. Corner Condition: Square cut.
4. Thickness: 1/8 inch.
5. Size and Layout: 8 inch x 8 inch.
6. Font: Contrasting color

C. Interior Signs: Wall mounted vandal resistant acrylic
1. Surface Finish: Brushed.
2. Edge Condition: Square cut.
3. Corner Condition: Square cut.
4. Thickness: 1/8 inch.
5. Size and Layout: 8 inch x 8 inch.
6. Font: Contrasting color

D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Acrylic, Aluminum or Stainless steel.
2. Raised-Copy Thickness: Not less than 1/32 inch.

E. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
1. Color: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 FABRICATION

A. General: Provide manufacturer's standard restroom signs and other configurations indicated.
1. Construct all work to eliminate burrs, cutting edges, and sharp corners.
2. Follow manufacturer's fabricating procedures regarding expansion / contraction, fastening, and restraint of acrylic plastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent

walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
   1. Mount signs to smooth, nonporous surfaces using vandal resistant fasteners.

3.2 SCHEDULE

A. Provide wall mount ADA compliant signage at all locations required by IBC 2009, ADA-ABA and ANSI 117.1 as follows and as indicated on Drawings:
   a. Containment area signage as required by code for Pool Equipment, Acid, and Chlorine Rooms.
   b. Room Identification (plaques): One at each room entry.
      1. Fitness
      2. Office
      3. Mechanical
   c. Men and Womens Signage:
      1. As indicated on Drawings.
   d. Exterior Building Signage:
      i. Room Identification (plaques): One at each room entry
         1. Family Changing
         2. Pool Storage
         3. Acid
         4. Chlorine

END OF SECTION 10 1400

SECTION 10 2113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel toilet compartments configured as toilet enclosures to match existing in Men's 106.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for each exposed product and for each color and texture specified.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
   1. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvannealed.

B. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 STEEL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following to match existing toilet partitions located in room Mens 106:

1. Accurate Partitions Corporation.
2. American Sanitary Partition Corporation.
3. Bradley Corporation; Mills Partitions.
4. Global Steel Products Corp.
5. Knickerbocker Partition Corporation.

B. Toilet-Enclosure Style: Overhead braced; Floor anchored.

C. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
   1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
   2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
   3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

D. Urinal-Screen Construction:
   1. Flat-Panel Urinal Screen: Matching panel construction.

E. Facing Sheets and Closures: Hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses standard with manufacturer.

F. Pilaster Shoes: Stainless-steel sheet, not less than 3 inches high, finished to match hardware.

G. Brackets (Fittings):
   1. Stirrup Type: Ear or U-brackets; stainless steel.

H. Steel-Sheet Finish: Manufacturer's standard baked-on finish, with one color in each room.
   1. Color: To be chosen from Manufacturer's full selection.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   1. Material: Stainless steel.
   2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
   3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
   4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
   5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
   6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Clearances: Maximum 1/2 inch between pilasters and panels; 1 inch between panels and walls.

C. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 2113

SECTION 10 2800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet and Bath accessories.
   2. Warm-air dryers.
   3. Underlavatory guards.
   4. Custodial accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

C. Maintenance data.

1.3 QUALITY ASSURANCE

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.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES

A. Manufacturers: The design for accessories is based on the products specified. Subject to compliance with requirements, provide the named products or comparable products by one of the following manufacturer's:
   1. American Specialties, Inc.
   2. Bobrick Washroom Equipment, Inc.
   3. Bradley Corporation.
   4. Koala Kare Corporation.
   5. World Dryer Corporation.

B. Toilet Tissue (Dual-Roll) Dispenser:
   1. Basis-of-Design Product: Bradley 5425.
   2. Description: Two-roll unit tissue dispenser.
   3. Mounting: Surface
   4. Material and Finish: Stainless steel, No. 4 finish (satin).
   5. Lockset: Tumbler type.

C. Napkin Disposal:
   1. Basis-of-Design Product: Bradley 4781-15.
   2. Description: Napkin disposal with wax paper liners.
   3. Mounting: Surface
   4. Material and Finish: Stainless steel, No. 4 finish (satin).
   5. Lockset: Tumbler type.

D. Manual-Operated Soap Dispenser (Wall mounted)
   1. Basis-of-Design Product: Bradley 6562
   2. Description: Vertical tank designed for dispensing liquid soap.
   3. Mounting: Surface
   4. Capacity: 27 oz.
   5. Materials: Stainless Steel

E. Towel Pin
   1. Basis-of-Design Product: Bradley 9315.
   2. Description: Towel and Utility hook.
   3. Mounting: Surface
   4. Materials: Stainless Steel, No. 8

F. Grab Bars:
   1. Basis-of-Design Product: Bradley 812-001 x 18, 36, and 42.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Type 304 stainless steel, 18 gauge.
      a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant peened texture in grip area.
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: Straight, 36 inches long, 42 inches long, and 18 inches long (vertical mount).

G. Baby Changing Station (ADA Compliant):
   1. Basis-of-Design Product: Koala Kare KB101-01
   2. Description: Vertical mounted baby changing station with safety strap. ADA compliant.
   3. Mounting: Surface
   4. Material and Finish: Grey with Stainless steel, No. 4 finish (satin) flange.

H. Channel-Frame Mirror (Tempered Glass):
   1. Basis-of-Design Product: Bradley 781-24362
   2. Description: Mirror with roll-formed channel frame and theft-resistant mounting.
   3. Mounting: Surface
   4. Material and Finish: first quality ¼ tempered glass mirror and stainless steel with bright annealed finish frame.

I. Shower Curtain per Section 10 1710.
   1. Basis-of-Design Product: Bradley 9537
   2. Description: Antimicrobial Shower Curtain with aluminum grommets
   3. Mounting: Surface
   4. Material and Finish: 10 oz nylon-reinforced antimicrobial PVC vinyl fabric, White

J. Shower Curtain Rod per Section 10 1710.
   1. Basis-of-Design Product: Bradley 9538
   2. Description: Shower curtain rod with concealed mounting.
   3. Mounting: Surface
   4. Material and Finish: Stainless steel with satin finish

K. Shower Curtain Hooks per Section 10 1710.

1. Basis-of-Design Product: Bradley 9540
2. Description: Shower curtain hook with rollers
3. Material and Finish: stainless steel

L. Shower Soap Dish (Recessed)
1. Basis-of-Design Product: Bradley. Refer to plumbing fixture schedule on Drawings.
2. Description: Recessed soap dish.
3. Material and Finish: Stainless steel

2.2 WARM-AIR HAND DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.
3. Excel Dryer, Inc.

B. Warm-Air Hand Dryer:
1. Basis-of-Design Product: Thin Air Excel Hand Dryer TA-ABS
2. Mounting: Surface.
3. Operation: Adjustable electronic-sensor activated with timed power cut-off switch.
4. Cover Material and Finish: White Polymer (ABS)
5. Electrical Requirements: 115V, 20A, 2300W, 50/60 Hz, or 208V, 10A, 2400W, 60 Hz.

2.3 UNDERLAVATORY GUARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by the following:
1. Truebro by IPS Corporation.
   a. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
   b. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Mop Holder / Shelf:
1. Basis-of-Design Product: Bradley 9954.
2. Description: Four anti-slip mop holders with spring loaded rubber cam grips; Four stainless steel hooks.
3. Shelf: 22 gauge stainless steel.
4. Material and Finish: 304 Brushed stainless steel (satin).
5. Provide one at each janitor mop sink whether indicated or not.

2.5 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbs., when tested according to ASTM F 446.

END OF SECTION 10 2800

SECTION 10 5200 – FIRE-PROTECTION SPECIALTIES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Portable fire extinguishers.

1.2 QUALITY ASSURANCE
A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
1. Provide extinguishers listed and labeled by FM.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Portable Fire Extinguishers:
a. J.L. Industries, Inc.
b. Kidde: Walter Kidde, The Fire Extinguisher Co.

2.3 PORTABLE FIRE EXTINGUISHERS
A. Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
B. Multipurpose Dry-Chemical Type: UL-rated 2-A:10-B:C, 5-lb nominal capacity, in enameled-steel container.

2.6 ACCESSORIES

A. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged units.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Provide final protection and maintain conditions that ensure that fire-protection specialties are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 5200

SECTION 12 3616 - STAINLESS STEEL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel countertops and backsplashes.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Verification: For the following products:
1. Countertop material, 6 inches square.

1.3 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.4 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL COUNTERTOPS

A. Stainless-Steel Countertops:

1. Description: Flat countertops configured as indicated.

a. Tops: Stainless steel, Type 304, 0.078 inch thick, reinforced and sound deadened.

1) Back Splash: Manufacturer's standard height.
2) Edge: Bullnose on front edge, and sides.

B. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.2 COUNTERTOP MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.

1. Stainless-Steel Finish: Directional satin finish, No. 4.

B. Adhesives: Adhesives shall not contain urea formaldehyde.

2.3 FINISHES

A. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet.

B. Install countertops level and plumb, according to manufacturer's written instructions.

C. Complete assembly where field assembly is required.

1. Provide closed butt and contact joints that do not require a filler.
2. Grind field welds on stainless-steel equipment until smooth and polish to match adjacent finish.

D. Install countertops with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.

E. Install joint sealant in joints between stainless steel and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

A. After completing installation of countertops, repair damaged finishes.

B. Clean countertops as required to produce ready-for-use condition.

C. Protect countertops from damage during remainder of the construction period.

END OF SECTION 12 3616

SECTION 12 9300 - SITE FURNISHINGS AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Included: Provide site furnishings where shown on Drawings, as specified herein, and as needed for a complete and proper installation of the following:

1. Picnic Table.

1.02 QUALITY ASSURANCE

A. Set items in a timely manner in accordance with manufacturer's recommendations.

B. PVC coating material shall be of the highest grade resin coating with plasticizers and stabilizers added to insure resistance to fading and shall be thermally fused and adhered to a primer that is thermally cured onto galvanized steel. Vinyl properties, when applied at 250 mils, shall be as follows:

1.	Specific Gravity	ASTM-D792	1.30 Max. +/.03
2.	Hardness Durometer	ASTM-D676	A90 +/- 5
3.	Tensile Strength	ASTM-D412	2600 +/- 5%
4.	Ultimate Elongation	ASTM-412	275% +/- 5%
5.	Dielectric Strength	ASTM-D149	750
6.	Compress & Cut through Lbs.	Bell Labs	1500
7.	Accelerated Aging Test	ASTM-D1499	1500 Hrs@145o F

C. No degradation of PVC powder when exposed to 500,000 lanleys of ultraviolet exposure time using a fresnel-reflecting concentration employed in the EMMAQUA test method in accordance with ASTM-E838, ASTM-D4364 and ASTM-D4141.

D. In addition to the above, the PVC material shall be impervious to the following alkalies, acids and oils: Sulfuric acid, hydrochloric acid, citric acid, sodium hydroxide, petroleum, mineral and synthetic urine.

1.03 SUBMITTALS

A. Comply with provisions of Section 01340.

B. Samples:

Accompanying the Shop Drawings, submit samples of all finishes including actual materials on suitable substrates for true representation of color and textures of products called out under this Section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of Section 1640 Product Handling.

B. Components should be covered or otherwise protected to prevent any use until after final inspection.

PART 2 – PRODUCTS

2.01 PICNIC TABLE

A. Acceptable Manufacturers:

1. DuMor Site Furnishings, P.O. Box 142, Mifflintown, PA 17059, 800.598.4018, www.dumor.com

   a. 76 Series (4' square), PL-4 and PL-3 (accessible)
   b. Surface mount with non-corrosive tri-groove security bolt anti-theft hardware
   c. Recycled plastic slats, 3" x 4"
   d. Colors as selected from manufacturer's standards
   e. Install per manufacturer's instructions

2. Ultra Site, 1675 Locust Street, Red Bud, IL 62278, 618.282.8200, www.ultraplay.com

   a. 338 Series (4' square), 4-Seat Square Table and 3-Seat ADA Square Table
   b. Surface mount with non-corrosive tri-groove security bolt anti-theft hardware
   c. Recycled plastic slats
   d. Colors as selected from manufacturer's standards
   e. Install per manufacturer's instructions

3. Bedford Technology, LLC, 2424 Armour Road, PO Box 609, Worthington, MN 56187, 800.721.9037, http://www.plasticboards.com/

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper execution of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Coordinate as required with other trades to assume proper interface with the work of this Section.

B. Install the work of this Section in strict accordance with the design, approved shop drawings and the manufacturer's recommendations.

C. Upon completion of the installation, touch-up all scratches and abrasions to be completely invisible to the unaided eye from a distance of five feet.

END OF SECTION 12 9300

SECTION 131100 - SWIMMING POOLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.02 SUMMARY OF WORK *(for general guidance-not all inclusive)*

A. Introduction

1. Provide all labor, materials, equipment and services necessary to construct the following: (1) a leisure pool. This work shall include the structure(s) and installation of pool finishes as well as all products listed in Part 2 of Section 131100.

B. Work included in this section

1. It is the intent of this section to place the entire responsibility for the construction of the pool (including the construction of the pool shell(s)) under one vested CONTRACTOR. Under this section the Swimming Pool Contractor will provide but is not necessarily limited to the following:

a. Provide all equipment and services required for erection and delivery onto the premises of any equipment or apparatus provided. Remove equipment from premises when no longer required.

b. Provide all electrical conduit, wiring, junction boxes etc. to all low voltage pool equipment within pool filter/chemical rooms per Division 26 - Electrical. (Low voltage is considered less than 110 V.)

c. Coordinate for all required bonding and grounding of the pool shell, fittings, and equipment.

d. Provide all necessary piping and valving as shown on the drawings and specified herein.

e. Provide individually sized housekeeping pads for each pool pump.

f. Provide the main drain hydrostatic relief system and a sight sump as shown on the drawings. Reference Division 31 - Earthwork.

g. Provide winterization products and services for the outdoor swimming pool for a period not less than 12 months including a minimum of one (1) closing and one (1) opening. The Contractor shall provide one (1) additional opening if the outdoor facility is open for less than 40 days. Contractor to include winterization procedures with owner training.

h. Construct the cast in place or pneumatically applied concrete pool shell as described in these specifications and detailed on the drawings, including reinforcement steel, inserts, fittings, main drain sumps and all embedded items (piping, anchors, etc.) for the pool. Reference Division 3 - Concrete and Structural. Before commencing the placement of concrete, verify electrical bonding of the pool embedded items and

reinforcing steel. Also, coordinate and arrange any required electrical, plumbing and or building inspections. Provide any structure drainage around the pool as shown on the drawings. Backfill and compact fill around the pool structure, piping trenches and excavations required by this work. Reference Division 31 - Earthwork.

i. Provide an epoxy paint finish in the pool with a stainless steel gutter. Provide specialty tile for the depth markings and warning signs, and all other tile installation within the pool structures. Reference Section 093213 - Swimming Pool Tile - including the tolerance requirements for the concrete substrate.

j. Assemble and install the cleaning and maintenance equipment for the pool as specified herein.

k. Provide for the storage of all pool related equipment, materials and systems. All items are the responsibility of the CONTRACTOR until accepted by owner.

l. Obtain final acceptance by jurisdictional health department(s).

m. Start, test, calibrate and adjust all mechanical equipment, electrical equipment, recirculation, chemical, and other supplied systems including deck, loose, maintenance, and safety equipment. Instruct the Owner's representative in the systems operation and maintenance as described herein.

n. Layout and install all deck mounted anchors, sockets, and inserts for the pool.

1.03 Related work specified in other sections

A. Section 093213 – Swimming Pool Tile

B. Section 131101 – Cast-In-Place Concrete

C. Section 131102 – Pneumatically Applied Concrete

D. The following work related to the swimming pools shall be completed by other trades.

1. Provide, erect and maintain all necessary barricades, signs, lights and flares for pool construction to protect workers and the public.

2. Provide and maintain proper shoring and bracing for existing utilities, sewers and building foundations where required for swimming pool related excavations. Reference Division 31 - Earthwork.

3. Provide sub-surface drainage beneath the pump pit and backwash pit. Reference Division 31 - Earthwork.

4. Construct pump pit and backwash pit including reinforcement, inserts, wall sleeves, anchors, access hatches, and fittings. Reference Division 3 - Concrete.

5. Layout, excavate, remove from the construction site, replace and grade materials as required beyond the limits of excavation of the pool shell(s) to complete the work described in this section. Reference Division 31 - Earthwork.

6. Prior to concrete pours, verify electrical bonding of the pool embedded items. Coordinate and arrange any required electrical, plumbing and or building inspections to be performed on embedded items. Reference Division 26 - Electrical.

7. Provide sanitary sewer and storm drain connections. Reference Division 22 - Plumbing.

8. Provide deck finish beyond perimeter tile band. Reference Division 32 - Exterior Improvements.

9. Provide rules and regulations signage as required by code. Reference Division 1 - General Requirements.

10. Provide chlorine resistant caulking (sealant) and backer rod on pool decks. Reference Division 7 - Thermal and Moisture Protection.

E. Related work specified in Plumbing section. Reference Division 22 - Plumbing. Work to be completed by other contractors.

1. Provide trench drains and area drains on pool deck.

2. Provide sanitary sewer piping from the filter room including floor drains, sumps, and sump pump.

3. Provide water service to all hose bibbs, flush hydrant boxes and auto-fill bypass to air gap above fill funnel(s). Install the slow closing solenoid valve(s) in the bypass auto-fill piping.

4. Install Plumbing Contractor supplied water meter on the fresh water supply line upstream of the manual fill valve and the slow closing solenoid valve.

F. Related work specified in Mechanical section. Reference Division 23 – HVAC. Work to be completed by other contractors.

1. Provide air circulation systems for pool related spaces.

G. Related work specified in Electrical sections. Reference Division 26 – Electrical. Work to be completed by other contractors.

1. Provide power to the exhaust fans for the chemical rooms.

2. Provide motor starters, auxiliary contacts, magnetic relays and other electrical control devices necessary for the complete operation of the pool systems. Install power to Variable Frequency Drive pool pump starters and power from VFD to the pool pump motor.

3. Ground and bond all pool structures, fittings and equipment in accordance with Article 680 of the N.E.C. Test and verify that the system electrical ground is true and solid. Provide certification to this effort.

4. Obtain permits, inspections, and approvals of all wiring including grounding and bonding of all metal components associated with the pool in accordance with Local, State and National Electrical Codes.

5. Confirm all electrical conduits that penetrate the pool shell are watertight and installed per N.E.C. Article 680.

1.04 QUALITY ASSURANCE

A. The specifications and drawings illustrate and detail one (1) swimming pool system that shall be utilized for recreational use. Certain technical aspects of the design are common only to pool systems planned for public use. Understanding these aspects, their functions and interaction through experience is vital to completing a successful operating system. It is a mandatory requirement that all bidders will have achieved such experience as a prerequisite for bidding this project.

1. If the Contractor has not received prior written approval for this project or has not been included in the pre-approved list of Contractors, they must submit a list of projects meeting the aforementioned qualifications, including contact information of the General Contractor shall be submitted for review and approval at least 10 days prior to bidding of the project. The Contractor must have completed at least five (5) public-use leisure pools with individual water surface areas in excess of 4500 square feet and a depth of 11'-6" or more within the past 10 years.

2. The Contractor must submit prior to the start of construction the name of the swimming pool on-site Project Superintendent including their relevant experience. The Contractor's swimming pool on-site Project Superintendent must have completed at least five (5) public-use leisure pools with individual water surface areas in excess of 4500 square feet and a depth of 11'-6" or more within the past 10 years. A list of projects meeting the aforementioned qualifications, including contact information of the General Contractor as well as Owner shall be included with the experience submittal. Swimming pool project superintendent must not change on the project unless written authorization has been provided by the Architect and Owner.

3. The following bidders have been pre-approved. All bidders shall meet the requirements listed above.

Sunbelt Pools
Rob Morgan, Jon Collins
10555 Plano Rd.
Dallas, TX 75238-1305
p) 214.343.1133
f) 214.343.1201

Progressive Commercial Aquatics
Tim Phelps
15616 FM 973
Manor, TX 78653
p) 512.278.0801
f) 512.278.0804

California Commercial Pools
David Jackson, Lee Jackson
2255 E Auto Center Dr.
Glendora, CA 91713
p) 909.394.1280
f)909.394.4579

Atlantis Aquatics
Dennis Watson
PO Box 3475
Abilene, Texas 79604
p) 817-825-5844
f) 800-835-3678

Acapulco Pools
Bernie Gall
1550 Victoria Street North
Kitchener, Ontario
N2B 3E2 Canada
p) 519 - 743-6357
f) 519-743-9698

Shasta Industries
Karyn Smith
7220 N. 16th St., #C-200
Phoenix, AZ 85020
p) 602-997-7896
f) 602-943-8692

The Pool Company, Inc.
Matt Ruzicka
3077 20th St E, Suite D
Tacoma, WA 98424
p) 253.926.6875
f) 253.926.0590

Wescon, Inc.
Steve Kraft
P.O. Box 1483
7301 Jefferson St., NE
Albuquerque, NM 87109
p) 505.345.2511
f) 505.345.2512

Carrothers Construction
Fritz Caspar
401 West Wea
P.O. Box 269
Paola, KS 66071-0269
p) 913-294-2361
f) 913-294-2211

KC Gunnite
Mason Banks
16207 Kentucky Road
Belton, MO 64012
p) 816-331-6606

1.05 REGULATORY AGENCY REQUIREMENTS AND ENGINEERING SERVICES

A. The entire system shall be designed and installed to meet applicable national and local codes and be in compliance with applicable sections of the American National Standards Institute / National Spa and Pool Institute (ANSI /NSPI-1 2003).

B. The system shall comply with all necessary pre-construction approvals obtained by the Owner and Owner's Consultants from local regulatory agencies governing the design and construction of public swimming pools.

C. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, and other costs in connection with his work, including the filing of all necessary as-built drawings, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction over their work. The Contractor shall also be responsible for obtaining all required certificates of inspection for his work and deliver same to the Owner and Owner's Consultants before requesting acceptance and final payment for the work.

D. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus or drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

1.06 COORDINATION AND CLARIFICATION

A. Coordinate with other contractors or subcontractors all work relating to this section.

B. The Contractor must establish with other contractors or subcontractors, having related work in this section, that all work necessary to complete the pool as shown on the drawings and in the specifications is included in the base bid and alternates to the Owner.

C. If in doubt regarding the responsibility for work covered in this section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.07 ALTERNATES

A. Review the description of the alternates in Division 1 and on the drawings for possible effect upon work in this section. Alternates related to the work in this section are described in this division and on the bid proposal form.

B. Pool Alternates

1. ADD ALTERNATE #A1 - Climbing Walls - Climbing wall (1 required): deck-mounted artificial aquatic climbing wall feature designed to withstand chlorinated environments. Climbing holds are non-abrasive polyester resin with UV inhibitors in aquatic colors. Climbing wall base shall be fabricated from grade 304 stainless steel. Climbing wall shall be ASTM approved. Climbing wall shall be Kersplash model as shown on the drawings, by Everlast Climbing or approved equal.

1.08 SUBMITTALS

A. All submittals shall be made in accordance with the requirements of Division 1 - General Requirements and in strict compliance with the following procedures and guidelines.

B. Shop drawings and engineering data shall be tabbed, indexed, referenced to the specifications, per the requirements outlined in Division 1 - General Requirements. Provide cover sheet for each item submitted identifying item and product number. The first stage shall include all embedded items for the pool shell(s) (including piping diagrams) and the second stage shall be for all remaining items. Only complete sets will be reviewed.

1. Engineering data covering all systems, equipment, structures and fabricated materials, which will become a permanent part of the work under this contract, shall be submitted for review. This data shall include drawings and descriptive information in sufficient detail and scale to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorage and supports required; performance characteristics; fabrication and dimensions needed for installation and correlation with other materials and equipment. A certification, in writing, shall be provided indicating that all equipment will fit in the space allotted and as shown on the drawings.

C. Include complete product data indexed, tabbed, and referenced to specifications with 8 ½" x 11" cover sheet covering:

1. Paragraph 2.01 - Overflow System
2. Paragraph 2.02 - Pumping Equipment
3. Paragraph 2.03 - Filtration Equipment
4. Paragraph 2.04 - Recirculation Fittings
5. Paragraph 2.05 - Piping Systems
6. Paragraph 2.06 - Chemical Treatment Systems
7. Paragraph 2.07 - Chemistry Monitoring and Control Systems
8. Paragraph 2.08 - Flow Meters
9. Paragraph 2.09 - Water Level Controllers
10. Paragraph 2.10 - Inserts and Anchor Sockets
11. Paragraph 2.11 - Deck Equipment
12. Paragraph 2.12 - Loose Equipment
13. Paragraph 2.13 - Maintenance Equipment
14. Paragraph 2.14 - Safety Equipment
15. Paragraph 2.15 - Thermometers
16. Paragraph 2.16 – Swimming Pool Finishes
17. Paragraph 2.17 - Waterproofing

18. Paragraph 2.18 - Sealants

19. Paragraph 2.19 - Water Features and Support Equipment

D. Include engineering/construction drawings for the pool structure.

1. Reference Division 3 - Concrete.

E. Include engineering construction drawings for all pool piping.

F. Provide a complete set of structural drawings for the spray features and waterslide footing structures bearing the seal, signature, and date of a licensed professional engineer in the State of OKLAHOMA. Drawings shall include plans, elevations, cross sections, details, and calculations required to construct the spray feature and waterslide footing structures. Structural drawings shall clearly identify all reinforcement, construction joints, embedded items including waterstops, excavation lines and finish concrete elevations, under drainage requirements, under drain routing, clean out locations and location dimensions of all accessory items provided under this section. A licensed professional engineer shall utilize existing soils and geotechnical data in the preparation of the structural design criteria. Provide all design calculations and support data required to show compliance with performance requirements specified, including design assumptions concerning element restraint. All calculations shall be certified and sealed by the licensed professional engineer. Provide a design in response to actual site conditions.

G. Installation of the spray features and waterslide footings shall not commence until detailed plans and specifications are approved by the department of Building and Safety. The responsibility for all costs associated with obtaining such approval shall be part of the General Construction contract.

H. Reference Section 093213 – Swimming Pool Tile

1.09 OPERATION AND MAINTENANCE MANUALS AND CLOSE-OUT SUBMITTALS

A. Detailed operation and maintenance information shall be supplied for all equipment requiring maintenance or other attention. The equipment supplier and/or CONTRACTOR shall prepare an operation and maintenance manual for all equipment. Parts lists and operating and maintenance instructions shall be provided.

B. Each operation and maintenance manual shall include the following:

1. Equipment function and calibration, normal operating characteristics, and limiting conditions.

2. Assembly, installation, alignment, adjustment and checking instructions.

3. Operating instructions for start up, routine and normal operation, regulation and control, shut down and emergency conditions.

4. One (1) copy of all instructional videos.

5. Operating cycles shall be specifically described in outline format and in referenced detail. A wall-mounted color-coded piping flow diagram shall be provided in the pool equipment room. The diagram shall be engraved on laminated plastic with color-coded piping to match color of coding on piping, and including valves identified with number on tags. The minimum size shall be 11 inch x 17 inch.

6. Include manufacturer recommended maintenance schedule, parts lists, piping diagram (to agree with wall mounted diagram) and trouble-shooting information for all pool mechanical equipment.

7. Using reference to keyed valves and wall diagram, include specific written instructions for procedures to be followed for the following:

   a. Emptying and refilling the pool(s) including de-watering during the period that the pool(s) will be empty;

   b. Water level control adjustment and chemical control operation;

   c. Filter operation and backwashing; and

   d. Super chlorination.

8. Lubrication and maintenance instructions.

9. Guide to "trouble-shooting".

10. Parts list and predicted life of parts subject to wear.

11. Outline, cross section, and assembly drawings; engineering data and wiring diagrams.

12. Test data and performance curves, where applicable.

13. Specific written instructions for procedure for emptying and refilling the pool(s) including de-watering during any period that the pool will be empty. Include furnishing and installing a yellow warning sign 8-1/2 in. x 11 in., to be mounted in the filter room, that reads:

    WARNING

    Prior to emptying Pool

    Consult O & M Manuals for Procedures

    Add another sign shall read:

    Keep all Caps, Plugs and Tops Tight Fitting to Prevent Escape of Fumes.

14. One set of applicable submittals shall be included in each manual.

C. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by the CONTRACTOR.

D. Manuals and other data shall be printed on heavy, first quality paper, 8-1/2 x 11 inch size with standard 3-hole punching and inserted in plastic covers. Drawings and diagrams shall be reduced to 8-1/2 x 11 inches or 11 x 17 inches. Where reduction is not practical, larger drawings shall be folded separately and placed in envelopes that are bound into the manuals. Each envelope shall bear suitable identification on the outside.

E. Six (6) bound volumes of each manual shall be submitted. All parts lists and information shall be assembled in substantial manuals and permanent, three-ring or three-post binders. Material shall be assembled and bound in the same order as specified, and each volume shall have a table of contents and suitable index tabs.

F. All material shall be marked with project identification. Non-applicable information shall be marked out or deleted.

G. Shipment of equipment will not be considered complete until all required manuals and data have been received.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.

B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

C. Handle materials in a manner to prevent damage.

D. Store all materials on clean raised platforms with weather protective coverings. Provide continuous protection of materials against damage or deterioration.

E. Remove damaged materials from site.

1.11 WARRANTIES

A. The CONTRACTOR warrants to the Owner and Architect that materials and equipment provided under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted, and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements, including substitutions not properly approved and authorized will be considered defective. The CONTRACTOR'S warranty will exclude remedies for damage or defect caused by abuse, improper or insufficient maintenance, improper operations, modifications not executed by the CONTRACTOR or improper wear and tear under normal use. If required by the Architect, the CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of one year from the date of substantial completion or the owner begins using the pool unless otherwise specified.

B. The CONTRACTOR shall agree to repair or replace any defective or non-complying work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

C. Submit all warranties covering, but not limited to the following:

1. All pool deck equipment and accessories against defects in material, manufacturer and installation for a period of one (1) year.

2. Defects in material, manufacture and installation of the filtration, backwash, chlorination, pH adjustments and cleaning systems, including controls for a period of one (1) year.

3. Defects in material or workmanship of the pool structure causing a loss of water for a period of three (3) years.

4. Defects in material, workmanship, and installation of the pool piping system for a period of three (3) years.

5. Defects in material, workmanship, and installation of the pool pumps for a period of one (1) year.

6. Manufacturer's minimum fifteen (15) year warranty on the filter tank and lining against defective materials or workmanship of the tank and components. (Additional warranty time may be purchased from the manufacturer.) Prorated warranties are not acceptable.

7. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the sanitizing feed system.

8. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the pH buffer feed system.

9. Defects in material, manufacture or installation of the stainless steel recirculating overflow system for a period of two (2) year.

10. Manufacturer's minimum five (5) year warranty against defective materials, components and workmanship in the pool chemical controller. ORP, pH, flow and temperature sensors shall be covered by a standard two (2) year warranty. All other sensors and flow cell components shall be covered by a standard one (1) year warranty.

11. Manufacturer's minimum eighteen (18) month warranty against defective materials, components and workmanship in the Variable Frequency Drive system effective the date of supply.

12. Defects in material, workmanship, and installation of the pool painted finish against delamination for a period of one (1) year.

13. Manufacturer's minimum fifteen (15) year systems warranty against defective materials, components and workmanship in the pool tile setting materials.

14. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the ultraviolet sanitizing system (excluding the UV arc tube). UV arc tubes are warranted to operate for 4000 hours when operated continuously. A continuously operated UV arc tube that fails prior to 4000 hours of operation shall be replaced free of charge. Intermittently operated UV arc tubes(>1 on/off cycle per day) will be replaced free of charge if failure occur prior to 2000 hours and prorated between 2000 and 4000 hours.

1.12 SYSTEM TRAINING

A. A qualified representative of the CONTRACTOR performing work under this section shall put the equipment into operation and instruct the Owner's representatives in the operation of this equipment to the Owner's satisfaction immediately after project's substantial completion.

B. The CONTRACTOR'S training representative shall have completed the equipment/system's manufacturer's training requirements and be certified, by the manufacturer, to provide and teach system training.

C. The representative from the CONTRACTOR shall be either a CPO (Certified Pool Operator) or have an AFO (Aquatic Facility Operator) certification.

D. Training shall consist of a total of 32 hours of on-site training and scheduled as follows:

1. 16 hours of initial training on the complete swimming pool system. Training to include winterization procedures – Refer to Section 1.02 for winterization protocol. The 16 hours of initial training is to be comprised of at least 4 hours of training on water chemistry

analysis and adjustment. The water chemistry training will include in depth review of the use of the Langlier index and its computation.

2. The initial 16 hours of training shall include information on the care, operation, adjustment, and maintenance of all items provided by the CONTRACTOR under the "Part 2 – Products" section of this specification.

3. 16 hours of training after the Owner's staff has had experience operating the system. This time may be requested any time after the pool has been placed in operation within a period of one (1) year from the time the pool was accepted by the Owner. The additional training shall contain at least 2 hours of review of water chemistry.

4. The CONTRACTOR shall provide a project specific video recording instruction manual in addition to the training sessions. The video instructions shall be project specific and shall include information on the care, operation, adjustment, and maintenance of all items provided by the CONTRACTOR under the "Part 2 – Products" section of this specification. This video recording shall be done separate from the Owner training.

5. The CONTRACTOR shall include one (1) copy of all video recording instructions in each Operations and Maintenance Manual.

1.13 POOL FILL WATER QUALITY

A. The Contractor shall bear the cost of the water required for two (2) complete fillings of the pool (the initial water tightness test and the final filling). Removal of iron or copper (if in excess of .3 ppm) will be required for the final fill to avoid staining of the pool finish. Any subsequent fillings or partial fillings (more than 25%) of the pool shall be by the CONTRACTOR, at its own expense.

B. The CONTRACTOR shall provide the necessary plant equipment so that the temperature of fill water will be within plus or minus 10 degrees of the ambient air and/or the pool structure at the time of filling. Extreme caution is urged if the temperature variance is greater than 10 degree F.

C. The CONTRACTOR shall provide the necessary chemicals and to adjust and balance the water chemistry in the pools to the following levels:

pH	7.4 - 7.6
Calcium Hardness	200 - 400 PPM
Total Alkalinity (Calcium Hypochlorite)	60 - 80 PPM
Langelier saturation index	-0.3 - +0.3
Total Dissolved Solids (TDS)	not to exceed 1,500 PPM

1.14 START-UP CHEMICALS

A. The CONTRACTOR shall maintain the chemical balance of the pool water (including the cost of all chemicals required) until the pool and mechanical system(s) are fully operational and accepted by the Architect and the Owner.

B. Provide the Owner with sufficient quantities of the necessary chemicals to maintain the pool operation for a minimum of thirty (30) days from substantial completion or the owner begins using the pool.

C. Chemicals to be provided to the Owner shall include those required by the chemical feed systems installed.

1.15 RECORD DRAWINGS

A. Provide a complete set of record drawings of the entire pool system including all sub-systems. All record drawings shall be prepared in accordance with the requirements of Section 017839 and shall be a complete, stand-alone set. The CONTRACTOR shall be permitted to obtain original documents and copy them for this purpose only. Provide the record set on compact disk (AutoCAD Release 2010 or compatible software).

PART 2 - PRODUCTS

2.01 OVERFLOW SYSTEM

A. It is the intent of the specifications that the perimeter overflow system and surface cleaning be maintained under all conditions of normal operation and that no water be discharged to waste except when cleaning the filters or emptying the pool.

B. Stainless Steel Gutter

1. A perimeter overflow system for the pool shall consist of a continuous overflow channel and filtered water supply line generally following the details shown on the drawings shall be supplied around the entire perimeter of the pool. The entire system shall be fabricated of 304L (Outdoor) stainless steel with a #3 polished finish. All components of the system shall be no less than 12 gauge in thickness.

   a. Basis of Design: The system shall be the single channel deck level gutter as manufactured by Natare Inc.. Paddock, Neptune Benson or Natare, Inc. to the dimensions shown in the drawings.

2. The gutter system shall be sized to accommodate a flow capacity equal to 100% of the pool system recirculation rate.

3. Surface skimming shall be continuous around the entire pool perimeter. The water level of the pool shall be maintained at ±1/16" above the overflow lip of the gutter. Dynamic surge action shall be quelled by the gutter channel to reduce rebounding back into the swimming lanes.

4. Filtered Water Inlets

   a. The filtered water return tube shall have inlets not over 42 inches on center around the entire pool perimeter. The inlets shall be spaced so as to not interfere with wall areas, electronic touch pads or competitive racing lanes. These inlet jets shall be installed so as to provide a stream of filtered chlorinated water on a fixed 45 degree angle directed toward the bottom of the pool. Velocity through the inlet orifice shall be in the range of 5 to 20 feet per second. The inlet openings shall not be larger than 9/16 inch in diameter. The filtered water supply conduit shall be machine welded using the TIG process by the manufacturer in his plant and pressure tested prior to shipment. No exceptions.

5. Converters

   a. Gutter drain and supply/return converters shall be sized according to the system requirements and installed in the system where indicated on the drawings. The drain converter shall be fabricated of 304L (Outdoor) stainless steel no less than 12 gauge

thickness. The supply (pressure) converter shall be fabricated of 304L (Outdoor) stainless steel no less than 10 gauge thickness. A 1" x 1" x 1/8" angle shall be welded around the converter to increase rigidity.

6. Anchorage

   a. The entire perimeter overflow system section shall be anchored to the pool structure with commercial quality "U" bolts or expansion anchors made from reinforcing steel and fastened to the pool reinforcing steel, thus forming a continuous perimeter section as shown on the plans. These anchors shall be placed at the centers and on a maximum of 4 foot centers around the pool.

7. Depth Markers and Depth Marking Plates

   a. The manufacturer shall provide self-adhesive black vinyl depth markers as detailed on the plans and the CONTRACTOR shall apply these after all concrete work is complete. Stainless steel plates shall be installed as detailed on the plans at each depth marker location and the CONTRACTOR shall apply the vinyl depth markers to these plates.

8. Grating

   a. The grating shall be formed of white extruded PVC tubes. The top surface of the tube shall be 1-1/8 inch wide and the depth shall be 3/4 inch. The top surface shall be serrated to create a non-skid surface. The space between extruded sections shall not exceed 9/32 inch. Grating to be in sections not to exceed 10 feet and shall be secured in place with tamper proof stainless steel fasteners and be easily removable. The width of the grating shall permit the insertion of the touch pad holding brackets between the grating and the gutter lip. Grating surface bars shall run perpendicular to pool wall. Grating assembly by Lawson Aquatics supplied by Neptune.

9. Welding

   a. All seams shall be welded by the TIG process and shall result in a uniform appearance. Welds shall not be ground. All welds shall be brushed after cooling to approximately 300 degrees. Filler metal shall be added to present a flush appearance to finished seams.

10. Materials

    a. The exposed surfaces of the perimeter which form the front lip of the overflow system section shall be fabricated from 12 gauge 304L (Outdoor) stainless steel with a finish similar or approved equal to #3 polished (100 mesh abrasive) finish. The back section shall be fabricated from 12 gauge 304L (Outdoor) stainless steel.

       I. Finish

          i. The stainless steel components shall be cleaned and polished as required to present a substantially uniform finish. Each weld seam as completed, after it cools to approximately 300 degree shall be vigorously brushed with a stainless steel brush.

       II. Blending of all surfaces shall be done with a Scotch Brite flap wheel. Those areas requiring blending which are inaccessible with the power wheel shall be hand blended with a 3M Scotch Brite pad. The strength of the raised weld shall not be reduced by grinding. After all stainless steel welding, brushing,

blending and testing, the welds on the stainless steel components must be cleaned with a one-to-one solution of muriatic acid (HCl) and water. Swab the acid on the weld seams, keeping them wet with acid, for five to ten minutes. Thoroughly neutralize and rinse. Repeat swabbing the entire exposed surface of the stainless steel components with a 20% nitric acid solution. An integral, sandblasted non-skid strip shall be provided on the top surface of the overflow lip and gutter section at deck level.

11. Installation Experience

    a. All installation of stainless steel perimeter overflow system is to be performed by a welder with at least 5 years experience in the field of welding stainless steel recirculating systems. Submit the installer's experience in writing for approval prior to ordering the recirculating system. All work is to be performed in accordance with the manufacturer's technical bulletins. If the requirements of these bulletins contradict this or any over section of the specifications, the procedures called for in the bulletin shall govern. The installer of the system shall perform all grouting and caulking between the stainless steel gutter system and concrete or grout surfaces required in the installation of the system. The manufacturer of the stainless steel gutter system shall provide the grout and/or caulk to properly join the system to the concrete shell.

2.02 PUMPING EQUIPMENT

A. Any proposed substitutions shall include a mechanical drawing incorporating all required changes in layout, piping and valves. The cost of such changes shall be included in the price of the substitute. CONTRACTOR to confirm voltage prior to ordering pump. All motors shall be capable of continuously running without overloading at any point on the characteristic curve of the pump without overload or harm. CONTRACTOR shall confirm by 1/4 inch scale shop drawing that the pumps and filters to be provided will fit in the available space and can be removed for servicing.

1. Pumps shall be certified by the National Sanitation Foundation (NSF) and bear the certification mark.

2. Pump casing shall be cast iron fitted with a replaceable bronze case wear ring. Mechanical seals shall be provided specific for a clear, mildly chlorinated water application. Pump impeller shall be enclosed type of cast bronze, statically and dynamically balanced, and trimmed for the specified design conditions. All bronze materials shall be suitable for use in a chlorinated environment. Suction and discharge flanges shall be provided and tapped for gauge connections. Provide steel or cast iron bases.

3. If the pump is powered with a VFD, the impeller to be trimmed to a maximum diameter based on the most limiting condition of either the diameter of the maximum non-overloading rated motor horse power at the design point or a diameter resulting in 10% greater head than the specified head.
4. Pump motor shall be totally enclosed, fan cooled (TEFC) and premium efficiency of the horsepower and speed specified. A pump requiring larger horsepower shall not be acceptable.

5. Provide a hair and lint strainer, for each pump, of fiberglass or epoxy coated stainless steel construction with a clear observation top in the sizes (or pipe sizes) indicated on the drawings. Provide hair and lint strainers with perforations no greater than 1/16" for feature pumps (PP2). Verify and coordinate pipe and pump suction sizes in the field. Strainer to be of a low pressure drop full-open or a tapered eccentric reducing type.

Straight reducing type strainers will not be acceptable without the addition of an approved tapered eccentric reducer between the strainer and the pump (in which case, sufficient space in the pump pit must be verified). Provide a stainless steel basket with at least 4 times the free open area as the inlet pipe, and one spare basket with each strainer

a. Basis of Design: As manufactured by MerMade Filter Inc. or Neptune/Benson Inc.

6. Provide a coating to protect all non-bronze pumps from corrosion. Coating shall be fusion bonded epoxy coating on all wetted parts. Sandblast to bare, white metal. Thickness shall be 8 to 12 mils (heavy film). Verify thickness by non-destructive testing. Coat parts as recommended by manufacturer, including preheating parts to 400 degrees and electrostatic deposition or fluidized bed technique. Provide primers if required to resist chlorinated water <10 ppm. Coating shall be Scotchkote 134 manufactured by Fusecote or approved equal, 9658 Alpaca St., South El Monte, CA 91733, 818-443-6760, 213-886-2258, or fax 818-443-9142, or approved equal.

7. Entire pumping unit shall be mounted on a base using cap screws to preserve the back pull-out feature of the pump. Pumps shall not be secured with floor studs. The pump base shall be coated with the same epoxy coating as the pump. An OSHA approved guard shall protect coupling and exposed rotating components of the pump and motor where required.

8. Recirculating Pumps and Motors

a. All recirculation pumps shall be provided by the same manufacturer. Confirm voltages prior to ordering pumps.

b. Leisure Pool Recirculation Pump:

Provide one (1) horizontally mounted centrifugal pump, as shown on the drawings and described in these specifications. Each pump is to be of a straight centrifugal, end suction, bronze fitted, close coupled type, capable of pumping 900 GPM against 70 ft. TDH with an efficiency of no less than 80% and a required net positive suction head (NPSHr) no greater than 20 ft. It shall be provided with a 25 HP, 1800 RPM, 208 VAC, 3 phase, 60 cycle electrically driven motor meeting these specifications.

i. Basis of Design: The system design is based upon Paco. Pumps manufactured by Paco, ITT Marlow, Griswold, or Aurora shall all be considered, provided they meet the requirements.

c. Feature Pump

Provide one (1) horizontally mounted centrifugal pump, as shown on the drawings and described in these specifications. Each pump is to be of a straight centrifugal, end suction, bronze fitted, close coupled type, capable of pumping 270 GPM against 45 ft. TDH with an efficiency of no less than 70% and a required net positive suction head (NPSHr) no greater than 8 ft. It shall be provided with a 5 HP, 1800 RPM, 208 VAC, 3 phase, 60 cycle electrically driven motor meeting these specifications.

i. Basis of Design: The system design is based upon Paco. Pumps manufactured by Paco, ITT Marlow, Griswold, or Aurora shall all be considered, provided they meet the requirements.

B. Variable Frequency Drive Starters

1. Provide VFD starters for the leisure pool and feature pump. VFD shall be a product of H2Flow Controls, Pentair AcuDrive, Neptune Benson Weg, or approved equal.

   a. Basis of Design: Eco-Flo-C by H2 Flow Controls.

2. The IP54 or NEMA 12 enclosure shall be of non-corrosive construction. External enclosure surfaces shall be corrosion resistant. VFD's installed within a supplementary panel shall not be vented or cooled from ambient external air. With the exception of the VFD's heatsink and water-resistant heatsink fan, the VFD's electronics shall be fully sealed within the NEMA 12 enclosure. Vented enclosures are not permitted.

3. The VFD shall convert incoming fixed frequency three phase AC power into a variable voltage and variable frequency three phase output utilizing pulse width modulation. Advanced Space Vector Control will be utilized to reduce motor heating and provide precise control of the AC motor.

4. The VFD shall include a built-in Line Filter to mitigate harmonic distortions being transmitted back through the supply lines.

5. The VFD shall include a full wave diode bridge rectifier. The drive shall maintain a fundamental power factor near unity regardless of speed or load. SCR front ends which produce line notching are not acceptable.

6. The VFD shall utilize DC capacitors to filter out bus ripple and provide smooth DC power to the transistor section.

7. The VFD shall utilize IGBT transistors to produce a pulse width modulated output. SCR's are not acceptable.

8. The VFD shall have a full load amp rating which exceeds or meets NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, and shall be able to provide 110% of its variable torque rating and 150% of its constant torque rating for one minute.

9. The VFD shall utilize space vector control to reduce motor harmonics and torque ripple.

10. The VFD shall include the ability to program Load Curve Monitoring Using Motor Shaft Power, to detect any of the following abnormal pump conditions: Run Dry/Loss of Prime; Cavitation; Dead head/Closed Valve; Worn impeller; Blocked Filter; Bearing Failure/Wear Detection. Protection using measured current (Amps), shall not be acceptable.

11. The VFD shall include Ramping of the DC Bus, to eliminate VFD failures associated with turning supply on and off using a contractor or disconnect, and to detect input phase failure and asymmetries (imbalanced supply).

12. The VFD shall provide a display with selectable readout of parameters, including: Speed; Torque; Motor Shaft Power; Electrical Power; Current; Output Voltage; Frequency; Heatsink Temperature; Motor Temperature; Run Time; Energy Consumed; Mains Time.

13. The VFD shall be capable of interfacing to an analog output signal from a Flow Transducer and displaying measured flow in GPM.

14. The VFD shall include the capability for copying of settings when multiple similar pumps are involved. Settings established in one VFD shall be transferred to the others via a removable keypad.

15. The VFD Control Panel shall include a Programmable Aquatic Controller (Controller) with an operator backlit LCD Graphical / Alpha / Numerical Display, housed in a separate NEMA-4X enclosure. The Controller shall comprise the following features:

    a. Real Time Clock

    b. Password protection

    c. Hard-wired tamper protection feature

    d. Custom software to control the VFD via a Modbus communication network

    e. Automatic Flow Control. The Controller and VFD are to automatically adjust the pump's speed in order to compensate for a filter becoming dirty. The system is to maintain a minimum flow (GPM) required to meet State mandated turnover rates.

    f. Programmable speeds for daytime and nighttime turnover rates.

    g. Nonvolatile memory. All programmed parameters as well as the real time clock settings shall be maintained in the event of a power outage.

    h. Manual Backwash Control. Single button control that will ramp the pump's speed to a higher level for backwashing.

    i. Programmable time duration for backwash speed

    j. Automatic Backwashing. The Controller shall accept an input from an Automatic Backwashing system. The Controllers program shall be written so that such a signal will automatically initiate a higher speed for the pump until the signal is removed.

    k. The Controller shall be capable of interfacing to an analog output signal from a Flow Transducer and displaying measured flow in GPM

    l. Password protected reprogram function

    m. Password protected speed override

    n. Electronic phase rotational check

    o. Automatic detection of flow / pressure feedback signal

    p. Accumulated energy savings screen

16. VFD Control Panel shall include a Lightning Arrestor.

17. Installations that require the VFD panel to be located greater than 300 feet from the Pump Motor shall require the installer to provide a suitably rated Load Reactor.

18. Installations to 460V Non-VFD rated motors shall require the installer to provide a high quality Load Reactor type V1K from Trans Coil Industries.

19. Installations in locations where a Power Disconnect is not within 'line of sight' of the VFD Control Panel, or where deemed necessary by local electrical codes, shall require the installer to provide a suitably rated Circuit Breaker Disconnect.

20. The VFD shall accept a supply voltage of -15% / + 10% of its stated supply rating

21. The Controller and VFD shall be electronically lockable in order to prevent unauthorized or unintended program changes.

22. Motors to which the VFD is to be installed shall have a minimum insulation of "Class F".

C. Pump Gauges

1. Pressure gauges shall be installed on the discharge of the pumps.

2. Compound gauges shall be provided at the intake port of the pumps, after the hair and lint strainer.

3. Gauges shall be liquid filled, 316L stainless steel bourdon tube type with a minimum 2-1/2 inch diameter dial, high impact polypropylene or stainless steel case, corrosion resistant white scale with black divisions and numerals, 300 Series stainless steel heavy duty rotary bushed movement, , black enameled balanced Micrometer pointer.

   a. Basis of Design: Gauges shall be as manufactured by Weksler Instrument Corporation or approved equal.

4. Scale ranges shall be selected to indicate the normal system operating pressure of each system or location within the system. Pressure ranges shall be calibrated in psig (0-60 psi) and compound gauge shall be calibrated in inches of mercury (0-30 in Hg / 0-60 psi).

5. A stainless steel filter type pressure snubber shall be provided for each pressure gauge installed consisting of a 3/8 inch diameter by 1/8 inch thick micro metallic stainless steel filter and placed in the line just before the pressure gauge. Provide isolation brass valves or brass gauge cocks at each gauge for easy replacement and maintenance.

D. Provide link seals for all pipe penetrations as indicated on the drawings. Locations will include the foundation wall penetrations *(if expansive soils are present)* and other locations as noted. Link seals shall be provided in the sizes and quantities shown on the drawings and installed to provide a flexible watertight penetration. Metal parts shall be made of 316L stainless steel. Links shall form a continuous rubber seal that is tightened with a series of stainless steel bolts to form a watertight seal. Link seals shall be manufactured by Thunderline Corporation, Calpico Inc. or approved equal. The CONTRACTOR is to provide factory plastic wall sleeves of the appropriate sizes designed for the specific application and seal size and type. Each sleeve is to have an integrated water stop.

2.03 FILTRATION EQUIPMENT

A. The filter system shall consist of high rate pressure sand filter tanks as shown on the drawings. Every aspect and component of the filter system must be certified by the National Sanitation Foundation (NSF) and bear the certification mark. The filter must have an engraved metal data plate permanently affixed on the face of the system that describes operational data and instructions and indicates start up date.

B. It is the intent of these specifications to describe a filtration system complete in every respect with all accessory items and supplied and warranted by one manufacturer.

C. Horizontally Oriented Fiberglass Tanks

1. The filter tanks shall be horizontally oriented single cell fiberglass tanks, minimum 42 inches in diameter. The filter system must be listed as approved by National Sanitation Foundation prior to bid date.

   a. Basis of Design: Fiberglass filters shall be the product of Paragon Aquatics / Stark, U.S. Filter, or Neptune Benson provided they meet the specifications and layout. System design based upon Neptune Benson. Valves must be provided to backwash one filter at a time.

2. Filter tanks must incorporate all components and feature as described in this section.

3. Two (2) saddle style bases shall be provided for tank support. Systems that incorporate stacked tanks shall include similar bases and mounting saddles for the upper vessel. Tank supports and connections shall be seismic rated to support the filter tank(s) for the appropriate seismic zone where the project is located. Access to the tank shall be provided by a 14" x 18" manhole with two (2) curved yokes. Manhole seal shall be complete with a one piece 1/4" neoprene gasket and positioned so that internal pressure from the filter will augment the seal. No additional hardware or through bolts will be allowed.

4. Each filter tank shall be equipped with the necessary flanges and connections for the internal and external piping. Connections shall be comprised of fiberglass flanges and schedule 80 PVC flanges.

5. All tank connections 2 inches and smaller shall be 150 lb. Type 316L stainless steel threaded full couplings. All tank connections 3 inches and larger shall be heavy steel bosses drilled and tapped both sides to receive standard flanged fittings or Sch. 40 Type 316L stainless steel nipples.

6. The discharge from the automatic air release valve shall be hard piped to waste. Each filter tank shall have a means of releasing air. Each coupling or orifice is to be provided with a slotted PVC sand retainer or stainless steel strainer. An automatic air release system shall be provided for each tank.

7. The drain system shall consist of a 3/4 inch 316L stainless steel coupling mounted at the lowest point in the bottom head. This drain shall be valved and piped to the nearest floor drain or backwash pit.

D. Filter Piping - Internal

1. The lower internal distribution system shall be a horizontal header/lateral arrangement. The header shall be Schedule 80 PVC construction, capped on one end and flanged or threaded at the other end for field connection. Lateral connections shall be spaced no more than 6 inches on centers, and shall be 1-1/2 inch FPT connections. All attachments to header shall be solvent welded and thermo-welded to insure integrity of connection.

2. Under drain system shall be factory installed and constructed of extra heavy Schedule 80 high impact PVC. Multiple PVC main headers to be tapped and threaded to receive laterals.

3. Laterals shall consist of 1-1/2 inch Schedule 80 PVC pipe with openings as required. Each lateral shall be fabricated complete with socket cap on one end and male adapter on the other end. Both fittings to be solvent welded to the slotted pipe. Laterals shall be designed and sized at the factory so as to be installed in the field and over the entire cross sections area of the filter.

4. The upper distributor shall consist of PVC piping Schedule 80 and/or deflector plate per manufacturer standard design.

5. Each filter shall be supplied with a pressure equalizing upper internal distribution system consisting of a horizontal header/lateral arrangement. The header piping shall be constructed of Schedule 80 PVC. The header/lateral piping and all connections shall be designed and sized to provide uniform distribution and unrestricted flow during the filtration and backwash cycles.

6. Upper laterals shall be constructed of Schedule 80 PVC pipe with machine slotted openings or orifices. All machined slots or orifices shall be clean, de-burred and free of any obstructions that would not permit the free flow of water through the opening. Details of the lateral attachment to the header shall be submitted for review and approval.

7. The lower and upper distribution systems shall be properly supported and anchored. All hardware in wetted areas shall be Type 316L stainless steel or non-metallic. Tank interiors must be inspected prior to the media being placed in the filters.

E. Filter Piping - External (Face)

1. External face piping shall be Schedule 80 PVC pipe and fittings. Flanges shall be located so as to allow for easy dismantling of face piping. All fittings shall be solvent cemented.

2. Piping shall be drilled and tapped where necessary to accommodate gauge tubing connectors.

3. All valves 3" and larger shall be constructed with cast aluminum S12A alloy (as defined by ASTM B275) housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and 316L stainless steel shaft. Valves shall be rated for 150 psi bubble tight shutoff. Unless otherwise specified, all nuts and bolts shall be stainless steel with stainless steel washers to be used when secured to PVC flanges. Systems incorporating solenoid, pneumatic, pressure amplified, hydraulic or multi-directional valves shall not be acceptable.

4. Standard accessory items shall include sight glass rated for 50 psi with polycarbonate glass, remote mounted gauge panel with two 4½" diameter pressure gauges, ¼" petcocks, ¼" poly vent tubing with PVC compression adapters.

F. Backwash Control

1. The filter manifold face piping shall be designed to allow for one (1) filter tank to be backwashed at a time while the recirculation system is operating. A manual backwashing system shall be provided with the filter system.

2. Manual Backwash System

a. The manual backwash system shall be equipped with a face piping configuration such that the operator shall be manually control and operator both the time and sequencing of the backwash cycle. Valving on the filter face piping shall be a mechanical linkage device allowing the operator to simultaneously move two (2) valves at once. All mechanical linkage components shall be PVC or Type 316L Stainless Steel.

G. Automatic Air Relief Valve

1. A 1" valve shall be provided to automatically and continuously release air in the filter. The valve shall be fabricated of plastic with Buna-N seals. A plumbing kit shall be provided with two (2) PVC ball valves to allow manual air relief and isolation of the automatic valve. Valves fabricated of cast iron, bronze or stainless steel valves will not be accepted.

H. Filter Media

1. Filter media shall be a carefully selected grade of hard uniformly graded silica material. Media shall be milled angular shaped particles of silica quartz. The filter sand shall have a particle size between 0.45 mm and 0.55 mm and have a uniformity coefficient not to exceed 1.53. Specific gravity shall not be less than 2.5 with a pH of 7.0.

2. All media (sand) shall be cleaned and free from any clay or limestone deposits. Bottom layer of support media shall be placed by hand to avoid damage to the under drain system and leveled before the addition of the upper layer of filter media.

3. All media shall be delivered after approval by the manufacturer of the filter and stored in 100 pound bags for ease of handling and elimination of possible contamination.

4. Media to be supplied by the filter manufacturer and approved by the filter manufacturer prior to shipping.

I. Filter Size

1. Filters have been sized based on a maximum allowable filtration rate of 15 GPM/SF:

	Units	Leisure Pool
Volume	Gallons	196,260
Flow Rate	GPM	900
Filter Model		48 by 96
Filter Size	Sq. Ft.	5.70
Turnover Rate	Hours	3.63
Filtration Rate	GPM/Sq.Ft.	12.6

2.04 RECIRCULATION FITTINGS

A. Main outlets (main drains) shall be concrete sumps with 12 gauge PVC frame and PVC grating/12 gauge 316L stainless steel or pre-manufactured PVC/Fiberglass box with PVC grating and sized as shown on the plan. Grate openings shall not exceed 11/32 inch in width, providing an open flow area to allow water velocity not to exceed 1.0 fps. The grate shall be PVC and fit closely and flush with top surface of frame, and secured to frame with vandal proof fasteners. Provide additional stainless steel flanged pipe connections where required by the drawings for approved equalizer lines. Provide no-leak seal flange at the midpoint of the boxes. All exposed edges of main outlets shall be rounded and smooth, free of burrs and sharp edges. All main drain covers shall comply with the Virginia Graeme Baker Act and ASME A112.19.8-2007.

B. Provide hydrostatic relief valves consisting of a 2" cycolac relief valve connected to a FPT commercial style Schedule 80 PVC collector tube. The collection tube shall have seepage holes, 3/8 inch in diameter, and shall be screwed securely to the valve body. The hydrostatic relief valve shall be designed to seal with minimum pressure and shall have a non-plugging, self-cleaning raised valve seat. Hydrostatic relief valve to be Hayward Number SP1056 with collector tube model Hayward Number SP1055, or approved equal.

C. Sight sump frame(s) and cover(s) shall be size appropriately to provide access to the vertical sight sump standpipe as indicated in the plans. Frame and cover shall be 15" x 17" CDR style Quazite polymer concrete enclosure model number B10151712G, with cover model number C10151702A. Cover shall be provided with stainless steel vandal-resistant fasteners. Quazite cover color shall be selected by Architect – standard color is concrete grey.

D. Valve box covers and frames that are not specified on the drawings or specifically identified as another size or material shall be Quazite polymer concrete enclosure model number PC1730BA12, and cover model number PC1730CG00. Cover shall be provided with stainless steel vandal-resistant fasteners. Quazite cover color shall be selected by Architect – standard color is concrete grey.

2.05 PIPING SYSTEMS

A. General

1. Provide all recirculating piping between the pool and the filter room, fill receptor and all interconnecting piping to and from the chemical feed systems and chemical controller.

2. Provide all necessary pipe supports and support systems required to support all associated piping and valves.

3. Provide all other tubing, conduit, or piping associated with equipment specified herein. Coordinate with other trades.

B. Pipes

1. Pipe routing as shown and detailed on the contract drawings is diagrammatic only and is not intended to show minor details or exact locations of piping systems. Installation is required to be adjusted to accommodate interference and adjustments anticipated and encountered. Pipe sizes on plans refer to nominal inside diameter of the pipe.

2. All PVC swimming pool piping shall be NSF approved and conform to the requirements of ASTM D-1785.

3. All PVC pipes shall be the product of one manufacturer. Approved manufacturers of PVC piping are Eslon, Harvel, and Chemtrol or approved equal.

4. Swimming pool piping above the floor or deck in the filter room shall be Schedule 80 PVC.

5. Swimming pool piping below the filter room floor or deck shall be NSF approved, Schedule 80 PVC.

6. All swimming pool piping under the pool floor shall be NSF approved, Schedule 80 PVC and concrete encased.

7. All below grade swimming pool piping not located beneath the pool floor can be backfilled with native granular material free of ice, clay, debris, organic matter, and rocks larger than 4" across their greatest dimension, and per recommendations indicated in the project geotechnical report.

8. All PVC and CPVC fittings shall be the product of one manufacturer. Molded fittings shall be as manufactured by Asahi, Eslon, Chemtrol, Harvel, Spear, Lasco or acceptable substitute. Fabricated fittings shall be as manufactured by Harrison Machine, Plastinetics, or acceptable substitute.

9. Vertical sight sump piping shall be NSF approved, Schedule 40 PVC. Horizontal sight sump piping shall be NSF approved, Schedule 40 PVC that is perforated and wrapped with fabric and have 3/8" diameter holes located top and bottom on 4 ft centers. Horizontal sight sump piping shall extend 1 ft minimum beyond the main drain.

10. Chemical feed lines from chemical feeders to recirculation piping shall be Schedule 80 PVC piping. Piping shall be hard piped into the recirculation plumbing. All required valves shall be of all PVC construction.

11. All flanged plumbing connection hardware shall be stainless steel.

12. All materials shall be installed by workmen thoroughly skilled in their trades and all work shall present a neat and mechanical appearance when complete. The CONTRACTOR, at no additional expense to the Owner, shall replace or correct any work not judged acceptable by the Architect, Owner's testing agency, or their consultants.

13. No installation shall be made that will provide a cross-connection or interconnection between a distributing supply for drinking purposes and the swimming pool, or between the pool and a sanitary or storm water sewer system that will permit a backflow of water into the pool water system.

14. All piping shall be hydrostatically (water) pressure tested for leaks before and after backfilling to guarantee water tightness. Pneumatic (air) pressure test not allowed.

15. The CONTRACTOR shall provide 1/4" PVC water stops for this work for watertight penetration of concrete walls. Water stops shall be round and the O.D. shall be sized to 150% of the O.D. of the pipe. The water stops shall be thermo-welded to the pipe from both sides and shall be located at the centerline of the wall being penetrated prior to placing the concrete to assure a watertight seal.

16. CONTRACTOR must adhere to all the applicable provisions in Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.

17. All mechanical equipment to be connected into the recirculation piping system shall be done so using flanged or union connections.

18. Provisions shall be made to purge all pipes in the system.

19. Concentric reducers shall be fiberglass by MerMade Filter, Inc., or equivalent reducers of schedule 80 PVC construction.

C. Pipe Hangers and Supports

1. Manufacturer

   a. Subject to compliance with these specifications, pipe hanger and support systems shall be manufactured by Cooper B-line (basis of design), Inc, TOLCO, and Anvil International or approved equal.

2. Hangers

   a. Pipes 2 inches and smaller

      I. Adjustable steel clevis hanger, B-Line models B3100 or B3104.

      II. Adjustable steel swivel ring (band type) hanger, B-Line model B3170.

   b. Pipes 2-1/2 inches and larger

      I. Adjustable steel clevis hanger, B-Line model B3100.

      II. Adjustable steel yoke pipe roll, B-Line model B3114.

3. Multiple or Trapeze Hangers

a. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS, Grade 33 structural steel channel, 1-5/8 by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.

b. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B-2000 series.

4. Wall Supports

a. Pipes 2-1/2 inches and smaller

I. Steel offset "J" hook hanger, B-Line model B3600.

b. Pipes 3 inches and larger

I. Welded strut bracket and pipe straps, B-Line models B3064 and B2000 series.

II. Welded steel bracket B-Line model B3066 or B3067 with roller chair or adjustable steel yoke pipe roll. B-Line model B3120 or B3110.

5. Floor Supports

a. Electroplated carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line model B3093 and B3088T or B3090 and B8088. Pipe saddle shall be screwed or welded to appropriate base stand.

6. Vertical Supports

a. Steel riser clamp sized to outside diameter of pipe, B-Line model B3373.

7. Plastic Pipe Supports

a. V-Bottom clevis hangers with galvanized 18-gauge continuous support channel, B-Line models B3106 and B3106V, to form a continuous support system for all plastic pipes smaller than 1 inch or flexible tubing.

b. A vented and sloped continuous PVC Schedule 40 pipe no smaller than 1-1/2 inch outside diameter will be used to route flexible tubing with the appropriate pipe supports.

8. Supplementary Structural Supports - Design and fabricate supports using structural quality steel bolted framing materials. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch or greater as required by loading conditions. Submit design for pipe tunnels, pipe galleries etc. for approval. Use clamps and fittings designed for use with the strut system.

D. Hanger Attachments

1. Upper Attachments

a. Beam Clamps

I. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.

II. C-Clamps shall be locknuts and cup point set screws similar to B-Line model B351L or B3036L. Top flange c-clamps shall be used when attaching a hanger rod to the flange of structural steel, B-Line model B3034 or B3033 or

approved equal. Refer to manufacturers recommendations for set screw torque. Retaining straps shall be used to maintain the clamp position on the beam where required.

III. Center load beam clamps shall be used where specified. Steel clamps shall be B-Line models B3050 or B3055. Forged steel beam clamps with cross bolt shall be B-Line B3291-B3297 series or approved equal as required to fit beams.

b. Concrete Inserts

I. Cast in place spot concrete inserts shall be used applicable, either steel or malleable iron body, B-line B2500 or B3014 or approved equal. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rods sizes, B-line models N2500 or B3014N series.

II. Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A1011 Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line models B22I, 32I, or 52I or approved equal. Select channel nuts suitable for strut and rod sizes.

E. Hanger Accessories

1. Hanger rods shall be threaded on both ends or continuously threaded rods of circular cross section. Use adjustable lock nuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

F. Hanger Finish

1. Indoor Finishes

a. Hangers shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish.

b. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR shall have an electro-deposited green epoxy finish.

c. Zinc Plated hardware is not acceptable for use in chemical rooms.

G. Valves

1. Valves 3 inches and larger shall be butterfly type valves, with PVC body, 150# SWP with stainless steel shaft, polypropylene disc and replaceable resilient seat bonded to a rigid shaft and guaranteed for bubble tight shutoff from 27 inch vacuum to 150 PSI. Extended neck 2 inch beyond flanges for any insulated piping shall be provided with handle for manual operation. All valve components shall be suitable for swimming pool chlorinated water service. Butterfly valves shall be Georg Fischer Type 563, Asahi/America Type SP Pool-Pro, Chemtrol Model-B, Simtech VP series, Colonial Valve 411 Series, or approved equal.

2. Valves smaller than 3 inches shall be PVC true union ball valves, full port, three-piece construction, blowout-proof stem, Viton seal with socket end connectors.

3. Check valves shall be a quick closing non-slam type, either self-aligning wafer or flanged type, of corrosion resistant materials suitable for use in a swimming pool environment. Install check valves in accordance with the manufacturer's recommendations. Locate check valves at least 5 pipe diameters from pumps and fittings. Provide check valves as indicated, where two pumps are used in parallel and on water feature or water play equipment systems where water is being pumped significantly above the source pool water level. Check valves shall be either by Technocheck Corp., model 5050, with epoxy coated cast iron body and bronze swing plates on a stainless steel spring; or approved equal, for installation between 150 lb flanges.

2.06 CHEMICAL TREATMENT SYSTEMS

A. Calcium Hypochlorite (Chlorinator Briquettes)

1. Shop drawings complete with a piping diagram depicting the location in which the dry chlorination feeder is to be connected to the system shall be provided and approved prior to installation. Installation of the system shall be as specified in the manufacturer's directions and no exceptions shall be taken. CONTRACTOR shall provide either of the calcium hypochlorite systems specified in this section.

2. A factory-authorized representative shall provide training to the owner and the training shall be video taped per 131100, Section 1.12 of the project contract documents.

3. Pulsar 140

   a. The Sanitization System for the pool shall be a Pulsar® 140 System, and shall operate in a non-pressurized manner to ensure optimum safety and ease of operation

   b. A post filter recirculation loop will be added to the main pool recirculation system to supply the chlorination system. The recirculation loop will provide the inlet water supply to the chlorinator as well as the vacuum to evacuate the chlorinated solution.

   c. The Sanitization System shall be N.S.F.® listed.

   d. The Sanitization System shall incorporate the principle of spray technology. Water shall spray on to the grids of Briquette Tank making contact with Pulsar® Plus Dry Chlorinator Briquettes. The briquettes shall be in contact with the water for a short time creating a chlorinated solution which will fall into the discharge tank. The chlorinated solution shall be drawn by the vacuum from the discharge tank and introduce into the recirculation system. The output shall operate with a vacuum range between 5" and 29" Hg.

   e. The vacuum is created by a Mazzei venturi, model 1585X, which is installed in the post filter recirculation loop driven by a 1hp Pulsar® booster pump. The venturi is installed on the discharge side of the Pulsar® pump creating a flow though the venturi, which provides the suction on the discharge valve evacuating the discharge tank. An emergency overflow switch shall ensure that water flow to the spray manifold is shut off in the unlikely event that the discharge tank has not emptied properly.

   f. The System will operate with an inlet water pressure of 25-45 psig. The inlet water is supplied from the 1hp Pulsar® pump.

   g. The Briquette Tank shall have a capacity of one hundred (100) pounds of Pulsar® Plus Dry Chlorinator Briquettes.

h. The chlorine output shall be controlled by a timer or an ORP controller. The timer has twenty settings and will be controlled by a PLC/HMI. The timer will allow a minimum available chlorine (AvCl) output of 8 lbs./day and will allow a maximum available chlorine (AvCl) output of 163 lbs./day.

i. The Sanitization System shall be capable of functioning in temperature between 40° F. and 115° F.

j. The Sanitization System shall operate with Pulsar® Plus Dry Chlorinator Briquettes having 65% minimum available chlorine with a 0.4 to 0.6% scale inhibitor (by weight).

k. The Sanitization System shall be capable of satisfactory performance if installed as per the Manufacturer's recommendations (Reference Pulsar® Installation Manual). An Authorized Representative of the Manufacturer shall be located within a reasonable distance of the facility and shall be available to install and service the system as required.

l. Manufacturer warrants parts (excluding electrical components) of the Sanitization System to be free of defects in workmanship and material for 2 years from date of installation.

B. pH Buffering System (Muriatic Acid)

1. Chemical feeders for muriatic acid shall be peristaltic type pumps. Chemical feed pump(s) shall be provided and connected to the filtered water return lines to the pool as shown on the pool plans. The pump(s) shall be capable of feeding a solution to the pool to maintain pH level against the back pressure involved and shall be fully adjustable while in operation.

2. The pump(s) shall be provided complete with fractional horsepower motor for 120V 60 Hz current, plastic feed lines, and fitting necessary for connections to pool system piping.

3. The chemical pump(s) shall be electrically connected to, and operated by the water chemistry controllers.

4. The acid pump(s) shall be affixed with a metallic stamped label indicating the chemical being pumped and the pool to which it is connected.

5. Provide non-metallic wall mounted shelf support for the chemical feeder(s).

6. Provide two (2) fifteen (15) gallon acid drums or one (1) 55 gallon acid tank by LMI.

7. Provide one (1) two drum modular spill platform. Platform shall be molded high-density polyethylene with removable polyethylene grating. Platform shall be 26.25" x 51.5" x 6.5" with a spill capacity of 30 gallons and a load capacity of 5,000 pounds. Platform shall be an Eagle two drum modular spill platform model 1632, or approved equal.

8. Provide one (1) low profile ramp. Ramp shall be molded high-density polyethylene. Ramp shall be an Eagle low profile ramp model 1689, or approved equal.

9. Provide "Vapor Shield" vent check valve for the acid drum/tank which seals container while allowing the liquid to be removed via pump. The Vapor-Shield shall prevent an internal vacuum and collapse of a sealed container. It will also prevent the pump from developing a vacuum-lock while attempting to remove the liquid from the sealed container. The Vapor-Shield shall prevent the release of any acid vapors. The Vapor-Shield body shall be constructed entirely from schedule 80 PVC with polypropylene tube fittings and factory-installed acid resistant viton sealant on all threaded connections. The

diaphragm and o-rings shall be constructed of acid resistant viton. No metallic or materials not rated appropriate for use with acid shall be used. The Vapor-Shield shall be fitted with a ¾" male NPT threaded fitting to allow for the installation onto any common: five (5) through fifty-two (52) gallon acid shipping container caps and lids. The unit shall be supplied with no less than fifteen (15) feet of 3/8" polyethylene tubing. Recreonics catalog no. 52-095. An Acid Fume Scrubber, part #7747090, with refill reagent kit, #7747091, manufactured by ProMinent shall be considered an equal.

10. Chemical feeders to be manufactured by ProMinent or approved equal.

    a. Leisure Pool Acid Pump (one required): Model 0704 - 1.17 GPH

C. Ultraviolet Dechloramination and Disinfection System

1. It is the intent of these specifications that the swimming pool water be routinely monitored and treated by UV sterilization in the range of 220nm to 400nm to kill microorganisms in accordance with NSF 50 (2012) Annex H for Cryptosporidium and to continuously remove chloramines. The concentration of free chlorine residual shall at all times meet the requirements of the Health Department authority having jurisdiction over the swimming pool.

2. The method of monitoring and treatment specified and shown on the drawings is intended as the basis for receiving bids. It is not the intent of these specifications to limit competition. The base proposal must be on providing equipment as specified; however, a bidder will at his option offer a substitution. The bidder is cautioned that any substitution must meet the quality and operational requirements of these specifications.

3. Furnish and install a complete closed vessel, medium pressure, high-intensity, ultraviolet disinfection (UV) system as described in this specification and as shown on the Drawings, to include 316L stainless steel chamber, control system located in a NEMA 12 rated panel, medium pressure lamps, quartz sleeves, automatic wiping system, strainer basket and system start up by a Certified Technician. . The Contractor shall be responsible for equipment unloading and installation per directions of the Manufacturer.

4. The UV system being submitted must have a complete and approved 3rd party validation by a reputable engineering firm experienced in conducting UV validations. 3rd party validations must be done in accordance to NSF 50 (2012) Annex H. for Cryptosporidium or Disinfection or to the US EPA 2006 Ultraviolet Disinfection Guidance Manual (UVDGM). Systems that are undergoing validation at the time of bid shall not be allowed. System must have a UL or equivalent (CSA, ETL or MET) listing. Any proposed UV system must have a UL listing on the complete system, and be listed under NSF Standard 50. Any substitute system shall have Health Department approval for this project prior to being offered.

5. UV Performance

    a. The system shall be designed to deliver a 3-log inactivation of Cryptosporidium as demonstrated during the NSF 50-2012 or US EPA UVDGM 3rd party validation testing at a UVT of 94%.

    b. Any systems validated or designed for flows based on a transmittance value greater than 94% shall not be allowed.

    c. UV system shall effectively keep chloramines below .2 ppm during normal operation.

6. The manufacturer must have ten years of experience supplying similar equipment to the aquatic industry and the bidder must supply a list of at least ten satisfactory installations with contact names and telephone numbers.

   a. Basis of design: Equipment shall have undertaken successful completion of the NSF 50 (2012) or US EPA 2006 UVDGM 3rd party validation at the time of bid. Approved companies are by Hanovia, Triogen, ProMinent, Engineered Treatment Systems (ETS), or approved equal.

7. Equipment General Description

   a. The UV System shall be a complete unit with all necessary controls. The system shall be preassembled and controls packaged for ease of installation at the job site and shall include:

      I. the UV chamber with flow and output safety control;

      II. a UV medium pressure arc tube modified to emit UV light from 220nm to 400nm;

      III. an automatic, adjustable, electric motor-driven quartz sleeve cleaning system;

      IV. operational and power controls.

      V. the ability to dose control the UV delivered to the pool water.

Pool Type	Model Number	Max Flow 3-log Crypto (GPM)	Lamps	Watts	Power (KW)	Voltage (V) with Breaker Size*
Leisure Pool	UV Swim I 450+	1453	2	2500	5.0	208V – 30A

*All breakers to be 'D' curve type breaker

8. UV Chamber

   a. The chamber(s) shall be constructed of 316 SS and be capable of either horizontal or vertical installation. All wetted parts shall be stainless steel, high purity quartz, Teflon, and/or viton.

   b. The chamber(s) shall be provided pre-wired and only require field connections from the power/control module to the chamber.

   c. Pressure shall be rated for 145 psi (tested to 220 psi). Pressure drop across the unit will be minimal.

   d. The chamber(s) shall be designed in such a way that when properly installed and operated there is no possibility of direct operator exposure to UV light from the UV lamps.

   e. Chambers shall be located no more than 16 ft. (5 m) from the control enclosure

   f. The chamber shall incorporate:

I. Temperature Sensor - A temperature sensor shall be fitted to the chamber for protection against heat buildup under no or low flow conditions. UV system will shut down and alarm in event of heat buildup in the chamber in accordance with NSF 50 (2012).

II. UV Intensity Sensor - The sensor will measure the UV intensity of the lamp and provide continuous performance verification.

i. The sensor shall be designed with an accuracy of +/- 10% or the accuracy of the identical sensors employed during validated testing.

ii. System shall be supplied with the same number of sensors used during the validation.

iii. Sensor shall be a dry type sensor, allowing removal of the sensor without the need to drain the vessel for removal of the sensor.

iv. The sensor window shall be automatically wiped as part of the overall automatic cleaning system and at the same frequency the sleeves are wiped.

v. Sensor shall be capable of field verification.

vi. The sensor shall produce a 4-20 mA signal, which shall be sent to the control module.

vii. Wet type sensors shall not be allowed.

III. Safety switches shall be incorporated into the lamp cover of the vessel, shutting down the UV system if an lamp cover is removed while the lamps are on, in accordance with NSF 50 (2012).

9. Automatic Wiping System

a. For periodic cleaning of the quartz sleeves and UV sensor, the chamber shall be fitted with an automatic/mechanical cleaning mechanism.

b. The cleaning mechanism is electrical/mechanical and shall be operated by means of a two-pole bi-directional capacitor driven motor and an acme lead screw. Limit switches shall be provided at the ends of the chamber to signal the control system to stop the motor when it reaches the end of the chamber.

c. The cleaning cycle shall be field adjustable. The cleaning cycle shall be activated from the control system or manually at the operator interface.

10. Ultra Violet Lamp

a. Only medium pressure high intensity ultraviolet lamps shall be provided. Germicidal UV output from the lamps shall not be affected by temperature. Full output must be available from 0 to 200 degrees.

b. Each lamp shall be individually numbered and the manufacturing process shall permit full audit and traceability of assembly. In addition to an individual serial number, the part number shall be displayed on the lamp.

11. Ballast

a. The UV lamps shall be powered by electronic ballasts, ensuring the required level of disinfection is met at all times.

   I. Electronic ballasts will be capable of varying power to the lamps in 1% increments from 40% to 100%.

12. UV System Control

    a. The UV system shall be provided with a microprocessor based control and monitoring system mounted in an epoxy coated steel, NEMA 12 (IP 54) cabinet suitable for indoor installation and includes fan cooling with replaceable inlet filters. The cabinet shall be electrically interlocked so that the module is de-energized when the door is open. The cabinet shall contain an operator interface on the front panel door. This operator interface shall consist of an alphanumeric display and membrane buttons for operator interface. All information, warnings, and alarms shall be presented on the alphanumeric display in plain English for ease of use and display the following information:

       I. Power on

       II. System ready indicator

       III. UV intensity (mJ/cm2)

       IV. UV dose (mJ/cm2)

       V. Flow rate in GPM

       VI. Alarm condition

       VII. Wiper status

       VIII. Local/remote operation switch, door mounted

    b. The control panel shall contain an Earth Leakage detector, which shall provide fail-safe protection for bathers and those working on the equipment within the pool environment. Systems without an Earth Leakage detector shall not be allowed.

    c. The control panel shall be UL LISTED, and in addition shall conform to EN 50081 and EN 61000. The panel and all UV components shall be manufactured to ISO 9001-2000.

13. Remote Data Monitoring and Trending

    a. The control system shall have the option of being equipped with a monitoring device capable of sending text and e-mail upon an alarm condition.

14. Instructions

    a. The manufacturer (supplier) shall prepare complete drawings for the installation and printed instructions for the operation of the UV system herein specified and shown on the drawings. A qualified factory trained representative of the manufacturer shall install this equipment, put it into operation and instruct the owner's representative in the operation and maintenance of all such equipment.

15. Warranty

    a. All components (excluding commodity items) have a limited warranty, to be free from defects in workmanship and materials for a period of 12 months from date of start-up

or 18 months from date of shipment, whichever occurs first. UV lamps are warranted to operate for 8000 hours when operated continuously. A continuously operated UV lamp which fails prior to 4000 hours of operation, shall be replaced free of charge. Intermittently operated UV lamps (>1 on/off cycle per day) will be replaced free of charge should failure occur prior to 2000 hours and prorated between 2000 and 4000 hours. All warranty replacements are FOB point of shipment. An additional 5 year equipment warranty (excluding commodity items) shall be provided based on the facility agreeing to a Service Agreement from a factory certified distributor who will provide at a minimum, an annual service visit.

2.07 WATER CHEMISTRY MONITORING AND CONTROL SYSTEMS

A. The water chemistry control system for the leisure pool shall provide continuous monitoring and control of sanitizers, oxidizers, pH, ORP, free chlorine temperature, system flow rate, and water chemistry balance calculations. The controller shall manage the recirculation pump with a programmable Fireman Cycle feature, which automatically turns off the Heater, UV and Auxiliary systems prior to shutting off the recirculation pump. All line-voltage wiring shall be performed in a separate NEMA 4X enclosure that precludes access to the controller electronics. Installation of the system shall be per the manufacturer's specification and no exceptions shall be allowed. A factory trained/authorized representative shall provide training to the Owner and the training shall be videotaped per 131100, Section 1.12 of the project contract documents. The specified controller, a BECSys7 manufactured by BECS Technology, Inc. shall be provided or Chemtrol by SB Control Systems, AcuTrol by Pentair, ProMinent, or a technically equal system capable of providing equal performance for all operating functions.

B. Certifications

1. The controller shall carry the following product certifications

a. NSF/ANSI Standard 50;

b. UL 61010-1

c. (CSA) C22.2 Number 61010-1

C. Sensors

1. The controller shall come with the following sensors

a. pH - The controller shall provide a measurement of pH by utilizing a sensor with the following characteristics:

I. 0 – 14 sensing range

II. ABS body with ½" NPT process connection

III. Minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal

IV. A porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction

V. A silver/silver chloride (Ag/AgCl) reference element

VI. A general purpose glass membrane pH sensing element

VII. Operating temperature range of 0 - 80 degrees C

VIII. Operating pressure range of 0 - 100 psiG.

IX. The controller shall continuously monitor, display and data log pH with 0.1 or 0.01 resolution (programmable).

b. ORP - The controller shall provide a measurement of ORP by utilizing a sensor with the following characteristics:

I. -1000 to +1000mV sensing range

II. ABS body with ½" NPT process connection

III. Minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal

IV. A porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction

V. A silver/silver chloride (Ag/AgCl) reference element

VI. A solid platinum or solid gold ORP sensing element with a minimum of 1 cm2 surface area; platinum-plated and gold-plated sensing elements, which are susceptible to abrasives, shall not be considered equal

VII. Operating temperature range of 0 - 80 degrees C

VIII. Operating pressure range of 0 - 100 psig

IX. The controller shall continuously monitor, display and data log ORP with 1mV resolution

c. Flow Sensor - The controller shall provide a measurement of pool circulation flow rate and volume by utilizing a flow sensor with the following characteristics:

I. 0-8800 gpm (0-33265 liter/min) measuring range,

II. Magmeter flow sensor with a frequency output,

III. Dual O-ring seal,

IV. Cable to meet length requirement for installation,

V. Saddle to meet return line size,

VI. Flow volume: 999 trillion gallons, 1 gallon resolution; 999 trillion liters, 1 liter resolution.

VII. The controller shall continuously monitor, display and data log flow rate with 0.1 gpm resolution.

d. Temperature - The controller shall provide a measurement of water temperature by utilizing a sensor with the following characteristics:

I. 32 – 212°F (0 – 100°C) sensing range;

II. 2 wire, 100Ω resistive temperature detector (RTD) with a 0.00385 Alpha.

III. The controller shall continuously monitor, display and data log temperature with 1°F resolution.

e. Free Chlorine Sensor - The controller shall provide a measurement of free chlorine by utilizing an amperometric sensor with the following characteristics:

I. 0.0 to 20.0 mg/l (ppm) measuring range with fully selectable scale,

II. 32 - 113F operating temperature range,

III. A PVC body,

IV. Replaceable PTFE membrane and electrolyte,

V. Gold cathode and silver/silver chloride anode.

VI. The controller shall continuously monitor, display and data log free chlorine with 0.1 mg/l resolution.

D. User Interface

1. Standard Display - The standard display shall be a backlit transflective LCD with 14 line x 40 alpha/numeric graphical characters that will continuously display information related to the following:

a. All installed sensor readings

b. Set points, with current control status

c. All active alarms, including time activated

d. Smart menus w/ integrated on-screen help

e. Contrast adjustment of the backlit LCD shall be provided through clearly marked keys on the front-panel without the need for access to internal controller circuitry. After initial adjustment, controller shall monitor internal temperature and automatically adjust contrast to prevent LCD blackout in extreme ambient temperature conditions. Controllers that do not include front-panel contrast adjustment and automatic temperature compensation shall not be considered equal.

f. The standard user interface shall include single-touch access to Set Points, Relay Modes, Calibrations, Backwash status and settings, Menu access, and Reset Fail/Safes. An alphanumeric keypad shall be provided for ease of system configuration.

2. Color Touch-Screen Display - The controller shall have an 8.4" or larger color touch-screen NEMA 4 display that is remotely mountable from the controller(s), interfacing to the controller via Ethernet. The color touch-screen display shall be capable of providing an interface to multiple controllers on-site, with the following capabilities:

a. Monitor readings, setpoints and alarms through a graphical operator's console view

b. Graph all inputs through color-coded traces, time-synchronized with system events

c. Full view and modify access to all parameters and system settings through menu tree interface

d. Password protection using the same passwords stored in the controller.

e. Monochrome displays shall not be considered equal.

E. Control Functions

1. Water Chemistry

   a. pH Control: The controller shall continuously control pH. Chemical feed shall be configurable for feed-up, feed-down, or dual feed and either on/off or time-based proportional feed.

   b. Sanitizer Control: The controller shall continuously control sanitizer based upon the ORP reading, the amperometric sensor, or both with a bracketed control program. Chemical feed shall be configurable for either on/off or time-based proportional feed.

   c. Bracketed Sanitizer Control: With the amperometric ppm sensor, the controller shall be configurable for bracketed sanitizer control; The bracketed control algorithm shall allow either the ORP or ppm setpoint to be chosen as the primary control point, while using other parameter to create a secondary boundary (min and max settings) that must be maintained in addition to the primary control point.

   d. Sanitizer Booster Feed: The controller shall have a sanitizer booster program with selectable ORP and/or ppm set points with separate ending set points, allowing the option of the booster sanitizer to control to a lower set point while the primary system can recovers.

   e. UV Control: A Fireman Cycle feature shall turn off (ramp down) the UV relay 0 to 60 minutes (settable) prior to backwash initiation or recirculation pump shutdown.

   f. Superchlorination: The controller shall have a programmable superchlorination function, based upon ORP or ppm superchlor setpoint, which is triggered manually.

   g. Dechlorination: The controller shall have a programmable dechlorination function, based upon ORP or ppm dechlor setpoint, which is triggered either manually or by the completion of the superchlorination function.

   h. LSI & RSI: The controller shall compute the Langelier Saturation Index and the Ryznar Saturation Index based upon current inputs and the Ca Hardness and Alkalinity entered by the operator.

2. Expanded

   a. Flow Monitoring: The controller shall continuously monitor, display, and datalog system flow, maintaining a total flow volume. A Low Flow Alarm shall be operator settable, which can be programmed to disable chemical feeds. Controller shall also have a Minimum Flow Rate setting to turn off heater whenever system flow is less than this programmed minimum level.

3. Energy Conservation

   a. Alternate Setpoints: The controller shall have alternate Sanitizer, Heater, and Autofill setpoints, based upon a 4 event 28 day timer.

   b. Energy Conservation Mode: The controller shall have the capability to disable all mechanical and chemical functions during programmed conservation cycle. The Energy Conservation Mode shall include the ability to periodically monitor and satisfy all operation requirements based upon a programmed time schedule.

F. Main Recirculation Pump

1. On/Off Control with Relay

a. Controller shall provide the capability to interface to and control a recirculation pump with a programmable relay. The controller shall provide 3 operator-settable independent Fireman Cycle settings and relays for the UV and Auxiliary controls. The controller shall include the following capabilities, available as appropriate based upon installed sensors and implemented features:

I. Fireman Cycle: Upon the following events, the controller shall automatically delay recirculation pump shutdown until the UV and Auxiliary controls have been deactivated and the corresponding Fireman Cycles have expired:

i. Backwash Operations

ii. Energy Conservation mode (24 hr., 7 day function)

iii. Manual off (per Operator)

II. Immediate: Upon the following events, the controller shall immediately turn off the recirculation pump (and UV and Auxiliary controls), without first satisfying Fireman Cycle timing requirements:

i. Surge Tank Level Low Alarm: Turn off pump immediately (surge tank is almost empty)

ii. Strainer Vacuum High Alarm: Turn off pump immediately (possible entrapment)

iii. Emergency shutdown, triggered by front-panel Emergency Off: Turn off pump immediately (per Operator)

2. Total Dynamic Head (TDH)

a. Controller shall provide the capability to continuously monitor the Total Dynamic Head (TDH) of the main recirculation pump, directly calculated by the controller from recirculation pump influent vacuum and filter influent pressure transducers. TDH shall be displayed on the user interface and recorded in data logs, with user-programmable High and Low TDH Alarm settings.

3. VFD Interface with 4-20mA signal

a. Controller shall provide the capability to interface to and control a recirculation pump equipped with a Variable Frequency Drive (VFD) through a 4-20mA signal. The controller programming shall allow the operator to manage the VFD entirely from the water chemistry controller, by providing the following capabilities:

I. Programmable setpoint specified as either flow rate, effluent filter pressure, or fixed setting,

II. Four programmable operator-triggered alternate profiles ("Manual Turndowns"),

III. Four programmable scheduled alternate profiles ("Scheduled Turndowns"),

IV. Override setting for backwash,

V. Ramp up and ramp down settings,

VI. Minimum output setting.

VII. Remote access to current VFD status and all VFD parameters shall be provided through the BECSys for Windows PC software provided with

controller. The name of each alternate profile shall be changeable by the operator, so that VFD menus and data log entries are intuitive and recognizable by the users of the system.

VIII. Systems that do not provide both local and remote management of the VFD through the water chemistry controller shall not be considered equal.

G. Control Outputs

1. Relay Outputs

a. Solid-State Relays

I. The controller shall come with a total of 4 integral line or dry contact 5A solid-state relay outputs capable of switching 3A under all normal operating conditions, accounting for the effects of the temperature gradient inside the NEMA 4X enclosure. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity. All solid-state relays shall have a provision for an electrical interlock with the circulation pump motor starter.

2. Mechanical Relays

a. The controller shall come with a total of 5 mechanical relays:

I. 1 integral 8A dry contact mechanical relay, and

II. 4 integral 3A dry contact or line powered mechanical relays.

III. Since mechanical relays have the inherent risk of failing in the closed (active) position, as a safety measure the controller shall preclude the ability to assign any of the integral mechanical relays to chemical feed functions. Systems that do not preclude mechanical relays from being configured for chemical feeds shall not be considered equal. All mechanical relays shall have a provision for an electrical interlock with the circulation pump motor starter.

H. Safety Features

1. Manual-On limit

a. The controller shall have built-in limits to the amount of time any relay control output may be forced on (i.e. in "Manual On" mode). This is an important safety feature to prevent control outputs from inadvertently being left forced on after service or diagnostics.

2. High/Low Alarm Settings & Control Lockouts

a. The controller shall have programmable high and low alarm settings for pH, ORP, PPM, temperature, low flow & no flow and chemical overfeed, turbidity, pressure & vacuum, surge tank levels, chemical inventory. The controller shall have a programmable lockout of sanitizer feed upon pH high or low alarm.

3. No Flow Alarm & Flow Restored Delay

a. The controller shall activate a No Flow alarm when the dedicated sample stream flow switch indicates there is insufficient flow through the sample stream. This No Flow alarm shall lockout all chemical feed control operations. The controller shall include a

Flow Restored Delay, which shall extend the No Flow lockout user-programmable amount of time after the No Flow alarm ends (i.e. flow is restored). This feature is necessary to assure that the system has valid, stable sensor readings of circulating water prior to making chemical feed control decisions.

4. Feed Limit Alarms

   a. The controller shall trigger a FailSafe alarm if a chemical feed relay remains on longer than the programmable Feed Limit Timer. Chemical feeds shall automatically be disabled if the corresponding reading goes into a FailSafe alarm condition.

5. Emergency Off

   a. The controller shall have a dedicated Emergency Off button on the front panel of the system, which immediately halts all chemical feeds and control outputs when pressed. This feature shall be password protectable, which shall require entry of one of the Security passwords.

6. Safety shield

   a. The controller shall include a safety shield or other mechanism for allowing fuse replacement without access to high voltage circuitry or wiring.

I. Security

1. The controller shall have three security password levels: six for operators, two for managers and one for the distributor providing for a history of access identified by the user.

J. Data Logging

1. The controller shall have 512K battery backed-up RAM for input level recording and events. All input level shall be recorded for 10 to 56 days depending on sample rate (2 to 10 minutes).

2. The controller shall record and maintain the latest 1100 events over a maximum of 14 days recording all alarms, parameter changes, user logins, and operational cycles related to all control features.

K. Local Alarms Indicators

1. The controller shall signal all alarm conditions with the following indicators:

   a. A bright red flashing LED on the front of the controller,

   b. Activation of a master alarm signal provided as a dry contact relay enabling the use of 0-240 VAC alarms, and

   c. Each active alarm listed on the LCD display along with time activated.

L. Remote Communication, Access & Alarm Notification

1. Ethernet

   a. The controller shall come with a standard, integral 100BaseT Ethernet connection. The controller shall be capable of providing Remote Access via PC with Ethernet connection and Alarm Notification via email or text message via an Ethernet connection to the Internet.

2. Remote Access

   a. The controller manufacturer shall provide BECSys for Windows graphical remote operation software, for interactive connection to the controller from a PC. Remote operation software shall be Vista-compatible, and have all of the following operational modes:

      I. Site Data Base – for organizing and accessing multiple controllers on site, or at multiple sites.

      II. Graphical Operator's Console – to display current readings, setpoints, alarm points and control status in an easy-to-read graphical mode.

      III. Data Log Graphing – to review data logs with time-synchronized event data; data log traces shall be configurable, with color and line style selectable by operator.

      IV. Full Menu Tree – All system parameters accessible through a full menu tree interface.

      V. Auto-Polling – to allow automatic download of data logs from all controllers in site database.

3. Alarm Notification

   a. The controller shall be capable of providing alarm notification to 8 different recipients. Each recipient shall be individually configurable to receive alarm notification by one of the following methods.

      I. Email: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

      II. Text Message: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

      III. Fax: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

      IV. Numeric Pager: Notification message shall include callback number. Controller shall acknowledge pager notification when callback is received, and not notify subsequent recipients programmed for pager notification.

4. Ethernet with MODBUS TCP/IP The controller shall come with a standard, integral 100BaseT Ethernet connection that supports a MODBUS TCP/IP connection to 3rd party applications such as EMS, BMS, BAC and SCADA systems. The MODBUS TCP/IP connection shall support access to Inputs (current readings), System Information, Set Points, Alarm Points, Control Status and Alarms. Set Points and Alarm Points shall be modifiable from the 3rd party application via the MODBUS TCP/IP interface.

5. Wi-Fi

   a. The controller shall come with a BECSys Wi-Fi module, which allows wireless integration into existing Wi-Fi networks.

M. Enclosures

1. The controller shall be housed in a NEMA 4X polycarbonate enclosure.

2. Field wiring enclosure - All high voltage field wiring shall be through a separate NEMA 4X enclosure that precludes access to controller electronics. All high voltage connections shall be clearly identified and a field wiring diagram shall be provided with the controller for installer reference. All controller high-voltage relay assignment parameters shall be programmed at the factory prior to delivery to installation location.

N. Flow Cell

1. PVC flow cell

a. The flow cell shall have a PVC body with two ½" NPT ports for pH and ORP sensors, two ¼"NPT ports for temperature sensor and sensor wash acid injection, and a clear acrylic front viewing window. The flowcell design shall provide precise sample flow rate and water velocity regulation past the probes. The flowcell shall come provided with PVC ½" isolation ball valves, PVC ¼" wet test valve and standard reed or optional rotary flow switch.

b. Each flow cell shall be equipped with a pressure-sensing device. The pressure sensor shall consist of a compound pressure/vacuum gauge manufactured in stainless steel, 2 ½" diameter, liquid filled with an operating pressure range of 0 to 60 psig and vacuum of 0 to –30 in./ Hg.

O. Start-up and Manuals

1. The control system shall be provided with on-site start-up, on-site operator training, and 1 year on-site warranty service performed by a representative trained and authorized by the controller manufacturer.

2. Manufacturer shall supply an Operation and Maintenance Manual describing features, operating instructions, maintenance procedures and replacement parts.

2.08 FLOW METERS

A. Flow Meter

1. Flow meters (1 required) shall be installed according to the manufacturer in the filtered water return lines to each of the pools. Flow sensor shall be the GF Signet 2551 insertion magmeter. Provide the coaxial cable from the sensor to the display/transmitter. Flow meter accuracy shall be +/- 2% of reading.

2. Backwash piping flow meter (1 required) shall be a pilot, impact ball, variable area type with one piece, impact resistant machined acrylic plastic body. GPM scale to be permanently etched or imprinted on the meter. Flow rate indicator to be of stainless steel material. Scale range to be appropriate for specific flow rate. Pipe size to accommodate backwash rate. Manufacturer shall be BLUE-WHITE or approved equal

2.09 WATER LEVEL CONTROLLERS

A. In Deck Water Level Controller

1. Provide a water level sensing and control system for the Leisure Pool that will monitor the water level in a well located in the deck at the side of the pool and which will

automatically activate the auto water make-up control valve. For sensing water level and activating make-up water control valve for each pool, use Series ELC-810 Controller housed in a watertight NEMA 4X UL94 5V UL flammability rated polycarbonate enclosure to meet IP66 and NEMA 4, 4X, 12 and 13 ratings. The Controller shall utilize one sensor to control water level. ELC-810 series shall have a menu- driven LCD display screen and utilize a five-switch user interface for navigation through the menu. The menu shall allow changing the following settings: delay to shutoff, alternate sensor option, maximum time on, manual override, delay to normal, type of sensor, high level option, flow sensor active, and sounder with alarm. All menu settings shall be capable of password protection. The Controller shall be capable of displaying the following data: last fill time, last drain time, last alarm. The Controller shall be capable of determining the following: maximum time on exceeded, over current to solenoid valve, no valve/valve wiring problem, and sensor not working properly. The Controller shall interlock with auto water make-up solenoid valve and shall provide adjustable time delay for increasing level and manual override; 115 VAC, 1 phase, 60 Hz. Manufactured by AquatiControl Technology, Model ELC-810-SS-DW-XXX (Contractor to coordinate the specific length(s), "XXX," of cable required for each controller prior to ordering). Refer to drawings for additional information. Provided and installed by CONTRACTOR and connected by electrical.

2. Provide a proximity switch sensor that shall be sensitive to within +/- 1/8" (4mm) of nominal water level. Supply voltage to sensor shall be 12V to 24V DC from Controller. Current consumption shall be < or = 15mA. Response frequency shall be 100Hz. Maximum control output shall be 200mA. Sensor operating temperature shall be -25 Deg. C to 70 Deg. C. Operating humidity shall range from 35% RH to 95% RH. Sensor shall be housed within a fiberglass deck well. The deck well shall consist of two compartments – a wet well connected to the pool via a 1½" static line, and the dry well to consist of a rigid plastic enclosure which houses the sensor and attaches to a ½" static line connected to the wet side. The dry side shall incorporate a 1½" overflow drain and a ¾" female threaded connection to allow connection of sensor cable conduit. Installation of Deck Well at pool side by CONTRACTOR. Coordinate for the provision of conduit from deck well to Controller by Electrical and plug drain from deck well to waste.

3. Wiring from the sensor to the Controller shall be provided and shall be connected to the terminal points mounted within a corrosion-resistant, nonmetallic NEMA 4X enclosure. All wiring connections shall be made through the bottom of the enclosure. The enclosure size shall be no less than 8" wide x 5" high x 4" deep. The access door shall be the entire front face panel of the enclosure. Confirm location of Controller in Field.

4. Major components shall be plugged in using WAGO terminal blocks for ease of installation and replacement. Unit shall be designed to activate a 24-volt AC solenoid valve.

5. Provide a make-up water solenoid valve, normally closed, stainless steel fitted, bronze body, 24 VAC slow closing type. Size to pipe. Interlock with automatic water level control system. Refer to the Drawings for additional information. Such as ASCO, or approved equal.

6. Discharge of make-up water shall be into a fill standpipe and piping to the Leisure Pool Refer to the Drawings for additional information.

2.10 INSERTS AND ANCHOR SOCKETS

A. Sockets and anchors shall be provided as stainless steel or cast bronze for swimming pool accessories. The CONTRACTOR shall confirm compatibility of deck equipment and deck

anchors with the deck equipment manufacturer. All anchors or sockets shall be provided with flush closure caps and escutcheons with set screws where indicated. Escutcheons shall be of the keyhole or oblong shape, similar to the casted, electro-polished stainless steel escutcheon with set screw by Paragon #28303SS, or approved equal.

1. Anchor sockets for all railings and grab rails shall be of the wedge type, cast bronze, 4 inches in depth and made to receive 1.50 inch OD tubing as manufactured by Paragon #28105, or approved equal. The wedge shall be cast bronze, incorporate a stainless steel tightening bolt and flat washer, and be designed as the sacrificial element to the anchor system. All metallic components shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance.

2. Anchor sockets for all stanchions and water polo goals shall be of cast bronze, sized to receive a full 6 inches penetration of 1.900 inch OD tubing as manufactured by Paragon Aquatics Catalog No. 38201TC, Spectrum Products No. 23626, Kiefer No. 700103, or approved equal. Each anchor socket is to be provided with a flush threaded, vandal proof closure cap Paragon Aquatics Catalog No. 38201TC or Spectrum Products No. 23628, or Kiefer No. 700103C, and a grounding lug with screw. Provide Paragon Aquatics catalog no. 38303, Spectrum Products catalog no. 23630, Kiefer No. 700103K, or approved equal spanner wrenches for removing the closure cap.

3. Anchors for the diving board stands shall be all bronze threaded castings for respective 5/8" threaded anchor bolts. The stand shall be designed for mounting with the use of Durafirm catalog number 70-231-900 bronze deck anchors.

4. Recessed steps shall be a single molding of white ABS with an integral slip resistant tread surface. The step shall be 16.5 in. wide by 6 in. deep. All portions of the backside shall be completely filled with non-shrink grout and set into the wall block-out and mortared in with non-shrink grout. Step by KDI Paragon, S.R. Smith, or approved equal.

2.11 DECK EQUIPMENT

A. Grab rails shall be provided as required in the quantities and to the dimensions as shown on the drawings. Grab rails shall be fabricated of one continuous length of polished and buffed tubing. The tubing shall be ASTM-A-554 grade 304L (Outdoor) stainless steel, 1.50 inch OD x .120 inch minimum wall thickness, polished and buffed to 320 grit finish and shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. All bends shall be smooth and free of wrinkles. Grab rails shall be pretzel bend style with dimensions as indicated in the plans and as manufactured by Spectrum, SR Smith, Paragon, or approved equal.

B. Entry rails shall be provided as shown on the drawings, fabricated from one continuous piece of polished and buffed ASTM-A-554 grade 304L (Outdoor) stainless steel, 1.500 inch OD x .120 inch wall thickness, polished and buffed to 320 grit finish and shall be passivated for maximum corrosion resistance. Bends shall be smooth and wrinkle free. Custom rails shall be as manufactured by Spectrum Products, or approved equal. Custom rail submittal drawings shall be complete with details of custom fabrication and installation information.

C. Railings for the diving tower and springboard pedestals shall be provided as detailed on the architectural drawings. Rails shall be custom fabricated of one continuous length of tubing wherever possible. The tubing shall be type 304L (Outdoor) stainless steel, 1.500 inch OD x .120 inch wall thickness polished and buffed to 320 grit finish with slip resistant finish.

D. Diving Stands

1. The superstructure shall consist of a pedestal, side guardrails, fulcrum supports, sloping access ladder, adjustable fulcrum, and hinged rear board support. The pedestal shall be a column 8" x 8" x 3/16" wall thickness. It shall be set at a 15 degree angle toward pool edge, include a ¼" top plate and ½" bottom plate, and be T.I.G. welded with 3/16" reinforcing gussets. The side guardrails shall be constructed of 1.90" x .065" wall thickness. Fulcrum support tubes shall be 1.90" x .145" wall thickness, sloping access ladder is to be 1.90" x .109" wall thickness. The adjustable fulcrum shall be operable using a single hand or foot. The axle shall be covered with a stainless steel lined rubber sleeve and be fitted with stainless steel spur gears at each end meshing onto stainless steel gear racks. All gears shall be covered and there shall be visible markings for positioning the axle. Two hinged rear board supports shall be provided. They shall facilitate full range of motion, allowing the board (by others) to be rendered inoperable when not in use. Three (3) 15-degree step treads shall be provided. They shall be 26" wide, have an integral non-slip top surface, and shall be injection molded using U.V. stabilized ABS plastic. All metallic components of the dive stand shall be fabricated of 304L stainless steel. The dive stand shall be supported by one (1) 16" x 16" 300 series stainless steel pedestal cage anchor and two (2) heavy-duty 4" bronze anchors.

   a. One meter stand (1 required) shall be Spectrum Products catalog #22121 and included with manufacturer recommended deck anchors.

2. Railings for the diving tower stairs and springboard pedestals shall be provided as shown on the drawings. Rails shall be custom fabricated of one continuous length of tubing wherever possible. The tubing shall be Anodized Type 6061-T6 Schedule 40 Aluminum, 1.500 inch OD x .120 inch wall thickness – A31 Architectural Class II Clear Anodize. Surface preparation of Aluminum tubing shall be M32 Medium Satin finish. Floor flanges shall be J Blum #7571 heavy duty aluminum or approved equal. Anchors shall be stainless steel, Type 316L. All rails shall be vented for Anodizing. All welding shall be in accordance with American Welding Society Code D1.1-94. Welding electrodes shall be Aluminum 5356. Welding slags, burrs and splatter shall be removed from hand rail surfaces and all exposed welds shall be ground smooth. All dimensions shall be field verified prior to fabrication.

E. Diving boards (1 required) shall be an aluminum extrusion type springboard. The diving boards shall be a Maxi-Flex Model "B" diving board as manufactured by Duraflex International, Inc., model #66-231-330 or approved equal. The diving board shall be 16 ft long and 19-5/8 inches wide. The top surface shall be finished with three coats combined with a mixture of sand and white aluminum oxide to affect the non-skid surface with 200 perforations.

F. Provided a ship's ladder in the size and shape shown on the drawings. Ladder shall be aluminum with aluminum stiffeners if required by OSHA. CONTRACTOR shall provide ladder to general contractor for installation. Refer to the Architect.

2.12 LOOSE EQUIPMENT

A. Lifeline shall be 3/4 inch blue and white polyethylene rope with floats that are 5 inch diameter by 9 inch long. Floats to be spaced on five foot centers. All metallic rope hooks shall be stainless steel. Provide lifeline at five foot break between shallow and deep water as shown on the drawings. Lifeline to be equal to Recreonics no. 14-381.BW or Lincoln Aquatics 44-115 safety line rope, Recreonics no. 14-381 or Lincoln Aquatics 44-190 locking 5" x 9" floats, and Recreonics no. 14-456 or Lincoln Aquatics 44-125 rope end hooks.

2.13 MAINTENANCE EQUIPMENT

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Wall brush (2 required) - Brush backing shall be a flexible polyethylene material with five (5) rows of nylon bristles. Pool brush holder shall be permanent mold cast aluminum with hydrofoil flap. Holder shall have stainless steel screws to facilitate brush changes. Handle bracket shall be quick detachable mount to fit standard 1 ¼ or 1 ½ inch diameter handles. Brush to be Recreonics no. 10-135, Lincoln Aquatics 31-020, or approved equal.

2. Skimming net (2 required) - Skimmer head shall consist of one-piece molded plastic frame with a reinforced, integral handle bracket suitable for quick attachment to a standard 1¼ or 1 ½ inch diameter handle using bolts and wing nut. The standard nylon net shall be attached to the frame using the groove and spline method. Net depth shall be 4 inches minimum in the center. Skimmer net shall be manufactured by Skimlife No. SS8, or approved equal.

3. Telescopic Poles (2 required) - Cleaning tool handle shall be of the telescopic design and fabricated from corrosion resistant, high-quality anodized aluminum. Poles shall be fully adjustable, to desired length, with a simple twist of a cycolac threaded locking device. Poles shall consist of a 1 inch tube fitted inside a 1¼ inch tube and be adjustable from a range of 8 ft. to 16 ft. Handle shall be adjustable from 8 ft. to approximately 16 ft. having a threaded bushing type clamp to lock handle at desired position. Poles shall be manufactured by Pool King, or approved equal.

4. Portable Vacuum Poles

   a. Telescopic poles fiberglass poles (1 required) - Vacuum head attachment poles are to have a super-tough 1¼ inch fiberglass handle. Poles are to be 8 ft. each, totaling a 24 ft. length for vacuum head attachment. Poles are to be Recreonics No. 10-370 with quick change adapter Recreonics no. 10-374 or approved equal.

5. Test Kits - Provide two (2) test kits for each mechanical room.

   a. The first test kit shall feature liquid reagents, color comparator, waterproof instructions and treatment charts, chemistry guide and water gram. Test kit to have the ability to test for free and total chlorine (0.5 – 5.0 ppm), bromine (1-10 ppm), pH (7.0 – 8.0), acid and base demand, total alkalinity, calcium hardness and cyanuric acid. Test kit shall be Taylor Complete 2005 test kit, or approved equal.

   b. The second test kit shall be photometric and utilize tablet reagents for stability that will allow accurate measurement of free and total chlorine (0-10 ppm), bromine, pH, alkalinity, calcium hardness, and cyanuric acid. The test kit shall have solid-state digital electronics and built-in filters. The test kit shall be direct-reading with automatic blank settings, automatic power cut-off, and store the last 10 results in nonvolatile memory. Test kit shall be a Pooltest 6 system based on the Palintest system of water analysis. Provide SPH 006D Pooltest 6 - Hard Carry Case Kit and SPC 006 Check Standard or AquaPRO 6 Test Kit manufactured by Orbeco-Hellige Inc. and Reference Standard Kit (LP275680).

6. Stainless Steel Cleaner - Provide a stainless steel cleaner. The cleaner shall comprise of one (1) gallon of organic passivation solution. It shall be complete with instructions for proper maintenance of stainless steel surfaces and material safety data sheets for the passivation solution. The cleaner shall be the Spectra-Clean System 2 as manufactured by Spectrum Products. Product to be applied with 3M scouring pad, or equivalent.

7. Vacuum Cleaner

a. Vacuum cleaner (filtered water return to pool) - (1 required) to be complete with a 36-inch dual manifold head with 50 feet of 2-inch floating hose. Hose to be Recreonics, catalog no. 10-422 or approved equal. 24 ft. stainless steel pole shall be available for attachment. The portable cartridge vacuum cleaner system shall include a 155 square foot T-316 stainless steel up-flow single cartridge filter, a 1 HP self-priming thermoplastic self-priming pump 1-1/2" suction and discharge connection and 110 cubic inch strainer capacity. Cartridge shall be Harmsco no. ST/155 or approved equal. The pump motor shall be 115/230 volt single phase, 60-cycle, open-drip proof and shall be UL and NSF listed. The pump motor shall be provided with a 120-volt Hubbell switch, weather proof switch cover, in-line pre-wired GFCI and a 100' power cord. The cord shall be wired to a 20 amp, 115/230 volt switch which shall be mounted on pump motor. All interconnecting pipe and fittings shall be schedule 40 PVC. The entire assembly shall be bolted to a T-316 stainless steel cart and shall have pneumatic wheels with grease fittings and roller bearing hubs. The system shall be provided with one spare cartridge filter. Unit to be Recreonics, catalog no. 10-806, Lincoln Aquatics no. 27-010, or approved equal. Accessories shall include a 1½ inch x 25 ft. discharge hose with stainless steel hose clamp. Hose to be manufactured by Quaker Plastic Corporation no. QT-131, or approved equal.

8. Robotic Pool Cleaner

a. JetMax Robotic Pool Cleaner

I. Provide one pump motor driven automatic swimming pool vacuum device. Cleaner weighs 18 lbs and has internal oil-cooled, water-cooled, brushless pump motor that filters 5,900 GPH. Jet-drive valve system on top propels the cleaner forward and back by diverting the filtered water expelled by the pump motor. Four non-marring rubber wheels on free-spinning axles guide the cleaner along pool surfaces. Motion sensor detects any obstruction in the path of the cleaner and changes direction. Two axle locking screws provide adaptable cleaning patterns for pool shape and size. The cleaner is to have four moving parts only. Cleaners with drive motors, gears, pulleys, belts or tracks are not acceptable. The cleaner to have an automatic program to clean pool floor and radius walls, travelling 1 ft per second, scrubbing pool surfaces with two power-washing jets, vacuuming a 2¼ ft wide path using two offset 7½ square inch suction inlets underneath, filtering fine debris <10 microns small and solids as large as 1½ inch into an internal reusable filter bag. Unit complete with 120 ft cord, manual guidance attachment, 2 filter bags, digital timer, power supply with 24 volt transformer, operator manual. Requires 110 volt GFCI receptacle onsite, consumes 2½ amps electricity. The pool cleaner shall be a JetMax Turbo as manufactured by Aqua Products, or approved equal.

2.14 SAFETY EQUIPMENT

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Ring buoy and extension rope (5 required) – Buoy shall be 24 inch diameter vinyl clad PVC foam with a metal ring molded inside. Buoy shall have a 3/8 inch polyethylene rope attached to it at four points and be a minimum 60 feet in length. Preserver shall be U.S.C.G. approved. Buoy and rope to be mounted at each lifeguard chair on hooks.

Ring buoy to be manufactured by Cal-June no. G-24-WH or approved equal. Throw rope to be Recreonics no. 12-261, Lincoln Aquatics No. 42-050, or approved equal.

2. Life hook and pole (2 required) – Life hook shall be an anodized aluminum 3/8 inch OD "shepherd's crook" with a 1-1/8-inch OD handle attachment suitable for a 1¼-inch 16 ft. aluminum extension pole. Hook shall be of looped construction. Each pole to be provided with a set of spring type stainless steel pole clamps for mounting on each lifeguard chair. Life hook shall be equal to manufactured by Rainbow no. 153. Pole clamps shall be Recreonics no. 10-353, or approved equal.

3. Life hook and fiberglass pole (2 required) - Life hook shall be an anodized aluminum 3/8 inch OD "shepherd's crook" with a 1-1/8-inch OD handle attachment suitable for a 1¼-inch 16 ft. fiberglass extension pole. Each life hook shall be provided with a separate 16 ft pole. Hook shall be of looped construction. Each pole to be provided with a set of spring type stainless steel pole clamps for mounting on each lifeguard chair. Life hook shall be manufactured by Rainbow no. 153, or approved equal. Pole clamps shall be Recreonics no. 10-353, or approved equal, and fiberglass poles shall be equal to Recreonics no. 10-372.

4. Spineboards (1 required) - Spineboard shall be 72" long x 20" wide, constructed of 100% virgin high density polyethylene. The design shall provide stiffness and torsional rigidity while remaining lightweight. The spineboard shall accommodate up to 500 lbs and shall feature customizable buoyancy that allows users to adjust the buoyancy by inserting polyethylene foam rods (supplied with the spineboard). There shall be (10) handholds around the perimeter of the board. The spineboard shall be supplied with one (1) 2-piece head immobilizer, one (1) head strap, four (4) body straps, one (1) head immobilizer with head bed, and two (2) flotation rods. The spineboard shall be CJ Rescue 6 package as manufactured by CJ spineboard at 1-206-824-8886 or approved equal. The CONTRACTOR shall provide one (1) set of heavy duty stainless steel utility hooks per spineboard for storing the spineboard at a convenient and readily accessible location near the pool (Recreonics catalog no. 10-362).

5. First aid kit (1 required) - First aid kit shall be a 24 unit kit per American Red Cross standards as manufactured by Swift First Aid, or approved equal.

6. Rescue tube (7 required) - Provide one rescue tube for each lifeguard chair. Rescue tube to be manufactured by Bremen Corporation No. 21414-14, or approved equal.

7. Safety eyewash station (2 required) - Safety eyewash station shall be a self-contained system in which eyewash bottles are securely positioned in a portable holder. Eyewash bottles shall be 32 ounces and easily removable from case, and shall contain a sterile, saline solution with the ability to neutralize a varying quantity acids or caustics. Eyewash stations shall be equipped with a double back screw and holes for easy mounting in location to be determined by the Architect. Stations shall be Recreonics 12-033, Lincoln Aquatics 49-026, or approved equal.

8. Safety eyeglasses - Provided a safety eyeglass dispenser station containing ten (10) pairs of safety glasses. Eyeglasses shall be ANSI/OSHA accepted, and be equal to Lab Safety Supply Inc. (1-800-356-0783) no. WQ-14740B.

9. Bag Valve Masks – Provide two (2) bag valve mask assistant resuscitation systems, one size Adult (1500ml tidal volume) and one size Infant/Child (450ml tidal volume). Product shall be a latex free disposable bag mask unit with support strap, transparent patient valve, and textured surface to eliminate slipping. Integral swivel valve, available with a closed reservoir system. Standard pack includes resuscitator, oxygen reservoir and a

transparent bag for storage. Bag Valve Masks shall be Ambu SPUR II, or approved equal.

2.15 THERMOMETERS

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Portable thermometer (2 required) shall be a molded ABS plastic tube body type with the ability to measure temperature in both degrees Fahrenheit and Celsius. A 3 ft. polyethylene cord is to be attached to thermometer. Thermometer is to be manufactured by Pac-Fab/Rainbow no. R141036 or approved equal.

2.16 SWIMMING POOL FINISHES

A. Paint

1. Scope shall consist of the pool interior, vertical and horizontal warning signage and entry stair and nosing, all with the addition of a non-slip additive. Note: Provide a sample mock-up on a 4 ft. x 4 ft. plywood sheet showing the coating with the non-slip additive. Sample to be approved by owner and architect. The interior surfaces of the gutter trough pit shall be coated with a high build epoxy. The color shall be white or an approved light color.

2. Coating shall be a low VOC compliant polyamidoamine epoxy suitable for chlorinated water below 3.2 ppm for installation on concrete surfaces. CONTRACTOR shall provide on-site technical services and approval from the coating manufacturer prior to application and during the coating application. Coating shall be Tnemec Series L69F Hi-Build Epoxoline II, Induron Perma-Clean II Semi-Gloss or approved equal. Color shall be white.

3. Surface Preparation

a. Cast-In-Place Concrete

I. Allow concrete to cure a minimum of 28 days at 60 deg. F. Brush-off pool interior surfaces, then blast clean to remove laitance and weak surface concrete to produce an anchor profile similar to medium grade sandpaper referencing SSPC-SP13/NACE 6, ICRI-CSP 2-4 Surface Preparation of Concrete. Blasting shall open up surface voids, holes and irregularities. No holes or holidays in the paint membrane will be allowed. Fill with an approved grout or Tnemec Series 215 Surfacing Epoxy, or Induron EFS707 Epoxy Surfacer and Filler, any hole or irregularity that cannot be satisfactorily painted. Do not entirely remove the surface or completely expose underlying aggregate. After blasting, neutralize concrete with a solution of 2 cups aqua ammonia per 5 gallons of water. Flush with clean water and allow to thoroughly dry.

b. Pneumatically Applied Concrete

I. Allow concrete to cure a minimum of 28 days at 60 deg. F. Prior to applying paint to a pneumatically applied concrete surface, a brown coat plaster leveling surface shall be applied. The pneumatically applied concrete surface shall be prepared for the application of the brown coat by removing all loose materials, laitance, minerals, and chemical traces. If a brown coat has been utilized, provide a clean, firm surface or anchor profile similar to a medium

grade sandpaper, suitable for the application of paint. No holes or holidays in the paint surface will be allowed. Fill with an approved grout or Tnemec Series 215 Surfacing Epoxy, or Induron EFS707 Epoxy Surfacer and Filler, any hole or irregularity that cannot be satisfactorily painted.

4. Application Procedures

   a. Before applying any material, measure and record the temperature and relative humidity. Apply only if temperature is above 55 deg. F. and at no lower temperature than 5 deg. F. above the dew point. Do not apply when the relative humidity is greater than 85%. If possible, plan the painting schedule so that all painting is done in the coolest part of the day. Provide proper ventilation so that paint fumes do not become concentrated.

5. Application of the Primer

   a. After the pool surface has been thoroughly dried and cleaned the primer coat can be applied. Surface spreading rate shall be observed as not to exceed the recommended manufacturer's rate of application. The primer will be applied at a minimum rate of 200 SF per gallon and shall conform to local VOC requirements. A good heavy coat shall be applied. A rough or porous concrete pool will require more paint than recommended. On particularly rough surfaces two coats are recommended in order to provide a smooth, uniform finish. Note: Any marks or irregularities that show through the primer will also be apparent when the finish coat is applied.

6. Application will be made by brush, roll, lambs wool applicator, or spray. When the finish coat is to be a color other than white the primer will be tinted.

7. Application of the Finish

   a. After the primer is dry enough to walk on without removing or marking surface, apply the finish coat(s) in accordance with the manufacturer's instructions. Application shall be done by the use of a brush, roller, lamb's wool applicator, or spray methods at a rate of 150-250 SF per gallon. Allow a minimum of 5 hours (at 75 deg. F) drying time between coats. Two coats of finish paint are recommended to improve upon general appearance of pool shell. Allow 7 days curing (at 77 deg. F.) before filling the pool.

8. Application of pool striping, depth markings, warning signs and wall targets, shall be done after final coat of finish paint has cured for at least 24 hours.

9. Slip resistant additive shall be applied to the all outdoor areas, entry steps, ramp areas, zero entry and all deck markings.

10. Final paint coating shall be allowed to dry a minimum of 7 days at 35 degree Fahrenheit or above, before filling the pool.

B. Pool Tile – Reference specification section 093213, Swimming Pool Tile.

2.17 WATER FEATURES

A. ADD ALTERNATE #A1 - Climbing Walls - Climbing wall (1 required): deck-mounted artificial aquatic climbing wall feature designed to withstand chlorinated environments. Climbing holds are non-abrasive polyester resin with UV inhibitors in aquatic colors. Climbing wall base shall be fabricated from grade 304 stainless steel. Climbing wall shall be ASTM approved. Climbing wall shall be Kersplash model as shown on the drawings, by Everlast Climbing or approved equal.

B. Water Slide

1. The water slide shall be designed in accordance with ASTM F 1487-01, and CPSC Part 1207, and for use on in-ground commercial swimming pools that have a minimum water depth of 4'. All metallic components of the slide its tower, stairway, and flume supports shall be fabricated of stainless steel. Flume sections and tower side panels shall be fabricated of color-impregnated, ultraviolet stabilized LDPE. The water slide shall be permanently mounted to the swimming pool deck.

   a. Basis of Design: Spectrum Aquatics Slide 135150 or approved equal.

2. Tower

   a. The tower support legs shall be fabricated from 4" square x 0.120" wall thickness, 304 series stainless steel. Each leg shall receive a 8" x 8" x 3/8" 304 series stainless steel four-hole flange for attachment to pool deck.

3. Flumes, Tower Side Panel and Observation Deck

   a. The slide flume sections shall be 30" in diameter and shall be rotationally molded of ultraviolet stabilized polyethylene. Slide entrance panels shall be rotationally molded of ultraviolet stabilized polyethylene. The platform shall be surrounded by 3/4" clear ultraviolet stabilized on all sides. The polycarbonate panels and attachment hardware shall be capable of withstanding a concentrated load of 200 pounds or a linear load of 50 pounds per foot.

4. Tower Platform Deck and Step Treads

   a. The tower platform deck and stair step treads shall be fabricated from 1" ultraviolet stabilized, non-slip, structural fiberglass T-bar.

5. Stair Assembly/Rails

   a. The stair assembly shall be constructed of, 2" x 8" x 0.135" wall thickness, 304 series stainless steel. Stair rails shall be fabricated from; 1.50" O.D. x 0.120" wall thickness, ASTM-A-554 grade 316L series stainless steel. The stair rails shall have clear 3/4" polycarbonate panels capable of withstanding a concentrated load of 200 pounds or a linear load of 50 pounds per foot.

6. Flume Supports

   a. Flume supports shall be fabricated from, 1.90" O.D. and 1.66" O.D. x 0.109" wall thickness, 304 series stainless steel tubing. Stainless steel floor flanges shall be provided for each deck contact point. The supports shall be adjustable and shall cradle the flume assemblies, providing strength and structural support.

7. Water Supply

   a. The flumes' entrance will be equipped with two-spray nozzles that will direct a fine spray of water into the flumes. A ¾" female threaded water connection shall be supplied and shall be located at the base of the tower assembly.

8. Warranty Two year limited warranty on flumes. Three year limited warranty on stainless steel parts.

C. CASCADES NO 1.

1. Play Product Structure: The Cascades No.1 VOR-7042.2008 shall include one (1) Bubbling Basin, one (1) Lily Pond, one (1) Play Ponds, one (1) Waterway, and one (1) Waterway with

star wheels. The Bubbling Basin: shall be constructed of 304L stainless steel structural tubing with an outside diameter of 2.375" (60mm) and a wall thickness of 0.109" (2.8mm). The overall height of the structure shall be no less than 35" (89cm). The basin shall be constructed of red translucent SEEFLOW™ polymer. The flower shall be constructed of three (3) layers of ¾" (20mm) laminated High Density Polyethylene and shall be fastened to the bell with tamper-resistant hardware. The Lily Pond shall be constructed of 304L stainless steel structural tubing with an outside diameter of 2.375" (60mm) and a wall thickness of 0.109" (2.8mm).The overall height of the structure shall be no less than 17.50" (45cm). The pond basin shall be constructed of red translucent SEEFLOW™ Polymer. The lily shall be constructed of ¾" (20mm) laminated High Density Polyethylene and shall be fastened to the basin with tamper resistant hardware. The Double Flower Bucket Table shall be constructed of 304L stainless steel structural tubing with an outside diameter of 2.375" (60mm) and a wall thickness of 0.109" (2.8mm). The overall height of the structure shall be no less than 21.50" (55cm). The basins shall be constructed of red translucent SEEFLOW™. The table shall be constructed of ¾" (20mm) laminated High Density Polyethylene and shall be fastened to the basins with tamper resistant hardware. The Waterways shall be supported by ¾" (20mm) High Density Polyethylene panels fastened to the SEEFLOW™ Waterways with tamper-resistant hardware. The overall height of the structure shall be no less than 28" (71cm). The Waterways shall be constructed of translucent SEEFLOW™ Polymer. The flow gates shall be constructed of High Density polyethylene guides and a Neotex foam gate. The star wheel shall be constructed of stainless steel support brackets and netotex foam wheels. The rotational shaft shall be constructed of stainless steel. The Bubbling Basin shall be anchored with a SAFESWAP™ Anchoring System. All other basins shall be fastened to the surface with mechanical anchors. The Waterways shall have two (2) leveling supports with two (2) holes on each face allowing for installation on sloped surfaces.

2. Overall play product dimensions: The overall height of the Cascades N°1 shall be no less than 35" (89cm) with a width of 91" (232cm) and a length of 117" (296cm).

3. Play Product Interactivity: Users must work together to keep the water flowing from one piece to the next in the Cascade, giving everyone a chance to participate and encouraging team play.

4. Hydraulic Activity/Components: The bubbling basin shall be filled with water from the water line connection and then cascade into 3 different directions, filling the Waterways and pond. Once the Lily Pond is filled, the water will cascade in three different directions. Cascading water from the Bubbling basin shall fill the first basin of the Play Pond before cascading to the second basin.

5. Hydraulic Requirements: The hydraulic requirements shall be 10-30 gpm (38-114 lpm) @ 5-10 psi (0.3-0.7 bar).

6. Basis of Design: The Cascades No.1 VOR-7042 by Vortex International or approved equal.

D. AQUA DOME N°1 (one (1) required):

1. Play Product Structure: The Aqua Dome N° 1 VOR-555.2000 shall be constructed of 304L stainless steel structural tubing with an outside diameter of 4½" (11.4cm) and a wall thickness of 0.120" (3mm). The Safeswap anchoring and leveling system shall be used.

2. Overall play product dimensions: The overall height of the structure shall be no less than 45" (114cm) height.

3. Hydraulic Activity/Components: The spray effect shall be a clear, laminar bell shaped, sheet descending from the top of the post towards grade.

4. Hydraulic Requirements: The hydraulic requirements shall be 10-18 gpm @ 5-10 psi.

5. Basis of Design: The Aqua Dome Nº 1 VOR-555.2000 by Vortex International or approved equal.

E. SUNSPRAY NO 1

1. Play Product Structure: The SunSpray No.1 VOR-7578.2008 main post shall be constructed of 304L stainless steel structural tubing with an outside diameter of 4½" (11.4cm) and a wall thickness of .120" (3mm). It shall also have 304L stainless steel structural tubing with an outside diameter of 3½" (89mm) and wall thickness of 0.120" (3mm) bent into a circle. A 4" (10cm) solid lead-free brass 360° rotational joint consisting of a stainless steel bearing collar and an Ultra-High Molecular Weight Polyethylene spray control collar. A Twirltec™ shall be fastened to the main post structure allowing the user to rotate the entire post. The Safeswap anchoring and leveling system shall be used.

2. Overall play product dimensions: The overall height of the structure shall be no less than 121" (307cm).

3. Play Product Interactivity: With the Twirltec™, users can grasp the handle to turn the SunSpray, causing the six water jet to fan out.

4. Hydraulic Activity/Components: Water jets from six (6) Rivozzles shall produce six (6) water jets flowing out of the circular portion of the SunSpray.

5. Hydraulic Requirements: The hydraulic requirements shall be 10-15 gpm (38-57 lpm) @ 15-20 psi (1.0-1.4bar).

6. Basis of Design: The SunSpray No.1 VOR-7578.2008 by Vortex International or approved equal.

F. SUNSPRAY NO 2

1. Play Product Structure: The SunSpray No.2 VOR-7579 main post shall be constructed of 304L stainless steel structural tubing with an outside diameter of 4½" (11.4cm) and a wall thickness of .120" (3mm). It shall also have 304L stainless steel structural tubing with an outside diameter of 3½" (89mm) and wall thickness of 0.120" (3mm) bent into a circle. A 4" (10cm) solid lead-free brass 360° rotational joint consisting of a stainless steel bearing collar and an Ultra-High Molecular Weight Polyethylene spray control collar. A Twirltec™ shall be fastened to the main post structure allowing the user to rotate the entire post. The Safeswap anchoring and leveling system shall be used.

2. Overall play product dimensions: The overall height of the structure shall be no less than 130" (331 cm).

3. Hydraulic Requirements: The hydraulic requirements shall be 18-22 gpm @ 15-20 psi (1.0-1.4bar).

4. Basis of Design: The SunSpray No.2 VOR-7579 by Vortex International or approved equal.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Carefully examine all of the contract documents for requirements that affect the work of this section. Prior to starting any work, notify the General Contractor of defects requiring correction. Do not start work until conditions are satisfactory.

B. Verify that all work by others, related to this section, has been completed. This includes all earthwork, concrete work, and mechanical, electrical and plumbing connections.

C. Protect all materials and work completed by others from damage while completing the work in this section.

3.02 FIELD MEASUREMENTS

A. Verify benchmark and pool location prior to layout.

B. If field measurements differ from the construction drawing dimensions, notification shall be given to the Architect prior to proceeding with work.

3.03 EXCAVATION, REINFORCING STEEL AND SWIMMING POOL PNEUMATICALLY APPLIED OR CAST-IN-PLACE CONCRETE

A. Reference Division 31 - Earthwork

B. Reference Division 3 - Concrete

C. Reference Section 131101 – Swimming Pool Pneumatically Applied Concrete

D. Reference Section 131102 – Swimming Pool Cast-In-Place Concrete

3.04 TOLERANCES FOR CONSTRUCTION OF THE POOL SHELL

A. The completed structures shall be constructed level and to the dimensions, elevation, depths and thickness as shown on the plans.

B. The elevation tolerance of the pool shell and gutter lip shall be plus or minus 1/8 inch for the entire perimeter of the pool.

C. The vertical wall surface tolerance of the pool shell, for the first 36 inches from the water surface shall be plus or minus 1/4 inch from plumb measured with a 6 foot straight edge.

D. The CONTRACTOR shall provide the services of a registered engineer or land surveyor who shall measure and certify the elevations of the gutter lip at 10 foot centers.

E. Ground wires or grade pins, if used, shall be installed in such a manner that they accurately outline the section of the pool shell as indicated on the plans. They shall be located at intervals sufficient to insure proper thickness throughout and shall be maintained tight. Grade pins or grounding wires shall not be permanently embedded in the pool shell.

3.05 WATER TIGHTNESS TEST

A. This test applies to the pool. The water tightness test shall be completed prior to the application of the pool finish.

B. Water Tightness Test Procedure

1. Preparation

a. Allow the concrete structure to set 28 days for curing purposes. Once the pool shell has gained sufficient strength to withstand the test load and after all the outlets have been securely sealed, the pool shall be filled with water.

2. Fill: Fill and then isolate the pool. The water tightness test shall begin after the vessel has been filled for a minimum of three (3) days. During the filling, all outlets shall be monitored for water tightness and all concrete joints shall be monitored for any visible leakage. If any visible leakage from the vessel is observed, the condition shall be corrected prior to the start of the test.

   a. After the initial fill, all ground water shall be removed from the pool sight sump or the pool location de-watering system. This shall be completed prior to the start of the water tightness test. De-watering of the pool sight sump shall be maintained during the entire duration of the test.

3. Evaporation/Precipitation Measurement Procedure

   a. Fill a floating, restrained, partially filled, calibrated, open container with water and allow the container to float within the pool during the testing period. This will be used to measure evaporation and precipitation.

4. Measurement

   a. On a separate sheet of paper draw a sketch of the pool. Measurements shall be taken at the pool. Multiple test points with averaging are recommended for vessels which will be exposed to wind. Document the separate findings on the chart below. Repeat the measurements and document every 12 hours for a total of three (3) days. The General Contractor shall check the pool for water loss with the Architect or Owner's representative every 12 hours.

Total Allowable Water Loss:	Total Gallons:	196,260	(0.1%) x 0.001 = 196.26	Allowable Loss	Pan Depth Per 24 Hrs.
Pool Measurements	Leisure Pool				Pan Measurements
12 Hrs.					
24 Hrs.					
36 Hrs.					
48 Hrs.					
60 Hrs.					
72 Hrs.					

5. Total Loss = 7.481 x Structure Surface Area (SF) x Total Water Loss per Day (FT) – Evaporation per Day (FT) + Precipitation per Day (FT)

   a. Day #1 =

   b. Day #2 =

   c. Day #3 =

6. Repair

a. The allowable leakage rate for an unlined pool structure shall not exceed 0.1 percent of the total water volume in a 24-hour period. (Example: 0.001 x 200,000 gallon pool = 200 gallons per 24 hour period.) This excludes the loss/addition of evaporation/precipitation.

7. Absorption

a. Waiting 3 days after the initial water fill will allow the concrete to absorb water and shall be sufficient to minimize the effect of absorption on the test results.

8. If leaks are detected, repair the vessel and make water tight in accordance with these requirements.

9. With regard to this test, the curing requirements, the final fill and the cost of the water for two (2) complete fillings shall be borne by the Owner. Any subsequent fillings or partial fillings (more than 25%) of the pool shall be by the CONTRACTOR, at its own expense.

3.06 PIPING INSTALLATION

A. General

a. Provide and erect, according to the best practices of the trade, all piping shown on the drawings and required for the complete installation of these systems. The piping shown on the drawings shall be considered as diagrammatic in indicating the general run and connections, and may or may not in all parts be shown in its true position. The piping may have to be off set, lowered or raised as required or as directed at the site. This does not relieve the CONTRACTOR from responsibility for the proper erection of the systems or piping in every respect suitable for the work intended as described in the specifications and approved by the Architect. In the erection of all piping, it shall be properly supported and proper provisions shall be made for expansion, contraction and anchoring of piping. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate installation will not be permitted. All pipes shall have burrs and/or cutting slag removed by reaming or other cleaning methods in strict accordance with the manufacturer's instructions. All changes in direction shall be made with fittings. All open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the systems. Plugs of rags, wool, cotton waste or similar materials will not be used in plugging. All piping shall be arranged so as not to interfere with removal and maintenance of equipment, filters or devices, and so as not to block access to manholes, access openings, etc. Flanges or unions as applicable for the type of piping specified shall be provided in the piping at connections to all items of equipment. All piping shall be installed to ensure noiseless circulation. All valves and specialties shall be so placed to permit easy operation and access.

B. Pipe Hangers and Supports

1. Pipes shall be adequately supported by pipe hangers and supports specified in Paragraph 2.05 Pipe, Hangers, and Valves.

2. Horizontal PVC Schedule 80 piping shall be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 120 degree F and as listed below:

3. Horizontal CPVC Schedule 80 piping shall be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 140 degree F and as listed below:

Nominal Pipe Size (Inch)	Hanger Support Spacing (Feet)	Minimum Rod Size for Single Rod Hanger (Inch)
1-1/4" and less	5	3/8"
1-1/2" to 3"	6	1/2"
4" to 6"	8	5/8"
8" to 12"	10	7/8"
Greater than 12"	12	1"

C. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape.

D. Install hangers to provide a minimum of 1 inch space between finished covering and adjacent work.

E. Place a hanger within 12 inches of each horizontal elbow.

Nominal Pipe Size (Inch)	Hanger Support Spacing (Feet)	Minimum Rod Size for Single Rod Hanger (Inch)
½" and less *	4	3/8"
¾" to 2"	6	3/8"
2-1/2" to 3"	7	1/2"
4" to 8"	8	7/8"
Greater than 12"	10	1"

F. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

G. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.05.C.3. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to the support spacing schedules.

H. Do not support piping from other pipes, ductwork or other equipment that is not building structure. Do not modify building structure for hanger installation.

I. Concrete Inserts

1. Provide inserts for placement in form work before concrete is poured.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Where concrete slabs form finished ceilings, provide inserts to be flush with the slab surface.

4. Provide hook rods to concrete reinforcement section for inserts carrying pipe over 4 inches.

J. Pipe Hangers and Supports

1. All piping shall be rigidly supported from the building structure by means of hanger assemblies properly selected and sized for the application in accordance with the manufacturer's recommendations and specifications.

2. All piping in a service tunnel, if required shall be supported by a structure of the CONTRACTOR'S design. The structure shall be non-corrodible and shall be of a size and configuration to rigidly support all the piping as shown in the plans at a minimum spacing as shown below.

3. Piping hangers shall be spaced per the below schedule and shall have hangers not more than one foot on each side of every change in direction. The piping systems shall be installed in an approved manner and shall not overload the building structural frame. The CONTRACTOR shall provide additional hangers and miscellaneous steel supports as required to distribute the piping system load over several structural members where required or directed. Maximum allowable spacing for piping shall be as follows:

4. Round rods supporting the pipe hangers shall be of the following dimensions:

5. Hanger rods shall be galvanized steel. Provide for controlling level and slope by turn buckles or other approved means of adjustment and incorporate lock nuts.

6. Where piping is installed side by side, the CONTRACTOR will support the piping by utilizing trapeze type hanger assemblies. Horizontal trapeze member shall be non-metallic channel. The CONTRACTOR shall provide heavier members as required for the load to be supported for the entire span distance. Hanger rods shall be as specified above and properly sized for the load supported, but not less than 5/8 inches diameter.

PVC Piping	Maximum Spacing
3/4" thru 2"	5'-0"
2 1/2" thru 4"	6'-0"
6" thru 10"	9'-0"
12" thru 14"	12'-0"

7. The use of pipe hooks, chains, or perforated iron for pipe hanger supports will not be permitted.

8. Attachment of piping hangers to the building structure shall be provided in a manner approved by the Architect. The CONTRACTOR shall provide concrete inserts to be installed by the General Contractor in the building construction at the time the concrete is poured and hangers shall be attached to these inserts.

K. Piping Installation

1/2" to 2" pipe	-3/8" rod
2-1/2" to 3" pipe	-1/2" rod
4" to 5" pipe	-5/8" rod
6" pipe	-3/4" rod

1. Trench bottoms shall be smooth and free of rocks and debris. If the trench is dug in ledge rock, hardpan or where large boulders are not removed, place 3 inches of sand or compacted fine-grained soil below pipe. Pipe must be supported over its entire length with firm, stable material. Blocking will not be used to change pipe grade or provide intermittent support over low sections in the trench. Surround the pipe with backfill meeting the requirements of Section 312000 with a particle size of 1-1/2 inch or less and in accordance with the project geotechnical report. Compact in layers not to exceed 6 inches with vibratory method. Follow installation methods of ASTM D2774 "Underground Installation of Thermoplastic Pressure Piping".

2. Installations are to be installed in a straight run of pipe, with a minimum 10 pipe diameters upstream and minimum 5 pipe diameters downstream of any pipe fitting.

L. Flushing, Draining and Cleaning Pipe Systems

1. The CONTRACTOR shall flush out all water systems with water before placing them in operation. Other systems shall be cleaned by using compressed air or nitrogen. After systems are in operation and during the test period, all strainer screens shall be removed and thoroughly cleaned.

M. Expansion and Contraction

1. The CONTRACTOR shall make all necessary provisions for expansion and contraction of piping with offsets, loops, flexible connections and anchors as required to prevent undue strain. The CONTRACTOR shall provide shop drawings for proposed method and arrangement for control of expansion and contraction of piping.

N. Testing

1. All piping installation and pressure testing shall be reviewed by the Owner's testing agency before commencement of backfilling. A minimum notice of one (1) week is required prior to review. Results of review shall be documented.

2. All pool related piping, shall be hydraulically pressure tested (with water, not air) to a pressure of not less than 50 PSI for a period of no less than two (2) hours.

3. Contractor is responsible for the maintenance of a sustained 20 PSI pressure on all pool related piping throughout the course of construction.

4. The Contractor shall adhere to the applicable provisions of Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.

3.07 EQUIPMENT AND SYSTEMS INSTALLATION

A. The CONTRACTOR shall assemble and install all equipment, special parts and accessories as shown on pool drawings, specifications and shop drawings of the equipment suppliers.

B. The CONTRACTOR shall provide all anchors and inserts to be imbedded in the deck including all fittings, inserts and structure sleeves and required anchorage as shown on the plans and as indicated in this section of the specifications. Equipment shall be set true and plumb, using factory jigs where available. Removable equipment items shall be easily removable from anchors and shall fit without noticeable wobble.

C. Provide templates for all equipment anchors. Provide anchor bolts of the size and spacing as required by the equipment manufacturer. All anchor bolts shall be stainless steel Type 316L and of a length capable of adequate anchorage into rough slab-on-grade allowing for finish deck tile and setting bed. Anchors shall be set and cast into place during building concrete work. Inspect all anchor settings for horizontal and vertical alignment prior to placing concrete.

D. The CONTRACTOR shall install all equipment and systems in accordance with manufacturer's directions. Equipment shall all be assembled and in place for final observation.

E. All items necessary to complete this section are shown on the plans or described in the specifications including items that may be purchased by the Owner. Items are detailed and specified as a guide for dimensional purposes. The CONTRACTOR must make provisions accordingly and submit shop drawings and submittals based on that data.

3.08 START-UP AND INSTRUCTION

A. The CONTRACTOR shall supply the services of an experienced swimming pool operator/instructor for a period of not less than two days (total 16 hours) after the pool have been filled and initially placed in operation. During this period, the Owner's representatives who will be operating the pool shall be thoroughly instructed in all phases of the pool's operation. The CONTRACTOR shall deliver complete sets of operating and maintenance instructions for the swimming pool, structures, finishes and all component equipment per the requirements outlined in Division 1 - General Requirements.. Prior to leaving the job, the CONTRACTOR shall obtain written certification from the designated Owner's representative acknowledging that the instruction period has been completed and all necessary operating information provided. The CONTRACTOR shall, in his contract, include the cost of two (2) additional days (total 16 hours) of instruction and operational check out by the qualified representative of the CONTRACTOR during the first season of operation.

B. Written reports of each of these visits outlining the pool's operation, competence and performance of the pool's operation personnel, and other pertinent comments shall be submitted to the Owner and Architect/Engineer within one (1) week after each visit.

C. The CONTRACTOR shall provide specific written procedures to be followed for emptying and refilling the pool as mentioned previously in this section. The procedures must be included in the bound volume of operating instructions and references in the front index with a note headed by the words: "CAUTION -- VERY IMPORTANT".

END OF SECTION 131100

SECTION 13 1101 – SWIMMING POOL CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:

1. Swimming pool:

a. Bottom slab.

b. Walls.

c. Miscellaneous features, slabs on grade and all other elements.

B. Related Requirements:

1. Division 03 for all concrete not related to swimming pool construction.

2. Division 03 or Division 13 for water tightness testing.

3. Section 13 1102 "Swimming Pool Shotcrete". Shotcrete may be substituted for swimming pool cast-in-place walls.

4. Division 31 for subgrade preparation, subbase, subsurface drainage back fill, excavating, and backfilling.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete Subcontractor.

e. Special Pool finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, anchor rod and anchorage device installation tolerances if required for equipment installation, under slab pipe encasement requirements, and concrete protection.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Engineer.

E. Samples: For waterstops.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Form materials and form-release agents.

4. Steel reinforcement and accessories.

5. Waterstops.

6. Curing compounds.

7. Bonding agents.

8. Joint-filler strips, if required.

9. Repair materials.

10. Dowel bar substitutes.

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

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

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

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

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

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

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

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

3. Testing Agency to be provided by Owner.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).

2. ACI 117 (ACI 117M).

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms (if indicated on drawings): Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.04 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

B. Dowel Bar Substitutes: Tapered, threaded couplers, pre-assembled to reinforcing with mounting plate for attachment to form work and a pressed in metal disc thread protector which can be easily removed. The mechanical connection shall meet building code requirements of developing in tension or compression. The mechanical connection shall be the positive locking, taper threaded type coupler manufactured from high quality steel. The bar ends must be taper threaded using the manufacturer's requirements.

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. Lenton Form Saver; Erico Corp.

2.05 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M and potable.

2.06 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

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. Sika Greenstreak.

b. Vinylex Waterstop & Accessories.

2. Profile: Ribbed without center bulb, non-tapered.

3. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.75 mm thick); nontapered.

B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compount, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.

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

a. Synko-Flex SF302, Henry Company.

1) Synko-Flex SF311 Solvent Based Primer.

2.07 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

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. BASF Corporation-Construction Systems; Confilm.

b. ChemMasters, Inc; Spray-Film.

c. Dayton Superior; AquaFilm J74RTU.

d. Euclid Chemical Company (The); an RPM company; Eucobar.

e. L&M Construction Chemicals, Inc; E-CON.

f. Metalcrete Industries; Waterhold.

g. Sika Corporation; Caltexol CIMFILM.

h. TK Products; TK-2120 TRI-FILM.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of pool finish.

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

a. BASF Corporation-Construction Systems; MasterKure CC 200 WB (Pre-2014: Kure-N-Seal W).

b. Dayton Superior; Cure & Seal 1315 J22 WB.

c. Euclid Chemical Company (The); an RPM company; Diamond Clear VOX.

d. L&M Construction Chemicals, Inc; Dress & Seal WB.

e. SpecChem, LLC; Cure & Seal WB 25.

f. W.R. Meadows, Inc; Vocomp-20.

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

1. Provide for cast-in-place concrete coping.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

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

a. Dayton Superior Corporation; Conspec Strong Bond.

b. Euclid Chemical Company (The), an RPM company; Flex-Con.

c. W. R. Meadows, Inc.; Sealtight Acry-Lok.

d. Kaufman Products, Inc.; Surebond.

2.09 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

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. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.

1) Xypex Concentrate.

2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

3. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

5. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

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. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.

1) Xypex Concentrate.

2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

3. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

5. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR SWIMMING POOL ELEMENTS

A. Slabs, Walls, Coping and Other Elements: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

2. Maximum W/C Ratio: 0.42.

3. Minimum Cement Content: 600 lb/cu. yd.

4. Slump Limit: 4 inches (100 mm), 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.14 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

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

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

2. Class D, 1 inch (25 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

1. Comply with pool and gutter profile shown if edges not shown to be chamfered.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. If required for equipment or piping installation, install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.04 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Dowel bar substitutes may be used in lieu of lap splices.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams and slabs in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of slabs and beams.

5. Vertical joints in walls shall be located at corners, and in concealed locations where possible.

6. Use a bonding agent:

   a. At locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

   b. At cove joint where cove mortar is placed against hardened wall and slab.

   c. At coping where coping is placed against hardened wall.

C. Contraction Joints in Slabs: No contraction joints shall be placed in pool bottom slab.

D. Joints in Coping:

1. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated, or, 2 feet maximum. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

   a. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

   b. Isolation Joints: Install vertical joint-filler strips at 3 feet.

      1) Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants are indicated.

3.07 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Non-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform

color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING SLABS AND WALLS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Verify all finish requirements with swimming pool finish subcontractor before finishing concrete.

1. Provide certification, with swimming pool finish subcontractor, that concrete finish complies with manufacturer's recommendations for final pool finish.

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with ceramic tile, paint, or another thin-film-finish coating system.

2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt,

and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.

2. Headed bolts (if required for equipment and piping installation).

3. Verification of use of required design mixture.

4. Concrete placement, including conveying and depositing.

5. Curing procedures and maintenance of curing temperature.

6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

8. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

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

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 13 1101

SECTION 13 1102 – SWIMMING POOL SHOTCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes shotcrete applied by dry-mix or wet-mix process for the following:

1. Swimming pool walls.

B. Related Sections include the following:

1. Division 13 Section "Swimming Pools" for pool shell tolerances and other items.

2. Division 13 Section "Swimming Pool Cast-In-Place Concrete" for pool bottom slabs and other pool-related structures.

3. Division 13 Section "Swimming Pool Cast-In-Place Concrete" for pool coping.

4. Division 03 or Division 13 for water tightness testing.

5. Division 31 for subgrade preparation, subbase, subsurface drainage back fill, excavating, and backfilling.

1.03 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the mixing water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

B. Design Mixtures: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. For predampened dry-mix mixtures, indicate amounts of mixing water to be added to the dry-mix materials before mixing and conveying through the delivery hose.

C. Shop Drawings: For shotcrete installation. Include support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support; and locations of proposed construction joints.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following:

1. Cementitious materials.

2. Admixtures.

3. Form materials.

C. Preconstruction Test Reports: For shotcrete.

D. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom attains mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests, is ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical Position, is ACI Shotcrete Nozzleman certified in Wet-Mix Process for Vertical Position as appropriate to the required shotcrete work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. ACI Publications: Comply with ACI 506.2, "Specification for Shotcrete," unless modified by requirements in the Contract Documents.

D. Shotcrete Testing Service: Owner to engage a qualified independent testing agency to perform material evaluation tests and to design shotcrete mixtures.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:

1. Produce shotcrete test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mixture, shooting orientation, and nozzle operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm).

2. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:

   a. Strength Testing: Test each set of unreinforced specimens for compressive strength according to ASTM C 42/C 42M.

   b. Core Grading: Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practical sizes to minimize number of joints.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice" and as follows:

   1. For uncoated reinforcement, use all-plastic bar supports.

C. Reinforcing Anchors: ASTM A 36/A 36M, unheaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel; and carbon-steel nuts.

   1. Finish: Plain, uncoated.

2.03 SHOTCRETE MATERIALS

A. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.

B. Portland Cement: ASTM C 150, Type I or Type III. Use only one brand and type of cement for Project.

   1. Fly Ash: Fly ash is not approved for use.

C. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

   1. Combined Aggregate Size: ACI 506R or ASTM C 1436, Grading No. 2 sieve analysis.

D. Water: Potable, complying with ASTM C 94/C 94M, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.

F. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.04 ADMIXTURES

A. General: ASTM C 1141, Class A (liquid) or Class B (non-liquid), but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Accelerating Admixture, Conventional: ASTM C 494/C 494M, Type C or Type E.

2. Pozzolanic Admixture: Ground granulated blast-furnace slag, and silica fume as limited in "Shotcrete Materials" Article.

3. Coloring Admixture: Coloring agent as limited in "Shotcrete Materials" Article.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.06 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based laboratory trial mixture or field test data, or both.

B. Cementitious Materials: Use 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.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

D. Admixtures: When included in shotcrete design mixtures, use admixtures according to manufacturer's written instructions.

E. Design-Mixture Adjustments: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.07 SHOTCRETE MIXTURES

A. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).

2. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1-1/2 percent.

2.08 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.

2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.09 BATCHING AND MIXING

A. Dry-Mix Process: Measure mixture proportions by weight batching according to ASTM C 94/C 94M or by volume batching complying with ASTM C 685/C 685M requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.

2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. Comply with ASTM C 685/C 685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

2.10 RELATED MATERIALS

A. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II.

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

a. Latex Bonding Agent, Type II (Non-Redispersible):

1) Dayton Superior Corporation; Conspec Strong Bond.

2) Euclid Chemical Company (The), an RPM company; Flex-Con.

3) W. R. Meadows, Inc.; Sealtight Acry-Lok.

4) Kaufman Products, Inc.; Surebond

2.11 REPAIR MATERIALS

A. Concrete Patching Mortar: Chemical treatment for waterproofing concrete.

1. Products: 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. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.

1) Xypex Concentrate.

2.12 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

a. Bometals, Inc.

b. Greenstreak.

c. Meadows, W. R., Inc.

d. Murphy, Paul Plastics Co.

e. Progress Unlimited, Inc.

f. Tamms Industries, Inc.

g. Vinylex Corp.

2. Profile: Ribbed without center bulb.

3. Dimensions: 4 inches by 3/16 inch thick (150 mm by 10 mm thick); nontapered.

B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compount, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.

1. Products: 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. Synko-Flex SF302, Henry Company.

1) Synko-Flex SF311 Solvent Based Primer.

2.13 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

PART 3 - EXECUTION

3.01 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.

1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces to saturated, surface-dry condition before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. Dampen surfaces to saturated, surface-dry condition before shotcreting.

D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.02 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.

2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover.

E. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

3.04 WATERSTOPS

A. Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. Prevent displacement during shotcrete application.

3.05 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints unless otherwise indicated.

3.06 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.07 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.08 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

   1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment-control devices after shotcrete placement.

L. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.

M. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

N. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

   1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling.

   2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).

3. Do not use frozen materials or materials containing ice or snow.

4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.

5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

O. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.

2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

3.09 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R.

B. Natural Finishes:

1. Gun Finish: Natural undisturbed finish as sprayed.

2. Rod Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set. Do not push or float with flat part of trowel.

3. Broom Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set; followed by uniform brooming.

C. Flash-Coat Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finely textured finish.

D. Flash-Coat with Final Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve, and apply wood-float finish.

3.10 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.

c. Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C), provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C 173/C 173M, volumetric method or ASTM C 231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of thickness and

reinforcing layout of shotcrete work on project. Testing agency will obtain sets of test specimens from each test panel.

1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.

2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. In-Place Shotcrete Testing: : Only if samples obtained in item D indicate unsatisfactory shotcrete, and only if directed by Owner, Architect or Engineer, take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed; whichever is less. Do not cut steel reinforcement.

F. Strength of shotcrete will be considered satisfactory according to the following:

1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.

2. Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.13 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.

2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.

3. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.14 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 13 1102

SECTION 13 3410 – PRE-FABRICATED SHADE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Work to include:

1. Pre-fabricated steel shade structure and concrete footings.

B. Related Documents:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
2. Section 03 3000 – Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

A. Provide drawings and structural calculations signed and sealed by an Engineer registered to practice in the State of Oklahoma.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are proficient with the specified requirements and methods necessary for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3300.

B. Product data: Provide the following:

1. Materials list of items proposed to be provided under this Section.
2. Shop drawings showing pertinent details of the units and their interface with other components of the structure.
3. Manufacturer's recommended installation procedures.
4. For permitting: Provide and submit to the City of Tulsa two (2) sets of approved shop drawings and calculations with the engineering seal and signature of a structural engineer licensed in the State of Oklahoma for deferred permit submittal for pre-fabricated shade structure and associated footings.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver the units to the job site with adequate wrapping to prevent staining and other damage from moisture, per manufacturer's recommendations.

B. Store materials in accordance with manufacturer's recommendation and as directed by the Owner's Representative.

C. Maintain wrapping in proper condition until erection has started.

1.5 DESIGN LOADS

A. Provide design as required by the International Building Code, edition currently adopted by the City of Tulsa, for this site.

1.6 COORDINATION

A. Coordinate the work of this section with installation of any underground piping, conduit or wiring, and grading.

B. Closely coordinate all work with grading, paving and other site work.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for shade structures shown on the Drawings in relation to the property survey and existing structures, and verify locations by field measurements prior to construction.

1.8 WARRANTY

A. A supplemental warranty from the manufacturer shall be provided for a period of 10 years against manufacturer defects from date of Final Acceptance.

B. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Product: Subject to compliance with requirements, provide prefabricated Steelworx shade structure as manufactured by Coverworx or equal as approved by Architect during Bidding.

1. Coverworx Recreational Architecture, www.coverworx.com
2. Icon Shelter Systems, Inc., www.iconshelters.com

2.2 PRE-FABRICATED SHADE STRUCTURES

A. Shade Structures as manufactured by COVERWORX. Refer to drawings for locations.

1. Steelworx Single Post Dodecagon Shelter, 30 feet; Model #: DO-30-SW-SP; Provide all prefabricated components and installation instructions for a 30 foot wide (measured from eave to eave) single post dodecagon 12 sided free standing bolt together, tubular steel constructed shade structure.
2. Steelworx Single Post Dodecagon Shelter, 20 feet; Model #: DO-20-SW-SP; Provide all prefabricated components and installation instructions for a 20 foot wide (measured from eave to eave) single post dodecagon 12 sided free standing bolt together, tubular steel constructed shade structure.

B. Design Criteria

1. Design for 25 lb live load and a 90 mph wind load capacity and/or local building code requirements, whichever is greater.

2. All structural members are to be ASTM A-500 U.S. grade B steel.

3. Welded connection plates shall be ASTM A-36 hot rolled steel.

4. All fabrication per latest AISC standards by AWS Certified welders.

5. All framing connections to us A325 grade bolts within concealed access openings from above to be concealed by roofing.

6. All roof framing shall be flush against the roof decking to eliminate the possibility of bird nesting.

7. Recessed base plate to be surface mounted to top of footing one foot below finish slab elevation or embedded directly into concrete footing without base plate.

C. Tubular Steel Columns and Beams

1. Standard column dimensions shall be 12 inch diameter tubular steel.

2. Main support beams to be engineered to meet or exceed design criteria.

D. Roofing: 24 Ga, pre-cut sheet multi-rib panels with Kynar 500 finish. Attach to structural framing with exposed self tapping screws painted to match roof color. Provide matching 25 Ga. trim.

E. Roof Slope: 6/12 pitch

F. Eave Height: 8 feet above finish grade.

G. Frame Finish: All steel framework to receive corrosion protective TGIC Polyester powder coat, electro-statically applied and cured at 400 F.

H. Colors as selected from manufacturer's standards.

I. Hardware: All structural hardware and roofing fasteners shall be provided.

J. No field welding.

K. Provide factory touch up paint.

L. Concrete Footings:

1. Unless noted otherwise for footing and piers by Contractor's Engineer, concrete specification for footings, piers, slabs, curbs and walkways shall meet a minimum 3,500 psi at 28-day strength.
2. Concrete work is executed in strict accordance with the latest American Concrete Institute Building Code (ACI 318-99).
3. Refer to Section 03 3000 – Cast-In-Place Concrete for additional requirements.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the shop drawings and manufacturer's recommendations as approved by the Owner's representative and with the requirements of governmental agencies having jurisdiction.

B. Comply with manufactures instructions for assembly, installation, and erection per approved drawings.

END OF SECTION 13 3400