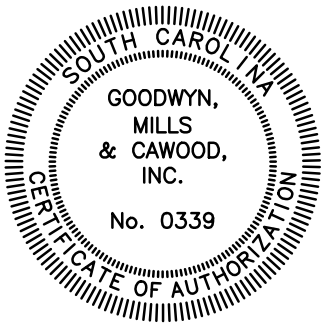
GRAND STRAND WATER & SEWER AUTHORITY

INTERNATIONAL DRIVE BOOSTER PUMP STATION

SRF PROJECT NO. 2620004-25
GSWSA PROJECT NO. 629-01
GMC PROJECT NO. CGRE190054

PREPARED BY:

GMC



Goodwyn, Mills and Cawood, Inc.
617 East McBee Avenue
Suite 200
Greenville, SC 29601
T 864.527.0460
www.gmcnetwork.com

January 2021

THIS PAGE INTENTIONALLY LEFT BLANK

INTERNATIONAL DRIVE BOOSTER PUMP STATION

FOR

GRAND STRAND WATER & SEWER AUTHORITY

SRF PROJECT NO. 2620004-25
GSWSA PPROJECT NO. 629-01
GMC PROJECT NO. CGRE190054

TABLE OF CONTENTS

SPECIFICATIONS

DIVISION 1	**GENERAL REQUIREMENTS**
01 10 00	Summary of Work
01 15 00	Measurement and Payment
01 26 00	Contract Modification Procedures
01 29 00	Payment Procedures
01 31 00	Project Management and Coordination
01 32 00	Construction Progress Documentation
01 32 33	Photographic Documentation
01 33 00	Submittal Procedures
01 40 00	Quality Requirements
01 50 00	Temporary Facilities and Controls
01 60 00	Product Requirements
01 70 00	Execution and Closeout Requirements
01 78 23	Operation and Maintenance Data
01 78 39	Project Record Documents
01 81 00	Geotechnical Data
DIVISION 2	**(NOT USED)**
DIVISION 3	**CONCRETE**
03 30 00	Cast-In-Place Concrete
03 60 00	Grouting
DIVISON 4	**MASONRY**
04 22 00	Insulated Concrete Masonry Units
DIVISION 5	**METALS**
05 44 00	Cold Formed Metal Trusses
DIVISION 6	**WOOD, PLASTICS AND COMPOSITES**
06 16 00	Sheathing
DIVISION 7	**THERMAL AND MOISTURE PROTECTION**
07 21 00	Thermal Insulation
07 26 00	Under Slab Vapor Retarder
07 41 13.16	Standing Seam Metal Roofing
07 46 46	Fiber Cement Siding
07 92 00	Joint Sealant

DIVISION 8 DOORS AND WINDOWS

08 11 13	Hollow Metal Doors and Frames
08 33 23	Overhead Coiling Doors

DIVISION 9 FINISHES

09 22 16	Non-Structural Metal Framing
09 29 00	Gypsum Board
09 91 13	Exterior Painting
09 91 23	Interior Painting
09 96 00	High-Performance Coatings

DIVISION 10 – 25 (NOT USED)

DIVISON 26 ELECTRICAL

26 00 00	Electrical
26 04 44A	Pump Station Control Panel
26 05 19	Low-Voltage Electrical Power Conductor and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 09 23	Lighting Control Devices
26 22 00	Low-Voltage Transformers
26 24 13	Switchboards
26 24 16	Panelboards
26 27 13	Electricity Metering
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Enclosed Switches and Circuit Breakers
26 43 13	Surge Protection for Low-Voltage Electrical Power Circuits
26 51 19	LED Interior Lighting
26 52 19	Emergency and Exit Lighting
26 56 19	LED Exterior Lighting

DIVISION 27 – 30 (NOT USED)

DIVISON 31 EARTHWORK

31 10 00	Site Clearing
31 23 19	Dewatering
31 25 00	Erosion and Sedimentation Controls
31 31 16	Termite Control

DIVISON 32 (NOT USED)

DIVISON 33 UTILITIES

33 05 63	Precast Concrete Vaults and Chambers
32 12 16	Water Utility Distribution Valves
33 13 00	Disinfecting of Water Utility Distribution

DIVISON 34-39 (NOT USED)

DIVISON 40 PROCESS INTERCONNECTION

40 05 06	Couplings, Adapters, and Specials for Process Piping
40 05 07	Hangers and Supports for Process Piping
40 05 19	Ductile Iron Process Pipe
40 70 23	Process Control Narratives
40 71 13	Electromagnetic Flow Measuring System
40 73 13	Pressure and Differential Pressure Gauges
40 73 23.26	Absolute-Pressure and Gauge-Pressure Transmitters
40 73 63	Diaphragm Seals
40 75 33	Chlorine Analyzers

DIVISON 41 MATERIAL PROCESSING AND HANDLING EQUIPMENT

41 22 00	Hoist and Cranes

DIVISION 42– 50 (NOT USED)

SUPPLEMENTAL SPECIFICATIONS

Grand Strand Water & Sewer Authority Standard Specifications

SECTION 00100

ADVERTISEMENT FOR BIDS

Grand Strand Water & Sewer Authority (GSWSA) will be receiving sealed bids for the construction and installation of the **INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)** and appurtenant items as prepared by Goodwyn, Mills, and Cawood, Inc. (GMC) in Horry County, SC. The bid opening will be held on **THURSDAY, FEBRURY 18, 2021 AT 2:00 P.M.** at GSWSA's Administrative Center conference room located at 166 Jackson Bluff Road, Conway, SC 29526. A pre-bid conference will not be held for this project.

Due to the ongoing COVID-19 pandemic and social distancing guidelines, GSWSA will only allow one (1) representative per bidder into the public bid opening area. A separate representative of the general contractor, sub-contractors, suppliers, or other vendors will not be allowed. If you prefer to attend the bid opening via teleconference, you may call (843) 872-0017 and enter the meeting code 813227 to listen to the bid opening.

The project consists of the construction of a new booster pump station housing four (4) horizontal split case pumps and related appurtenances, the installation of approximately 1,500-LF of 42" PVC suction and discharge water line, and cutting in two (2) system connections to existing system.

The contract awarded under this Advertisement for Bids will be funded in full by a loan from the State Revolving Fund (SRF). Bidders shall comply with all local, state and federal requirements as identified in the bid documents. Bidders are required to implement procedures to ensure, to the fullest extent possible, that DBE (disadvantaged businesses enterprise) firms have the opportunity to participate in a fair share of the contracts and subcontracts awarded for the project. The fair share goal for the contracts and subcontracts awarded for the project that must be made available is 2.5% Disadvantaged Business Enterprises (DBE's) and 2.5% Women's Business Enterprises (WBE's).

Bidders must comply with the "American Iron and Steel" (AIS) provision and certify that all iron, steel and manufactured goods used in the project were produced in the United States unless a waiver is granted by the EPA. Bidders shall also comply with the Davis-Bacon and Related Acts. All laborers and employed shall be paid wages at rates not less than the prevailing wage rates for the project area.

All bids must be accompanied by a certified cashier's check or a bid bond in the amount of 5% of the total amount of the bid made payable to the Grand Strand Water & Sewer Authority.

Copies of the Contract Documents may be obtained online by visiting www.bidnetdirect.com/south-carolina/gswsa. Please contact the Engineering Department at (843) 443-8258 with questions.

END OF SECTION 00100

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00200

INFORMATION FOR BIDDERS

Bids will be received by Grand Strand Water & Sewer Authority at its Administrative Center (hereinafter called the "OWNER") located at 166 Jackson Bluff Road, Conway, SC 29526, until **THURSDAY, FEBRURY 18, 2021 AT 2:00 P.M.** and then at said office publicly opened and read aloud.

Each Bid must be submitted in a sealed envelope, addressed to Grand Strand Water & Sewer Authority at PO Box 2368, Conway, SC 29528 or hand-delivered to its Administrative Center located at 166 Jackson Bluff Road, Conway, SC 29526.

Each sealed envelope containing a Bid must be plainly marked on the outside as BID for:

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

and the envelope should bear on the outside, the name of the Bidder, his address and his license number, if applicable. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to the Owner at P. O. Box 2368, Conway, South Carolina 29528. All Bids must be made on the required Bid form. All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid form must be fully completed and executed when submitted. Only one copy of the Bid form is required.

The Owner may waive any informalities or minor defects or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within 90 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between Owner and the Bidder.

Bidders should be aware that the project is being funded in full by a loan from the State Revolving Fund (SRF), therefore, Bidders must comply with all applicable local, state, and federal requirements identified in the bid documents, including Davis-Bacon and "American Iron and Steel" provisions. Bidders are required to implement procedures to ensure, to the fullest extent possible, that DBE (disadvantaged businesses enterprise) firms have the opportunity to participate in a fair share of the contracts and subcontracts awarded for the project. Compliance with these provisions is required in order for the project costs to be eligible for SRF funding. Mandatory SRF contract documents can be found in Appendix A of project manual.

Questions should be submitted through GSWSA's online bidding platform at www.bidnetdirect.com/south-carolina/gswsa no later than **THURSDAY, FEBRURY 11, 2021 AT NOON**. All interpretations, clarifications, or changes will be made in the form of written addenda published through the online bidding platform.

A responsive and responsible GSWSA service area vendor who is within five percent (5%) of the lowest non-local Bidder, may be given the opportunity to match the bid submitted by the non-local Bidder and thereby be awarded the contract. This preference shall apply only when purchases are $10,000 or more in value.

A vendor shall be deemed a GSWSA service area vendor if such a vendor is an individual, partnership, association or corporation that is authorized to transact business within the State of South Carolina, has a physical business address located and operating within the GSWSA service area and has been doing business in the GSWSA service area for a period of twelve (12) months or more prior to the bid opening date and the vendor provides proof of payment of all applicable taxes within their specific GSWSA service area.

If purchase is to be made pursuant to State or Federal Guidelines that prohibit or restrict local vendor preferences, there shall be no local vendor preference unless a more restricted variation is allowed under the guidelines.

Bidders must satisfy themselves of the accuracy of the extent of work in the Bid Schedule by examination of the site and a review of the drawings and specifications including Addenda. After Bids have been submitted, the bidder shall not assert that there was a misunderstanding concerning the quantities of work or of the nature of the work to be done.

The Provider shall submit a bid which is true, genuine, and not collusive. The bid shall not be made in the interest of or on behalf of any undisclosed person, partnership, company, associate, organization, or corporation. The Provider nor any of its officers, partners, owners, agents, representatives, employees, or parties of interest, shall collude, conspire connive or agree, directly or indirectly, with another Provider, firm, or person to submit a collusive bid in connection with the contract for which the bid has been submitted. The Provider shall not directly or indirectly, seek by agreement, collusion, communication, or conference with any other Provider, firm, or person to fix the price(s) submitted on the bid. The Provider shall not fix any overhead, profit, or cost element of the bid price of any other Provider or to secure through collusion, conspiracy, connivance or unlawful agreement any advantage against the Authority or any other person interested in the requested bid.

The Contract Documents contain the provisions required for the construction of the Project. Information obtained from an officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the contract.

Each Bid must be accompanied by an original raised seal Bid Bond payable to the Owner for five percent of the total amount of the bid unless otherwise noted on the Bid form. As soon as the Bid prices have been compared, the Owner will return the bonds of all except the three lower responsible Bidders. When the Agreement is executed, the bonds of the two remaining unsuccessful Bidders will be returned. The Bid Bond of the successful Bidder will be retained until the Payment Bond and Performance Bond have been executed and approved, after which it will be returned. A certified check may be used in lieu of a Bid Bond. The Form DHEC 3590 (Certification Regarding Debarment, Suspension and

other Responsibility Matters) shall be filled out and signed by the Bidder and included with their bid submittal package. Also, DHEC Form 2556 Bidder's "American Iron and Steel" Certification plus EPA forms regarding the requirements of participation of Disadvantaged Business Enterprises (DBE's) must be signed and submitted along with the bid. Mandatory SRF contract documents can be found in Appendix A of project manual.

Original raised seal Performance and Payment Bonds in the amount of 100 percent of the Contract Price, with a corporate surety approved by the Owner, will be required for the faithful performance of the Contract.

Attorneys-in-fact who sign Bid Bonds, Performance Bonds and Payment Bonds must file with each bond a certified and effective dated copy of their power of attorney.

The party to whom the Contract is awarded will be required to execute and return the Agreement along with the original raised seal Performance and Payment Bonds within ten calendar days from the date when the Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the necessary Agreement and bond forms. In case of failure of the Bidder to execute the Agreement, the Owner may at his option consider the Bidder in default, in which case the Bid Bond accompanying the proposal shall become the property of the Owner.

The Owner, within 10 days of receipt of acceptable Performance and Payment Bonds and Agreement signed by the party to whom the Agreement was awarded, shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the Owner not execute the Agreement within such period, the Bidder, by written notice, may withdraw his signed Agreement. Such Notice of Withdrawal shall be effective upon receipt of the Notice by the Owner.

The Notice to Proceed shall be issued within 10 days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period; the time may be extended by mutual agreement between the Owner and Contractor. If the Notice to Proceed has not been issued within the 10 day period or within the period mutually agreed upon, the Contractor may terminate the Agreement without further liability on the part of either party.

The Owner may make such investigations as he deems necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.

A conditional or qualified Bid will not be accepted.

Award may be made as a whole or as separate contracts for separate scheduling.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout.

Each Bidder is responsible for inspecting the site and for reading and being thoroughly familiar with the Contract Documents. The failure or omission of any Bidder to do any of the foregoing shall in no way relieve any Bidder from any obligation in respect to his Bid.

The low Bidder must supply the names and addresses of major material subcontractors when requested to do so by the Owner.

Inspection trips for prospective Bidders will be conducted from the office of the owner when requested. Contact Ms. Christy Everett, Chief Operations Officer, at (843) 443-8293 or via email at ceverett@gswsa.com.

Bidder must be in conformance with all pertinent local, state and federal laws, and industry regulations, **including the FACTA (Fair and Accurate Credit Transactions Act) Section 114 Red Flag Plan and the South Carolina Financial Identity Fraud and Identity Theft Protection Act.**

END OF SECTION 00200

SECTION 00300

SPECIAL AND GENERAL CONTRACT REQUIREMENTS

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

The contractor's attention is directed to the following special provisions that are considered to be a part of this contract and that may be in addition to all other general and special requirements as may be contained within the bidding and contract requirements.

1. As given by bid items, all material and labor for taps, shut downs and tie-ins are considered to be included in the various bid items and no additional compensation shall be allowed in this project. The contractor shall schedule all shut downs, cut-ins, tie-ins, flushing and work on existing lines through the Authority's inspector which said work shall also include inspection and direct observation of the contractors tapping and tie-in work when associated with the various existing water utilities. The installation costs that may occur due to alignment changes are considered to be a part of the price submitted for pipe installation and no additional compensation is allowed. The final location selected for installation by the contractor other than what is shown on the plans shall be first approved by the Authority prior to proceeding with the work and actual installation.

2. The contractor will be responsible for verifying the location and existence of all underground utilities both prior to the bid submittal and during construction. Location of utilities are tentatively shown on the plans, whether fully and correctly located or partially and/or incorrectly located or omitted will not relieve the contractor of the responsibility or liability for providing for any derivation from the planned location and for the complete installation and/or damage to other utilities. The contractor will be responsible for contacting local utilities for assistance in locating their underground utilities both prior to bid proposals and during installations. The contractor must fully comply with the South Carolina Underground Utilities Damage Prevention Act, General Statutes 58-36 Sections 10 through 120 and all applicable statutes and state approved requirements.

3. All line work unit costs shall include any clearing, stump removal, import backfill, stabilization and compaction requirements.

4. Locations and depths of all lines, laterals, valves and appurtenances to clear other facilities will be determined by the contractor and approved by the inspector prior to installation. The contractor is responsible to see that the waterlines, sewer force main and appurtenances are placed to the required roadway alignments and grades.

5. Restoration of the right-of-way area where this installation occurs shall include all final grading, compaction and any necessary spoil removal and the import of any finish

grade material necessary to re-establish an accurate and final and acceptable finish grade.

6. The contract work herein is intended to be that portion of

   Booster Pump Station:

   - Clearing and grubbing, civil/site work, etc.
   - Installation of 42-inch suction and discharge piping.
   - System connections to existing transmission mains.
   - Installation of new booster pump station and yard piping.
   - Installation of pumps (Furnished by Owner)
   - Installation of ATS and emergency generator (Furnished by Owner).
   - Miscellaneous valving and piping.
   - Electrical work and controls.

   and appurtenances as shown on drawings by Goodwyn, Mills, and Cawood, Inc.

7. The contractor's attention is directed to the Authority's Standard Specifications 1.4.8 Safety. Safety vests, hard hats, signing and/or any other requirements will be strictly enforced.

8. As-built Drawings: The contractor shall provide As-built drawings indicating the actual as-built condition of the project at completion. As-builts will be furnished at or prior to final inspection by Engineer. Mark-up copies of drawings indicating all dimensions and elevations are acceptable as as-built drawings for the water project.

9. The following EPA Forms shall be filled out, signed by the Bidder, and included in their bid submittal package:
   - Form 5700-52A: MBE/WBE Utilization Under Federal Grants, Cooperative Agreements, and Interagency Agreements
   - Form 6100-2: DBE Subcontractor Participation Form
   - Form 6100-3: DBE Subcontractor Performance Bond
   - Form 6100-4: DBE Program Subcontractor Utilization Form

10. The following DHEC Forms shall be filled out, signed by the Bidder, and included in their bid submittal package:
    - Form 2323: EEO Documentation Form
    - Form 2556: Bidder's "American Iron and Steel" Certification
    - Form 3590: Certification Regarding Debarment, Suspension and Other Responsibility Matters
    - Form 3591: Prime Contractor's Subagreement Certification
    - Form 3592: Certification by Proposed Prime or Subcontractor Regarding Equal Employment Opportunity

11. Details regarding equipment furnished by the Owner can be found in Specification 01 10 00 – Summary of Work. Equipment furnished by the Owner for this project includes:
    - 125 HP Horizontal Split Case Pumps (4 total)
    - Variable Frequency Drives (4 total)
    - 1250 kW Diesel Generator
    - 2000A Automatic Transfer Switch (ATS)
    - SCADA Panel and Antenna

THIS PAGE INTENTIONALLY LEFT BLANK

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of South Carolina)
County of Horry)

_____

being first duly sworn, deposes and says that:

(1) He is _____of _____, the Bidder that has submitted the attached Bid:

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid:

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owners or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit

Signed: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 20___.
_____. My commission expires
_____ on:_____(Title)_____

THIS PAGE INTENTIONALLY LEFT BLANK

STATEMENT OF LICENSE CERTIFICATE

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING:

This is to certify that _____ have fully complied with all the requirements of the South Carolina Licensing Board for Contractors. The Contractor's license number and date of registration shall appear on the envelope containing the bid, otherwise the bid will not be considered.

_____ was issued Certificate No. _____ on _____ 20____ by the State Board for licensing General Contractors.

Signed: _____

Title: _____

THIS PAGE INTENTIONALLY LEFT BLANK

STATEMENT OF EXISTING WORK LOAD OF THE BIDDER

The bidder is requested to state below all other work the bidder will be committed to or under contract during the duration of this contract. This will enable the Owner to judge his ability to conduct the work as completely and as rapidly as required under the terms of the contract.

	Project and Location	Owner of Project
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Date: _____ Bidder: _____

Signed: _____

Title: _____

THIS PAGE INTENTIONALLY LEFT BLANK

STATEMENT OF EXPERIENCE OF THE BIDDER

The bidder is requested to state below what work of similar scope and complexity he has completed, and to give references that will enable the Owner to judge his experiences, skill, and business standing and his ability to conduct the work as completely and as rapidly as required under the terms of the contract.

	Project and Location	Reference
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Date: _____ Bidder: _____

Signed: _____

Title: _____

THIS PAGE INTENTIONALLY LEFT BLANK

PROJECT SUPERINTENDENCE

The Undersigned states that the following employee will assume the role of project superintendent representing the Contractor on this Project. The undersigned further states that this individual, whose qualifications are presented below (attach additional sheets, if necessary), will have authority to speak for the Contractor and will not be removed from this Project or temporarily substituted for on this Project without the written consent of the Owner and Project Engineer.

Project Superintendent's Name: _____

Years of Experience: _____

Brief but Complete Description of Experience Relevant to this project:

_____
_____
_____
_____
_____
_____
_____
_____
_____

References from Owners where work of similar scope and complexity has been accomplished under Proposed Superintendent's direct supervision.

1. _____
2. _____
3. _____
4. _____
5. _____

"I consent to the disclosure of my qualifications and other applicable personal data for the purpose of evaluating proposals under this solicitation."

Employee's Signature: _____ Date: _____

"I certify to this employee's role in this Project and that the qualifications presented herein are accurate, complete, and current."

Bidder: _____ Date: _____

Signed: _____

Title: _____

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF SUBCONTRACTORS

The undersigned states that the following is a full and complete list of the proposed subcontractors on this Project and the class of work to be performed by each, and that such list will not be added or altered without written consent of the Owner.

Subcontractor and Address	Class of Work to be Performed
1.	
2.	
3.	
4.	
5.	
6.	
7.	

Date: _____

Bidder: _____

Signed: _____

Title: _____

THIS PAGE INTENTIONALLY LEFT BLANK

BID PROPOSAL

CONTRACT INSTALLATION OF

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

Proposal of _____ hereinafter called the "Bidder", organized and existing under the laws of the State of _____ doing business as (a corporation) (a partnership) (an individual).

To GRAND STRAND WATER AND SEWER AUTHORITY hereinafter called "Owner".

In compliance with your Advertisement for Bids, the Bidder hereby proposes to perform all work for the construction of the

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below.

By submission of this Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

Bidder hereby agrees to commence work under this Contract on or before a date to be specified in the Notice to Proceed and to fully complete the Project within **270** consecutive calendar days thereafter. Bidder further agrees to pay, as liquidated damages, in the sum of **$1,000.00** for each consecutive working day thereafter as provided in Section 15 of the General Conditions.

Bidder acknowledges the receipt of the following addendum:

_____

_____

_____

THIS PAGE INTENTIONALLY LEFT BLANK

SCHEDULE OF BID ITEMS

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

The Contractor shall furnish all labor, equipment, materials, and transportation to perform all work necessary to complete the project as shown on the drawings prepared by Goodwyn, Mills, and Cawood, Inc. and per all specifications herein.

The bid item descriptions do not include every part required and are to indicate the major components of the elements in the unit price for a complete system. Bid item descriptions can be found in Specification 01 15 00 – Measurement and Payment.

All items that are to be provided by the owner are noted in Specification 01 10 00 – Summary of Work. All other items required to complete the project are to be provided by the Contractor.

BID PROPOSAL

BIDDER: _____

Bidder agrees to perform the work described in the plans and specifications for the following lump sum & unit prices:

ITEM	QTY.	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
			GENERAL		
1	1	LS	Mobilization (3%)	$ _____	$ _____
2	1	LS	Erosion and Sediment Control	$ _____	$ _____
3	1	LS	Clearing and Grubbing	$ _____	$ _____
4	1	LS	Seeding and Restoration	$ _____	$ _____
			SITE WORK		
5	1	LS	Earthwork and Grading	$ _____	$ _____
6	3350	SY	6" Crusher Run and Filter Fabric	$ _____	$ _____
7	715	LF	Fencing and Gates	$ _____	$ _____
8	1	LS	Maintain Existing Road/Dust Control	$ _____	$ _____
9	1	LS	Existing 24" System Connection (Cut in)	$ _____	$ _____
10	1	LS	Existing 30" System Connection (Cut in)	$ _____	$ _____
			PIPING		
11	80	LF	12" C900 DR25 PVC Pipe	$ _____	$ _____
12	80	LF	24" C900 DR25 PVC Pipe	$ _____	$ _____
13	100	LF	30" C900 DR25 PVC Pipe	$ _____	$ _____
14	150	LF	36" C900 DR25 PVC Pipe	$ _____	$ _____
15	1500	LF	42" C900 DR25 PVC Pipe	$ _____	$ _____
16	200	LF	24" Class 150 DIP	$ _____	$ _____
17	20	LF	36" Class 150 DIP	$ _____	$ _____
18	20	LF	42" Class 150 DIP	$ _____	$ _____
19	1	LS	Misc. Pump Station Piping	$ _____	$ _____

			FITTINGS		
20	1	EA	8" MJ Plug (Restrained)	$ _____	$ _____
21	1	EA	36" MJ Plug (Restrained)	$ _____	$ _____
22	1	EA	24" MJ Sleeve	$ _____	$ _____
23	1	EA	30" MJ Sleeve	$ _____	$ _____
24	4	EA	24" 45° MJ Bend (Restrained)	$ _____	$ _____
25	4	EA	42" 45° MJ Bend (Restrained)	$ _____	$ _____
26	9	EA	24" 90° MJ Bend (Restrained)	$ _____	$ _____
27	1	EA	30" 90° MJ Bend (Restrained)	$ _____	$ _____
28	1	EA	36" 90° MJ Bend (Restrained)	$ _____	$ _____
29	1	EA	12" x 6" MJ Tee (Restrained)	$ _____	$ _____
30	2	EA	24" x 24" MJ Tee (Restrained)	$ _____	$ _____
31	2	EA	30" x 30" MJ Tee (Restrained)	$ _____	$ _____
32	3	EA	36" x 36" MJ Tee (Restrained)	$ _____	$ _____
33	9	EA	42" x 24" MJ Tee (Restrained)	$ _____	$ _____
34	1	EA	42" x 30" MJ Tee (Restrained)	$ _____	$ _____
35	1	EA	42" x 24" MJ Reducer (Restrained)	$ _____	$ _____
36	1	EA	42" x 30" MJ Reducer (Restrained)	$ _____	$ _____
37	2	EA	42" x 36" MJ Reducer (Restrained)	$ _____	$ _____
38	8	EA	24" 90° FL Bend (Restrained)	$ _____	$ _____
39	4	EA	24" x 12" FL Eccentric Reducer	$ _____	$ _____
40	4	EA	24" x 14" FL Eccentric Reducer	$ _____	$ _____
			VALVES		
41	12	EA	1/2" Ball Valve	$ _____	$ _____
42	5	EA	1" Ball Valve	$ _____	$ _____
43	4	EA	1/2" Air Release Valve	$ _____	$ _____
44	1	EA	4" Air Release Valve	$ _____	$ _____
45	1	EA	8" Gate Valve	$ _____	$ _____
46	2	EA	12" Gate Valve	$ _____	$ _____
47	4	EA	12" Butterfly Valve	$ _____	$ _____
48	4	EA	14" Butterfly Valve	$ _____	$ _____
49	11	EA	24" Butterfly Valve	$ _____	$ _____
50	3	EA	30" Butterfly Valve	$ _____	$ _____
51	4	EA	36" Butterfly Valve	$ _____	$ _____
52	9	EA	42" Butterfly Valve	$ _____	$ _____
53	4	EA	12" Tilted Disc Check Valve	$ _____	$ _____
54	1	EA	36" Swing Check Valve	$ _____	$ _____
			PLUMBING		
55	1	LS	Drain Line Piping and Components	$ _____	$ _____
56	1	LS	Water Line Piping and Components	$ _____	$ _____
57	2	EA	Sump Pump	$ _____	$ _____
			STRUCTURES		
58	1	LS	Booster Pump Station Building	$ _____	$ _____
59	1	LS	Structural Concrete	$ _____	$ _____
60	8	EA	Removable Bollard	$ _____	$ _____

61	2	EA	Precast Vault and Hatch	$	$
			ELECTRICAL		
62	1	LS	Electrical	$	$
63	1	LS	Instrumentation & Control	$	$
64	1	LS	Generator and ATS Installation	$	$
65	1	LS	Antenna Tower	$	$
66	1	LS	Electrical Service Allowance	$ 50,000	$ 50,000
			EQUIPMENT		
67	3	EA	Wall Hung HVAC Unit	$	$
68	1	LS	3 Ton Hoist Crane	$	$
69	4	EA	Pump Installation	$	$
70	4	EA	Electronic Pressure Transmitter	$	$
71	8	EA	Pressure Gauge	$	$
72	1	EA	Chlorine Analyzer	$	$
73	1	EA	Insertion Flow Meter	$	$
			MISC.		
74	350	LF	1" Schedule 80 PVC Pipe	$	$
75	30	LF	6" Schedule 80 PVC Casing Pipe	$	$
76	5	EA	1" Tapping Saddle	$	$
77	1	EA	8" Tapping Saddle	$	$
78	1	EA	12" Tapping Saddle	$	$
79	4	EA	12" Flanged Coupling Adapter (Restrained)	$	$
80	4	EA	14" Flanged Coupling Adapter (Restrained)	$	$
81	1	EA	36" Flanged Coupling Adapter (Restrained)	$	$
82	1	EA	Hydrant Assembly	$	$
83	1	LS	Blow Off Assembly	$	$
84	1	EA	Water Sampling Assembly	$	$
85	1	LS	Concrete for Pipe Encasement	$	$
86	500	CY	Unsuitable Soils (As Directed by Engineer)	$	$
87	250	CY	Miscellaneous Concrete (As Directed by Engineer)	$	$
88	1000	TN	Rip-Rap (As Directed by Engineer)	$	$
			TOTAL BASE BID (ITEMS 1 - 88)	**$**	

TOTAL BASE BID (ITEMS 1 - 88) IN WORDS: _____

_____

_____

Respectfully submitted,

Contractor Name	Address
Signature	
Title	
License Number Seal if bid is from a corporation	Date

Attest:_____

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____ _____, as principal, and _____ _____ as Surety, are hereby held and firmly bound unto GRAND STRAND WATER AND SEWER AUTHORITY as Owner in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves; successor and assigns. Signed, this _____ day of _____, 20___. The condition of the above obligation is such that whereas the Principal has submitted to _____ a certain Bid, attached hereto and hereby made a part thereof to enter into a contract in writing, for the **INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054).**

NOW THEREFORE,

a) If said Bid shall be rejected, or in the alternate.

b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the Agreement created by the acceptance of said Bid.

Then this obligation shall be void, otherwise, the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees: that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____ (L.S.)
PRINCIPAL

_____
SURETY
BY: _____

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

END OF SECTION 00300

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00400

NOTICE OF AWARD

TO: _____ **DATE:** _____

_____

_____

PROJECT DESCRIPTION:

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, and Information for BIDDERS.

You are hereby notified that your BID has been accepted for items in the amount of **$_____.**

You are required by the Information of BIDDERS to execute the Agreement and furnish the required Contractor's Performance Bond and Payment Bond within ten calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said bonds within ten days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20___

Grand Strand Water and Sewer Authority
OWNER

BY _____
Joshua D. Roberts
Title: Purchasing Manager

ACCEPTANCE OF NOTICE:
Receipt of the NOTICE OF AWARD is hereby acknowledged by:

_____, this the _____ day of _____, 20 ___.
By: _____
TITLE:_____

THIS PAGE INTENTIONALLY LEFT BLANK

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20 ____, by and between GRAND STRAND WATER AND SEWER AUTHORITY, hereinafter called "Owner" and _____ doing business as (an individual), or (a partnership), or (a corporation), hereinafter called "Contractor".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The Contractor will commence and complete the construction of: **INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)**
2. The Contractor will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the Project described herein.
3. The Contractor will commence the Work required by the Contract Documents within 10 calendar days after the date of the NOTICE TO PROCEED and will complete the same **270** calendar days unless the period for completion is extended otherwise by the Contract Documents.
4. The Contractor agrees to perform all of the Work described in the Contract Documents for the sum of **$_____.**
5. The term "Contract Documents" means and includes the following:
   - A. Advertisement for Bids
   - B. Information for Bidders
   - C. Special and General Contract Requirements
   - D. Non-Collusion Affidavit of Prime Bidder
   - E. Statement of License Certificate
   - F. Statement of Existing Work Load of the Bidder
   - G. Statement of Experience of the Bidder
   - H. Project Superintendence
   - I. List of Subcontractors
   - J. Bid Proposal
   - K. Schedule of Bid Items
   - L. Bid Bond
   - M. Notice of Award
   - N. Agreement
   - O. Contractor/Subcontractor Certification of Compliance with Storm Water Pollution Prevention Plan
   - P. Payment Bond
   - Q. Performance Bond
   - R. Notice to Proceed
   - S. Change Order
   - T. General Conditions
   - U. Mandatory Supplemental General Conditions for SRF
   - V. GMC Geotechnical Report

W. Property Plat and Easements
X. Permits
Y. Addenda No. _____, Dated: _____
Addenda No. _____, Dated: _____
Addenda No. _____, Dated: _____
Z. Specifications prepared by Goodwyn, Mills, and Cawood, Inc., dated May 2020.
AA. Drawings prepared by Goodwyn, Mills, and Cawood, Inc., dated May 2020

6. The Owner will pay to the Contractor, in the manner and at such time as set forth in the General Conditions, such amounts as required by the Contract Documents.
7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in four copies each of which shall be deemed an original on the date first above written.

OWNER: GRAND STRAND WATER AND SEWER AUTHORITY

BY: _____

(SEAL) NAME: FRED R. RICHARDSON

TITLE: CHIEF EXECUTIVE OFFICER

ATTEST:

_____

NAME: Christy Everett

TITLE: Chief Operations Officer

CONTRACTOR: _____

BY: _____

(SEAL) NAME: _____

ADDRESS: _____

ATTEST:

_____

NAME: _____

TITLE: _____

Contractor/Subcontractor Certification of Compliance with Storm Water Pollution Prevention Plan

I certify by my signature below that I accept the terms and conditions of the Storm Water Pollution Prevention Plan (SWPPP) as required by the general National Pollutant Discharge Elimination System (NPDES permit number SCR100000) issued to the owner/operator of the construction activity for which I have been contracted to perform construction related professional services. Further, by my signature below, I understand that I am becoming a co-permittee with the owner/operator and other contractors that have become co-permittees to the general NPDES permit issued to the owner/operator of the facility for which I have been contracted to perform professional construction services. As a co-permittee, I understand that I, and my company, as the case by be, are legally accountable to the South Carolina Department of Health and Environmental Control (DHEC), under the authorities of the CWA and South Carolina Pollution Control Act, to ensure compliance with the terms and conditions of the SWPPP. I also understand that DHEC enforcement actions may be taken against any specific co-permittee or combination of co-permittees if the terms and conditions of the SWPPP are not met. Therefore, having understood the above information, I am signing this certification and am receiving co-permittee status to the aforementioned general NPDES permit. The date of the signature, the title of the person providing the signature, and the name, address, and telephone number of the contracted firm, shall also be provided. In the event the SWPPP is amended by the owner, such amendments should be incorporated to the plan and the contractors and subcontractors should acknowledge by signature.

Prime Contractor	Witness 1
Name & Title	Witness 2
Signature	Date
Subcontractor 1	Witness 1
Name & Title	Witness 2
Signature	Date
Subcontractor 2	Witness 1
Name & Title	Witness 2
Signature	Date

THIS PAGE INTENTIONALLY LEFT BLANK

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)
herein after called Surety, are held and firmly bound unto _____

GRAND STRAND WATER AND SEWER AUTHORITY (Name of Owner) P. O. Box 2368, Conway, SC 29528 (Address of Owner) hereinafter called OWNER, in the penal sum of _____ Dollars, $(_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.
THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____ 20__, a copy of which is hereto attached and made a part hereof for the construction of:

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed there under or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____(Number) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____
Principal

_____
(Principal) Secretary

(SEAL) by _____ (s)

_____
(Address)

_____

_____
Witness as to Principal

_____
Address

_____ _____
Surety

ATTEST: By_____
Attorney-in-Fact

_____ _____
Witness as to Surety (Address)

_____ _____
(Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)
hereinafter called Surety, are held and firmly bound unto _____

GRAND STRAND WATER AND SEWER AUTHORITY (Name of Owner) P. O. Box 2368, Conway, SC 29528-2368 (Address of Owner) hereinafter called OWNER, in the penal sum of _____ Dollars, $(_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.
THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____ 20__, a copy of which is hereto attached and made a part hereof for the construction of:

INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)

NOW, THEREFORE, if the Principal shall well, truly, and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition of the terms of the contract or to the WORK to be performed there under or the specifications accompanying the same shall in any wise affect its obligations on this bond, and it does hereby waive notice of any

such change, extension of time, alteration or addition to the terms of the contract or to the WORK or the specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this _____ day of _____, 20_____.

ATTEST:

_____
Principal

_____
(Principal) Secretary

(SEAL)

by _____ (s)

_____
(Address)

_____

_____
(Witness as to Principal)

_____
(Address)

_____ _____
Surety

ATTEST:

By_____
Attorney-in-Fact

_____ _____
(Surety) Secretary (Address)

(SEAL)

_____
(Witness as to Surety)

_____ _____
(Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

NOTICE TO PROCEED

TO: _____ **DATE:** _____

_____

_____

PROJECT: **INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)**

You are hereby notified to commence WORK in accordance with the Agreement dated _____ on or before _____and you are to complete the WORK within **270** consecutive calendar days thereafter. The date of completion of all WORK is therefore _____.

GRAND STRAND WATER AND SEWER AUTHORITY
OWNER

BY: _____
Christy Everett

TITLE: CHIEF OPERATIONS OFFICER

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by:

_____, this _____ day of _____, 20___.

BY: _____

TITLE: _____

THIS PAGE INTENTIONALLY LEFT BLANK

CHANGE ORDER

Order No._____
Date: _____
Agreement Date: _____

NAME OF PROJECT: **INTERNATIONAL DRIVE BOOSTER PUMP STATION (629-01 / CGRE190054)**

OWNER: **GRAND STRAND WATER & SEWER AUTHORITY**

CONTRACTOR:

The following changes are hereby made to the CONTRACT DOCUMENTS:

Justification:

Change to CONTRACT PRICE: $_____

Original CONTRACT PRICE: $_____

Current CONTRACT PRICE adjusted by previous CHANGE ORDER(S) $ _____

The CONTRACT PRICE due to this CHANGE ORDER will be $ _____

Change to CONTRACT TIME:

The CONTRACT TIME will be (increased)(decreased) by _____ calendar days.

The date for completion of all WORK will be _____ (Date).

Approvals Required

To be effective this Order must be approved by the Federal agency if it changes the scope or objective of the PROJECT, or if it will increase the budgeted amounts of Federal funds needed to complete the PROJECT, or as may otherwise be required by the SUPPLEMENTAL GENERAL CONDITIONS.

Acceptance & Approvals

_____
Contractor

_____
Engineer

_____
Owner

_____
State/Federal Agency (where applicable)

END OF SECTION 00400

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00500

GENERAL CONDITIONS

1. Definitions
2. Additional Instructions and Detail Drawings
3. Schedules, Report and Records
4. Drawings and Specifications
5. Shop Drawings
6. Materials, Services and Facilities
7. Inspection and Testing
8. Substitutions
9. Patents
10. Surveys, Permits, Regulations
11. Protection of Work, Property, Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion and Liquidated Damages
16. Correction of Work
17. Subsurface Conditions
18. Suspension of Work, Termination and Delay
19. Payments to Contractor
20. Acceptance of Final Payment as Release
21. Insurance
22. Contract Security
23. Assignments
24. Indemnification
25. Separate Contracts
26. Subcontracting
27. Engineer's Authority
28. Land and Rights-of-Way
29. Guarantee
30. Taxes

1. **DEFINITIONS:**

Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural:

1.1 **ADDENDA:**

Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS AND SPECIFICATIONS, by additions, deletions, clarifications or corrections.

1.2 **BID**:

The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.

1.3 **BIDDER**:

Any person, firm or corporation submitting a BID for the WORK.

1.4 **BONDS**:

Bid, Performance, and Payment Bonds and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.

1.5 **CHANGE ORDER**:

A written order to the CONTRACTOR authorizing an addition, deletion, or revision in the WORK within the general scope of the CONTACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or CONTRACT ITEM.

1.6 **CONTRACT DOCUMENTS**:

The contract, including Advertisement for Bids, Information for Bidders, Bid, Bid Bond, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, General Conditions, Special Provisions, Drawings, Specifications, and Addenda.

1.7 **CONTRACT PRICE**:

The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

1.8 **CONTRACT TIME:**

The number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

1.9 **CONTRACTOR**:

The person, firm, or corporation with whom the OWNER has executed the Agreement.

1.10 **DRAWINGS:**
The part of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ENGINEER.

1.11 **ENGINEER:**
The person, firm or corporation named as such in the CONTRACT DOCUMENTS.

1.12 **FIELD ORDER**:
A written order affecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, issued by the ENGINEER to the CONTRACTOR during construction.

1.13 **NOTICE OF AWARD**:
The WRITTEN NOTICE of the acceptance of the BID from the OWNER to the successful BIDDER.

1.14 **NOTICE TO PROCEED**:
Written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.

1.15 **OWNER**:
A public or quasi-public body or authority, corporation, association, partnership, or individual for whom the WORK is to be performed.

1.16 **POLLUTION PREVENTION PLAN**:
The standardized document outlining Best Management practices to utilize in minimizing the effects of erosion of disturbed site and their effect on sensitive wetlands and waterways.

1.17 **PROJECT:**
The undertaking to be performed as provided in the CONTRACT DOCUMENTS.

1.18 **RESIDENT PROJECT REPRESENTATIVE**:
The authorized representative of the OWNER who is assigned to the PROJECT site or any part thereof.

1.19 **SHOP DRAWINGS**:
ALL DRAWINGS, diagrams, illustration, brochures, schedules and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, supplier, or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.

1.20 **SPECIFICATIONS**:
A part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

1.21 **SUBCONTRACTOR:**
An individual, firm or corporation having a direct contact with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

1.22 **SUBSTANTIAL COMPLETION**:
That date as certified by the ENGINEER when the construction of the project or a specified part thereof is sufficiently completed in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

1.23 **SUPPLEMENTAL GENERAL CONDITIONS**:
Modifications to General Conditions required by a Federal Agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS.

1.24 **SUPPLIERS:**
Any person, supplier or organization who supplies materials or equipment for the WORK, including that fabricated to a special design, but who does not perform labor at the site.

1.25 **WORK:**
All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

1.26 **WRITTEN NOTICE**:
Any notice to any party of the Agreement relative to any part of this Agreement, in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the WORK.

2. **ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS:**

2.1 The CONTRACTOR may be furnished additional instructions and detail DRAWINGS, by the ENGINEER as necessary to carry out the WORK required by the CONTRACT DOCUMENTS.

2.2 The additional DRAWINGS and instructions thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail DRAWINGS and instructions.

3. **SCHEDULES, REPORTS AND RECORDS:**

3.1 The CONTRACTOR shall submit to the OWNER such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the OWNER may request concerning WORK performed or to be performed.

3.2 Prior to the first partial payment estimate the CONTRACTOR shall submit schedules showing the order in which he proposed to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part, and as applicable:

3.2.1 The dates at which special detail DRAWINGS will be required; and

3..2.2 Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

3.3 The CONTRACTOR shall submit monthly progress reports at the end of each month.

3.4 The CONTRACTOR shall also submit a schedule of payments that he anticipates he will earn during the course of the WORK.

4. **DRAWINGS AND SPECIFICATIONS:**

4.1 The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, miscellaneous material as discussed in the Bid Schedule and General Conditions, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS and all incidental WORK necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

4.2 In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions, and detailed DRAWINGS shall govern over general DRAWINGS.

4.3 Any discrepancies found between the DRAWINGS and SPECIFICATIONS, and site conditions or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies, or ambiguities shall be done at the CONTRACTOR'S risk.

5. **SHOP DRAWINGS:**

5.1 The CONTRACTOR shall provide electronic copies of SHOP DRAWINGS and associated errata as may be necessary for the prosecution of the work as required by the CONTRACT DOCUMENTS. The ENGINEER shall promptly review all SHOP DRAWINGS within a 7-day to 10-day period. The ENGINEER'S approval of any SHOP DRAWINGS shall not release the CONTRACTOR from responsibility for deviations from the CONTRACT DOCUMENTS. The approval of any SHOP DOCUMENTS which deviate substantially from the requirement of the CONTRACT DOCUMENTS shall be evidenced by a CHANGE ORDER.

5.2 When submitted for the ENGINEER'S review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.

5.3 Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been approved by the ENGINEER. A copy of each approved SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ENGINEER.

6. **MATERIALS, SERVICES AND FACILITIES:**

6.1 It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

6.2 Materials and equipment shall be so stored as to ensure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

6.3 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

6.4 Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

6.5 Materials, supplies or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

7. INSPECTION AND TESTING:

7.1 All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards.

7.2 The CONTRACTOR shall provide, at his expense, the necessary testing and inspection services required by the CONTRACT DOCUMENTS, unless otherwise provided.

7.3 The OWNER shall provide all other inspection and testing services not required by the CONTRACT DOCUMENTS.

7.4 If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction required any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing, or approval.

7.5 Neither observations by the ENGINEER nor inspections, tests or approval by persons other than the CONTRACTOR shall relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.

7.6 The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the work and also for any inspection or testing thereof.

7.7 If any work is covered contrary to the written request of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observations and replaced at the CONTRACTOR'S request.

7.8 If any work has been covered which the ENGINEER has not specifically requested to observe prior to its being covered, or if the ENGINEER considers it necessary or advisable that covered work be inspected or tested by others, the CONTRACTOR at the ENGINEER'S request, will uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the CONTRACTOR will bear all expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective, the CONTRACTOR will be allowed and increase in the

CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate CHANGE ORDER shall be issued.

8. **SUBSTITUTIONS:**

8.1 Whenever a material, article or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article or piece of equipment of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

9. **PATENTS:**

9.1 The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, but if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

10. **SURVEYS, PERMITS, REGULATIONS:**

10.1 The OWNER shall furnish all land surveys and establish all base lines for locating the principal component parts of the WORK together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

10.2 The CONTRACTOR shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, he shall be responsible for any mistakes that may be caused by the unnecessary loss of disturbance.

10.3 Permits and licenses of a temporary nature for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance with such permits, licenses or easements, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in Section 13, CHANGES IN THE WORK.

11. PROTECTION OF WORK, PROPERTY AND PERSONS:

11.1 The CONTRACTOR will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

11.2 The CONTRACTOR will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the work may affect them. The CONTRACTOR will remedy all damage, injury or loss caused to any property.

11.3 In emergencies affecting the safety of person or the work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury or loss. He will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the work or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.

12. SUPERVISION OF CONTRACTOR:

12.1 The CONTRACTOR will supervise and direct the work. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR will employ and maintain on the WORK a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The Supervisor shall have full authority to act on behalf of the CONTRACTOR and all communications given to the Supervisor shall be as binding as if given to the CONTRACTOR. The Supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

13. **CHANGES IN THE WORK:**

13.1 The OWNER may at any time, as the need arises, order changes within the scope of the work without invalidating the Agreement. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the work, and equitable adjustable shall be authorized by CHANGE ORDER.

13.2 The ENGINEER also may, at any time, by issuing a field order, make changes in the details of the work. The CONTRACTOR shall proceed with the performance of any changes in the work so ordered by the ENGINEER unless the CONTRACTOR believes that such field order entitles him to a change in CONTRACT PRICE or time, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within fifteen (15) days after the receipt of the ordered change, and the CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

14. **CHANGES IN CONTRACT PRICE:**

14.1 The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any work covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

(a) Unit prices previously approved
(b) An agreed lump sum
(c) The actual cost for labor, direct overhead, materials, supplies, equipment and other services necessary to complete the work. In addition, there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the work to cover the cost of general overhead and profit.

15. **TIME FOR COMPLETION AND LIQUIDATED DAMAGES:**

15.1 The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the work embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

15.2 The CONTRACTOR will proceed with the work at such rate of progress to ensure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

15.3 If the CONTRACTOR shall fail to complete the work within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR will pay the OWNER the amount for liquidated damages as specified in the Bid for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS.

15.4 The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the OWNER or ENGINEER:

15.4.1 To any preference, priority or allocation order duly issued by the OWNER.

15.4.2 To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, Acts of God, or of the public enemy, Acts of the OWNER, Acts of another CONTRACTOR in the performance of a CONTRACT with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

15.4.3 To any delays of SUBCONTRACTORS occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

16. CORRECTION OF WORK:

16.1 The CONTRACTOR shall promptly remove from the premises all work rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and re-execute the work in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all work of other CONTRACTORS destroyed or damaged by such removal or replacement.

16.2 All removal and replacement work shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected work within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such work and store the materials at the expense of the CONTRACTOR.

17. SUBSURFACE CONDITIONS:

17.1 The CONTRACTOR shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the OWNER by WRITTEN NOTICE OF:

17.1.1 Subsurface or latent physical conditions at the site differing materially from those indicated in the CONTRACT DOCUMENTS: or

17.1.2 Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the CONTRACT DOCUMENTS.

17.2 The OWNER shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the work, and equitable adjustment hereunder shall be made and the CONTRACT DOCUMENTS shall be modified by a CHANGE ORDER. Any claim of the CONTRACTOR for adjustment hereunder shall not be allowed unless he has given the required WRITTEN NOTICE provided that the OWNER may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

18. SUSPENSION OF WORK, TERMINATION AND DELAY:

18.1 The OWNER may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR and the ENGINEER which notice shall fix the date on which work will be resumed. The CONTRACTOR will resume that work on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any suspension.

18.2 If the CONTRACTOR is adjudged bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the CONTRACTOR or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to SUBCONTRACTORS or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations, or orders of any public body having jurisdiction of the work or if he disregards the authority of the ENGINEER, or if he otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and his surety a minimum of ten (10) days from delivery of a WRITTEN NOTICE, terminate the services of the CONTRACTOR and take possession of the PROJECT and of all materials, equipment, tools, construction equipment and machinery thereon owned by the CONTRACTOR, and finish the work by whatever method he may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the CONTRACT PRICE exceeds the direct and indirect costs of completing the PROJECT, including compensation for additional professional service, such excess shall be paid to the CONTRACTOR.

If such costs exceed such unpaid balance, the CONTRACTOR will pay the difference to the OWNER. Such costs incurred by the OWNER will be determined by the ENGINEER and be incorporated in a CHANGE ORDER.

18.3 Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

18.4 After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, the OWNER may, without cause and without prejudice to any other right of remedy, elect to abandon the PROJECT and terminate the CONTRACT. In such case, the CONTRACTOR shall be paid for all work executed and any expense sustained plus reasonable profit.

18.5 If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER or awarded by arbitrators within thirty (30) days of its approval and presentation, then the CONTRACTOR may, after ten (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER, terminate the CONTRACT and recover from the OWNER payment for all work executed and all expenses sustained. In addition and in lieu of terminating the CONTRACT, if the ENGINEER has failed to act on a request for payment or if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may upon ten (10) days notice to the OWNER and the ENGINEER, stop the work until he has been paid all amounts then due in which even and upon resumption of the work, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME or both to compensate for the costs and delay attributable to the stoppage of work.

18.6 If the performance of all or any portion of the work is suspended, delayed, or interrupted as a result of a failure of the OWNER or ENGINEER to act within the time specified in the CONTRACT DOCUMENTS, or if no time is specified, within a reasonable time, an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, shall be made by CHANGE ORDER to compensate the CONTRACTOR for the costs and delays necessarily caused by the failure of the OWNER or ENGINEER.

19. PAYMENTS TO CONTRACTOR:

19.1 At least ten (10) days before each monthly progress record falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering

the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonable require. (Refer to APPLICATION AND CERTIFICATE FOR PAYMENT in CONTRACT DOCUMENTS for approved forms.) If payment is requested on the basis of materials and equipment not incorporated in the work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect his interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within ten days of presentation to him of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate. The OWNER shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all work covered by the CONTRACT DOCUMENTS. The OWNER at any time, however, after fifty (50) percent of the work has been completed, if he finds that satisfactory progress is being made, may reduce retainage to five (5) percent on the current and remaining estimates. On completion and acceptance of a part of the work on which the price is stated separately in the CONTRACT DOCUMENTS, payment may be made in full, including retained percentages, less authorized deductions.

19.2 The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

19.3 All work covered by partial payment made shall thereupon become the sole property of the OWNER, but this provision shall not be constructed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the OWNER to require the fulfillment of all terms of the CONTRACT DOCUMENTS.

19.4 Upon completion and acceptance of the work, the ENGINEER shall issue a certificate attached to the final payment request that the work has been accepted by him under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of the work.

19.5 The CONTRACTOR will indemnify and save the OWNER or the OWNER'S agents harmless from all claims growing out of the lawful demands of SUBCONTRACTORS, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools and all supplies,

incurred in the furtherance of the performance of the work. The CONTRACTOR shall, at the OWNER'S request, furnish, satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so, the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the CONTRACTOR shall be resumed, in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, his Surety, or any third party.

19.6 If the OWNER fails to make payment 30 days after approval by the ENGINEER, in addition to other remedies available to the CONTRACTOR, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the CONTRACTOR.

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE:

20.1 The acceptance by the CONTRACTOR as final payment shall be and shall operate as a release to the OWNER of all claims and liability to the CONTRACTOR other than claims in stated amounts as may be specifically excepted by the CONTRACTOR for all things done or furnished in connection with this work, and for every act and neglect of the OWNER and others relating to or arising out of the work. Any payment, however, final or otherwise, shall not release the CONTRACTOR or his sureties from any obligations under the CONTRACT DOCUMENTS or the Performance Bond and Payment Bonds.

21. INSURANCE:

21.1 The CONTRACTOR must purchase and maintain such insurance as will protect the CONTRACTOR against loss or other claims that may arise out of, or result from, the execution of this contract, whether the execution is by the CONTRACTOR or anyone acting on the Provider's behalf. **The** CONTRACTOR **must provide a certificate of insurance to the Authority's Purchasing Manager along with the official bid forms. The certificate must indicate appropriate general liability, workmen's compensation, and auto liability coverage, of at least $500,000 coverage per policy, per occurrence.**

22. CONTRACT SECURITY:

22.1 The CONTRACTOR shall within ten (10) days after the receipt of the NOTICE OF AWARD furnish the OWNER with a Performance Bond and Payment Bond in

penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions, and agreements of the CONTRACT DOCUMENTS and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the work provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these BONDS shall be borne by the CONTRACTOR. If at any time a surety on any such BOND is declared bankrupt or loses its right to do business in the state in which the work is to be performed or is removed from the list of Surety Companies accepted on Federal BONDS, CONTRACTOR shall within ten (10) days after notice from the OWNER to do so, substitute an acceptable BOND (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the OWNER.

23. **ASSIGNMENTS:**

23.1 Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign or otherwise dispose of the CONTRACT or any portion thereof, or of this right, title or interest therein or his obligations thereunder, without written consent of the other party.

24. **INDEMNIFICATION:**

24.1 The CONTRACTOR will indemnify and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

24.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by any employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR, or any SUBCONTRACTOR under

workman's compensation acts, disability benefit acts or other employees benefit acts.

24.3 The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, design or specifications.

25. SEPARATE CONTRACTS:

25.1 The OWNER reserves the right to let other contracts in connection with this PROJECT. The CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. If the proper execution or results of any part of the CONTRACTOR'S work depends upon the work of any other CONTRACTOR, the CONTRACTOR shall inspect and promptly report to the ENGINEER any defects in such work that render it unsuitable for such proper execution and results.

25.2 The OWNER may perform additional work related to the PROJECT by himself, or he may let other contracts containing provisions similar to these. The CONTRACTOR will afford the other CONTRACTORS who are parties to such Contracts (or the OWNER, if he is performing the additional work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work and shall properly connect and coordinate his work with theirs.

25.3 If the performance of additional work by other CONTRACTORS or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the CONTRACT, WRITTEN NOTICE thereof shall be given to the CONTRACTORS prior to starting any such additional work. If the CONTRACTOR believes that the performance of such additional work by the OWNER or others involves him in additional expense or entitles him to an extension of the CONTRACT TIME, he may make a claim therefore as provided in Sections 14 and 15.

26. SUBCONTRACTING:

26.1 The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the work which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.

26.2 The CONTRACTOR shall not award work to SUBCONTRACTOR(S) without prior written approval of the OWNER. The OWNER reserves the right to reject any or all SUBCONTRACTORS.

26.3 The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

26.4 The CONTRACTOR shall cause appropriate provisions to be inserted in all SUBCONTRACTS relative to the work to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS insofar as applicable to the work of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.

26.5 Nothing contained in this CONTRACT shall create any contractual relation between any SUBCONTRACTOR and the OWNER.

27. ENGINEER'S AUTHORITY:

27.1 The ENGINEER shall act as the OWNER'S representative during the construction period. He shall decide questions which may arise as to quality and acceptability of materials furnished and work performed. He shall interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ENGINEER will make visits to the site and determine if the work is proceeding in accordance with CONTRACT DOCUMENTS.

27.2 The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship and execution of the work. Inspections may be made at the factory or fabrication plant of the source of material supply.

27.3 The ENGINEER will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

27.4 The ENGINEER shall promptly make decisions relative to interpretation of the CONTRACT DOCUMENTS.

28. LAND AND RIGHTS-OF-WAY:

28.1 Grand Strand Water and Sewer Authority has obtained certain access and permanent utility easements within Santee Cooper rights-of-way and private property owners.

28.2 Prior to issuance of NOTICE TO PROCEED, the OWNER will provide maps and descriptions of rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.

28.3 The OWNER shall provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.

28.4 The CONTRACTOR shall provide at his own expense and without liability to the OWNER any additional land and access thereto that the CONTRACTORS may desire for temporary construction facilities, or for storage of materials.

29. GUARANTY:

29.1 The CONTRACTOR shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of SUBSTANTIAL COMPLETION. The CONTRACTOR warrants and guarantees for a period of one year from the date of SUBSTANTIAL COMPLETION of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

30. TAXES:

30.1 The CONTRACTOR will pay all sales, consumer use and other similar taxes required by the law of the place where the work is performed.

END OF SECTION 00500

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

Mandatory Supplemental General Conditions for SRF

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A – Federal Funds

Mandatory Supplemental General Conditions

For The

South Carolina State Revolving Fund Program

Federally-funded Projects

July 2020

Following is the standard language that must be incorporated into all solicitations for offers and bids for (1) construction contracts, (2) subcontracts, (3) equipment, and (4) material to be funded by the Federally-assisted State Revolving Fund Program.

The requirements in these Supplemental General Conditions shall not relieve the participants in this project of responsibility to meet any requirements of other portions of this contract or of other agencies, whether any other requirements are more or less stringent. The requirements in these Supplemental General Conditions must be satisfied in order for work to be funded in the State Revolving Fund Program.

APPENDIX A
TABLE OF CONTENTS

Page

EPA 6100 forms are suspended as of 3/2016

General Instructions

Submittal and Approval of DBE and EEO Documentation

It is the policy of the State Revolving Loan Fund (SRF) to assure that:

(a) Disadvantaged business enterprises (DBEs) have the opportunity to participate in a fair share of the funds awarded for contracts and subcontracts for supplies, construction, equipment or services; and

(b) Discrimination in employment practices on the basis of race, color, religion, national origin, sex, age or handicap (referred to as Equal Employment Opportunity) is prohibited.

Compliance with these provisions IS REQUIRED in order for project costs to be eligible for SRF funding. Failure on the part of the tentatively selected bidder to submit required information may be grounds for rejecting the bid.

The Contractor must submit the following items to the Project Sponsor (Owner):

1. **DBE Compliance Documentation** listed on page 7 to include a "Bidder's List" showing all bidders for any subcontracting opportunities. Documentation of DBE solicitation and results of such efforts must be submitted along with the following forms (See Attachment B) as part of the DBE package:

    - **"Prime Contractor's Subagreement Certification" (DHEC 3591)** - This form provides a list of all proposed subcontractors, both DBE firms and non-DBE firms. Each prime contractor must submit this form.

    - **"DBE Program Subcontractor Utilization Form" (EPA Form 6100-4)** - This form captures the prime contractor's intended use of an identified DBE subcontractor, and the estimated dollar amount of the subcontract.

    EPA 6100 forms are suspended as of 3/2016

    - **"DBE Subcontractor Performance Form" (EPA Form 6100-3)** - Each DBE subcontractor must submit this form which captures an intended DBE subcontractor's description of the work to be performed for the prime contractor and the price of the work submitted to the prime contractor.

    *The South Carolina Department of Health and Environmental Control (DHEC) cannot authorize the Project Sponsor (Owner) to award the construction contract(s) until the project's "**good faith efforts**" (See page 6) are approved.*

2. **"EEO Documentation Form" (DHEC Form 2323)** and all required attachments (See Attachment B). Each prime contractor and any subcontractor whose contract amount exceeds $10,000 must submit this information. *DHEC cannot authorize the Project Sponsor to award the construction contract(s) until the EEO documentation is approved.*

3. **"Certification by Proposed Prime or Subcontractor Regarding Equal Employment Opportunity" (DHEC 3592)** (See Attachment B). Each prime contractor and any subcontractor whose contract amount is expected to exceed $10,000 must submit this form.

4. **"Certification Regarding Debarment, Suspension and Other Responsibility Matters" (DHEC Form 3590)** (See Attachment B). Each prime contractor and any subcontractor whose contract amount is expected to equal or exceed $25,000 must submit this form.

The tentatively selected bidder is required to submit the above information in duplicate to the Project Sponsor after bid opening. As part of the bid package, the Project Sponsor must forward one copy of the information to DHEC at the address listed below.

During Construction, the Prime Contractor must submit the following items:

1. **A copy of each DBE subcontract.**

2. **"MBE/WBE Utilization under Federal Grants, Cooperative Agreements, and Interagency Agreements" (EPA Form 5700-52A)** (See Attachment B). This report must be submitted semi-annually by April 15th and October 15th until the final draw has been processed for the project.

3. **Weekly Certified Payrolls** for each prime contractor and all subcontractors. **Payrolls should be submitted weekly with little lag time to the Project Sponsor**. Project Sponsors must retain payroll records for three years from the completion of the project.

4. Notice of **changes, substitutions or additions to the approved list of subcontractors. Any changes must be reported immediately to DHEC's SRF Section and a revised DHEC Form 3591, and EPA 6100-4** must be submitted to the project's SRF Project Manager as soon as practical. (See also "Reporting Requirements During Construction" on page 8.) **Use of any unapproved subcontractor on the project may delay payment or result in costs associated with that subcontract declared ineligible for SRF assistance.**

The Project Sponsor must forward one copy of the above items **(except for item number 3, payroll records)** to the project's SRF Project Manager:

[Project Manager Name Here], SRF Project Manager
SRF Section, Water Facilities Permitting Division
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

THE DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM IN THE STATE REVOLVING FUND PROGRAM

Objective

The objective of the State Revolving Fund (SRF) Program's DBE program is to ensure Project Sponsors and their prime contractors utilize certified DBEs as subcontractors to the fullest extent possible. Compliance with these provisions is required in order for the project costs to be eligible for SRF funding. Failure on the part of the prime contractor to submit required documentation and obtain DBE approval may be grounds for rejecting the bid or result in subcontractor costs declared ineligible for SRF assistance.

Policy

It is SRF policy to require the Project Sponsor to implement procedures to ensure DBE firms are given opportunities for meaningful participation if subcontracts are awarded. A fair share goal of

2.5% MBE and 2.5% WBE

of the funds awarded for prime contracts or subcontracts for supplies, construction, equipment or services, must be made available to organizations owned and controlled by socially and economically disadvantaged individuals, women, disabled Americans, historically black colleges and universities, and minority institutions. Prime contractors must include the fair share goal in their bid documents for subcontracts.

NOTE: The fair share goal is subject to change each fiscal year. Therefore, prior to bidding, it is the Project Sponsor's responsibility to check with the SRF Project Manager for the current fair share percentage to be included in bid documents.

DBE Definitions

A Disadvantaged Business Enterprise (DBE) is defined as a business that meets the criteria cited below:

> Owned by socially disadvantaged individuals who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities;
>
> Owned by economically disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities, as compared to others in the same line of business who are not socially disadvantaged. An individual claiming disadvantaged status must have an initial and continued personal net worth of less than $750,000.

For purposes of this definition, disadvantaged individuals include the following:

Black Americans	Asian Americans
Women	Hispanic Americans
Disabled Americans	Native Americans
Minority Institutions	Historically Black Colleges and Universities

To qualify as a DBE firm, at least 51 percent of an independent business must be owned and controlled by a socially and economically disadvantaged individual whose personal net worth is less than $750,000. The minority or woman owner's interest must be real, substantial and continuing. The control determination will revolve around the minority or woman owner's involvement in the day-to-day management of the business enterprise.

DBE Certification

DHEC does not determine the DBE status of businesses. Instead, the SRF Program accepts certification of DBE status from other sources already established to make this determination, such as:

- ► South Carolina Department of Transportation
- ► South Carolina Governor's Office of Small & Minority Business Assistance
- ► South Carolina Minority Business Development Agency (MBDA) Business Center
- ► South Carolina Chamber of Commerce
- ► Other agencies or organizations that provide procurement assistance to DBEs if their definition of a DBE matches the criteria established above.

Note: See Attachment A for a listing of the addresses, telephone numbers and web addresses for the above referenced agencies.

DBE Requirements – "Six Good Faith Efforts"

Project Sponsors and their prime contractors must comply with the following "Six Good Faith Efforts" before a contract is awarded:

(1) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

(2) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, **posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date**.

(3) Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will involve dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

(4) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

(5) Use the services and assistance of the Small Business Administration (SBA) and the Minority Business Development Agency (MBDA) of the U.S. Department of Commerce.

(6) If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (1) through (5) of this section.

The prime contractor must employ the "Six Good Faith Efforts" to subcontract with DBEs, even if the prime contractor has achieved his or her fair share objectives.

Solicitation of DBE Firms

Solicitation should allow adequate time for price analysis; as stated above, whenever possible, **contact should be made not later than 30 days before bid opening**. Efforts taken to comply with these requirements must be documented in detail.

Prime contractors must create and maintain a **Bidders List**. This list must include **all firms that bid or quote subcontracts including both MBE/WBEs and non-MBE/WBEs**. The Bidders List must be kept until the project period has ended. The following information must be obtained from all subcontractors:

Subcontractor's name with point of contact,

Subcontractor's mailing address, telephone number and e-mail address;

The procurement (scope of work) on which the subcontractor bid or quoted and when; and

The subcontractor's status as a certified MBE, WBE, or non-MBE/WBE.

The prime contractor is **required** to use the services of the Minority Business Development Agency (MBDA). MDBA Business Centers are funded by the U.S. Department of Commerce to provide technical, financial and contracting assistance to minority and women's business enterprises. These Centers are located in a number of Regional cities. Use of the services provided by these Centers does not absolve the prime contractors from pursuing additional efforts to comply with this requirement. See Attachment A for a listing of the address, telephone number and web address for the MBDA Business Center – Columbia SC as well as other resource agencies.

DBE Compliance Documentation

If subcontracts are awarded, prime contractors *must submit the following items* as documentation of their good faith efforts, **even if the prime contractor has achieved its fair share objectives:**

(1) A copy of the prime contractor's Bidder's List.

(2) Evidence of solicitation to *certified* prospective DBE firms, such as copies of solicitation letters/emails listing **specific scope/volume of work**, phone logs, fax confirmation sheets, printouts of online searches with results of said searches, etc. The prime contractor is strongly encouraged to follow-up each written, faxed or emailed solicitation with at least one logged phone call.

(3) Copies of letters or e-mails asking for assistance from the MBDA Business Center – Columbia, SC, the South Carolina Governor's Office of Small & Minority Business Assistance, or other agencies or organizations that provide procurement assistance to DBEs. **Note: As outlined in the "Good Faith Effort" Number 5 above, it is mandatory that prime contractors contact the SBA and the MBDA Business Center.**

(4) List by trade the names of *certified* DBE subcontractors solicited but not selected, including name, address, telephone number, contact person, date of contact, and outcome of contact, including dollar amount of quote.

(5) List any job-specific criteria that disqualified a certified DBE firm that submitted a low bid for a subcontract. Attach a copy of the disqualified bid or quote along with the bid or quote from the selected subcontractor for comparison.

(6) Proof of **DBE certification** from an acceptable source for each subcontractor listed as a MBE or WBE.

(7) DHEC form entitled "Prime Contractor's Subagreement Certification" (DHEC Form 3591) (See Attachment B) listing **all** proposed subcontractors, both DBE firms and non-DBE firms.

(8) EPA Form 6100-4 "DBE Subcontractor Utilization Form" (See Attachment B) listing all proposed DBE subcontractors.

(9) Require all DBE subcontractors to complete EPA Form 6100-3, "DBE Subcontractor Performance Form" (See Attachment B) This form captures an intended DBE subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime contractor.

Reporting Requirements for Prime Contractors During Construction

- ► Forward a copy of each DBE subcontract as soon as possible after contract award.
- ► Pay subcontractors for satisfactory performance no more than **30 days** from the prime contractor's receipt of payment.
- ► Report any proposed changes/additions from the approved subcontractor list to the Project Sponsor and DHEC **prior to initiation of the action** along with the following actions:
    - ■ Submit a **revised/updated** "Prime Contractor's Subagreement Certification" (DHEC Form 3591) and EPA Form 6100-4 (See Attachment B).
    - ■ Document the reason for the proposed deviation
    - ■ Submit evidence of the prime contractor's continued good faith efforts to secure a DBE firm for the new and/or replacement subcontract work.
    - ■ Provide any new subcontractors with the "DBE Subcontractor Performance Form" (EPA Form 6100-3) (See Attachment B) **if** work is subcontracted to a **new** DBE firm.
    - ■ Submit a "EEO Documentation Form" (DHEC Form 2323) (See Attachment B) from the **new** subcontractor **if** the subcontract amount exceeds $10,000.
    - ■ Submit a "Certification by Proposed Prime or Subcontractor Regarding Equal Employment Opportunity" (DHEC 3592) (See Attachment) from the **new** subcontractor **if** the subcontract amount exceeds $10,000.
    - ■ Submit a "Certification Regarding Debarment, Suspension and Other Responsibility Matters" (DHEC 3590) (See Attachment B) from the **new** subcontractor **if** the subcontract amount equals or exceeds $25,000.

Use of any unapproved subcontractor on the project may delay loan draw requests or result in costs associated with that subcontract declared ineligible for SRF assistance.

- ► Submittal of the data for "MBE/WBE Utilization under Federal Grants, Cooperative Agreements, and Interagency Agreements" (EPA Form 5700-52A) to the Project Sponsor. The reporting period is semiannual, with reporting periods ending March 31st and September 30th. Submission of this report is required even if there is no MBE/WBE activity to report; this is called a Negative Report.

- ► Provide EPA Form 6100-2, "DBE Subcontractor Participation Form", to all DBE subcontractors. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and other concerns the DBE subcontractor might have. DBE subcontractors may send completed copies of EPA Form 6100-2 directly to: EPA DBE Coordinator, EPA Region 4, 61 Forsyth Street SW, Atlanta, Georgia, 30303.

SPECIAL NOTICE TO BIDDERS

Number 1: The State Revolving Fund Program requires the Equal Employment Opportunity (EEO) commitment of the prime contractor and all subcontractors with a contract in excess of $10,000 to the requirements of Executive Order 11246. EEO Affirmative Action is mandated throughout the duration of the contract.

The tentatively selected bidder is required to submit the EEO documentation as outlined in the "General Instructions" of these Supplemental General Conditions.

Failure to submit the EEO documentation may subject the contractor to sanctions under Executive Order 11246.

Number 2: By the submission of this bid, each bidder acknowledges that he understands and agrees to be bound by the equal opportunity requirements of EPA regulations (40 CFR Part 8, particularly Section 8.4(b)), which shall be applicable throughout the performance of work under any contract awarded pursuant to this solicitation. Each bidder agrees that if awarded a contract, it will similarly bind contractually each subcontractor. In implementation of the foregoing policies, each bidder further understands and agrees that if awarded a contract, it must engage in affirmative action directed at promoting and ensuring equal employment opportunity in the workforce used under the contract. The bidder understands and agrees that "affirmative action" as used herein shall constitute a good faith effort to achieve and maintain minority employment in each trade in the on-site workforce used on the project.

Number 3: The successful bidder is required to certify that they are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participating in a contract using federal funds. In turn, prime contractors will require subcontractors whose contract amount is expected to equal or exceed $25,000 to also submit such certification using the "Certification Regarding Debarment, Suspension and Other Responsibility Matters" (DHEC Form 3590) (See Attachment B).

Number 4: Bonding requirements are as follows:

(a) Bid guarantee equivalent to five percent of the bid price. The bid guarantee shall be in the form of a certified check or bid bond.
(b) Performance bond equal to 100 percent of the contract price; and
(c) Payment bond equal to 100 percent of the contract price.

Bonds must be obtained from companies holding Certificates of Authority as acceptable sureties, issued by the U.S. Treasury.

Number 5: The Project Sponsor and contractors must follow the flood hazard area requirements of the Flood Disaster Protection Act of 1973 contained in 40 CRF Part 30.

Number 6: Fire and Extended Coverage Insurance (Builder's Risk):

(a) The Contractor shall maintain, as applicable, in an Insurance Company or Insurance Companies acceptable to the Project Sponsor, Fire, Extended Coverage and Vandalism and Malicious Mischief Insurance on buildings and structures, while in the course of construction, including foundations, additions, attachments and all permanent fixtures belonging to and constituting a part of said buildings or structures. The policy or policies shall also cover machinery if the cost of machinery is included in the contract. The amount of insurance must at all times be at least equal to the actual cash value of the insured property. The policy shall be in the name of the Project Sponsor and the Contractor, as their interests may appear, and shall also cover the interests of all subcontractors performing work.

(b) The Contractor shall provide the Project Sponsor with satisfactory evidence certifying that the foregoing insurance is in force; and such evidence shall include provisions that the insurance shall not be cancelled, allowed to expire or be materially changed without giving the Project Sponsor advance notice by registered mail.

(c) Cancellation and Re-Insurance: If any insurance should be cancelled or changed by the insurance company or should any insurance expire during the period of this Contract, the Contractor shall be responsible for securing other acceptable insurance to provide the coverage specified in this section to maintain continuous coverage during the life of this Contract.

Number 7: Use of American Iron and Steel

The Contractor acknowledges to and for the benefit of the Project Sponsor and the State Revolving Fund (SRF) Program that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Project Sponsor and the SRF Program that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Project Sponsor or the SRF Program. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Project Sponsor or the SRF Program to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Project Sponsor or the SRF Program resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the SRF Program or any damages owed to the SRF Program by the Project Sponsor). While the Contractor has no direct contractual privity with the SRF Program, as a lender to the Project Sponsor for the funding of its project, the Project Sponsor and the Contractor agree that the SRF Program is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the SRF Program.

The proposed prime contractor(s) must certify American Iron and Steel compliance using DHEC Form 2556.

DAVIS-BACON AND RELATED ACTS

WAGE RATE REQUIREMENTS FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

Wage Rate Requirements

Preamble
With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, ~~below~~ [available upon request], shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), ~~below~~ and for compliance as described in Section II-5.

I. Requirements Under The Water Resources Reform and Development Act of 2014 (WRRDA) and Under the Safe Drinking Water Act, Section 1452(a)(5) For Subrecipients That Are Governmental Entities:
The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance with respect to State recipients and sub recipients that are governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Sheryl Parsons, parsons.sheryl@epa.gov, 404-562-9337 of EPA, Region 4 for guidance. The recipient or sub recipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.
DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a sub recipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the sub recipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Sub recipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the sub recipient shall monitor http://beta.sam.gov/ weekly to ensure that the wage determination contained in the solicitation remains current. The sub recipients shall

amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the sub recipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the sub recipient.

(ii) If the sub recipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the sub recipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The sub recipient shall monitor http://beta.sam.gov/ on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the sub recipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the sub recipient shall insert the appropriate DOL wage determination from http://beta.sam.gov/ into the ordering instrument.

(c) Sub recipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a sub recipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the sub recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the sub recipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The sub recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the sub recipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the Safe Drinking Water Act, Section 1452(a)(5), or WRRDA, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans,

funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Sub recipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The sub recipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding.

The sub recipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each

covered worker, and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice

performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and sub recipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of $100,000.

(a) Contract Work Hours and Safety Standards Act. The sub recipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The sub recipient**,** upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth I paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these

clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Sub recipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Sub recipient shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c) The sub recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The sub recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the sub recipient should spot check payroll data within two weeks of each contractor or subcontractor’s submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Sub recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the sub recipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The sub recipient shall periodically review contractors and subcontractor’s use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Sub recipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/whd/america2.htm.

"General Decision Number: SC20210043 01/01/2021

Superseded General Decision Number: SC20200043

State: South Carolina

Construction Type: Heavy

County: Horry County in South Carolina.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

* IRON0848-001 07/01/2020

	Rates	Fringes
IRONWORKER, STRUCTURAL	$ 26.00	15.80

SUSC2011-041 11/02/2011

	Rates	Fringes
CARPENTER, Includes Form Work	$ 14.85	0.00
LABORER: Common or General	$ 11.56	2.53
LABORER: Pipelayer	$ 12.55	1.82
OPERATOR: Backhoe/Excavator/Trackhoe	$ 15.56	2.19
OPERATOR: Grader/Blade	$ 20.11	1.39

OPERATOR: Loader.....$ 10.50 1.98

TRUCK DRIVER.....$ 13.85 2.49

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISION
"

"General Decision Number: SC20210026 01/01/2021

Superseded General Decision Number: SC20200026

State: South Carolina

Construction Type: Building

County: Horry County in South Carolina.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

* PLUM0421-005 07/01/2020

	Rates	Fringes
PIPEFITTER	$ 29.35	12.41

SUSC2011-022 08/31/2011

	Rates	Fringes
BRICKLAYER	$ 18.00	0.00
CARPENTER (Drywall Hanging Only)	$ 16.32	1.50
CARPENTER (Form Work Only)	$ 14.09	2.22
CARPENTER, Excludes Drywall Hanging, and Form Work	$ 17.21	3.02

CEMENT MASON/CONCRETE FINISHER...$ 14.77 0.00

ELECTRICIAN.....$ 18.15 0.00

HVAC MECHANIC (HVAC Duct Installation Only).....$ 19.36 2.62

LABORER: Common or General.....$ 9.88 1.43

LABORER: Landscape.....$ 9.45 0.49

LABORER: Mason Tender-Brick/Concrete/Cement/Stone.....$ 11.00 0.00

LABORER: Pipelayer.....$ 14.69 2.08

OPERATOR: Backhoe/Excavator/Trackhoe.....$ 17.04 0.25

OPERATOR: Bulldozer.....$ 17.07 2.65

OPERATOR: Crane.....$ 19.39 2.02

OPERATOR: Grader/Blade.....$ 17.59 1.56

OPERATOR: Loader.....$ 14.18 1.99

PAINTER: Brush, Roller and Spray.....$ 12.36 0.00

PLUMBER.....$ 18.87 5.55

ROOFER.....$ 12.11 0.00

TRUCK DRIVER.....$ 14.05 3.18

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

```
================================================================

           END OF GENERAL DECISION
"
```

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

EEO Notice

Following is the standard language which must be incorporated into all solicitations for offers and bids on all Federal and Federally-assisted construction contracts or subcontracts in excess of $10,000 to be performed in designated geographical areas:

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

1. The Offerer's or Bidder's attention is called to the "Equal Opportunity Clause" which is included in the Nondiscrimination Provision and Labor Standards, and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation in each trade
	See below for county list	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area.

The Contractor's compliance with the Executive Order and the regulations in 41 CRF Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minority and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

Minority Goals by Economic Areas for Standard Metropolitan Statistical Area (SMSA) or Non-SMSA

029 Charlotte, NC:
SMSA Counties:
1520 Charlotte – Gastonia, NC _____ 18.5%
NC Gaston; NC Mecklenburg; NC Union.
Non-SMSA Counties _____ 15.7%
NC Alexander; NC Anson; NC Burke; NC Cabarrus; NC Caldwell; NC Catawba; NC Cleveland; NC Iredell; NC Lincoln; NC Rowan; NC Rutherford; NC Stanley; SC Chester; SC Lancaster SC York.

031 Greenville – Spartanburg, SC:
SMSA Counties:
3160 Greenville –Spartanburg, SC _____ 16.0%
SC Greenville; SC Pickens; SC Spartanburg.
Non-SMSA Counties _____ 17.8%
NC Polk; SC Abbeville; SC Anderson; SC Cherokee; SC Greenwood; SC Laurens; SC Oconee; SC Union.

032 Columbia, SC
SMSA Counties:
1760 Columbia, SC _____ 23.4%
SC Lexington; SC Richland.
Non-SMSA Counties _____ 32.0%
SC Calhoun SC Clarendon; SC Fairfield; SC Kershaw; SC Lee; SC Newberry; SC Orangeburg; SC Saluda; SC Sumter

033 Florence, SC
Non-SMSA Counties _____ 33.0%
SC Chesterfield; SC Darlington; SC Dillon; SC Florence; SC Georgetown; SC Horry; SC Marion; SC Marlboro; SC Williamsburg.

034 Charleston - North Charleston, SC
SMSA Counties
1440 Charleston - North Charleston, SC _____ 30.0%
SC Berkeley; SC Charleston; SC Dorchester.
Non-SMSA Counties _____ 30.7%
SC Colleton

035 Augusta, GA:
SMSA Counties:
0600 Augusta, GA – SC _____ 27.2%
GA Columbia; GA Richmond; SC Aiken
Non-SMSA Counties _____ 32.8%
GA Burke; GA Emanuel; GA Glascock; GA Jefferson; GA Jenkins; GA Lincoln; GA McDuffie; GA Taliaferro; GA Warren; GA Wilkes; SC Allendale, SC Bamberg; SC Barnwell; SC Edgefield; SC McCormick

039 Savannah, GA:
SMSA Counties:
7520 Savannah, GA _____ 30.6%
GA Bryan; GA Chatham; GA Effingham
Non-SMSA Counties _____ 29.8%
GA Appling; GA Atkinson; GA Bacon; GA Bullock; GA Candler; GA Coffee; GA Evans; GA Jeff Davis; GA Liberty; GA Long; GA McIntosh; GA Montgomery; GA Screven; GA Tattinall; GA Toombs; GA Wayne; SC Beaufort; SC Hampton; SC Jasper.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

EEO Specifications

Following is the standard language which must be incorporated into all solicitations for offers and bids on all Federal and Federally-assisted construction contracts or subcontracts in excess of $10,000 to be performed in designated geographical areas:

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:

    a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

    b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

    c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

    d. "Minority" includes:

        1. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

        2. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

        3. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

        4. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications and Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

    a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

    b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to

community organizations when the Contractor or its unions have employment opportunities available and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union, or if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and training programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, lay-off, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work on any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the

Contractor. The obligation to comply; however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the "Equal Opportunity Clause", including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof, as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, Social Security Number, race, sex, status (e.g. mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be constructed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

ATTACHMENT A

Contacts for Procurement of DBEs

Minority Business Development Agency
(MBDA) Business Center – Columbia SC
1515 Richland Street
Columbia, SC 29201
Office: (803) 743-1154
Fax: (803) 743-1162
Email: busdev@columbiambdacenter.com
Website: http://columbiambdacenter.com/

Office of Small & Minority Business Assistance
South Carolina Office of the Governor
1205 Pendleton Street, Suite 474
Columbia, SC 29201
Telephone: (803) 734-5010
Website: www.govoepp.state.sc.us/osmba

South Carolina Chamber of Commerce
1201 Main Street, Suite 1700
Columbia, SC 29201
Telephone: (803) 799-4601
Website: www.scminoritybusiness.net

South Carolina Department of Transportation
Office of Business Development & Special Programs
Post Office Box 191
Columbia, SC 29202
Telephone: (803) 737-1372
Website: http://www.scdot.org/doing/businessDevelop.aspx

ATTACHMENT B

FORMS

OMB CONTROL NO. 2030-0020
APPROVED: 04/06/2018
APPROVAL EXPIRES: 04/30/2021

U.S. ENVIRONMENTAL PROTECTION AGENCY
MBE/WBE UTILIZATION UNDER FEDERAL GRANTS AND COOPERATIVE AGREEMENTS

FOR COOPERATIVE AGREEMENTS OR OTHER FEDERAL FINANCIAL ASSISTANCE WHERE THE COMBINED TOTAL OF FUNDS BUDGETED FOR PROCURING SUPPLIES, EQUIPMENT, CONSTRUCTION OR SERVICES EXCEED $150,000.

PART 1: PLEASE REVIEW INSTRUCTIONS BEFORE COMPLETING

1A. FEDERAL FISCAL YEAR (Oct 1- Sep 30)	1B. REPORT TYPE
20_____	☐ Annual ☐ Last Report (Project completed)

1C: REVISION OF A PRIOR YEAR REPORT? ◯ No ◯ Yes, Year_____

IF YES, BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE COORDINATOR)	3A. RECIPIENT NAME AND ADDRESS
2B. EPA DBE COORDINATOR Name: Email: Phone: Fax:	3B. RECIPIENT REPORTING CONTACT Name: Address: Phone: Email:
4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C)	4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE OR CFDA NUMBER:
5A. TOTAL ASSISTANCE AGREEMENT AMOUNT EPA Share: $ _____ Recipient Share: $ _____ ☐ N/A (SRF Recipient)	5B. If NO procurements and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), **CHECK and SKIP to Block No. 7**. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs.) ☐

5C. Total Procurements This Reporting Period (Only include amount not reported in any prior reporting period)

Total Procurement Amount $_____

(Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, including MBE/WBE expenditures.)

5D. Were sub-awards issued under this assistance agreement? Yes ◯ No ◯

Were contracts issued under this assistance agreement? Yes ◯ No ◯

5E. MBE/WBE Accomplishments This Reporting Period

Actual MBE/WBE Procurement Accomplished (Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.)

	Construction	Equipment	Services	Supplies	Total
$MBE:	_____	_____	_____	_____	0.00
$WBE:	_____	_____	_____	_____	0.00

6. COMMENTS: (If no MBE/WBE procurements, please summarize how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	DATE

OMB CONTROL NO. 2030-0020
APPROVED: 04/06/2018
APPROVAL EXPIRES: 04/30/2021

PART II.

MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD

EPA Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. $ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or Service (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

Type of Product or Service Codes: 1 = Construction 2 = Supplies 3 = Services 4 = Equipment

Note: Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year the recipients receive the award, continuing until the project is completed.

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. The reporting requirement reflects the class deviation issued on November 8, 2013, clarified on January 9, 2014 and modified on December 2, 2014. EPA Form 5700-52A must be completed annually by recipients of financial assistance agreements where the combined total of funds budgeted for procuring supplies, equipment, construction or services exceeds $150,000.This reporting requirement applies to all new and existing awards and voids all previous reporting requirements.

In determining whether the $150,000 threshold is exceeded for a particular assistance agreement, the analysis must focus on funds budgeted for procurement under the supplies, equipment, construction, services or "other" categories, and include funds budgeted for procurement under sub-awards or loans

Reporting will also be required in cases where the details of the budgets of sub-awards/loans are not clear at the time of the grant awards and the combined total of the procurement and sub-awards and/or loans exceeds the $150,000 threshold.

When reporting is required, all procurement actions are reportable, not just the portion which exceeds $150,000.

If at the time of award the budgeted funds exceed $150,000 but actual expenditures fall below, a report is still required.

If at the time of award, the combined total of funds budgeted for procurements in any category is less than or equal to $150,000 and is maintained below the threshold, no DBE report is required to be submitted.

Recipients are required to report 30 days after the end of each federal year, per the terms and conditions of the financial assistance agreement.

Last reports are due October 30th or 90 days after the end of the project period, whichever comes first.

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

B. Definitions:

Procurement is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A ***contract*** is a written agreement between an EPA recipient and another party (also considered "prime contracts") and any lower tier agreement (also considered "subcontracts") for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A ***minority business enterprise*** **(MBE)** is a business concern that is (1) at least 51 percent owned by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority

individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

*A **woman business enterprise*** **(WBE)** is a business concern that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women and (2) whose daily business operations are managed and directed by one or more of the women owners. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact not managed and operated by minorities or females do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

Good Faith Efforts

A recipient is required to make the following good faith efforts whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These good faith efforts for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

6. If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

C. Instructions for Part I:

1A. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2014 falls within Federal fiscal year 2015**)

1B. Specify report type. Check the annual reporting box. Also indicate if the project is completed.

1C. Indicate if this is a revision to a previous year and provide a brief description of the revision you are making.

2A-B. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at http://epa.gov/osbp/dbe_cord.

3A-B. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4A. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients**: In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form.

4B. Refer back to Assistance Agreement document for this information.

5A. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only**: SRF recipients will not enter an amount in 5a. SRF recipients should check the "N/A" box.

5B. Self-explanatory.

5C. Provide the total dollar amount of **ALL** procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures, not just the portion which exceeds $150,000. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from other sources including the central purchasing/ procurement centers).

***NOTE**: To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

***For SRF recipients only**: In 5c please enter the total annual procurement amount under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. **(SRF state recipients report state procurements in this section)**

5D. State whether or not sub-awards and/or subcontracts have been issued under the financial assistance agreements by indicating “yes” or “no”.

5E. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

6. If there were no MBE/WBE accomplishments this reporting period, please briefly how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

D. Instructions for Part II:

For each MBE/WBE procurement made under this financial assistance agreements during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.

2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the “Value of the Procurement” reported in column #3**

3. Dollar value of procurement.

4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**

5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc.).

6. Name, address, and telephone number of MBE/WBE firm.

**This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Parts 30, 31, and 33 and/or 2 CFR Parts 200 and 1500); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average l hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

SOUTH CAROLINA SRF STATE REVOLVING FUND

As of March 7, 2016, the following EPA Forms are suspended:

- EPA Form 6100-2 DBE Subcontractor Participation Form
- EPA Form 6100-3 DBE Subcontractor Performance Form
- EPA Form 6100-4 DBE Program Subcontractor Utilization Form

Upon reinstatement SC SRF Staff will inform SRF loan recipients, consultants and contractors as to the correct use and submittal requirements for these forms.

Equal Employment Opportunity (EEO) Documentation Form

SRF Project Number _____

Project Name _____ Division_____

Project Sponsor _____

This form is required of Prime Contractors and any Subcontractors with subcontracts valued at $10,000 or greater for SRF equivalency projects only.

1. Proposed Prime Contractor or Subcontractor:_____

   Address:_____

   Telephone Number: _____

2. Fill out and attach "Certification by Proposed Prime or Subcontractor Regarding Equal Employment Opportunity" (DHEC Form 3592). ____ Attached

3. Attach a copy of the Employer Information Report EEO-1 (also known as Standard Form 100) if the firm meets the criteria outlined on page 3. ____ Attached, **or** ____ N/A (Check N/A if the firm does not meet the EEO-1 Report criteria.)

4.a. Name of company official responsible for EEO: _____

b. Attach a copy of the contractor's Affirmative Action Plan. ____ Plan attached, **or** ____ Letter attached stating subcontractor will be using the prime's Affirmative Action Plan

5.a. List current construction contracts, with dollar amount: (Attach a separate sheet if needed.)

_____

_____

_____

b. List contracting federal agencies, if applicable:

_____

_____

6. Detail the sex and race/ethnic composition of the company's workforce, temporary and permanent, by job category. List statistics by percent or number.

Job Category	Male	Female	African American	Asian	Hispanic	Native American	White

Number of Disabled: _____

7. Check applicable employment sources:

____Newspaper Advertisement
____Job Service
____Walk-In Applications
____Employee Referrals
____Trade Schools
____Trade Associations
____Other: _____

8. List anticipated employment needs for this project, indicating percentage or number of female/minority participation in each trade:

Trade	Female	African American	Asian	Hispanic	Native American

OR
____ Check here if you plan to only use your existing workforce.

9. **Prime Contractors Only**: Fill out and attach "Prime Contractor's Subagreement Certification" (DHEC Form 3591). ____ Attached

10. Contract Price: $_____

11. Duration of Contract: _____

12. **All Prime Contractors** and **Subcontractors** when the subcontract equals or exceeds $25,000: Fill out and attach "Certification Regarding Debarment, Suspension and Other Responsibility Matters" (DHEC Form 3590). _____ Attached, or _____ NA (Subcontract is < $25,000)

_____
Signature of Authorized Official

_____
Printed Name and Title of Authorized Official Date

Submit by email to DHEC project manager or by mail to:
SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201

Instructions – DHEC 2323

PURPOSE: The *EEO Documentation Form* is used to document compliance with Equal Employment Opportunity (EEO) requirements, which prohibit discrimination in employment practices on the basis of race, color, religion, national origin, sex, age or handicap. The affirmative action program is designed to enhance hiring, training, and promotion opportunities for minorities and women and is governed by Executive Order 11246. EEO compliance applies to State Revolving Fund (SRF) projects designated as equivalency projects.

INSTRUCTIONS: This form must be completed by each prime contractor and any subcontractor whose contract amount exceeds $10,000 for SRF equivalency projects only.

Enter the requested project information and answer each question. Submit any requested attachments with this form.

DHEC REVIEW AND FILING: The SRF Section will use this form to document prime contractor and subcontractor compliance with the EEO requirements. The form will be kept in the DBE/EEO file for the named project and will be retained for three years following the final SRF disbursement to the project's Sponsor - per Retention Schedule 15795.

RE: Employer Information - Report EEO-1

Under the direction of the U.S. Equal Employment Opportunity Commission (EEOC), the Joint Reporting Committee (JRC) is responsible for the full-length, multi-phase processing of employment statistics collected on the Employer Information Report EEO-1. This report, also known as Standard Form 100, details the sex and race/ethnic composition of an employer's work force by job category.

The Employer Information EEO-1 survey is conducted *annually* under the authority of Public Law 88-352, Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972. All employers with 15 or more employees are covered by Public Law 88-352 and are required to keep employment records as specified by Commission regulations. Based on the number of employees and federal contract activities, certain large employers are required to file an EEO-1 Report on an annual basis.

The EEO-1 Report must be filed by:

(A) All private employers who are: (1) subject to Title VII of the Civil Rights Act of 1964 (as amended by the Equal Employment Opportunity Act of 1972) with 100 or more employees EXCLUDING State and local governments, primary and secondary school systems, institutions of higher education, Indian tribes and tax-exempt private membership clubs other than labor organizations; OR (2) subject to Title VII who have fewer than 100 employees if the company is owned or affiliated with another company, or there is centralized ownership, control or management (such as central control of personnel policies and labor relations) so that the group legally constitutes a single enterprise and the entire enterprise employs a total of 100 or more employees.

(B) **All federal contractors (private employers)** who: (1) are not exempt as provided for by 41 CFR 60-1.5; (2) have 50 or more employees, **and** (a) are prime contractors or first-tier subcontractors, and have a contract, subcontract, or purchase order amounting to $50,000 or more; or (b) serve as depository of Government funds in any amount; or (c) is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Notes.

When filing the EEO-1 Report for the first time, go to the EEOC website at: https://www.eeoc.gov/employers/eeo-1-survey and select "First Time Filers". **If you have previously registered**, you should receive a notification letter by mail prior to the survey opening, and will be informed when and how to file your report.

Bidder's American Iron and Steel Certification

SRF Project Number _____

Project Name _____ Division _____

Project Sponsor _____

Both the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) require loan recipients to use iron and steel products that are produced in the United States in a manner that complies with the American Iron and Steel (AIS) requirement for projects that involve the construction, alteration, maintenance, or repair of a public water system or treatment works. For more information about AIS requirements and authorization, visit the U.S. Environmental Protection Agency (EPA)'s website: http://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement.

As a bidder for the project listed above, I certify that I have read, understand, and will comply with the "American Iron and Steel" provisions as required by federal law. Furthermore, I understand that AIS provisions apply to any and all portions of this project, including subcontracted portions and that I certify to the best of my knowledge and belief that I will identify domestic sources of AIS-covered products, provide verification documentation for AIS-compliance, and when needed provide waiver documentation per current EPA guidance.

I understand that a false statement on this certification may be grounds for rejection or termination of any award.

Signature of Bidder Date

Printed Name and Title of Bidder

Name of Bidder's Company

Bidder's Company Address

Bidder's Telephone Number

Instructions – DHEC 2556

PURPOSE: The *Bidder's "American Iron and Steel" Certification* is used to certify that, as required by federal law, all of the iron and steel products permanently incorporated into a project funded with assistance by the State Revolving Fund are produced in the United States in a manner that complies with the AIS requirement, unless a waiver is granted by the EPA.

GENERAL INFORMATION: American Iron and Steel (AIS) Guidance identifies "iron and steel" products as the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers, *municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, *structural steel, *reinforced precise concrete, and *construction materials. (*Note that several of these products are actually categories of products.)

Relevant AIS information is posted on the EPA's website, including guidance, examples of AIS-compliant documentation, currently approved national waivers, and information on how to request an individual project waiver: http://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement.

INSTRUCTIONS: The contractor bidding on a project funded in whole or in part by the SRF will enter SRF project number, name, and project sponsor's name (utility, town, etc.).

Certify that the contractor will comply with AIS requirements by signing the form. Include the date, name, and title of the bidder, name of bidder's company, bidder's address, and bidder's telephone number. Please note that AIS covered materials to be supplied by a subcontractor must be AIS compliant as well.

The Project Sponsor must submit this form from the winning bidder (typically as part of the bid package) either by email to the DHEC project manager or by mail to: SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201.

DHEC REVIEW AND FILING: The SRF Section will use this form to document bidder compliance with AIS. The form will be kept in the Bidding file for the named project and will be retained for three years following the final SRF disbursement to the project's Sponsor - per Retention Schedule 15795.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters*

SRF Project Number _____

Project Name _____

Project Sponsor _____

**See Instructions for who must submit this form and where/when it should be submitted.*

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
2. Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and
4. Have not within a three year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default; and
5. Will not contract with an entity that is presently debarred, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 U.S.C. Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____

Name of Prospective Participant (Town, Utility, Contractor, Subcontractor)

_____

Printed Name and Title of Authorized Official

_____

Signature of the Authorized Official Date

____ I am unable to certify the above statements. Attached is my explanation.

Submit by email to DHEC project manager or by mail to:
SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201

INSTRUCTIONS – DHEC 3590

PURPOSE: The *Certification Regarding Debarment, Suspension, and Other Responsibility Matters* form (Debar form) is used to certify that potential participants are not debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549 "Debarment and Suspension", as required for State Revolving Fund (SRF) projects designated as equivalency projects.

INSTRUCTIONS:

- This form is to be filled out by prospective participants in the State Revolving Loan fund program, including towns, public utilities, contractors, and subcontractors (when the subcontract is greater than $25,000).

- Fill in the project sponsor's name, project name, and SRF project number.

- Fill in the potential participants name and name of authorized official for the participant. Sign and date the form to certify that the potential participant is not debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549 "Debarment and Suspension," or, provide an explanation why the potential participant cannot.

- Where/when to submit:

    - A prospective loan recipient (Sponsor) must return the signed certification or explanation with the preliminary engineering report.

    - A prospective prime contractor must submit a signed certification or explanation to the entity awarding the contract (Sponsor) <u>for submittal to the SRF Section</u>. Upon receipt, the Sponsor must visit *sam.gov* and search to confirm that the contractor is not presently excluded from participation in federally-assisted opportunities.

    - A prospective subcontractor, with a subcontract worth over $25,000, must submit a signed certification or explanation <u>to the</u> (prospective) <u>prime contractor</u> for the project for submittal to the SRF Section. Upon receipt, the prime contractor must then visit *sam.gov* and search to confirm that the entity is not presently excluded from participation in federally-assisted opportunities.

    - See also, SRF guidance documents.

DHEC REVIEW AND FILING. The SRF Section will use this form to document compliance with Executive Order 12549. The Sponsor's Debar form will be kept in the Loan file for the named project, and the prime contractor or subcontractor's Debar form will be kept in the DBE/EEO or Bidding file for the named project and will be retained for three years following the final SRF disbursement to the project's Sponsor - per Retention Schedule 15795.

Prime Contractor's Subagreement Certification

SRF Project Number _____

Project Name _____ Division _____

Contractor's Name and Address _____

_____

Contractor's Telephone _____

CERTIFICATION

I, as the authorized representative of the above named contracting firm, certify that we:

☐ Plan to subcontract a portion of this project and will submit to SCDHEC evidence of the positive steps taken to utilize minority and women's businesses as required by Executive Order 11246 prior to entering into any subagreement. We agree to submit MBE/WBE utilization reports (U.S. EPA Form 5700-52A or equivalent). (*Please fill out page 2 of this form with each tentative subcontractor and/or any uncommitted work*.)

☐ Do not elect to subcontract any portion of this project. We understand that should we elect, at a later date, to subcontract a portion of this project, we will be required to provide evidence of the positive steps taken to utilize minority and women-owned businesses as required by Executive Order 11246 prior to entering into any subagreement. Failure to do so may result in costs associated with that subagreement declared ineligible for SRF assistance.

_____

Printed Name and Title of Contractor's Representative

_____

Signature of Contractor's Representative Date

Submit by email to DHEC project manager or by mail to:
SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201

PURPOSE / INSTRUCTIONS / REVIEW & RETENTION:
For SRF equivalency projects, prime contractors certify whether they plan to utilize subcontractors to complete project construction using the *Prime Contractor's Subagreement Certification*. The prime contractor's representative will enter the requested project information and indicate subcontracting intentions. The representative will sign the certification and fill out page 2 with requested information as needed. *A revised DHEC 3591 must be submitted any time the information on page 1 or 2 changes.*

The SRF Section will use this form to document the subcontracting intentions of the prime contractor. The form will be kept in the DBE/EEO file for the named project and will be retained for three years following the final SRF disbursement to the project's Sponsor - per Retention Schedule 15795.

List all tentative subcontractors/vendors you plan to use for this project, identify any that are suppliers and indicate whether the subcontractor/vendor is a minority business enterprise (MBE) or a women-owned business enterprise (WBE). If more space is needed, attach additional sheets using the same format.

1. Type of Work _____
   Subcontractor's Name and Address _____
   _____
   Contact Person _____ Telephone Number _____
   Subcontract Amount _____ Duration of Subcontract _____
   ☐ MBE ☐ WBE ☐ Supplier

2. Type of Work _____
   Subcontractor's Name and Address _____
   _____
   Contact Person _____ Telephone Number _____
   Subcontract Amount _____ Duration of Subcontract _____
   ☐ MBE ☐ WBE ☐ Supplier

3. Type of Work _____
   Subcontractor's Name and Address _____
   _____
   Contact Person _____ Telephone Number _____
   Subcontract Amount _____ Duration of Subcontract _____
   ☐ MBE ☐ WBE ☐ Supplier

4. Type of Work _____
   Subcontractor's Name and Address _____
   _____
   Contact Person _____ Telephone Number _____
   Subcontract Amount _____ Duration of Subcontract _____
   ☐ MBE ☐ WBE ☐ Supplier

5. Type of Work _____
   Subcontractor's Name and Address _____
   _____
   Contact Person _____ Telephone Number _____
   Subcontract Amount _____ Duration of Subcontract _____
   ☐ MBE ☐ WBE ☐ Supplier

List of subcontract work <u>yet to be committed</u> with <u>approximate price</u> and <u>duration</u> of subcontract:

1. _____
2. _____
3. _____
4. _____

Submit by email to DHEC project manager or by mail to:
SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201

Equal Employment Opportunity (EEO) Certification by Proposed Prime Contractor or Subcontractor*

SRF Project Number _____ Project Name _____

Prime Contractor Name _____ Division _____

Subcontractor Name _____

Subcontractor Address _____

PURPOSE / INSTRUCTIONS

This certification is required pursuant to Executive Order 11246, Part II, Section 203 (b), (30 F.R. 12319-25) *for SRF equivalency projects*. Any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions. (For information about the EEO-1 report/survey visit http://www.eeoc.gov/employers/eeo1survey/index.cfm.)

Where the certification indicates that the prime or subcontractor has not filed a compliance report due under applicable instructions, such contractor shall be required to submit a compliance report.

PRIME CONTRACTOR OR SUBCONTRACTOR CERTIFICATION

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.
   ☐ Yes ☐ No (If "No" go to "Certification" and sign.)
2. Compliance Reports were required to be filed in connection with such contract or subcontract.
   ☐ Yes ☐ No (If "No" go to "Certification" and sign.)
3. Bidder has filed all compliance reports due under applicable instructions, including EEO-1 (SF-100).
   ☐ Yes ☐ No
4. If answer to item 3 is "No", please explain in detail on reverse side of this certification.

Certification: The information above is true and complete to the best of my knowledge and belief. (A willfully false statement is punishable by law – U.S. Code, Title 18, Section 1001).

Signature of Contractor/Subcontractor Representative Date

Printed Name & Title of Contractor/Subcontractor Representative

Submit by email to DHEC project manager or by mail to:
SRF Section - Water Facilities Permitting Division, S.C. DHEC, 2600 Bull Street, Columbia, SC 29201

**This form is required of Prime Contractors and any Subcontractors with subcontracts valued at $10,000 or greater.*

REVIEW & RETENTION: The SRF Section will use this form to document whether or not a contractor has submitted EEO Compliance Reports. The form will be kept in the DBE/EEO file for the named project and will be retained for three years following the final SRF disbursement to the project's Sponsor - per Retention Schedule 15795.

APPENDIX B

GMC Geotechnical Report

THIS PAGE INTENTIONALLY LEFT BLANK

GSWSA International Drive PS & Water Main

Myrtle Beach, Horry County, South Carolina

January 23, 2020

REPORT OF GEOTECHNICAL EXPLORATION

Prepared By

Goodwyn, Mills and Cawood, Inc.
617 East McBee Avenue
Suite 200
Greenville, SC 29601
T 864.527.0460
www.gmcnetwork.com

GMC PROJECT NUMBER: GGRE190018

Goodwyn Mills Cawood

617 East McBee Avenue
Suite 200
Greenville, SC 29601

T (864) 527-0460
F (864) 527-0461

www.gmcnetwork.com

January 23, 2020

Mr. Corbin Jenkins, PE
Goodwyn, Mills and Cawood, Inc.
617 East McBee Avenue
Suite 200
Greenville, SC 29601

RE: REPORT OF GEOTECHNICAL EXPLORATION
GSWSA INTERNATIONAL DRIVE PS & WATER MAIN
MYRTLE BEACH, HORRY COUNTY, SOUTH CAROLINA
GMC PROJECT NO. GGRE190018

Dear Mr. Jenkins,

Goodwyn, Mills and Cawood, Inc. (Geotechnical & Construction Services Division) is pleased to provide this report of geotechnical exploration performed for the above referenced project. This report includes the results of field and laboratory testing, excavation and fill placement recommendations, and foundation recommendations based on specific site conditions.

We appreciate the opportunity to perform this study on this phase of the project for you and look forward to continued participation during the construction phase of this project. If you have any questions pertaining to this report, or if we may be of further service, please call us.

Sincerely,

GOODWYN, MILLS, AND CAWOOD, INC.

Jay Shaddix
Geotechnical Professional

Michael J. McNeill, PE
Senior Geotechnical Engineer
Licensed South Carolina 36909

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
1-23-20
No. 36909
MICHAEL JOSEPH McNEILL

SOUTH CAROLINA
Goodwyn Mills & Cawood Inc. No. 339
CERTIFICATE OF AUTHORIZATION

TABLE OF CONTENTS

1.0 PROJECT INFORMATION

1.1 Existing Site

The proposed project site is located on a side access road off International Drive in Myrtle Beach, Horry County, South Carolina. The site is relatively flat, with thick underbrush and tall trees.

1.2 Planned Construction

The proposed construction will consist of the replacement of one booster pump station, generator pad, and a future ASR well. We understand the proposed booster pump station pad will be approximately 60 feet by 50 feet.

1.3 Scope of Work

The purpose of this exploration was to characterize the subsurface soil conditions at the site, and to provide the following:

- A brief summary of our test procedures and the results of all field and laboratory testing.
- A review of the site conditions and geologic setting.
- A review of subsurface soil stratigraphy including the individual Boring Record and Boring Location Plan.
- General recommendations for excavation considerations, preparation of existing soils for proposed construction activities, and construction of compacted fills.
- Information regarding groundwater conditions.
- Design and construction recommendations for foundations, including foundation bearing capacities, and installation recommendations.
- Recommendations for design and construction of concrete slabs-on-grade.

The scope of services for the geotechnical exploration did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on, below, or around this site. Any statements, if any, in this report or on the boring records regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

The site subsurface conditions were explored by drilling three soil test borings to a depth of about 30.5 feet below existing ground surface at the approximate location shown on the attached Boring Location Plan in the Appendix. The boring locations were staked in the field by GMC. We have not been provided topographic information at this time. Therefore, the ground surface elevation is not shown on the boring record. Field-testing employed by GMC was in general accordance with ASTM standards or generally accepted methods.

The borings were drilled on December 11, 2019, using a track drill rig equipped utilizing mud rotary techniques. Soils were sampled using a two-inch outside diameter split barrel sampler driven with an automatic hammer. Soil sampling

and drilling were performed in general accordance with the procedures for "Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils" (ASTM 1586). All samples were identified according to project number, boring number and depth, and were placed in polyethylene plastic wrapping to protect against moisture loss.

2.2 Laboratory Analyses

The laboratory-testing program included visual classification of all soil samples and laboratory testing of selected samples. Grain size analysis, Atterberg limits, and natural moisture content tests were performed on selected samples from the borings. The laboratory-testing program was conducted in general accordance with applicable ASTM standards and the results are summarized in the Appendix.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

Published geologic information indicates that the site is located in the Socastee Formation. This formation is a low coastal formation like Penholoway but younger and lower in altitude. The pelholoway formation has broad lateral extent underlying terraces in the Carolinas; swamps and ridges on terrace surface were originally barrier island and back bays.

3.2 Subsurface Conditions

The descriptions given below are for materials that were encountered in the specific boring location during the course of the fieldwork. The subsurface descriptions contained herein are of a generalized nature to highlight the major soil stratification features and soil characteristics. The boring records included in the Appendix should be reviewed for specific information as to a specific boring location. The stratification shown on the boring records represent conditions only at the actual boring locations. Variations may occur and should be expected at other locations. In addition, the stratifications represent the approximate boundary between subsurface materials, and the transition may be gradual. The results of laboratory tests, consisting of grain size and natural moisture contents performed on selected soil samples, are contained in the Appendix.

The boring initially penetrated about 4 to 5 inches of organic laden material (i.e., topsoil). Beneath the topsoil, the boring encountered very loose to dense poorly graded sands with varying amounts of silt (USCS designation of SP and SP-SM) and very soft sandy elastic silt (MH) to the boring termination depth of 30.5 feet each.

3.3 Groundwater Information

Groundwater levels could not be measured due to mud rotary drilling being performed. No long term water levels were recorded during this field exploration. Based on the moisture contents of the samples obtained, it is anticipated that groundwater will be relatively shallow across the site. We anticipate groundwater levels to be about 3 to 8 feet below the existing ground surface.

4.0 EARTHWORK RECOMMENDATIONS

4.1 General

The main concern with this site is the very loose to loose surficial sands. After the organic laden material has been removed, the subgrade should be proofrolled to identify any remaining loose material. The loose material should be removed and replaced with suitable compacted fill material up to final subgrade. Approximately 2 feet of undercut should be budgeted for across the site. These soils should be able to be reused as structural fill material. As an alternative, based on the low fines content of the surficial soils, in-place densification of the sands can be obtained up to about 30-inches. The subgrade soils should be compacted utilizing a heavy vibratory contractor with a minimum energy rating of 60,000 foot-pounds. We recommend that the compaction be verified by compaction tests at the subgrade level and at a level of -1 foot after compaction.

4.2 Fill Placement

Fill material should meet the following characteristics:

Property	Requirement
Liquid Limit (LL) and Plasticity Index (PI)	LL < 50 and PI ≤ 25
Maximum Dry Density (ASTM D1557)	≥ 95 pcf
Maximum Particle Size	4 inches or less
Organic Matter	≤ 5%
Fill Loose Lift Thickness	8 inches or less (4 inches of less for walk-behind compaction equipment)

The following table summarizes the compacted fill requirements:

Location	Test Method	Compaction Required (minimum)	Moisture Content
Structures and 5 feet beyond perimeter	ASTM D1557	95%	-3% to +3% of optimum moisture
All other areas	ASTM D1557	95%	-3% to +3% of optimum moisture

Samples of the proposed fill materials should be provided to the geotechnical engineer for testing and evaluation prior to placement. Density tests should be performed to document compaction and moisture content of any earthwork involving soils and other applicable materials. Density tests should be performed frequently, with a recommended minimum of one test per 5,000 square feet per lift of fill.

5.0 STRUCTURAL RECOMMENDATIONS

5.1 Shallow Foundations

The foundations for new structures will bear in compacted sands or fill material. Based on the conditions encountered, shallow foundations can be used for the pump station. The foundations should:

- Be founded a minimum of 18 inches below exterior adjacent grade.
- Foundations in soil may be sized using a net allowable soil bearing pressure of 2,000 pounds per square foot (psf).
- Even though computed footing dimensions may be less, column footings and continuous footings should have minimum dimensions of 24 inches and 18 inches, respectively. This allows for hand cleaning of materials disturbed during the excavation process and reduces the potential for punching shear failure.

A slab with turn-down foundations may be utilized at the site. We recommend that the exterior foundations bear a minimum of 18 inches below the final exterior grade.

5.2 General

The Geotechnical Engineer or his representative should observe all foundation excavations, prior to concrete placement. The engineer can provide geotechnical guidance to the owner's design team should any unforeseen foundation problems develop during construction. If any areas of foundation surfaces prove to be unsuitable, the foundation should be over-excavated.

When excavation takes place, the condition at the planned bearing elevation may vary from the conditions encountered during our exploration. If required by field conditions and directed by the Geotechnical Engineer, we recommend that an allowance be included in the budget to over-excavate footing excavations through existing loose soils. The over-excavated area can be backfilled with "lean" concrete, controlled low strength material (CLSM) with minimum 28-day strength of 1500 psi, or compacted well-graded crushed stone up to the planned foundation bearing depth.

Foundation concrete should be placed the same day they are excavated so that disturbance of the foundation bearing soils can be reduced. Foundation bearing surfaces should not be disturbed or left exposed during inclement weather. Saturation of the on-site soils can cause a loss of strength and increased compressibility. Excavations for footings should be hand cleaned to remove any loose soil or mud from the foundation bearing surface. If construction occurs during inclement weather and concreting is not possible immediately after excavation, we recommend that a thin layer (approximately 2 inches) of lean concrete or flowable fill be placed on the bearing surface for protection after we have observed and evaluated the exposed bearing surfaces.

5.3 Slab-On-Grade

Ground supported slabs should be founded on a minimum of 4 inches of compacted, granular material such as a graded crushed stone with less than 10% passing the #200 sieve. The purpose of this layer is to provide uniform and immediate support for the slab and act as a capillary break; however, it should not be considered a part of the slab design. The design should consider use of a vapor retarder beneath the slab, dependent on the floor coverings and climate control of the structure.

On most projects, there is some time lag between initial grading and the time when the contractor is ready to place concrete for the slab-on-grade. Inclement weather just prior to placement of concrete for the slab-on-grade can result in trapped water in the crushed stone.

Prior to the construction of concrete slabs, a geotechnical engineer should evaluate the subgrade. This evaluation may include proofrolling with a pneumatic tired vehicle, such as a fully loaded dump truck. We suggest that provisions be included in the project specifications for the contractor to restore the subgrade soils to an acceptable condition (as outlined in this report) prior to the construction of floor slab. Such restoration may include moisture conditioning of the surficial soils and re-compaction to the project requirements. Based on the results of our exploration, we conclude that the slab-on-grade is not likely to be subjected to hydrostatic pressure from groundwater, especially if water is diverted away from the structure in the drainage design.

6.0 REPORT LIMITATIONS

6.1 General

The recommendations submitted are based on the available soil information obtained by GMC and design details furnished by GMC for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, we should be notified immediately to determine if changes in the recommendations are required. If GMC is not retained to perform these functions, GMC cannot be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans are more complete, the geotechnical engineer should be provided the opportunity to review the design plans to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

We emphasize that this report was prepared for design and informational purposes only and may not be sufficient to prepare an accurate construction budget. Contractors reviewing this report should acknowledge that the information and recommendations contained herein are for design and informational purposes only. A more comprehensive exploration and testing program would be required to assist the contractor in preparing the final construction budget. In no case should this report be utilized as a substitute for development of earthwork specifications.

The recommendations in this report are applicable only to areas in the vicinity of our boring and should not be used for other areas or for structures not specifically mentioned in this report.

6.2 Construction Testing

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of the geotechnical design. We recommend that Goodwyn, Mills, and Cawood, Inc. be allowed to continue our involvement in the project through these phases of remediation and/or construction.

Quality assurance observations and testing related to earthwork should be performed by competent personnel under the general administrative supervision of a geotechnical engineer familiar with the design requirements and considerations of this project. We recommend that qualified geotechnical personnel observe excavations and subgrades, evaluate the materials to be used as fill, and test the compaction of backfill.

APPENDIX

Boring Location Plan

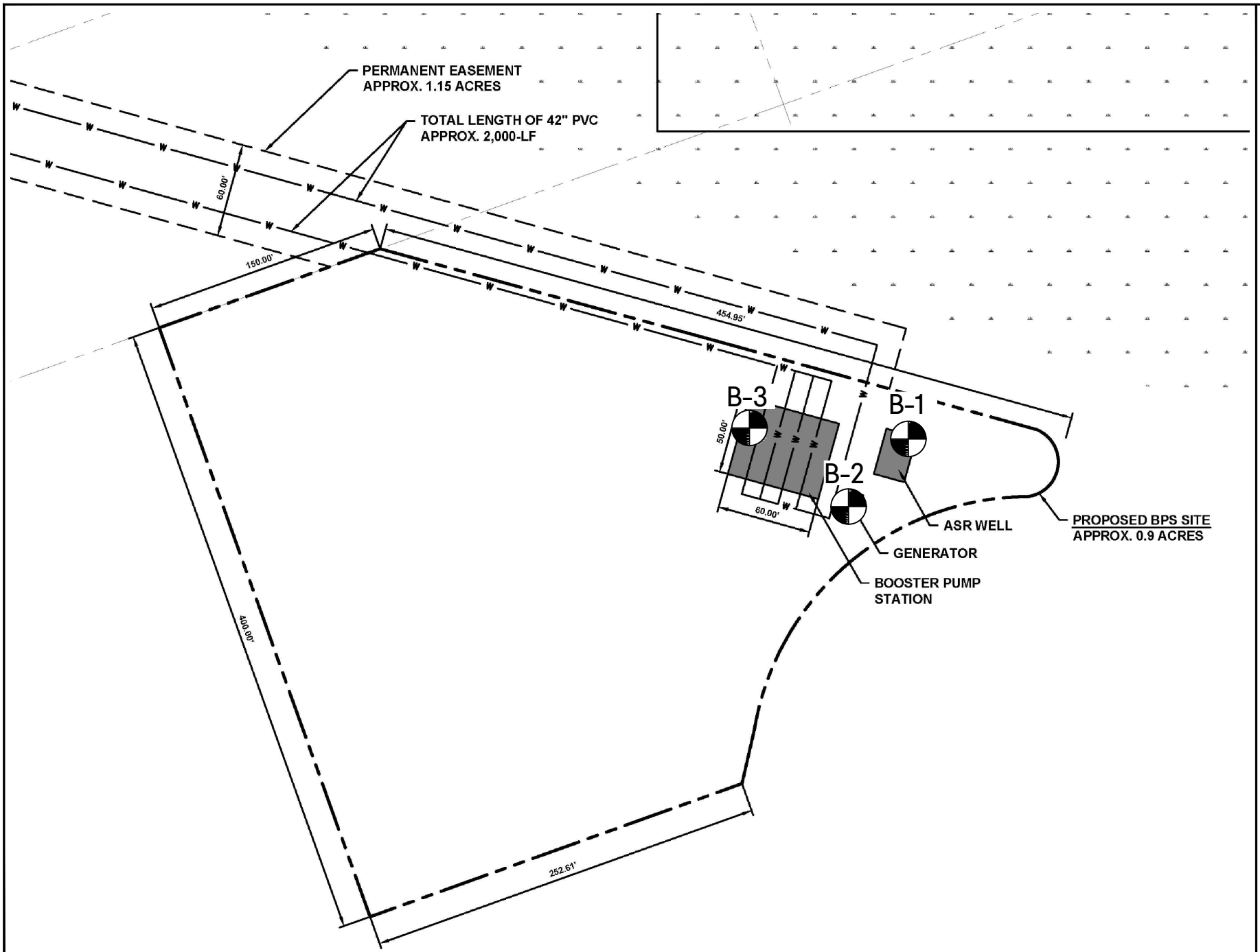
Soil Classification Chart

Subsurface Diagram

Boring Records

Summary of Laboratory Results

Field and Laboratory Procedures



GMC

101 East Washington Street, Suite 320
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

Figure 1

SUPPLEMENTAL DRAWING

GMC # GGRE190018

01/15/2020

DRAWN BY: J.S.

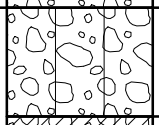
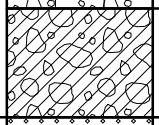
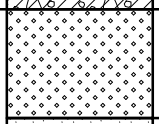
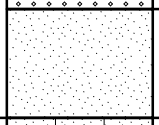
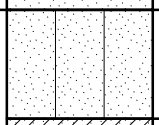
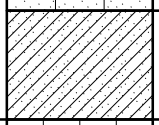
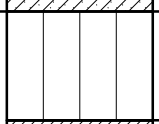
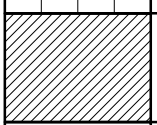
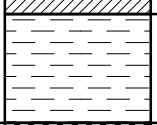
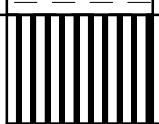
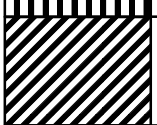
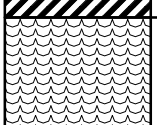
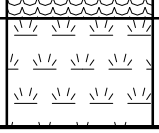
GSWSA International Drive PS & Water Main

Myrtle Beach, South Carolina

Boring Location Plan

GMC

SOIL CLASSIFICATION CHART

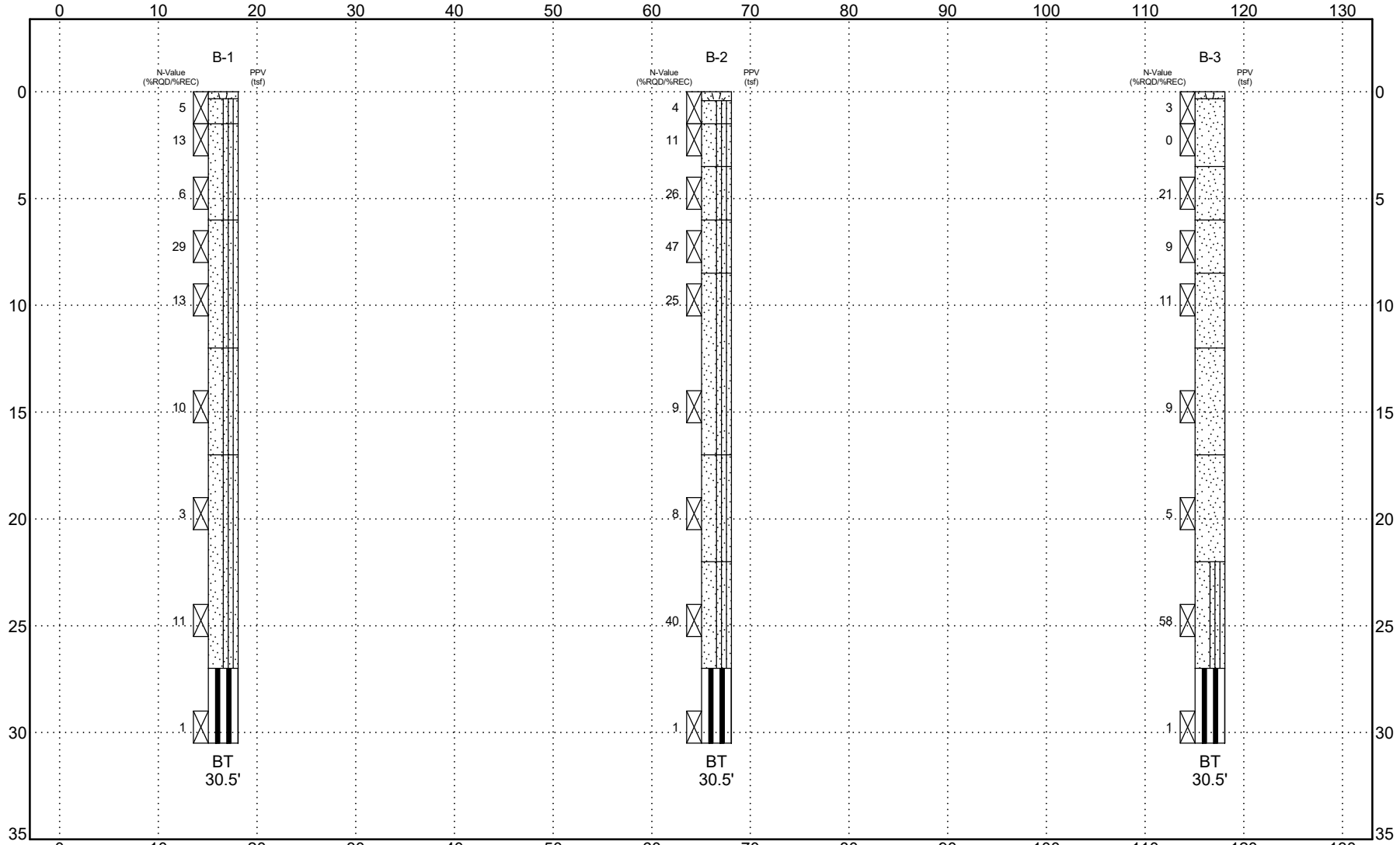
MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SUBSURFACE DIAGRAM
A-A'

TOPSOIL | SP-SM | MH | SP

CLIENT Grand Strand Water and Sewer Authority
PROJECT NAME GSWSA International Drive PS and Water Main
PROJECT NUMBER GGRE190018
PROJECT LOCATION Myrtle Beach, South Carolina



BT - Boring Termination
AR - Auger Refusal

BT-AR DEPTH WO EL GGRE190018 GSWSA INTERNATIONAL DRIVE PS AND WATER MAIN.GPJ GMC DATA TEMPLATE.GDT 1/22/20

BORING NUMBER B-1

CLIENT Grand Strand Water and Sewer Authority
PROJECT NAME GSWSA International Drive PS and Water Main
PROJECT NUMBER GGRE190018
PROJECT LOCATION Myrtle Beach, South Carolina
DATE STARTED 12/30/19 **COMPLETED** 12/30/19
GROUND ELEVATION _____ **HOLE SIZE** 6"
DRILLING CONTRACTOR Soils Consultants, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 45C, Track, Auto-Hammer, Mud Rotary w/ SPT
AT TIME OF DRILLING ---
LOGGED BY J. Shaddix **CHECKED BY** A. Sorace
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM), 4"										
			POORLY GRADED SAND with SILT (SP-SM), black and gray, loose, fine, wet	SS		1-1-4 (5)			18	NP	NP	NP	6
			POORLY GRADED SAND with SILT (SP-SM), dark brown, medium to loose, fine, wet	SS		3-5-8 (13)			20				
	5			SS		2-2-4 (6)			14				
			POORLY GRADED SAND with SILT (SP-SM), black, medium, fine, wet	SS		8-13-16 (29)							
	10			SS		2-4-9 (13)							
			POORLY GRADED SAND with SILT (SP-SM), brown, medium, fine, wet										
	15			SS		2-4-6 (10)							
			POORLY GRADED SAND with SILT (SP-SM), gray, very loose to medium, fine, wet										
	20			SS		2-1-2 (3)							
	25			SS		2-3-8 (11)							
			ELASTIC SILT (MH), gray, very soft, with shells										
	30			SS		0-0-1 (1)							
			Boring was terminated at 30.5 feet.										
	35												

BORING NUMBER B-2

CLIENT Grand Strand Water and Sewer Authority
PROJECT NAME GSWSA International Drive PS and Water Main
PROJECT NUMBER GGRE190018
PROJECT LOCATION Myrtle Beach, South Carolina
DATE STARTED 12/30/19 **COMPLETED** 12/30/19
GROUND ELEVATION _____ **HOLE SIZE** 6"
DRILLING CONTRACTOR Soils Consultants, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 45C, Track, Auto-Hammer, Mud Rotary w/ SPT
AT TIME OF DRILLING ---
LOGGED BY J. Shaddix **CHECKED BY** A. Sorace
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM), 5"										
			POORLY GRADED SAND with SILT (SP-SM), dark brown, very loose, fine, wet	SS		1-1-3 (4)			24				
			POORLY GRADED SAND with SILT (SP-SM), light brown, medium, fine, wet	SS		3-3-8 (11)			17	NP	NP	NP	6
	5		POORLY GRADED SAND with SILT (SP-SM), gray, medium, fine, wet	SS		5-11-15 (26)			18				
			POORLY GRADED SAND with SILT (SP-SM), black, dense, fine, wet	SS		9-21-26 (47)			20				
	10		POORLY GRADED SAND with SILT (SP-SM), dark brown, medium to loose, fine, wet	SS		5-10-15 (25)							
	15			SS		3-3-6 (9)							
			POORLY GRADED SAND with SILT (SP-SM), dark gray, loose, fine, wet										
	20			SS		2-3-5 (8)							
			POORLY GRADED SAND with SILT (SP-SM), gray, dense, fine, wet										
	25			SS		10-16-24 (40)							
			ELASTIC SILT (MH), gray, very stiff, with shells										
	30			SS		0-0-1 (1)							
			Boring was terminated at 30.5 feet.										
	35												

BORING NUMBER B-3

CLIENT Grand Strand Water and Sewer Authority
PROJECT NAME GSWSA International Drive PS and Water Main
PROJECT NUMBER GGRE190018
PROJECT LOCATION Myrtle Beach, South Carolina
DATE STARTED 12/30/19 **COMPLETED** 12/30/19
GROUND ELEVATION _____ **HOLE SIZE** 6"
DRILLING CONTRACTOR Soils Consultants, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 45C, Track, Auto-Hammer, Mud Rotary w/ SPT
AT TIME OF DRILLING ---
LOGGED BY J. Shaddix **CHECKED BY** A. Sorace
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM), 4"										
			POORLY GRADED SAND (SP), dark gray, very loose, fine, wet	SS		1-1-2 (3)			20				
				SS		1-0-0 (0)			19	NP	NP	NP	4
			POORLY GRADED SAND (SP), black, medium, fine, wet, with root fragments	SS		3-10-11 (21)			34				
	5		POORLY GRADED SAND (SP), black, loose, fine, wet	SS		3-3-6 (9)							
			POORLY GRADED SAND (SP), dark brown, medium, fine, wet	SS		3-4-7 (11)							
	10		POORLY GRADED SAND (SP), brown, loose, fine, wet										
				SS		3-4-5 (9)							
	15		POORLY GRADED SAND (SP), gray, loose, fine, wet										
				SS		2-2-3 (5)							
	20		POORLY GRADED SAND with SILT (SP-SM), gray, very dense, fine, wet										
				SS		16-25-33 (58)							
	25		ELASTIC SILT (MH), gray, very soft, with shells										
				SS		0-0-1 (1)							
	30		Boring was terminated at 30.5 feet.										
	35												

SUMMARY OF LABORATORY RESULTS

CLIENT Grand Strand Water and Sewer Authority **PROJECT NAME** GSWSA International Drive PS and Water Main

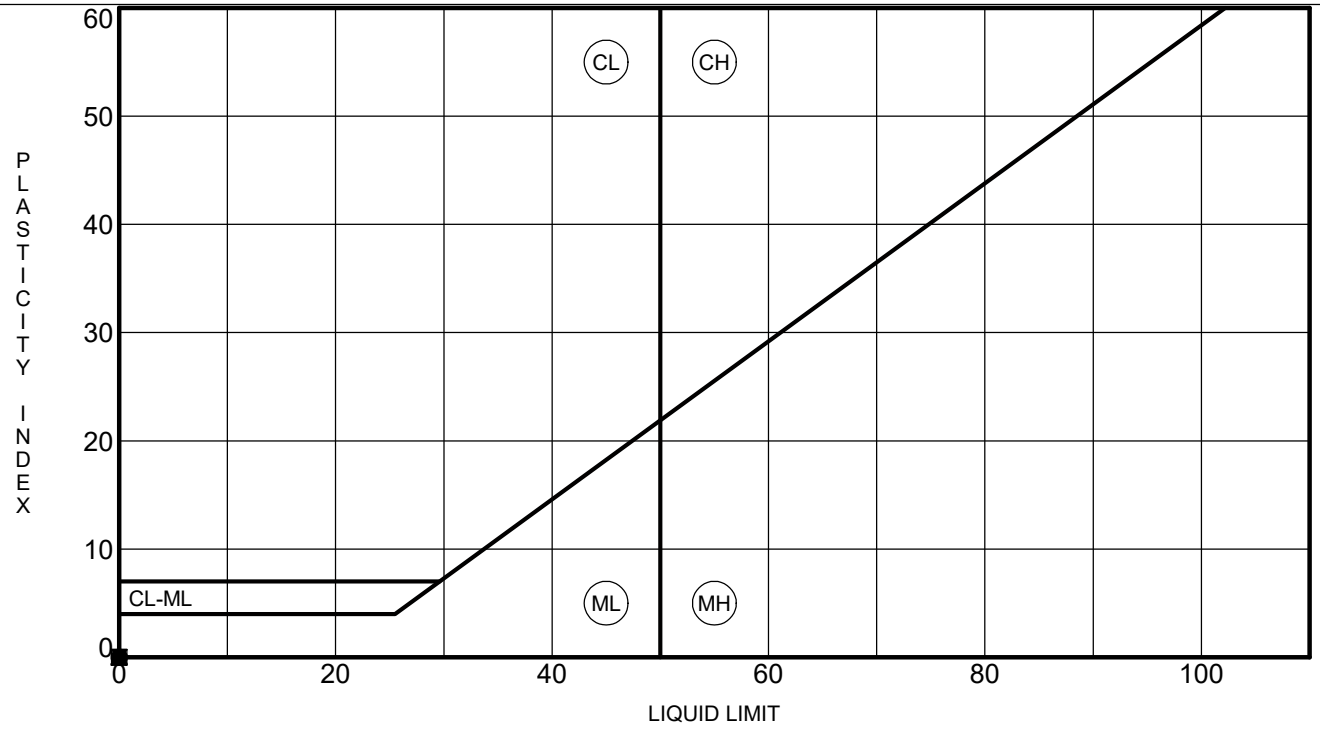
PROJECT NUMBER GGRE190018 **PROJECT LOCATION** Myrtle Beach, South Carolina

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Natural Moisture (%)	Class-ification	Opt. Moisture Content (%)	Max Dry Density (pcf)	Specific Gravity
B-1	0-1.5	NP	NP	NP	4.75	6	18.0	SP-SM			
B-1	1.5-3						20.0				
B-1	4-5.5						13.8				
B-2	0-1.5						24.0				
B-2	1.5-3	NP	NP	NP	2	6	17.2	SP-SM			
B-2	4-5.5						18.4				
B-2	6.5-8						20.1				
B-3	0-1.5						20.1				
B-3	1.5-3	NP	NP	NP	2	4	18.9	SP			
B-3	4-5.5						33.6				

ATTERBERG LIMITS' RESULTS

CLIENT Grand Strand Water and Sewer Authority **PROJECT NAME** GSWSA International Drive PS and Water Main

PROJECT NUMBER GGRE190018 **PROJECT LOCATION** Myrtle Beach, South Carolina

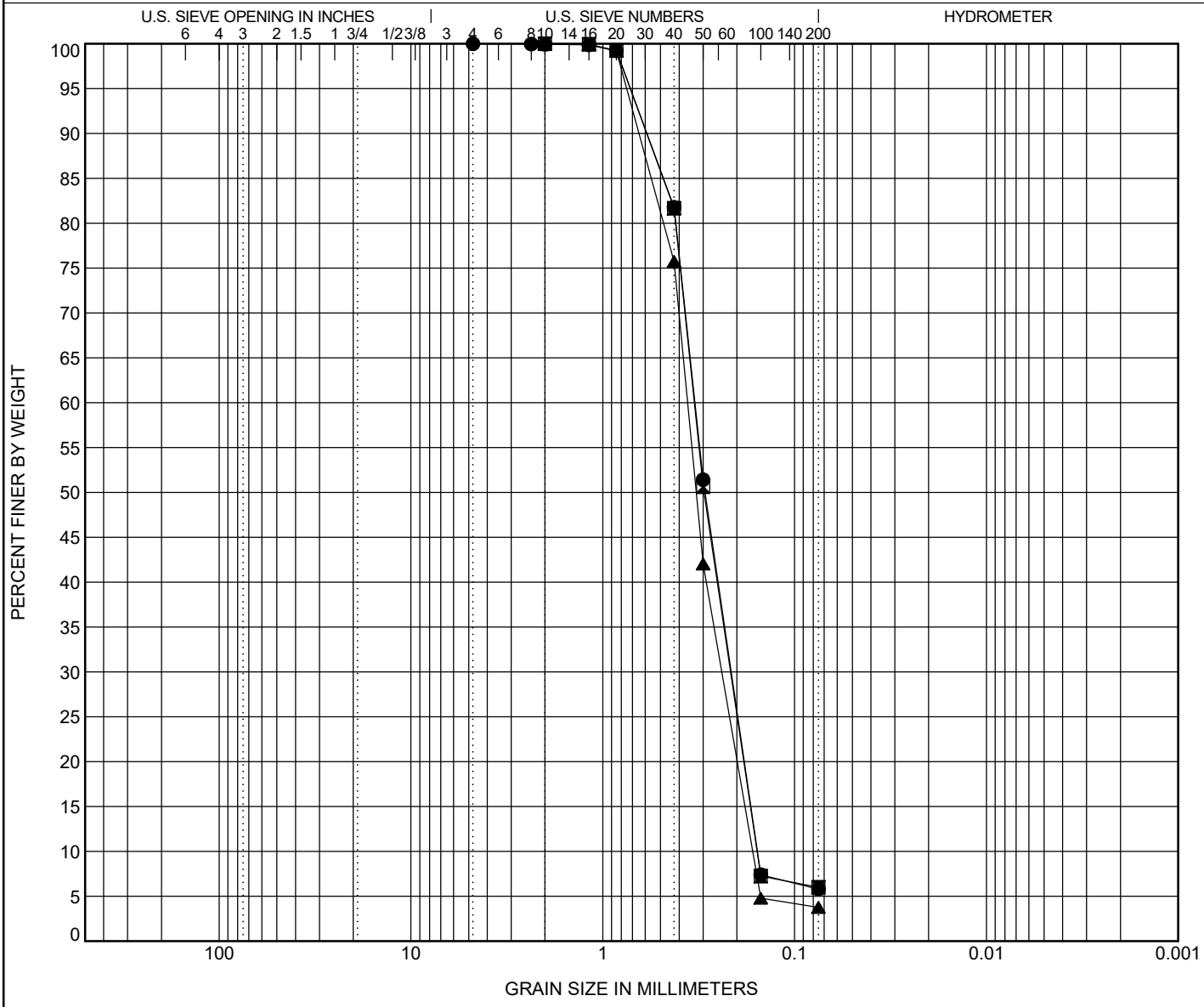


	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**0.0-1.5**	**NP**	**NP**	**NP**	**6**	**POORLY GRADED SAND with SILT(SP-SM)**
⧓	**B-2**	**1.5-3.0**	**NP**	**NP**	**NP**	**6**	**POORLY GRADED SAND with SILT(SP-SM)**
▲	**B-3**	**1.5-3.0**	**NP**	**NP**	**NP**	**4**	**POORLY GRADED SAND(SP)**

GRAIN SIZE DISTRIBUTION

CLIENT Grand Strand Water and Sewer Authority **PROJECT NAME** GSWSA International Drive PS and Water Main

PROJECT NUMBER GGRE190018 **PROJECT LOCATION** Myrtle Beach, South Carolina



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-1	0.0-1.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.89	2.12
⊠	B-2	1.5-3.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.89	2.13
▲	B-3	1.5-3.0	POORLY GRADED SAND(SP)	NP	NP	NP	0.96	2.19

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	0.0-1.5	4.75	0.331	0.214	0.156	0.0	94.2	5.8	
⊠	B-2	1.5-3.0	2	0.333	0.216	0.157	0.0	94.0	6.0	
▲	B-3	1.5-3.0	2	0.361	0.24	0.165	0.0	96.2	3.8	

GMC

FIELD TEST PROCEDURES

General

The general field procedures employed by Goodwyn, Mills and Cawood, Inc. (GM&C), are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

The detailed collection methods used during this exploration are presented in the following paragraphs.

Standard Drilling Techniques

General: To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. These techniques are as follows:

In Soils:

a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:

a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

Hollow Stem Auger: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Rotary Borings: Rotary drilling involves the use of roller cone or drag type drill bits attached to the end of drill rods. A flushing medium, normally water or bentonite slurry, is pumped through the rods to clear the cuttings from the bit face and flush them to the surface. Casing is sometimes set behind the advancing bit to prevent the hole from collapsing and to restrict the penetration of the drilling fluid into the surrounding soils. Cuttings returned to the surface by the drilling fluid are typically collected in a settling tank, to allow the fluid to be recirculated.

Hand Auger Boring: Hand auger borings are advanced by manually twisting a 4" diameter steel bucket auger into the ground and withdrawing it when filled to observe the sample collected. Posthole diggers are sometimes used in lieu of augers to obtain shallow soil samples. Occasionally these hand auger borings are used for driving 3-inch diameter steel tubes to obtain intact soil samples.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemeted soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material that cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D2113 using a diamond studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run,

the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes

General: Several techniques are used to obtain samples and data in soils; however, the most common methods in this area are:

a) Standard Penetrating Testing
b) Water Level Readings

These procedures are presented below. Any additional testing techniques employed during this exploration are contained in other sections of the Appendix.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2-inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Records. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water table readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water table at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water table through short-term water level readings. Also, fluctuation in the water table should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Records are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater table, which may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone. The cave-in depth is measured and recorded on the Boring Records.

Boring Records

The subsurface conditions encountered during drilling are reported on a field boring record prepared by the Driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of ground water. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed, a geotechnical professional classifies the soil samples and prepares the final Boring Records, which are the basis for all evaluations and recommendations. The following terms are taken

from ASTM D2487 or Deere's Technical Description of Rock Cores for Engineering Purposes, Rock Mechanical Engineering Geology 1, pp. 18-22.

Relative Density of Cohesionless Soils From Standard Penetration Test	
Very Loose	‹ 4 bpf
Loose	5 - 10 bpf
Medium	11 – 30 bpf
Dense	31 - 50 bpf
Very Dense	› 50 bpf
(bpf = blows per foot, ASTM D 1586)	

Consistency of Cohesive Soils	
Very Soft	‹ 2 bpf
Soft	3 - 4 bpf
Medium	5 - 8 bpf
Stiff	9 - 15 bpf
Very Stiff	16 - 30 bpf
Hard	› 30 bpf

Relative Hardness of Rock
Very Soft Rock disintegrates or easily compresses to touch; can be hard to very hard soil.
Soft Rock may be broken with fingers.
Moderately Soft Rock may be scratched with a nail, corners and edges may be broken with fingers.
Moderately Hard Rock a light blow of hammer is required to break samples.
Hard Rock a hard blow of hammer is required to break sample.

Particle Size Identification	
Boulders	Larger than 12"
Cobbles	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	4.76mm - 3/4"
Sand	
Coarse	2.0 - 4.76 mm
Medium	0.42 - 2.00 mm
Fine	0.42 - 0.074 mm
Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity	
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}}$ x 100 %	
Description	Core Recovery %
Incompetent	Less than 40
Competent	40 - 70
Fairly Continuous	71 - 90
Continuous	91 - 100

Relative Quality of Rocks	
RQD = $\frac{\text{Total core, counting only pieces › 4" long}}{\text{Length of Core Run}}$ x 100 %	
Description	RQD %
Very Poor	0 - 25 %
Poor	25 - 50 %
Fair	50 - 75 %
Good	75 - 90 %
Excellent	90 - 100 %

LABORATORY TESTING

GENERAL

The laboratory testing procedures employed by Goodwyn, Mills and Cawood, Inc. (GM&C) are in general accordance with ASTM standard methods and other applicable specifications.

Several test methods, described together with others in this Appendix, were used during the course of this exploration. The Laboratory Data Summary sheet indicates the specific tests performed.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Boring Records".

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary; grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

POCKET PENETROMETER TEST

A pocket penetrometer test is performed by pressing the tip of a small, spring-loaded penetrometer with even pressure to a prescribed depth into a soil sample. This test yields a value for unconfined compressive strength, which may be correlated with unconfined compressive strengths obtained by other laboratory methods.

MOISTURE CONTENT

Moisture contents are determined from representative portions of the specimen. The soil is dried to a constant weight in an oven at 100° C and the loss of moisture during the drying process is measured. From this data, the moisture content is computed.

PARTICLE SIZE DISTRIBUTION

The distribution of soils coarser than the No. 200 (75-mm) sieve is determined by passing a representative specimen through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage retained (or passing) is calculated.

A specimen may be washed through only the No. 200 sieve, if the full range of particle sizes is not required. The percentage of material passing the No. 200 sieve is reported.

The distribution of materials finer than the No. 200 sieve is determined by use of a hydrometer. The particle sizes and distribution are computed from the time rate of settlement of the different size particles while suspended in water. These tests are performed in accordance with ASTM D-421, D-422 and D-1140.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

Property Plat and Easements

THIS PAGE INTENTIONALLY LEFT BLANK

Deed BK: 4370 PG: 2828 Doctype: 001
12/11/2020 at 10:12:32 AM, 1 OF 3
EXEMPT
Marion D. Foxworth III
HORRY COUNTY, SC REGISTRAR OF DEEDS

(Space above this line for Recorder's Use)

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

LIMITED WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS, that **LANDBANK FUND VII LLC**, a South Carolina limited liability company ("Grantor") in the State aforesaid and in consideration of the sum of **SIXTY THOUSAND AND 00/100 DOLLARS ($60,000.00)** to the said Grantor in hand paid at and before the sealing of these presents by **GRAND STRAND WATER AND SEWER AUTHORITY** ("Grantee") in the State aforesaid, the receipt whereof is hereby acknowledged, subject to the reservations and limitations hereinafter stated, has granted, bargained, sold, conveyed, transferred and delivered and by these Presents does bargain, sell, grant, convey, transfer and deliver unto Grantee the below described property (the "Property"):

ALL AND SINGULAR, all that certain piece, parcel or tract of land lying, being and situate in Horry County, South Carolina containing 4.35 AC. (189,566 Sq. Feet) and shown on that certain plat entitled "Subdivision Plat of International Drive Booster Pump Station" prepared for Grand Strand Water & Sewer Authority by Palmetto Corp Land Surveying Division dated March 25, 2020 and recorded in Plat Book 296, at Page 176, Office of the Register of Deeds for Horry County, South Carolina, said survey being made a part and parcel hereof by reference thereto.

TMS No: Portion of 153-00-01-007
PIN No: Portion of 396-00-00-0001

Derivation: This being a portion of the same property Landbank Fund VII LLC by deed of International Paper Realty Corporation dated December 4, 2002, and recorded December 5, 2002, in Deed Book 2544, page 1284, Office of the Register of Deeds for Horry County, South Carolina.

Grantee's Address: PO Box 2368, Conway, South Carolina 29528-2368

This conveyance is made subject to all easements, conditions, and restrictions of record, including those as shown on any instruments and plats of record, and such matters as would be revealed by a current survey of the Property or by visual inspection of the Property. It is also made subject to all zoning and other governmental regulations of the County of Horry, South Carolina and any other local, state or federal governmental agency.

TOGETHER with all and singular, the rights, members, hereditaments and appurtenances to the said Property belonging, or in anywise incident or appertaining.

TO HAVE AND TO HOLD, all and singular, the said Property before mentioned unto the said Grantee, the Grantee's Successors and Assigns forever, subject to the reservations and limitations set forth above.

AND the said Grantor does hereby bind Grantor and Grantor's successors and assigns, to warrant and forever defend, all and singular, the said Property unto the said Grantee, the Grantee's successors and assigns,

against Grantor and Grantor's Successors and Assigns lawfully claiming, or to claim the same or any part thereof but no others.

IN WITNESS WHEREOF, Grantor has signed, sealed and delivered this deed executed to be effective this 9th day of December, 2020.

SIGNED, SEALED AND WITNESSED
IN THE PRESENCE OF:

Witness #1

Witness #2

SELLER:

LANDBANK FUND VII LLC,
a South Carolina limited liability company

By: Landbank Resource Management II, LLC
Its: Manager

By: _____ [SEAL]
Debra J. Walters, Chairman of the Board

STATE OF NORTH CAROLINA)
)
COUNTY OF COLUMBUS)

ACKNOWLEDGMENT

I, the undersigned Notary Public for the State of North Carolina, do hereby certify that Debra J. Walters, the Chairman of the Board of Landbank Resource Management II, LLC, Manager of Landbank Fund VII LLC, known to me personally to be the person who name is subscribed above, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

_____ [SEAL]
Signature of Notary Public
Printed Name: Linda E Evans
Notary Public for North Carolina
My commission expires: 2-18-23

Linda E. Evans

STATE OF SOUTH CAROLINA)
) **AFFIDAVIT FOR TAXABLE OR EXEMPT TRANSFERS**
COUNTY OF HORRY)

SS: STATE OF NORTH CAROLINA COUNTY OF COLUMBUS

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information

2. The property being transferred was Horry County PIN No.: a portion of 396-00-00-0001 was transferred by **LANDBANK FUND VII LLC**, a South Carolina limited liability company, to **GRAND STRAND WATER & SEWER AUTHORITY**, on December 10, 2020.

3. Check one of the following: The deed is
   (a) ____ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.
   (b) _____ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.
   (c) __X____ exempt from the deed recording fee because (See Information section of affidavit):
   # 2~~#15 transferring realty to a public service utility company~~
   (If exempt, please skip items 4 - 7, and go to item 8 of this affidavit.)

If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes ___ or No ____

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):
   (a) __X__ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $_____.
   (b) _____ The fee is computed on the fair market value of the realty which is
   (c) _____ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____.

5. Check Yes or No X to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. (This includes, pursuant to Code Section 12-59-140(E)(6), any lien or encumbrance on realty in possession of a forfeited land commission which may subsequently be waived or reduced after the transfer under a signed contract or agreement between the lien holder and the buyer existing before the transfer.) If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____

6. The deed recording fee is computed as follows:

(a)	Place the amount listed in item 4 above here:	$	0.00
(b)	Place the amount listed in item 5 above here (If no amount is listed, place zero here.)	$	
(c)	Subtract Line 6(b) from Line 6(a) and place result here	$	0.00

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $0

8. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: Grantor

9. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

SWORN to and subscribed before me this
4th day of December, 2020.

Notary Public for North Carolina
Notary (printed name): Linda E Evans
My Commission Expires: 2-18-23

Linda E. Evans

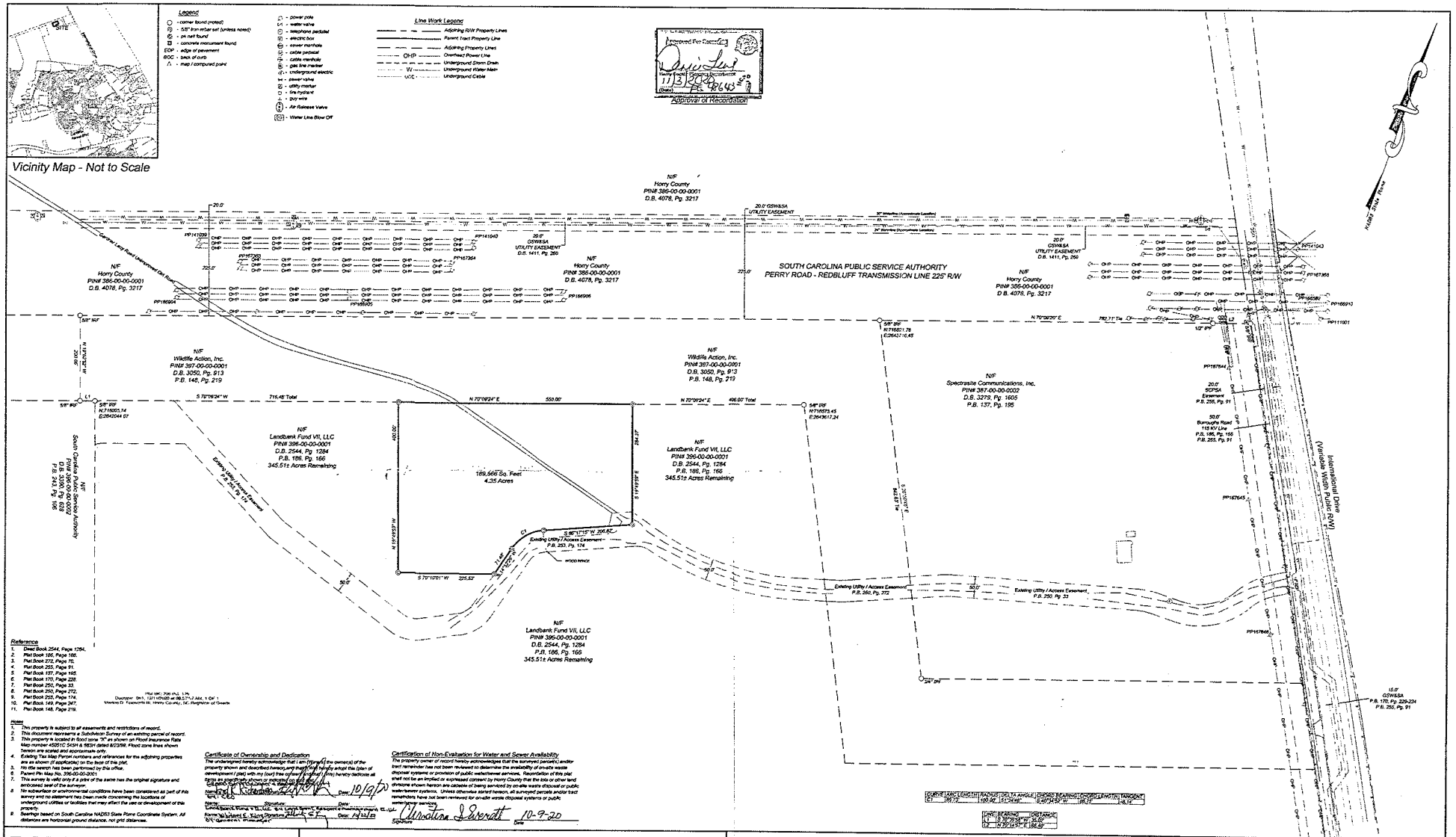
LANDBANK FUND VII LLC

By: Landbank Resource Management II, LLC
Its: Manager

By: _____
Debra J. Walters, Chairman of the Board

f-12-11-2020

PB 296-176



Deed BK: 4370 PG: 2831 Doctype: 062
12/11/2020 at 10:12:33 AM, 1 OF 7
EXEMPT
Marion D. Foxworth III
HORRY COUNTY, SC REGISTRAR OF DEEDS

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACCESS AND UTILITY EASEMENT
Portion of PIN # 396-00-00-0001

KNOW ALL MEN BY THESE PRESENTS, that **LANDBANK FUND VII LLC**, owner of the land hereinafter described (Grantor), for and in consideration of payment of Ten Dollars ($10.00) and no/100 Dollars to me in hand paid (the receipt whereof is hereby acknowledged) by the **Grand Strand Water and Sewer Authority**, PO Box 2368, Conway SC 29528-2368 (Grantee), a body politic under and pursuant to the laws of the State of South Carolina, does hereby grant, bargain, sell and convey unto the said **Grand Strand Water and Sewer Authority**, its successors and assigns, an easement in, over and across the following described property, to wit:

ALL AND SINGULAR, that certain non-exclusive, permanent, perpetual and appurtenant easement described as follows:

> That access and utility easement for purposes of installation/construction, maintenance and operation of pipelines and ingress and egress for pedestrian and vehicular traffic at a minimum of 50' in width on, over, under and across a portion of the Grantor's property containing 0.58 A.C. ± (25,141 S.F.) as more fully shown on **Exhibit "3"**, attached hereto and incorporated herein by reference, hereinafter referred to as the "Access and Utility Easement" and also running concurrent with the Existing 50' Existing Utility/Access Easement of South Carolina Public Service Authority.
>
> This being a portion of the property conveyed to Grantor by deed of International Paper Realty Corporation dated December 4, 2002 and recorded December 5, 2002 in Deed Book 2544, at page 1284, Office of the Register of Deeds for Horry County, South Carolina.

The easement herein granted include, but is not necessarily limited to, the right and privilege of the Grantee, its successors and assigns, to construct, access, maintain, operate and repair any and all useful, proper and necessary facilities and appurtenances for the purpose of conveying, pumping, and supplying potable water and to make such changes, renewals, substitutions, replacements and additions of or to the same from time to time as the said Grantee may deem desirable; the right at all times to cut and keep clear of said easements of any obstructions that might, in the reasonable opinion of the Grantee, endanger or injure the said utility facilities or their appurtenances, or interfere with their proper operation or maintenance; the right of reasonable ingress and egress in, to, over and across the area referred to above for the purpose of exercising the rights and privileges herein granted; provided, nevertheless, that the failure of the Grantee to exercise any of the rights or privileges herein granted shall not be construed as a waiver or abandonment of any of the rights and privileges herein granted.

The parties agree that the Grantor may landscape, grow crops, maintain private driveways or private parking areas, and utilize the lands above described for any other lawful purpose

provided that the use of said land by the Grantor shall not, in the reasonable opinion of the Grantee, injure, endanger or render inaccessible the waterlines or associated appurtenances. No building or permanent structure shall be erected by the Grantor on the easement herein granted. That no claim for damages or compensation shall be made by the Grantor, or successors heirs and assigns, on account of or by reason of the construction, operation, maintenance, repair or negligence of the construction, operation, maintenance, repair or improvement of said water and/or sewer lines or its appurtenances, or any accident or mishap that might occur therein or thereto.

The Grantee further covenants and agrees that upon the completion of any installation, maintenance, repair, removal, or other work performed by Grantor upon the property described herein, Grantee shall restore, repair, reconstruct and replace, at the Grantees sole cost and expense, any portion thereof affected by Grantee's activities including landscaping, to substantially the same condition as before said work was performed by Grantee. Except in the case of emergency, Grantee shall use reasonable efforts to minimize any disturbance.

The Grantor, with approval from Grantee, shall have the option to relocate the access easement for future development at no cost to Grantee but only if the 50' South Carolina Public Service Authority Access and Utility Easement is relocated. Said relocation will run concurrent with the relocation of the 50' South Carolina Public Service Authority Access and Utility Easement.

Grantor also grants access rights to Horry County, a Body Politic (hereinafter "Horry County") to permit vehicular access over the Access and Utility Easement to access land used by Horry County as a wetland mitigation bank (the "Horry County Parcel") located generally to the north of the Property. This easement shall be limited in its use to providing access solely for equipment needed to further the forest management activities generally associated with mitigation activities. Horry County anticipates that the Horry County Parcel will be subsequently transferred to the South Carolina Department of Natural Resources ("SCDNR") and incorporated into the Heritage Trust Program and that SCDNR would need the same limited access and uses after the conveyance. Horry County's rights are limited to the access and use for the Horry County Parcel as stated hereinabove. The Grantor, Grantee and Horry County acknowledge that other than Grantee herein and Horry County/SCDNR, no other third party shall receive the benefit of the Access and Utility Easement without the express written consent of the Grantor.

The Grantor herein by these presents, warrants and covenants that there are no liens, mortgages, or other encumbrances affecting or pertaining to the easement herein granted, and that the Grantor is empowered and vested with authority to enter into and execute the within easement.

TOGETHER, with all and singular, the rights, members, hereditaments and appurtenances to the said premises belonging, or in any wise incident or appertaining.

The Grantor agrees that all lines and appurtenances placed on, under, or across the within conveyed Easement shall be and remain the property of the Grantee.

TO HAVE AND TO HOLD all and singular the premises before mentioned for the purposes granted into the said Grand Strand Water and Sewer Authority, its successors and assigns forever.

And the said Grantor herein bind themselves, their heirs, successors and assigns to warrant and forever defend all and singular the said premises for the purposes granted unto the said Grand Strand Water and Sewer Authority, its successors and assigns, against itself, himself, herself, or themselves (as the case may be) and its, his, her or their heirs, successors, and assigns, and all persons whomsoever lawfully claiming.

[signature on next page]

IN WITNESS WHEREOF, the hand and seal of the Grantor herein has hereunto been set this 9th day of December, 2020.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

1ST WITNESS SIGNS HERE
Printed Name: Sandra Wells

NOTARY SIGNS HERE AS 2ND WITNESS
Printed Name: Linda E Evans

LANDBANK FUND VII LLC

By: LandBank Resource Management II, LLC, Manager

By: Debra J. Walters
Debra J. Walters, Chairperson

****

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACKNOWLEDGMENT

I, the undersigned Notary Public do hereby certify that Debra J. Walters as Chairperson for Landbank Resource Management II, LLC, as Manager for Landbank Fund VII LLC, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

WITNESS my hand and official stamp or seal this 9 day of December, 2020.

Notary Public for South Carolina
My commission expires: 2-18-23
Linda E. Evans

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

AFFIDAVIT FOR TAXABLE OR EXEMPT TRANSFERS

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located at/known as: **Access & Utility Easement** (bearing County Tax Map Number **PORTION OF 396-00-00-0001**, was transferred by **Landbank Fund VII LLC** to **Grand Strand Water and Sewer Authority** on December 9th, 2020.

3. Check one of the following: The deed is

(a) ☐ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ☐ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ☑ exempt from the deed recording fee because (See Information section of affidavit):

*2 #~~15 transferring realty to a public service utility company~~

(If exempt, please skip items 4 - 7, and go to item 8 of this affidavit.)
If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):

(a) ☐ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.

(b) ☐ The fee is computed on the fair market value of the realty which is

(c) ☐ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____

5. Check Yes_____ or No __X__ to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____

6. The deed recording fee is computed as follows:

(a) Place the amount listed in item 4 above here: $0.

(b) Place the amount listed in item 5 above here: $0.

(If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $0.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $0.

8. As required by Code Section 12-24-70, I state that I am a responsible person who was Grantor.

9. I understand that a person required to furnish this affidavit who wilfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

Responsible Person Connected with the Transaction:

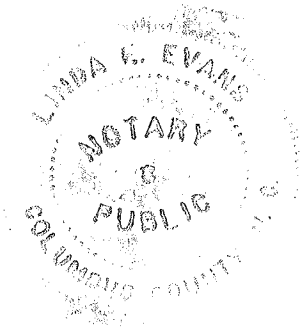
LANDBANK FUND VII LLC

By: Landbank Resource Management II, LLC, Manager

By: _____
Debra J. Walters, Chairperson

SWORN to before me this
9 day of December, 2020.

_____
Notary Public for South Carolina
My commission expires: 2-18-25
LINDA E. EVANS



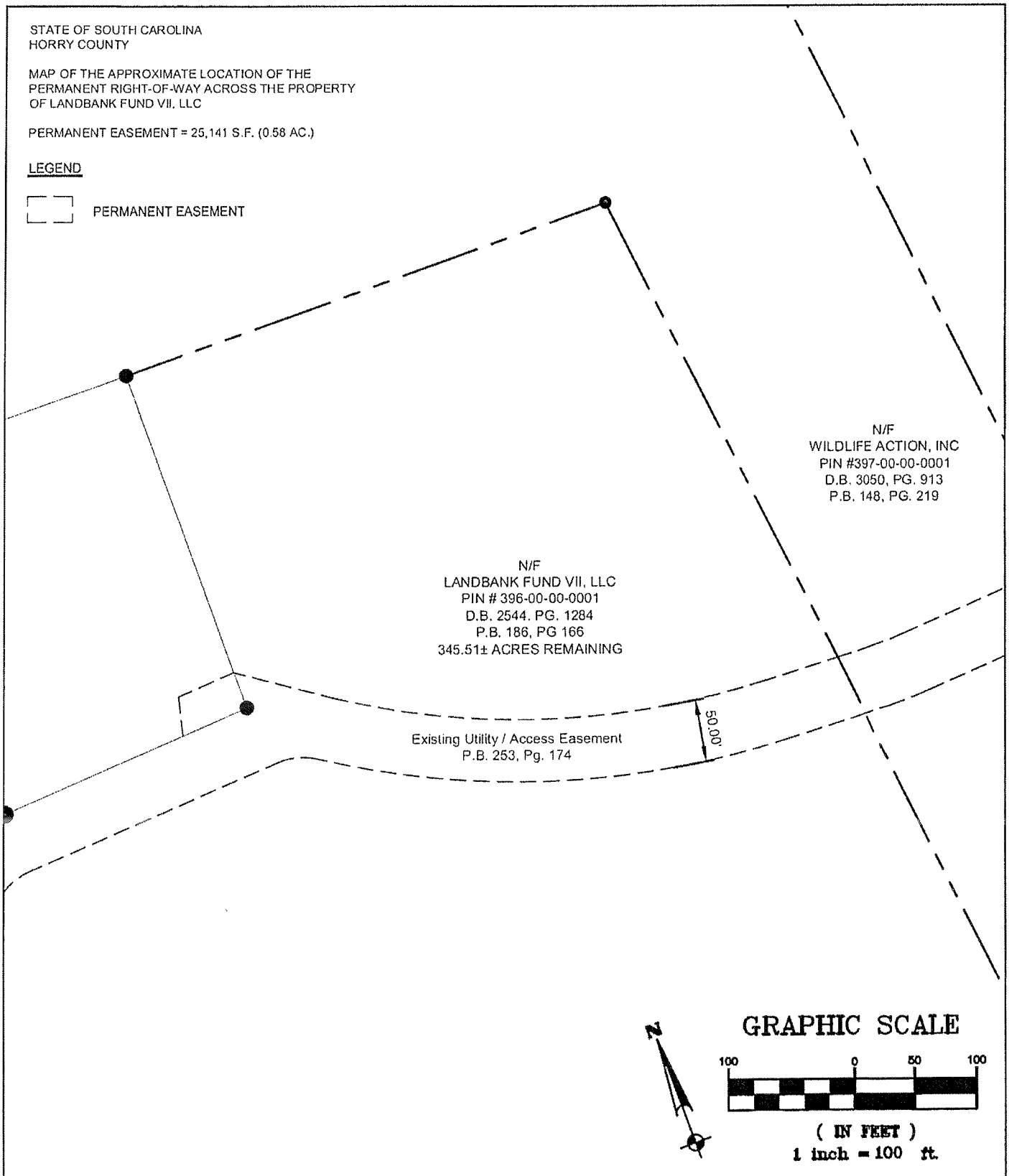
STATE OF SOUTH CAROLINA
HORRY COUNTY

MAP OF THE APPROXIMATE LOCATION OF THE
PERMANENT RIGHT-OF-WAY ACROSS THE PROPERTY
OF LANDBANK FUND VII, LLC

PERMANENT EASEMENT = 25,141 S.F. (0.58 AC.)

LEGEND

PERMANENT EASEMENT



INTERNATIONAL DRIVE BOOSTER
PUMP STATION
GRAND STRAND WATER & SEWER AUTHORITY

EASEMENT EXHIBIT
OWNER LANDBANK FUND VII, LLC
TAX ID NO.:396-00-00-0001

EXHIBIT: 3

GMC # CGRE190054
DATE: 4/1/2020
DRAWN BY: TNM

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC

Deed BK: 4370 PG: 2838 Doctype: 062
12/11/2020 at 10:12:34 AM, 1 OF 6
EXEMPT
Marion D. Foxworth III
HORRY COUNTY, SC REGISTRAR OF DEEDS

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

UTILITY EASEMENT
Portion of PIN # 386-00-00-0001

KNOW ALL MEN BY THESE PRESENTS, that **HORRY COUNTY, a Body Politic**, owner of the land hereinafter described (Grantor), for and in consideration of payment of Five Dollars and no/100 ($5.00) Dollars to me in hand paid (the receipt whereof is hereby acknowledged) by the **Grand Strand Water and Sewer Authority**, PO Box 2368, Conway SC 29528-2368 (Grantee), a body politic under and pursuant to the laws of the State of South Carolina exempt from affidavit under Section 12-24-40(2) and payment for documentary stamps to be affixed hereon by reason of Section 12-21-380, Code of Laws of South Carolina, as amended, do hereby grant, bargain, sell and convey unto the said **Grand Strand Water and Sewer Authority**, its successors and assigns, an easement in, over and across the following described property, to wit:

ALL AND SINGULAR, that certain non-exclusive, permanent, perpetual and appurtenant easement described as follows:

> That utility easement for purposes of installation/construction, maintenance and operation of pipelines at a minimum of 60' in width on, over, under and across a portion of the Grantor's property containing 0.31 A.C. ± (13,500 S.F.), as more fully shown on Exhibit "4" attached hereto and made a part and parcel hereof, hereinafter referred to as the "Utility Easement".

The easement herein granted include, but is not necessarily limited to, the right and privilege of the Grantee, its successors and assigns, to construct, access, maintain, operate and repair any and all useful, proper and necessary facilities and appurtenances for the purpose of conveying, pumping, and supplying water and to make such changes, renewals, substitutions, replacements and additions of or to the same from time to time as the said Grantee may deem desirable; the right at all times to cut and keep clear of said easement of any obstructions that might, in the opinion of the Grantee, endanger or injure the said utility facilities or their appurtenances, or interfere with their proper operation or maintenance; the right of reasonable ingress and egress in, to, over and across the areas referred to above for the purpose of exercising the rights and privileges herein granted; provided, nevertheless, that the failure of the Grantee to exercise any of the rights or privileges herein granted shall not be construed as a waiver or abandonment of any of the rights and privileges herein granted.

The parties agree that the Grantor may landscape, grow crops, maintain private driveways or private parking areas, and utilize the lands above described for any other lawful purpose provided that the use of said land by the Grantor shall not, in the opinion of the Grantee, injure, endanger or render inaccessible the waterlines or associated appurtenances. No building or structure shall be erected by the Grantor on the easement herein granted. That no claim for damages or compensation shall be made by the Grantor, or their heirs and assigns, on account of

or by reason of the construction, operation, maintenance, repair or negligence of the construction, operation, maintenance, repair or improvement of said water and/or sewer lines or its appurtenances, or any accident or mishap that might occur therein or thereto.

The Grantee further covenants and agrees that upon the completion of any installation, maintenance, repair, removal, or other work performed by Grantor upon the property described herein, Grantee shall restore, repair, reconstruct and replace, at the Grantees sole cost and expense, any portion thereof affected by Grantee's activities including landscaping, to substantially the same condition as before said work was performed by Grantee. Except in the case of emergency, Grantee shall use reasonable efforts to minimize any disturbance.

The Grantor herein by these presents, warrants and covenants that there are no liens, mortgages, or other encumbrances affecting or pertaining to the easement herein granted, and that the Grantor is empowered and vested with authority to enter into and execute the within easement.

This being a portion of the property conveyed to Grantor by deed of Riverstone Properties, LLC, a Virginia limited liability company successor by merger of Riverstone Properties II, LLC, a Virginia limited liability company dated January 29, 2018 and recorded January 31, 2018 in Deed Book 4078, at page 3217, Office of the Register of Deeds for Horry County, South Carolina.

The payment and privileges above specified are hereby accepted by the Grantors in full settlement of all claims and damages of whatever nature for said grant of the easement hereinabove described.

TOGETHER, with all and singular, the rights, members, hereditaments and appurtenances to the said premises belonging, or in any wise incident or appertaining.

The Grantor agrees that all lines and appurtenances placed on, under, or across the within conveyed Easement shall be and remain the property of the Grantee.

TO HAVE AND TO HOLD all and singular the premises before mentioned for the purposes granted into the said Grand Strand Water and Sewer Authority, its successors and assigns forever.

And the said Grantor herein bind themselves, their heirs, successors and assigns to warrant and forever defend all and singular the said premises for the purposes granted unto the said Grand Strand Water and Sewer Authority, its successors and assigns, against itself, himself, herself, or themselves (as the case may be) and its, his, her or their heirs, successors, and assigns, and all persons whomsoever lawfully claiming.

IN WITNESS WHEREOF, the hand and seal of the Grantor herein has hereunto been set this 30 day of October, 2020.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

1ST WITNESS SIGNS HERE
Printed Name: H. Randolph Halde

NOTARY SIGNS HERE AS 2ND WITNESS
Printed Name: Gina Livingston

HORRY COUNTY, a Body Politic

By:
Printed Name: Steven S. Gosnell
Its: Administrator

****

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACKNOWLEDGMENT

I, the undersigned Notary Public do hereby certify that Steven S. Gosnell as Administrator of Horry County, a Body Politic, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

WITNESS my hand and official stamp or seal this 30TH day of October, 2020.

Notary Public for South Carolina
My commission expires: 1-11-29
Gina Livingston

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

AFFIDAVIT FOR TAXABLE OR EXEMPT TRANSFERS

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located at/known as: **Access & Utility Easement** (bearing County Tax Map Number **PORTION OF 386-00-00-0001**, was transferred by **Horry County, a Body Politic.** to **Grand Strand Water and Sewer Authority** on December 10, 2020.

3. Check one of the following: The deed is

(a) ☐ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ☐ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ☑ exempt from the deed recording fee because (See Information section of affidavit):
~~#15~~ #2# ~~**15 transferring realty to a public service utility company**~~

(If exempt, please skip items 4 - 7, and go to item 8 of this affidavit.)
If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):

(a) ☐ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.

(b) ☐ The fee is computed on the fair market value of the realty which is

(c) ☐ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____

5. Check Yes_____ or No **X** to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____

6. The deed recording fee is computed as follows:

(a) Place the amount listed in item 4 above here: $0.

(b) Place the amount listed in item 5 above here: $0.

(If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $0.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $0.

8. As required by Code Section 12-24-70, I state that I am a responsible person who was Grantor.

9. I understand that a person required to furnish this affidavit who wilfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

Responsible Person Connected with the Transaction:

HORRY COUNTY, a Body Politic

By: _____

Printed Name: STEVEN S. GOSNELL

Its: ADMINISTRATOR

SWORN to before me this
30 day of October, 2020.

Gina Livingston
Notary Public for South Carolina
My commission expires: 1-11-29

GINA LIVINGSTON

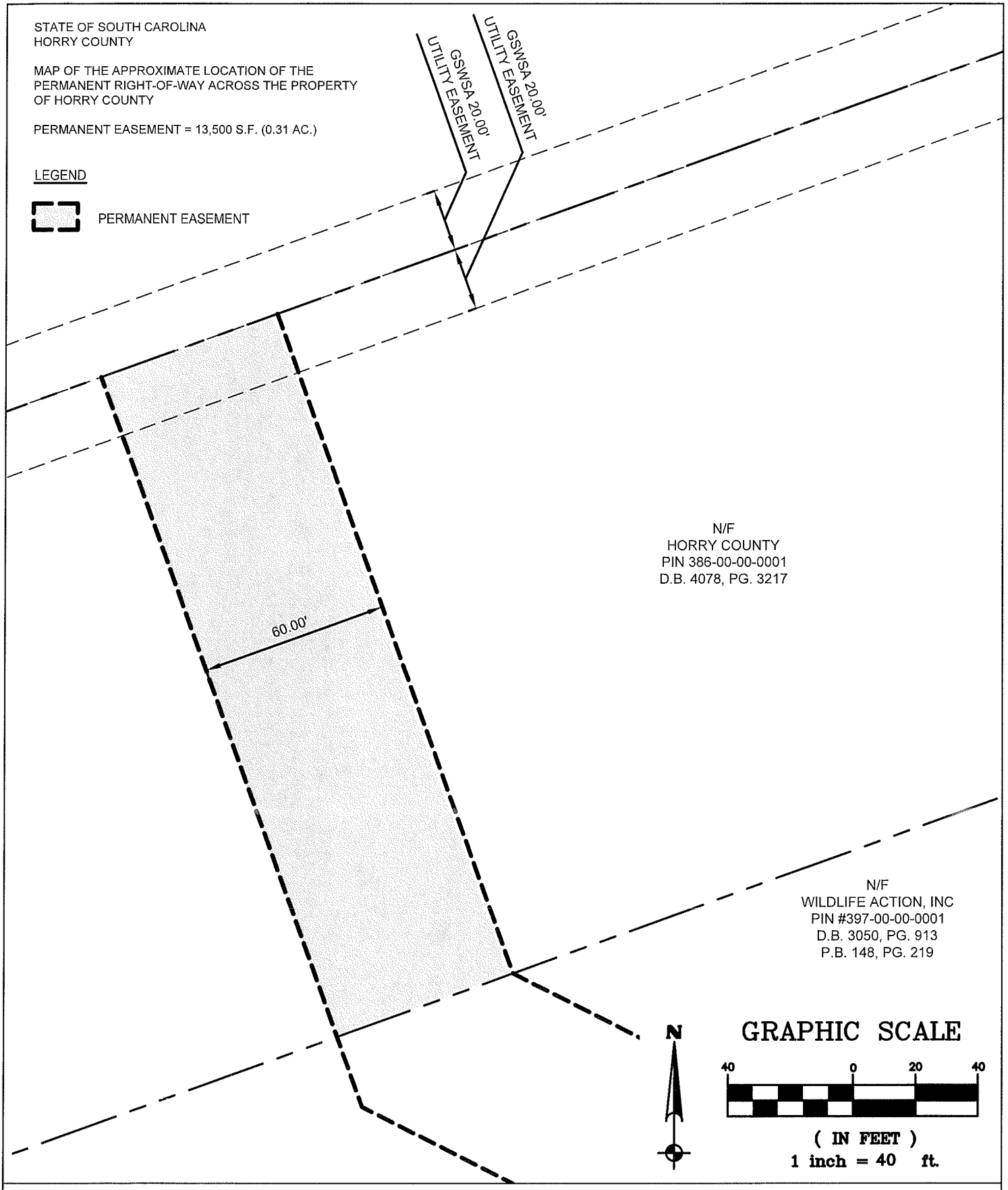
STATE OF SOUTH CAROLINA
HORRY COUNTY

MAP OF THE APPROXIMATE LOCATION OF THE PERMANENT RIGHT-OF-WAY ACROSS THE PROPERTY OF HORRY COUNTY

PERMANENT EASEMENT = 13,500 S.F. (0.31 AC.)

LEGEND

PERMANENT EASEMENT



INTERNATIONAL DRIVE BOOSTER PUMP STATION
GRAND STRAND WATER & SEWER AUTHORITY

EASEMENT EXHIBIT
OWNER: HORRY COUNTY
TAX ID NO.:386-00-00-0001

EXHIBIT: 4

GMC # CGRE190054
DATE: 4/1/2020
DRAWN BY: TNM

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC

Deed BK: 4370 PG: 2844 Doctype: 062
12/11/2020 at 10:12:35 AM, 1 OF 7
EXEMPT
Marion D. Foxworth III
HORRY COUNTY, SC REGISTRAR OF DEEDS

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACCESS AND UTILITY EASEMENT
Portion of PIN # 397-00-00-0001

KNOW ALL MEN BY THESE PRESENTS, that **WILDLIFE ACTION, INC.**, owner of the land hereinafter described (Grantor), for and in consideration of payment of Two Thousand ($2,000.00) and no/100 Dollars to me in hand paid (the receipt whereof is hereby acknowledged) by the **Grand Strand Water and Sewer Authority**, PO Box 2368, Conway SC 29528-2368 (Grantee), a body politic under and pursuant to the laws of the State of South Carolina exempt from affidavit under Section 12-24-40(2) and payment for documentary stamps to be affixed hereon by reason of Section 12-21-380, Code of Laws of South Carolina, as amended, do hereby grant, bargain, sell and convey unto the said **Grand Strand Water and Sewer Authority**, its successors and assigns, an easement in, over and across the following described property, to wit:

ALL AND SINGULAR, those certain non-exclusive, permanent, perpetual and appurtenant easements described as follows:

1. That access and utility easement for purposes of installation/construction, maintenance and operation of pipelines and ingress and egress for pedestrian and vehicular traffic at a minimum of 50' in width on, over, under and across a portion of the Grantor's property containing 0.23 A.C. ± (10,070 S.F.) as more fully shown on Exhibit "2A", hereinafter referred to as the "Access and Utility Easement" and also running concurrent with the Existing 50' Existing Utility/Access Easement of South Carolina Public Service Authority; and

2. That utility easement for purposes of installation/construction, maintenance and operation of pipelines at a minimum of 60' in width on, over, under and across a portion of the Grantor's property containing 0.37 A.C. ± (16,223 S.F.), as more fully shown on Exhibit "2B", hereinafter referred to as the "Utility Easement"

The easements herein granted include, but are not necessarily limited to, the right and privilege of the Grantee, its successors and assigns, to construct, access, maintain, operate and repair any and all useful, proper and necessary facilities and appurtenances for the purpose of conveying, pumping, and supplying potable water and to make such changes, renewals, substitutions, replacements and additions of or to the same from time to time as the said Grantee may deem desirable; the right at all times to cut and keep clear of said easements of any obstructions that might, in the opinion of the Grantee, endanger or injure the said utility facilities or their appurtenances, or interfere with their proper operation or maintenance; the right of reasonable ingress and egress in, to, over and across the roads referred to above for the purpose of exercising the rights and privileges herein granted; provided, nevertheless, that the failure of

the Grantee to exercise any of the rights or privileges herein granted shall not be construed as a waiver or abandonment of any of the rights and privileges herein granted.

The parties agree that the Grantor may landscape, grow crops, maintain private driveways or private parking areas, and utilize the lands above described for any other lawful purpose provided that the use of said land by the Grantor shall not, in the opinion of the Grantee, injure, endanger or render inaccessible the waterlines or associated appurtenances. No building or structure shall be erected by the Grantor on the easement herein granted. That no claim for damages or compensation shall be made by the Grantor, or their heirs and assigns, on account of or by reason of the construction, operation, maintenance, repair or negligence of the construction, operation, maintenance, repair or improvement of said water and/or sewer lines or its appurtenances, or any accident or mishap that might occur therein or thereto.

The Grantee further covenants and agrees that upon the completion of any installation, maintenance, repair, removal, or other work performed by Grantor upon the property described herein, Grantee shall restore, repair, reconstruct and replace, at the Grantees sole cost and expense, any portion thereof affected by Grantee's activities including landscaping, to substantially the same condition as before said work was performed by Grantee. Except in the case of emergency, Grantee shall use reasonable efforts to minimize any disturbance.

Grantor also grants access rights to Horry County, a body politic (hereinafter "Horry County") to permit vehicular access over the Access and Utility Easement to access land used by Horry County as a wetland mitigation bank (the "Horry County Parcel") located generally to the north of the Property. This easement shall be limited in its use to providing access for equipment needed to further the forest management activities generally associated with mitigation activities. Horry County anticipates that the Horry County Parcel will be subsequently transferred to the South Carolina Department of Natural Resources ("SCDNR") and incorporated into the Heritage Trust Program and that SCDNR would need the same limited access and uses after the conveyance. Horry County's rights are limited to the access and use for the Horry County Parcel as stated hereinabove. The Grantor, Grantee and Horry County acknowledge that other than Grantee herein and Horry County/SCDNR, no other third party shall receive the benefit of the Access and Utility Easement without the express written consent of the Grantor.

The Grantor herein by these presents, warrants and covenants that there are no liens, mortgages, or other encumbrances affecting or pertaining to the easement herein granted, and that the Grantor is empowered and vested with authority to enter into and execute the within easement.

This being a portion of the property conveyed to Grantor by deed of International Paper Realty Corporation dated February 6, 2006 and recorded February 16, 2006 in Deed Book 3050, at page 913, Office of the Register of Deeds for Horry County, South Carolina.

The payment and privileges above specified are hereby accepted by the Grantors in full settlement of all claims and damages of whatever nature for said grant of the easement hereinabove described.

TOGETHER, with all and singular, the rights, members, hereditaments and appurtenances to the said premises belonging, or in any wise incident or appertaining.

The Grantor agrees that all lines and appurtenances placed on, under, or across the within conveyed Easement shall be and remain the property of the Grantee.

TO HAVE AND TO HOLD all and singular the premises before mentioned for the purposes granted into the said Grand Strand Water and Sewer Authority, its successors and assigns forever.

And the said Grantor herein bind themselves, their heirs, successors and assigns to warrant and forever defend all and singular the said premises for the purposes granted unto the said Grand Strand Water and Sewer Authority, its successors and assigns, against itself, himself, herself, or themselves (as the case may be) and its, his, her or their heirs, successors, and assigns, and all persons whomsoever lawfully claiming.

IN WITNESS WHEREOF, the hand and seal of the Grantor herein has hereunto been set this 2nd day of September, 2020.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

1ST WITNESS SIGNS HERE
Printed Name: Thomas G. Meridith II

NOTARY SIGNS HERE AS 2ND WITNESS
Printed Name: Tina L Barnhill

WILDLIFE ACTION, INC.

By: _____
Printed Name: T Rivers Anderson
Its: President

****

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACKNOWLEDGMENT

I, the undersigned Notary Public do hereby certify that T Rivers Anderson as President of Wildlife Action, Inc. personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

WITNESS my hand and official stamp or seal this 2nd day of September, 2020.

Notary Public for South Carolina
My commission expires: 7-30-29
TINA L. BARNhill

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

AFFIDAVIT FOR TAXABLE OR EXEMPT TRANSFERS

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located at/known as: **Access & Utility Easement** (bearing County Tax Map Number **PORTION OF 397-00-00-0001**, was transferred by **Wildlife Action, Inc.** to **Grand Strand Water and Sewer Authority** on December 10, 2020.

3. Check one of the following: The deed is

(a) ☐ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ☐ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ☑ exempt from the deed recording fee because (See Information section of affidavit):

#2 ~~#1 transferring realty to a public service utility company~~

(If exempt, please skip items 4 - 7, and go to item 8 of this affidavit.)
If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):

(a) ☐ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.

(b) ☐ The fee is computed on the fair market value of the realty which is

(c) ☐ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____

5. Check Yes_____ or No __X__ to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____

6. The deed recording fee is computed as follows:

(a) Place the amount listed in item 4 above here: $0.

(b) Place the amount listed in item 5 above here: $0.

(If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $0.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $0.

8. As required by Code Section 12-24-70, I state that I am a responsible person who was Grantor.

9. I understand that a person required to furnish this affidavit who wilfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

Responsible Person Connected with the Transaction:

WILDLIFE ACTION, INC.

By: _____

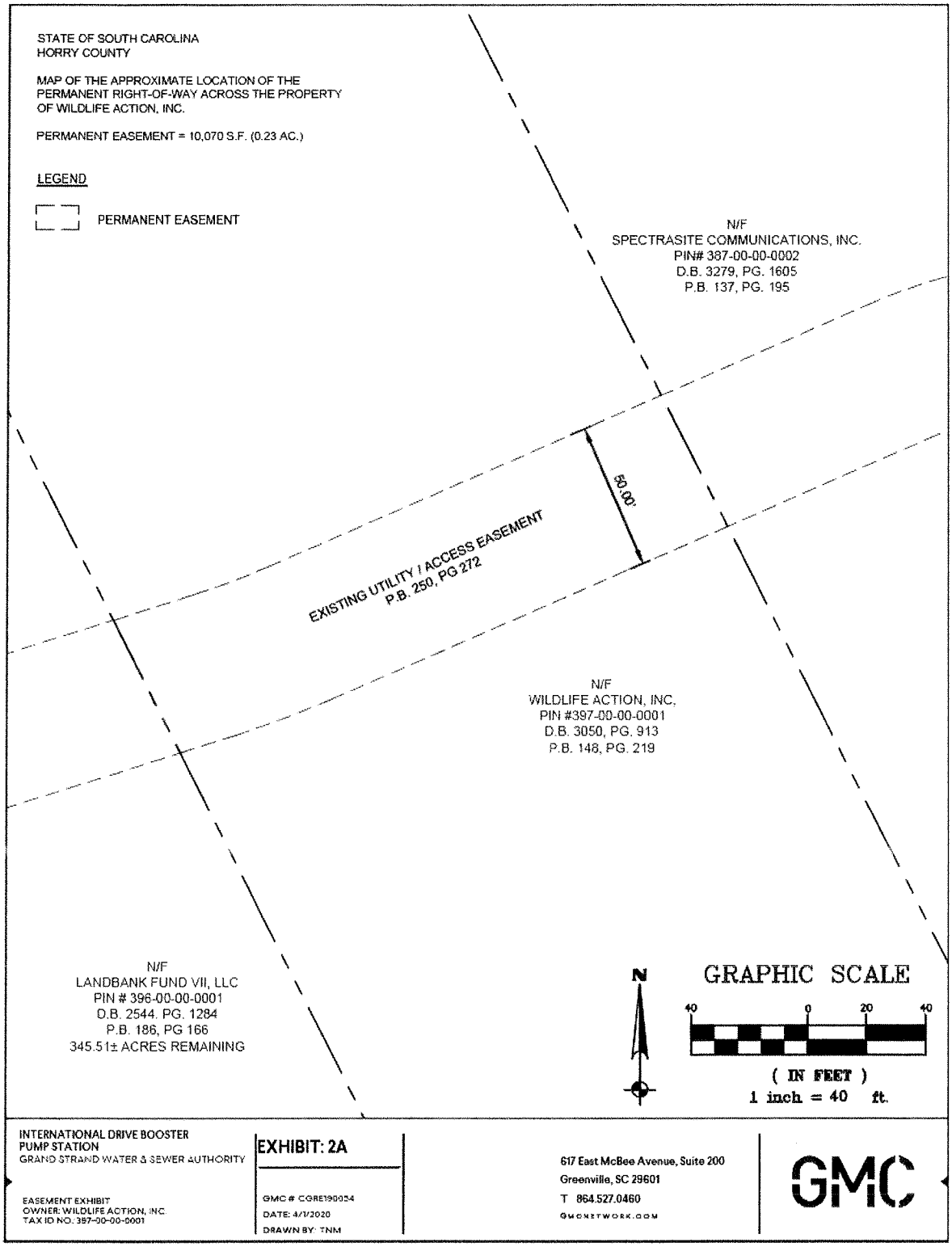
Printed Name: T Rivers Anderson

Its: President

SWORN to before me this
2nd day of September, 2020.

_____
Notary Public for South Carolina
My commission expires: 7-30-29

Tina L. Barnhill


STATE OF SOUTH CAROLINA
HORRY COUNTY
MAP OF THE APPROXIMATE LOCATION OF THE PERMANENT RIGHT-OF-WAY ACROSS THE PROPERTY OF WILDLIFE ACTION, INC.
PERMANENT EASEMENT = 10,070 S.F. (0.23 AC.)
LEGEND
PERMANENT EASEMENT
N/F
SPECTRASITE COMMUNICATIONS, INC.
PIN# 387-00-00-0002
D.B. 3279, PG. 1605
P.B. 137, PG. 195
50.00'
EXISTING UTILITY / ACCESS EASEMENT
P.B. 250, PG 272
N/F
WILDLIFE ACTION, INC.
PIN #397-00-00-0001
D.B. 3050, PG. 913
P.B. 148, PG. 219
N/F
LANDBANK FUND VII, LLC
PIN # 396-00-00-0001
D.B. 2544, PG. 1284
P.B. 186, PG 166
345.51± ACRES REMAINING
N
GRAPHIC SCALE
40 0 20 40
(IN FEET)
1 inch = 40 ft.
INTERNATIONAL DRIVE BOOSTER PUMP STATION
GRAND STRAND WATER & SEWER AUTHORITY
EASEMENT EXHIBIT
OWNER: WILDLIFE ACTION, INC
TAX ID NO. 387-00-00-0001
EXHIBIT: 2A
GMC # CGRE190054
DATE: 4/1/2020
DRAWN BY: TNM
617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM
GMC

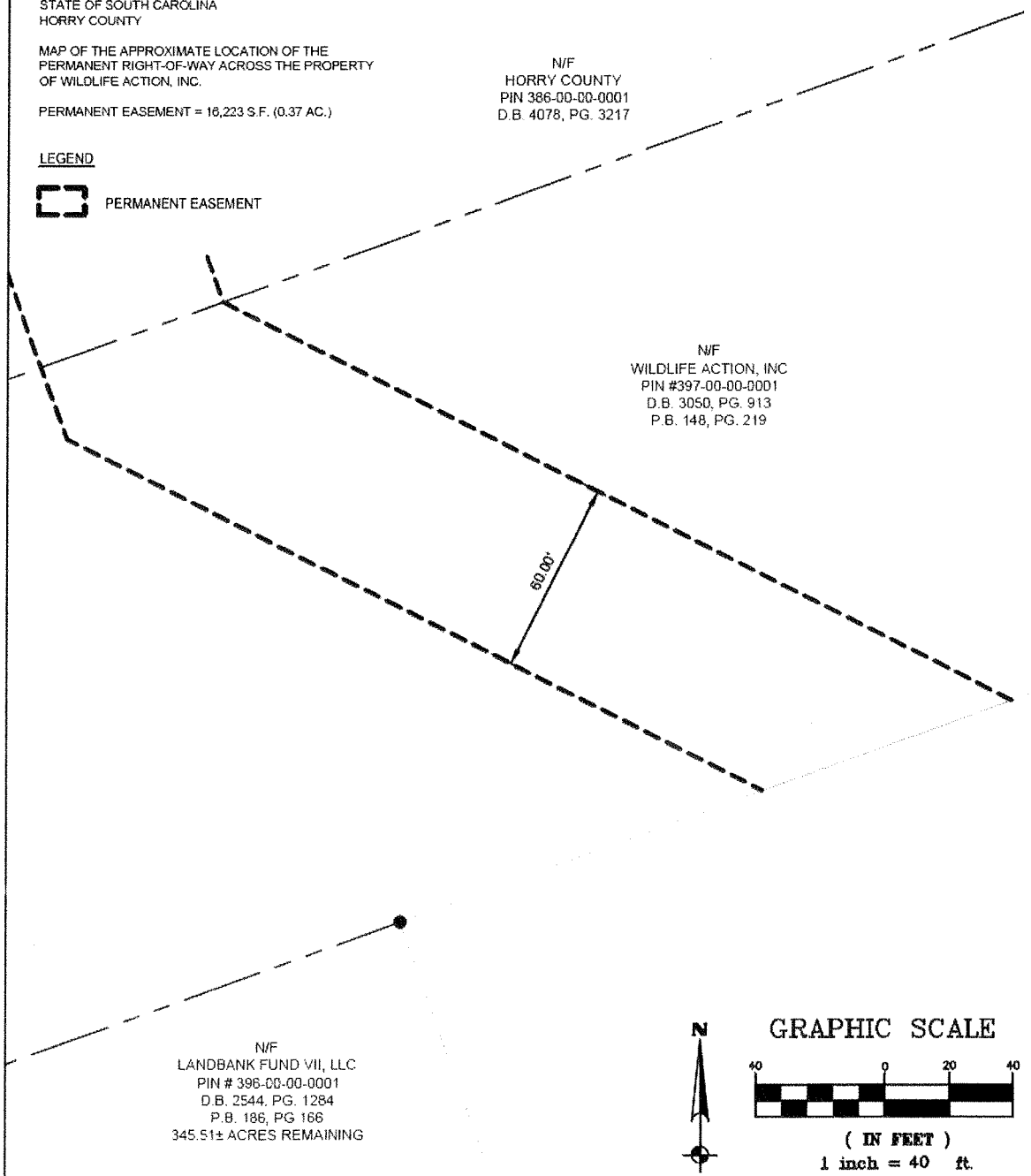
STATE OF SOUTH CAROLINA
HORRY COUNTY

MAP OF THE APPROXIMATE LOCATION OF THE PERMANENT RIGHT-OF-WAY ACROSS THE PROPERTY OF WILDLIFE ACTION, INC.

PERMANENT EASEMENT = 16,223 S.F. (0.37 AC.)

LEGEND

PERMANENT EASEMENT



INTERNATIONAL DRIVE BOOSTER PUMP STATION
GRAND STRAND WATER & SEWER AUTHORITY

EASEMENT EXHIBIT
OWNER: WILDLIFE ACTION, INC.
TAX ID NO. 397-00-00-0001

EXHIBIT: 2B

GMC # CGRE190054
DATE: 4/1/2020
DRAWN BY: TNM

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC

Deed BK: 4375 PG: 2617 Doctype: 062
12/29/2020 at 01:03:19 PM, 1 OF 7
EXEMPT
Marion D. Foxworth III
HORRY COUNTY, SC REGISTRAR OF DEEDS

STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

ACCESS AND UTILITY EASEMENT
Portion of PIN # 387-00-00-0002

KNOW ALL MEN BY THESE PRESENTS, **American Tower Asset Sub, LLC** (**"*Grantor*"**), owner of the land hereinafter described, for and in exchange of good and valuable consideration, the delivery of which is hereby acknowledged by the **Grand Strand Water and Sewer Authority** (**"*Grantee*"**), a body politic under and pursuant to the laws of the State of South Carolina with a mailing address of PO Box 2368, Conway SC 29528-2368, does hereby grant, bargain, sell and convey unto Grantee, subject to the covenants and conditions hereinafter set forth, an easement in, over and across the following described property, to wit:

ALL AND SINGULAR, that certain non-exclusive, permanent, perpetual and appurtenant easement described as follows:

> An easement for purposes of installing/constructing, maintaining, repairing, replacing and operating any and all useful, proper, and necessary underground water pipelines for the purpose of conveying, pumping and supplying potable water (collectively, the "***Utility Use***"), as well as for pedestrian and vehicular ingress and egress to perform the Utility Use (collectively, the "***Access Use***"), on, over, under and across a portion of the Grantor's property described as follows: that certain strip of land approximately fifty feet (50') wide and approximately four hundred thirty-one and 94/100 feet (431.94') long, more or less, all as more particularly depicted on **Exhibit "1"**, attached hereto and incorporated herein by reference, and **specifically EXCEPTING** all land, both above and below ground, surrounding the existing guy wire anchors as delineated and marked by the bollards and chains also depicted on **Exhibit "1"** (the "***Easement Area***"), and being the same strip of land granted by Grantor to the South Carolina Public Service Authority pursuant to that certain Access Road Easement recorded at Deed Book 3485, Page1751, in the Office of the Register of Deeds for Horry County, South Carolina (collectively, the "***Access and Utility Easement***").
>
> This being a portion of the property conveyed to Grantor by that certain Quitclaim Deed from SpectraSite Communications, Inc. dated February 28, 2007, and recorded September 26, 2007, at Deed Book 3279, Page 1563, in the Office of the Register of Deeds for Horry County, South Carolina.
>
> This Access and Utility Easement is limited to the property owned by Grantor herein, and does not include any property not owned by Grantor, whether or not any such property is included in the description and/or depiction on **Exhibit "1"**.

This Access and Utility Easement also grants to Grantee the right, at all times, to cut and clear any vegetative obstructions within this Access and Utility Easement that might, in the

reasonable opinion of the Grantee, interfere with Grantee's rights hereunder. Failure of Grantee to exercise any of the rights or privileges herein granted shall not be construed as a waiver or abandonment of any of the rights and privileges herein granted.

Grantor shall not build or place any permanent structure on the Access and Utility Easement which would prevent Grantee from accessing said underground water pipelines. Grantor agrees that all said underground water pipelines shall be and remain the property of Grantee. Grantor makes no warranty whatsoever, and the Grantee by its acceptance of this instrument agrees to obtain, at its sole cost and expense, all permits, approvals, licenses, conveyances, releases, easements and authorizations from any and all state, federal and/or local governmental agencies, and from any and all third parties, which may be necessary or advisable for the Utility Use and/or the Access Use.

Grantee covenants and agrees that the Easement Area shall be permanently open and accessible to Grantor, its successors, assigns, lessees and licensees, at all times, including but not limited to twenty-four hours a day, seven days a week, for pedestrian and vehicular access.

Grantee further covenants and agrees that upon the completion of any work and/or activities related to Utility Use, Grantee shall fully restore, repair, reconstruct and replace, at Grantee's sole cost and expense, any and all portions of the Easement Area affected by same, including but not limited to landscaping and road repairs, to substantially the same condition as before said work and/or activities was/were performed by Grantee. Except in the case of emergency, Grantee shall use reasonable efforts to minimize any disturbance to the Easement Area.

TO HAVE AND TO HOLD, all and singular, the aforesaid Access and Utility Easement unto the Grantee, subject to the foregoing exceptions, provisions and reservations, and to the following conditions and covenants to the full performance of which Grantee binds itself, and which covenants and conditions shall run with said Access and Utility Easement in perpetuity.

(1) Grantee agrees that no use of the Access and Utility Easement shall be such as to endanger health, create a nuisance, interfere with or otherwise be incompatible with the current and future use of the property, including but not limited to the property's use as a communications site.

(2) Grantee shall take adequate precautions and provide adequate protection for all guy wires and anchors, both above and below ground, located adjacent to the Access and Utility Easement prior to and during the performance of any and all Utility Use and/or Access Use.

(3) Grantee agrees not to disturb any markers, electrical/junction boxes, bollards and chains, signs and any other improvements placed within the Access and Utility Easement.

(4) Grantee agrees that it has not been granted any rights hereunder, and Grantor has retained all rights, to the property within said 50' wide strip of land set forth on **Exhibit "1"** surrounding the guy wire anchors as delineated and marked by the bollards and chains depicted on **Exhibit "1"**.

IN WITNESS WHEREOF, the hand and seal of the Grantor herein has hereunto been set as of the day and year set forth below.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

1ST WITNESS SIGNS HERE
Printed Name: Michael D'Pietro

NOTARY SIGNS HERE AS 2ND WITNESS
Printed Name: Sarah Kmieciak

AMERICAN TOWER ASSET SUB, LLC

By: Jennifer Bernazani-Ludlum
Printed Name: **Jennifer Bernazani-Ludlum**
Its: **Senior Counsel**

****

COMMONWEALTH OF MASSACHUSETTS)
) **ACKNOWLEDGMENT**
COUNTY OF MIDDLESEX)

I, the undersigned Notary Public do hereby certify that Jennifer Bernazani-Ludlum as Senior Counsel of American Tower Asset Sub, LLC personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

WITNESS my hand and official stamp or seal this 18 day of December, 2020.

Notary Public
My commission expires: 12/25/2020

SARAH KMIECIAK
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
December 25, 2020

Exhibit "1"

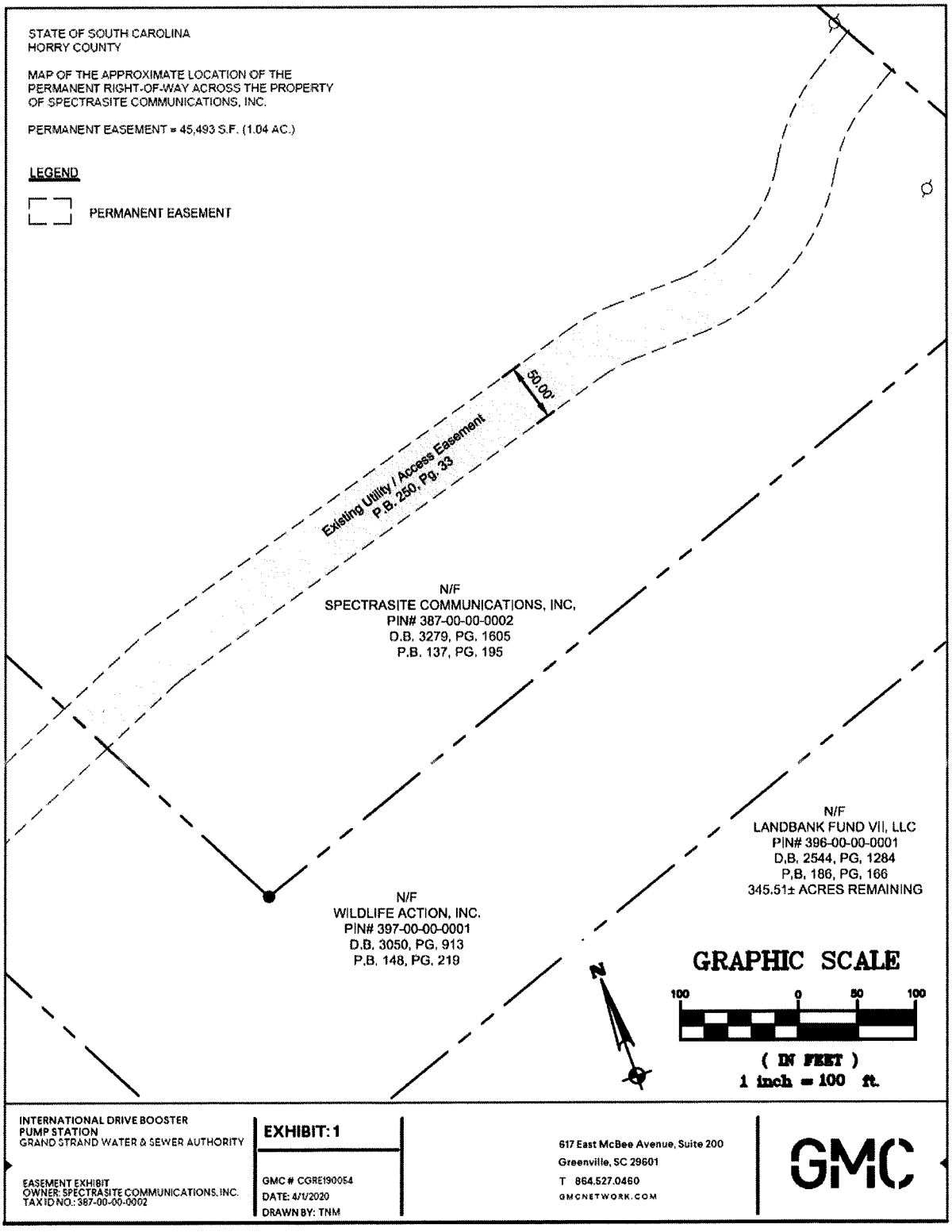
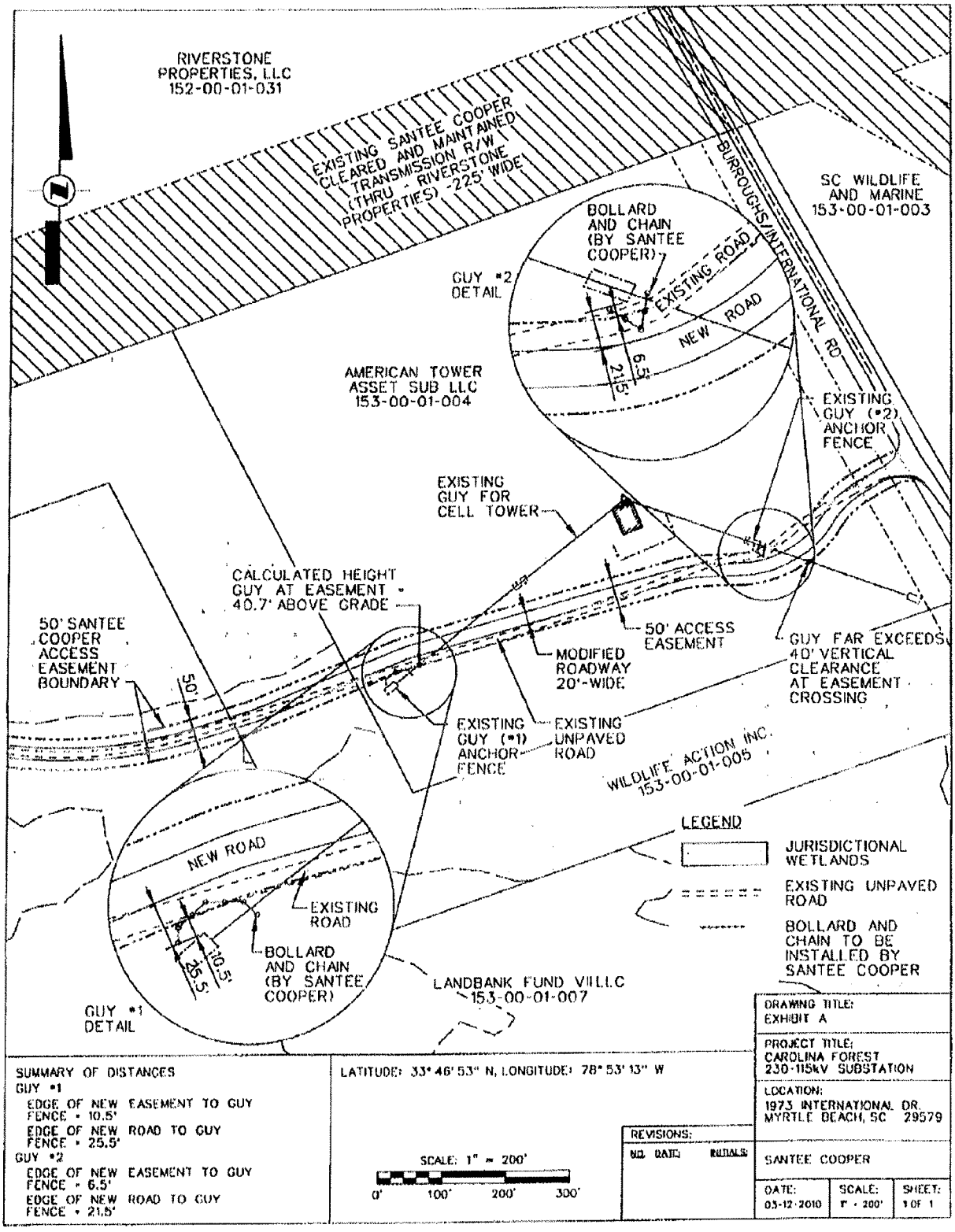

STATE OF SOUTH CAROLINA
HORRY COUNTY
MAP OF THE APPROXIMATE LOCATION OF THE PERMANENT RIGHT-OF-WAY ACROSS THE PROPERTY OF SPECTRASITE COMMUNICATIONS, INC.
PERMANENT EASEMENT = 45,493 S.F. (1.04 AC.)
LEGEND
PERMANENT EASEMENT
50.00'
Existing Utility / Access Easement
P.B. 250, Pg. 33
N/F
SPECTRASITE COMMUNICATIONS, INC,
PIN# 387-00-00-0002
D.B. 3279, PG. 1605
P.B. 137, PG. 195
N/F
LANDBANK FUND VII, LLC
PIN# 396-00-00-0001
D,B, 2544, PG, 1284
P,B, 186, PG, 166
345.51± ACRES REMAINING
N/F
WILDLIFE ACTION, INC.
PIN# 397-00-00-0001
D.B. 3050, PG. 913
P.B. 148, PG. 219
N
GRAPHIC SCALE
100 0 50 100
(IN FEET)
1 inch = 100 ft.
INTERNATIONAL DRIVE BOOSTER PUMP STATION
GRAND STRAND WATER & SEWER AUTHORITY
EASEMENT EXHIBIT
OWNER: SPECTRASITE COMMUNICATIONS, INC.
TAX ID NO.: 387-00-00-0002
EXHIBIT: 1
GMC # CGRE190054
DATE: 4/1/2020
DRAWN BY: TNM
617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM
GMC

Exhibit "1"

(Continued)



STATE OF SOUTH CAROLINA)
)
COUNTY OF HORRY)

AFFIDAVIT FOR TAXABLE OR EXEMPT TRANSFERS

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located at/known as: **Access and Utility Easement** (bearing County Tax Map Number **PORTION OF 387-00-00-0002**, was transferred by **American Tower Asset Sub, LLC** to **Grand Strand Water and Sewer Authority** on December 18, 2020.

3. Check one of the following: The deed is

(a) ☐ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ☐ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ☑ exempt from the deed recording fee because (See Information section of affidavit):

#2 **# ~~15~~ transferring realty to a public service utility company**

(If exempt, please skip items 4 - 7, and go to item 8 of this affidavit.)
If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.): **N/A (exempt)**

(a) ☐ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.

(b) ☐ The fee is computed on the fair market value of the realty which is

(c) ☐ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____

5. Check Yes __ __ or No X _ to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: **N/A (exempt)**

6. The deed recording fee is computed as follows: **N/A (exempt)**

(a) Place the amount listed in item 4 above here: $0.

(b) Place the amount listed in item 5 above here: $0.

(If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $0.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $0. **N/A (exempt)**

8. As required by Code Section 12-24-70, I state that I am a responsible person who was Grantee's counsel.

9. I understand that a person required to furnish this affidavit who wilfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

Responsible Person Connected with the Transaction:

Burr & Forman LLP

By: _____

Printed Name: Bhumi Patel, Attorney

SWORN to before me this
28th day of December, 2020.

_____
Notary Public for South Carolina
My commission expires: April 9, 2029

KIMBERLY D. E. RICH
Notary Public-State of South Carolina
My Commission Expires
April 09, 2029

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

Permits

THIS PAGE INTENTIONALLY LEFT BLANK

Water Supply Construction Permit
Bureau of Water

S.C. Department of Health and Environmental Control

SRF No. 2620004-25

For projects pursuing funding under the State Revolving Fund, the issuance of this construction permit does not relieve the owner of responsibility to fulfill the SRF program requirements. All construction prior to approval of the SRF program requirements may be at risk of being ineligible for SRF funding.

Permission is Hereby Granted To: **GRAND STRAND WATER & SEWER AUTHORITY**
PO BOX 2368
CONWAY SC 29528-2368

for the construction of a distribution system in accordance with the construction plans, specifications, design calculations and the SCDHEC Construction Permit Application signed by Tyler Morgan, Professional Engineer, S.C. Registration Number: 31119.

Project Name: **INTERNATIONAL DRIVE BOOSTER PUMP STATION** **County:** Horry
Location: Intersection of unimproved Access Road & International Drive

Project Description: Construction of a water booster pump station with four (4) 125 horsepower pumps, approximately 1,500 LF of 42-inch PVC suction and discharge water lines that will tie into existing Grand Strand Water & Sewer Authority transmission mains, and associated appurtenances.

Service By: Water will be provided by the Grand Strand Water & Sewer Authority (System Number: 2620004).

Permit Conditions: All products used for water disinfection must be properly registered for use in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Questions related to the FIFRA registration in labeling in South Carolina must be directed to the Department of Pesticide Regulation administered by the Clemson University Office of Regulatory Services.

Special Conditions (see page 2 for continuation of Special Conditions):

1. See attached (to original construction permit) DHEC Office of Ocean and Coastal Resource Management (DHEC-OCRM) certification for additional conditions related to the Coastal Zone Consistency determination.

In accepting this permit, the owner agrees to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

NOTE: This is a permit for construction only and does not constitute State Department of Health and Environmental Control approval, temporary or otherwise, to place the system in operation. No written approval shall be issued to place a drinking water project into operation until approval is obtained to place any associated wastewater project into operation. An Approval to Place in Operation is required and can be obtained following the completion of construction by contacting the MYRTLE BEACH EQC OFFICE at 843-238-4378. Additional permits may be required prior to construction (e.g., stormwater).

Permit Number: **34445-WS**
Date of Issue: **July 31, 2020**
Expiration Date: Construction must be completed and the Approval to Place in Operation granted prior to **July 31, 2023** or this permit will expire.

BSA

Shawn M. Clarke, P.E, Director
Water Facilities Permitting Division

2. US Fish and Wildlife Condition: The project area may be inhabited by the Venus flytrap - an at risk species (*Dionaea muscipula*). The Venus flytrap is a rare plant with the only known location in South Carolina to occurring in the Horry County's Lewis Ocean Bay complex, adjacent to this project. As conservation of the Venus flytrap is of merit, before construction begins, a survey for the Venus flytrap shall be conducted. If the survey finds the Venus flytrap in the area, contact the Charleston Office of the US Fish and Wildlife Service to allow the opportunity to relocate individuals to a protected location.

3. If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials. If archaeological materials are found, contact the SC Department of Archives and History's State Historic Preservation Office in Columbia.

Coastal Zone Consistency Determination

To:	Gagan Brar, BOW Coastal Stormwater Permitting Section
	Melanie A Williams, BOW Construction Permitting Section
From:	Colleen McDonald, OCRM Coastal Zone Consistency Section CPMM
Applicant:	Christy Everett, Grand Strand Water and Sewer Authority
Project Name:	International Drive Booster Pump Station
Finding:	Conditionally Consistent with the SC Coastal Zone Management Program
Site Location:	Intersection of Unimproved Road, off of International Drive, Myrtle Beach, Horry County, South Carolina 29579 (TMS#: 152-00-01-031, 153-00-01-005, and 153-00-01-007)
Reference #:	HP0-3Y2V-9W66H, WS/WW not assigned
Date:	July 16, 2020

The staff of the Office of Ocean and Coastal Resource Management (OCRM) reviewed the above referenced Coastal Zone Consistency project request for land disturbance associated with clearing and grading parcels to construct 2,330 square foot commercial pump station, 810 square foot generator pads, gravel drive, fencing, and associated water and sewer piping. The nearest receiving waterbody is an unnamed tributary of Socastee Swamp located 3,660 feet from the project site. The total area of disturbance will be 2.00 acres of a 2.00 acre project site.

This project is proposing impacts of 0.66 acres of jurisdictional wetlands. These impacts were reviewed and certified under the US Army Corps of Engineers Permit SAC-2020-00569. As compensatory mitigation for these impacts 3.6 credits must be purchased prior to construction.

We hereby certify that the above referenced project is **Conditionally Consistent** with the ***Guidelines for Evaluation of All Projects*** as well as the Public Services and Facilities *(Water Supply),* Activities in Areas of Special Resource Significance *(Public Open Spaces and Wetlands),* and Stormwater Management *(Runoff)* policies contained in the S.C. Coastal Zone Management Program provided the following conditions are included in the permits and adhered to by the applicant.

1. In the event that any historic or cultural resources and/or archaeological materials are found during the course of work, the applicant must notify the State Historic Preservation Office and the South Carolina Institute of Archaeology and Anthropology. Historic or cultural resources consist of those

sites listed in the National Register of Historic Places and those sites that are eligible for the National Register. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials.

2. The project must be consistent with State Stormwater Permitting requirements during and post construction for protection of water quality.

3. All construction BMPs must be installed, inspected and maintained to hold sediment onsite and to protect any adjacent or downstream critical area, wetlands and waters through the life of the project. Upon completion of construction activities, all disturbed (includes undeveloped) areas, including those impacted for access, must be immediately stabilized.

4. The project must be fully consistent with local zoning and comprehensive plans prior to work being conducted.

5. Prior to land disturbance and impacts to jurisdictional wetlands of 0.66 acres, applicant must fully comply with all general, special and regional terms and conditions of the US Army Corps of Engineers Permit (SAC-2020-00569) as well as SCDHEC requirements for Water Quality and Coastal Zone Certifications, including but not limited to those requirements for mitigation of impacts and onsite wetlands to be protected by restrictive covenant, rehabilitation and preserved buffer, must be clearly marked prior to and during all land disturbance activities to prevent encroachment.

This determination shall serve as the SCDHEC OCRM Coastal Zone Consistency Determination for the work described above. However, this determination ***does not*** serve as a Department permitting decision and ***does not*** alleviate the applicant's responsibility to obtain any applicable State or Federal permit(s) for the work. Local government authorizations ***may also*** be required.

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
1949 INDUSTRIAL PARK ROAD, ROOM #140
CONWAY, SOUTH CAROLINA 29526

May 15, 2020

Regulatory Division

Ms. Christy Everett
Grand Strand Water and Sewer Authority
P.O. Box 2368
Conway, South Carolina 29528
ceverett@gswsa.com

Dear Ms. Everett:

This is in response to a Pre-Construction Notification (PCN) (SAC-2020-00569) received on May 7, 2020, and considered complete on May 7, 2020. In submitting the PCN, you requested verification the proposed project is authorized by a Department of the Army (DA) Nationwide Permit (NWP).

The work affecting waters of the United States is part of an overall project known as GSWSA International Drive Booster Pump Station, a maintenance project on an existing utility service. The activities in waters of the United States include the clearing and filling of jurisdictional freshwater forested wetlands for the purpose of installing an attendant feature on an existing utility service. Specifically a new booster pump station and 700 linear feet of piping will be installed to bolster the existing capability. The project involves impacts to not more than 0.66 acre of waters of the United States. Specifically, this letter authorizes impacts to 0.66 acre of wetlands. The project is located west of, and adjacent to, International Drive, Horry County Tax Pins: 153-00-01-007, 153-00-01-005, and 152-00-01-031, in the City of Conway, Horry County, South Carolina (Latitude: 33.7836° N, Longitude: -78.8832° W). The PCN also includes the following supplemental information:

a. Drawing sheets 1-5 of 5 titled “SAC-2020-00569 / GSWSA International Drive Pump Booster Station" and dated March 24, 2020.

b. A mitigation plan/statement titled "**Carter Stilley Wetland and Stream Mitigation Bank / “CS-MBI, LLC”"** and dated April 7, 2020.

Based on a review of the PCN, including the supplemental information indicated above, the Corps has determined the proposed activity will result in minimal individual and cumulative adverse environmental effects and is not contrary to the public interest. Furthermore, the activity meets the terms and conditions of NWP 3.

For this authorization to remain valid, the project must comply with the enclosed NWP General Conditions, Charleston District Regional Conditions, and the following special conditions:

a) That impacts to aquatic areas do not exceed those specified in the above mentioned PCN, including any supplemental information or revised permit drawings that were submitted to the Corps by the permittee.

b) That the construction, use, and maintenance of the authorized activity is in accordance with the information given in the PCN, including the supplemental information listed above, and is subject to any conditions or restrictions imposed by this letter.

c) That the permittee shall submit the attached signed compliance certification to the Corps within 30 days following completion of the authorized work.

d) The permittee recognizes that their commitment to perform and implement the following conditions was a deciding factor in the favorable and timely decision on this permit and recognizes that a failure on their part to both actively pursue and implement these conditions may be grounds for modification, suspension or revocation of this Department of the Army authorization:

1) That as compensatory mitigation for impacts to aquatic resources, the permittee agrees to purchase or debit a total of 3.6 credits from the Carter Stilley Wetland and Stream Mitigation Bank ("CS-MBI, LLC"), managed by the American Mitigation Company. At least one half of the required credits [1.8 credits] must be restoration/non-buffer enhancement credits. In addition, no more than one half of the required mitigation credits [1.8 credits] may be preservation credits.

2) That the permittee must submit evidence of the purchase or debit of the required mitigation credits to both the Corps of Engineers and SCDHEC prior to commencement of the authorized work. Your responsibility to complete the required compensatory mitigation as set forth in Special Condition "d" will not be considered fulfilled until you have received written verification from the U.S. Army Corps of Engineers.

e) That the permittee shall use only clean fill material obtained from an upland source.

f) That the permittee shall incorporate Best Management Practices (BMPs) during construction to protect adjacent wetlands and Waters of the United States from sediment and erosion during construction. BMPs to be utilized, independently or in combination, may include but are not limited to; erosion control matting, mulch, silt fences, sediment tubes, and other devices. BMPs shall be maintained until the fill material is stabilized.

This verification is valid until March 18, 2022, unless the district engineer modifies, suspends, or revokes the NWP authorization in accordance with 33 CFR 330.5(d). If prior to this date, the NWP authorization is reissued without modification or the activity complies with any subsequent modification of the NWP authorization, the verification continues to remain valid until March 18, 2022. If you commence, or are under contract to commence this activity before the NWP expires, or the NWP is modified, suspended, or revoked by the Chief of Engineers or division engineer in accordance with 33 CFR 330.5(b) or (c), respectively, in such a way that the activity would no longer comply with the terms and conditions of the NWP, you will have 12

months after the date the NWP expires or is modified, suspended, or revoked, to complete the activity under the present terms and conditions of this NWP.

This NWP is verified based on information you provided. It is your responsibility to read the attached NWP(s) along with the General, Regional, and Special Conditions before you begin work. If you determine your project will not be able to meet the NWP and the conditions, you must contact the Corps before you proceed.

In all future correspondence, please refer to file number SAC-2020-00569. A copy of this letter is forwarded to State and/or Federal agencies for their information. If you have any questions, please contact me at (843) 365-1726, or by email at Austin.R.Dartez@usace.army.mil.

Sincerely,

Digitally signed by DARTEZ.AUSTIN.ROBERT.1275860022
Date: 2020.05.15 10:11:01 -04'00'

Austin Dartez
Project Manager

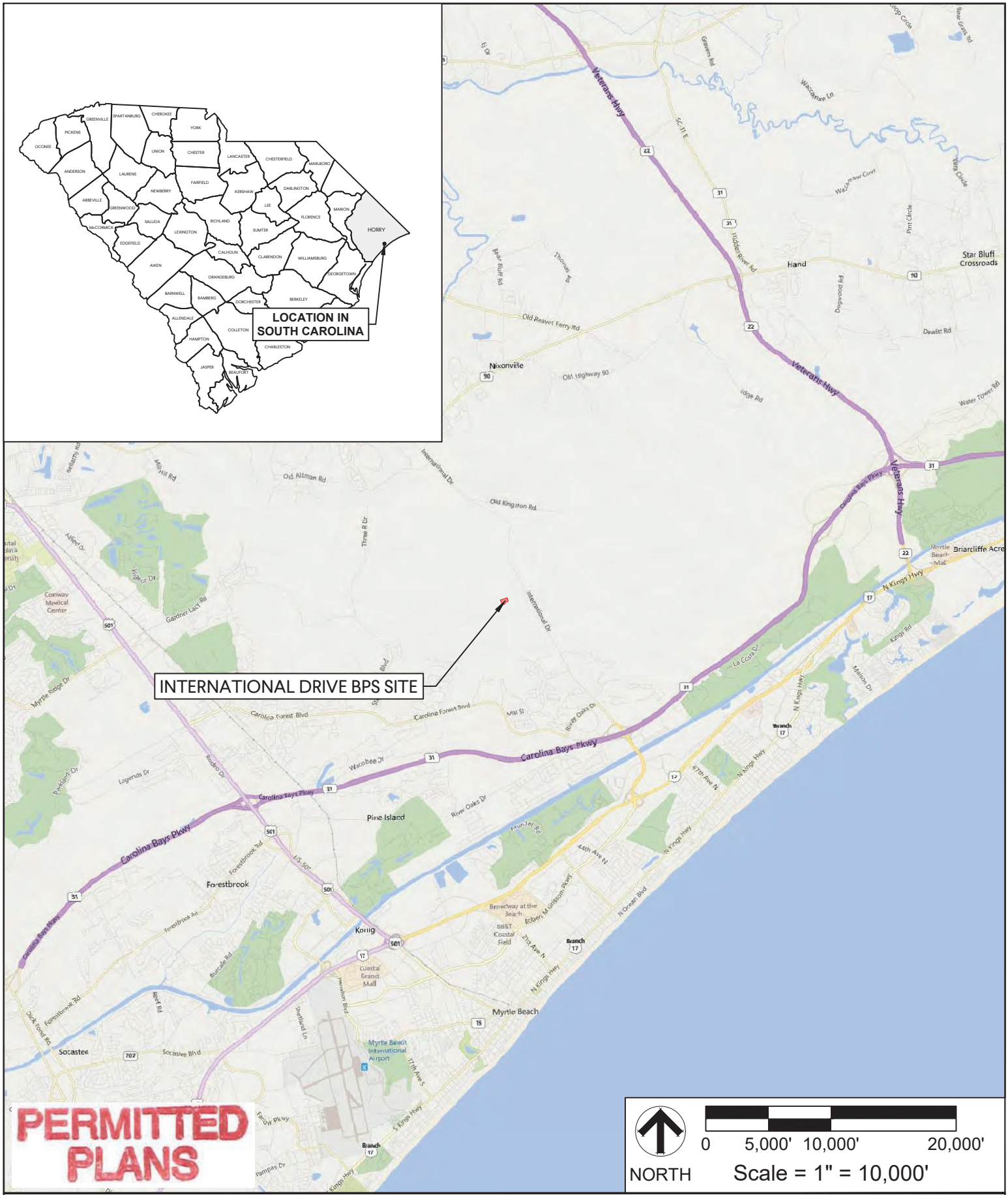
Attachments
Permit Drawings
Nationwide Permit #3
Nationwide Permit General Conditions
Nationwide Permit Regional Conditions

Copies Furnished:

Mr. Gary Brown
Goodwyn, Mills and Cawood, Inc.
101 East McBee Street
Greenville, South Carolina 29601
gary.brown@gmcnetwork.com

SC DHEC - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201
WQCWetlands@dhec.sc.gov

SC DHEC - OCRM
1362 McMillan Avenue, Suite 400
North Charleston, South Carolina 29405
OCRMPermitting@dhec.sc.gov



PERMITTED PLANS

SAC-2020-00569
GSWSA International Drive Pump Booster Station

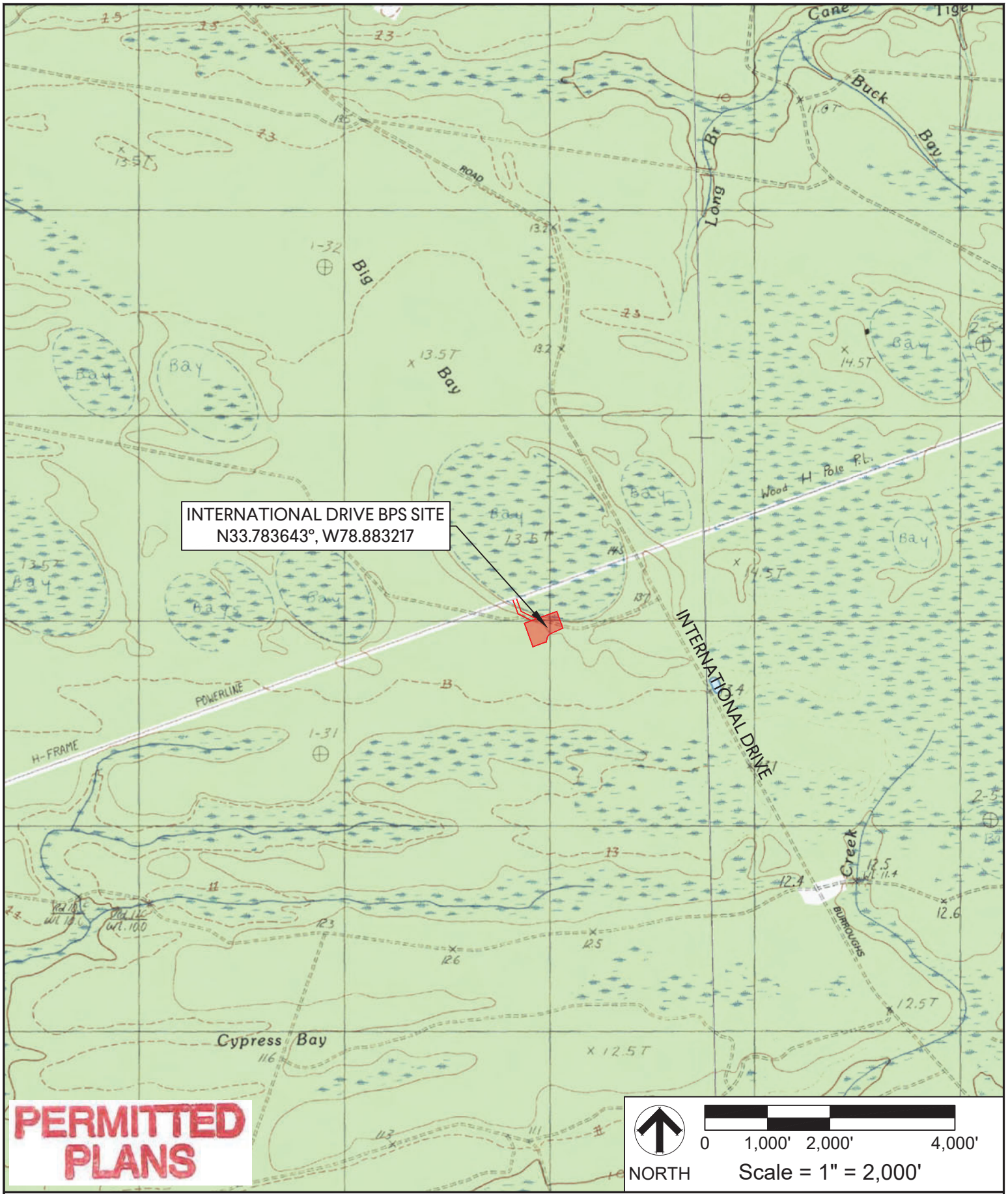
FIGURE 1

GENERAL LOCATION MAP

GMC # EGRE19A004
DATE: 03/24/2020
DRAWN BY: GLB

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC



SAC-2020-00569
GSWSA International Drive Pump Booster Station

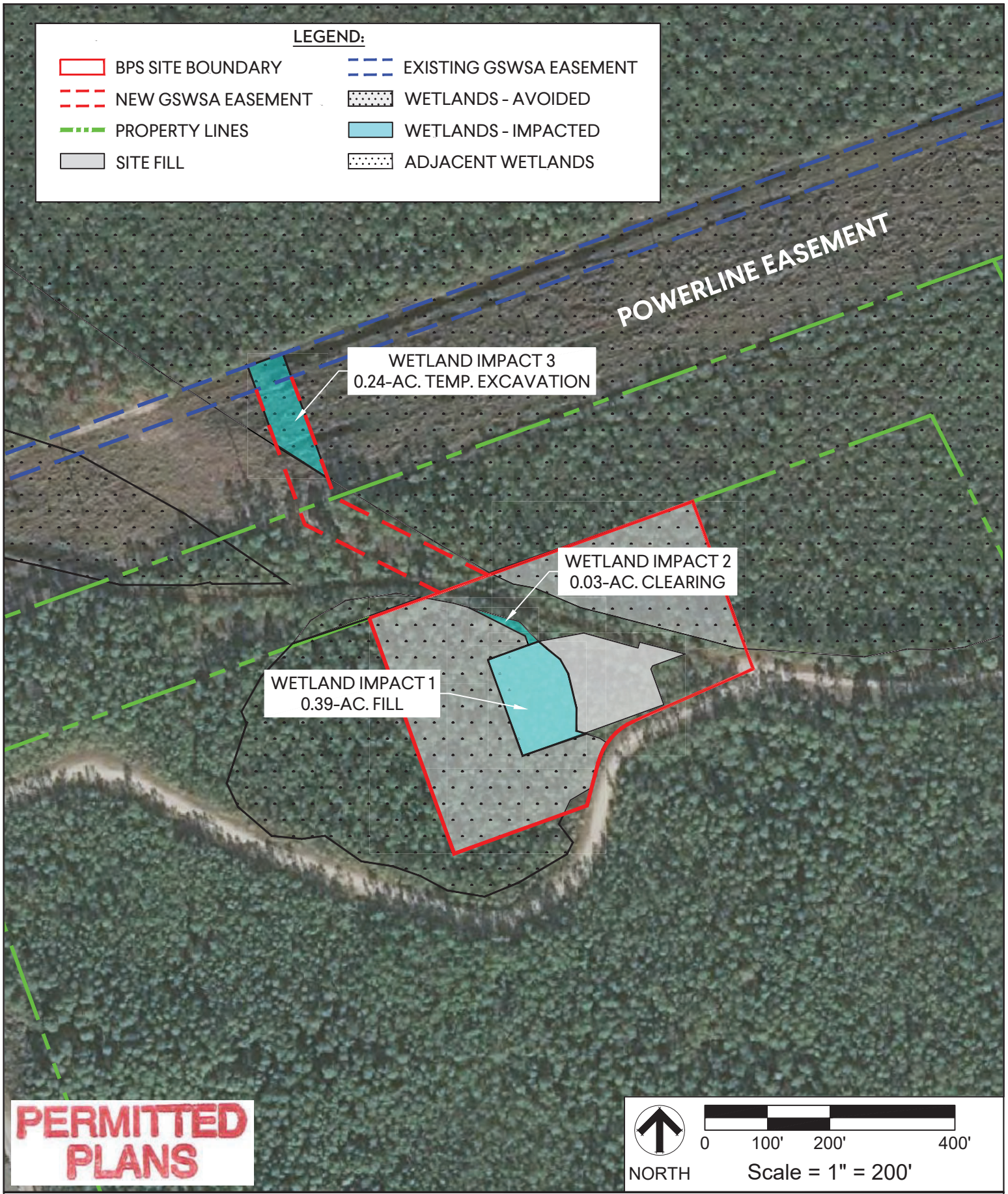
FIGURE 2

USGS QUADRANGLE MAP

GMC # EGRE19A004
DATE: 03/24/2020
DRAWN BY: GLB

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC



SAC-2020-00569
GSWSA International Drive Pump Booster Station

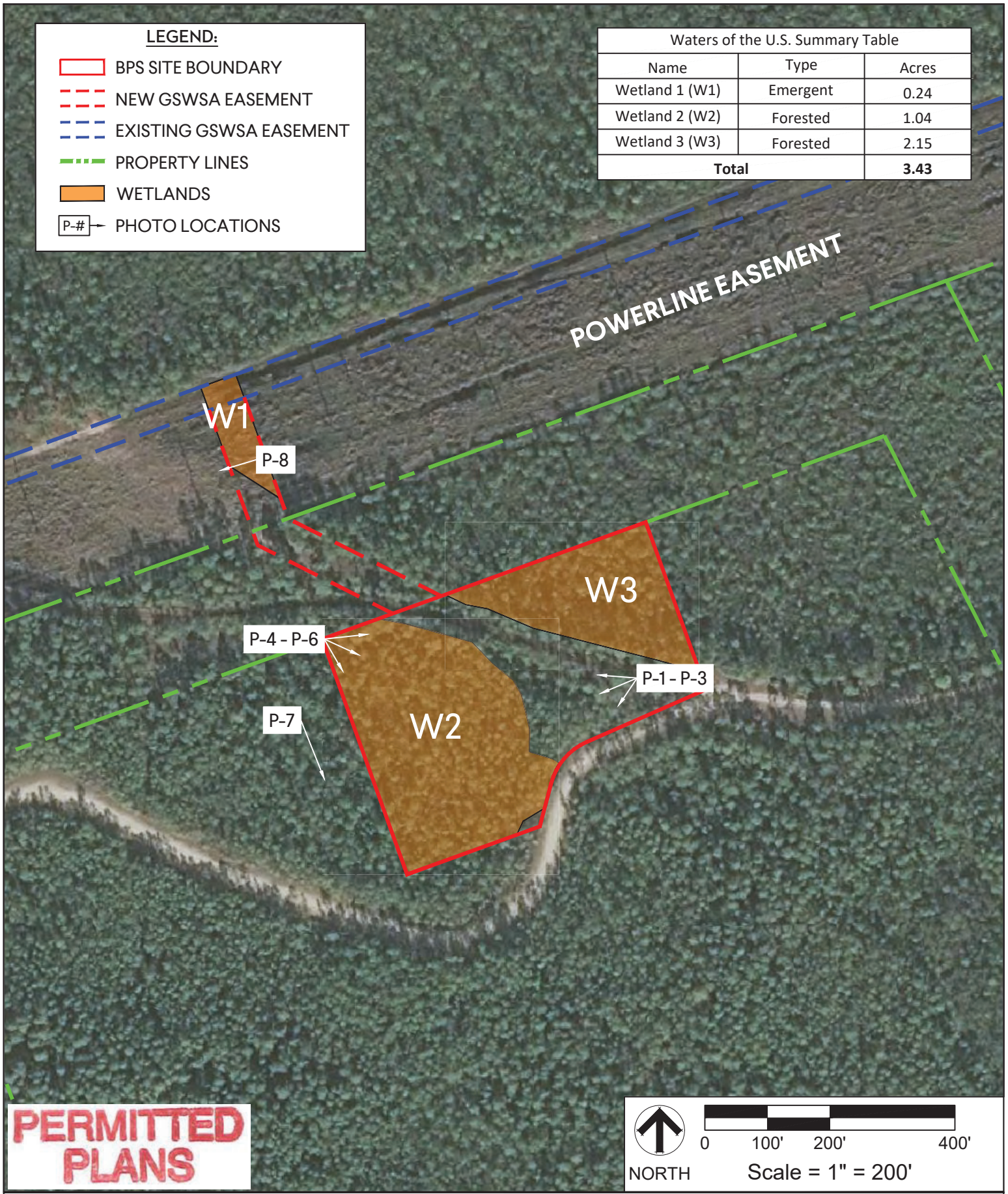
FIGURE 3

IMPACTS MAP - AERIAL

GMC # EGRE19A004
DATE: 03/24/2020
DRAWN BY: GLB

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC



Waters of the U.S. Summary Table		
Name	Type	Acres
Wetland 1 (W1)	Emergent	0.24
Wetland 2 (W2)	Forested	1.04
Wetland 3 (W3)	Forested	2.15
Total		**3.43**

SAC-2020-00569
GSWSA International Drive Pump Booster Station

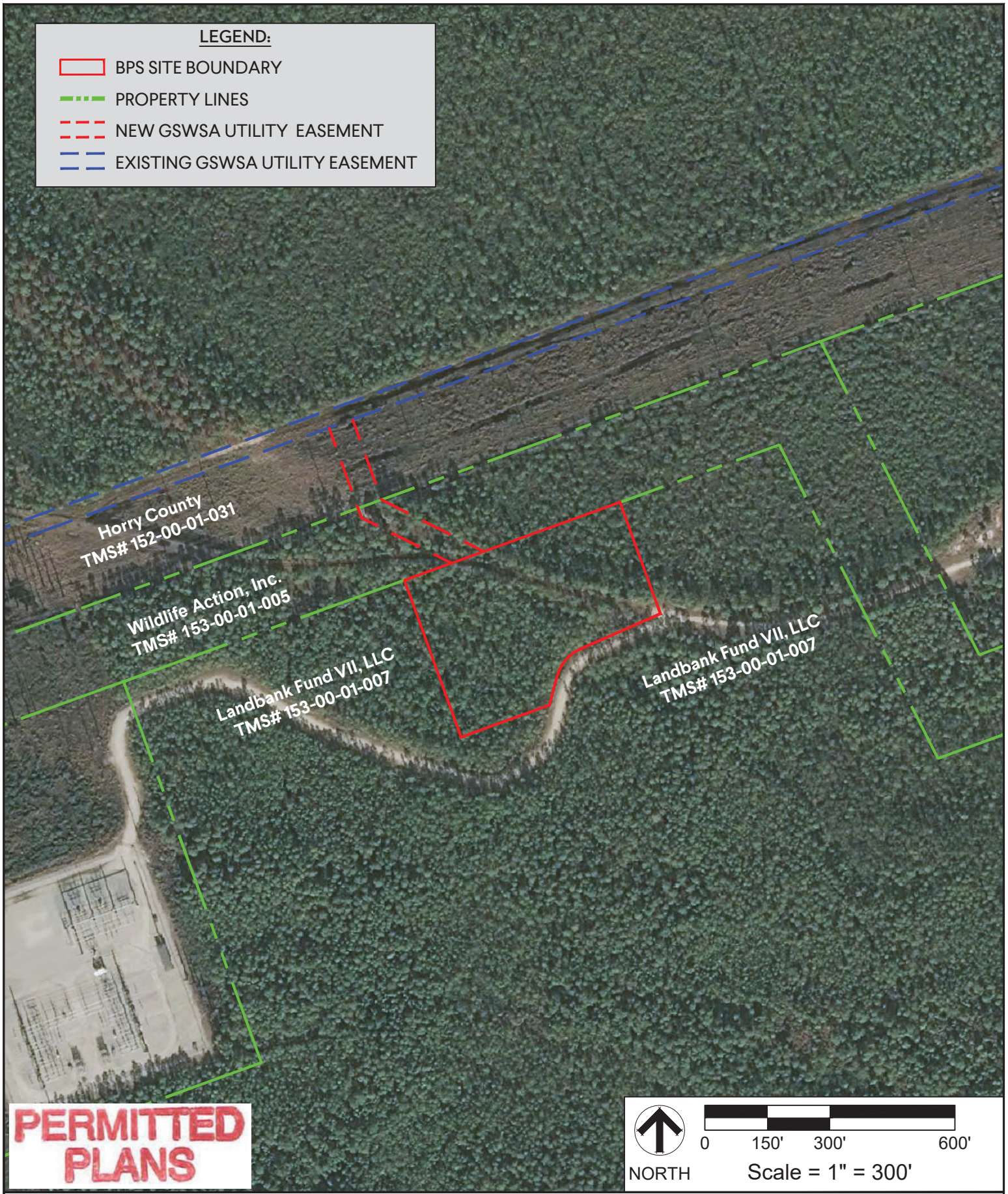
FIGURE 4

DELINEATION MAP

GMC # EGRE19A004
DATE: 03/24/2020
DRAWN BY: GLB

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC



SAC-2020-00569
GSWSA International Drive Pump Booster Station

FIGURE 5

PARCEL MAP

GMC # EGRE19A004
DATE: 03/24/2020
DRAWN BY: GLB

617 East McBee Avenue, Suite 200
Greenville, SC 29601
T 864.527.0460
GMCNETWORK.COM

GMC

2017 Nationwide Permit

Please read this Nationwide Permit along with the General, Regional, and Special conditions that may be associated with this permit. It is your responsibility to insure your project meets this nationwide permit and the conditions at all times. If changes are needed or if you cannot meet these requirements, please notify the Corps before proceeding with the work.

3. Maintenance.
(a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This NWP also authorizes the removal of previously authorized structures or fills. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project. This NWP also authorizes the removal of accumulated sediment and debris within, and in the immediate vicinity of, the structure or fill. This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays. (b) This NWP also authorizes the removal of accumulated sediments and debris outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.). The removal of sediment is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend farther than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures. All dredged or excavated materials must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization. (c) This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After conducting the maintenance activity, temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate. (d) This NWP does not authorize maintenance dredging for the primary purpose of navigation. This NWP does not authorize beach restoration. This NWP does not authorize new stream channelization or stream relocation projects.
Notification: For activities authorized by paragraph (b) of this NWP, the permittee must submit a preconstruction notification to the district engineer prior to commencing the activity (see general

condition 32). The pre-construction notification must include information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals. (**Authorities:** Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act)

Note: This NWP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act section 404(f) exemption for maintenance.

C. Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. *Navigation.* (a) No activity may cause more than a minimal adverse effect on navigation. (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States. (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. *Aquatic Life Movements.* No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. *Spawning Areas.* Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (*e.g.*, through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. *Migratory Bird Breeding Areas.* Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. *Shellfish Beds.* No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. *Suitable Material.* No activity may use unsuitable material (*e.g.*, trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. *Water Supply Intakes.* No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. *Adverse Effects From Impoundments.* If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. *Management of Water Flows.* To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (*e.g.*, stream restoration or relocation activities).

10. *Fills Within 100-Year Floodplains.* The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. *Equipment.* Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. *Soil Erosion and Sediment Controls.* Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. *Removal of Temporary Fills.* Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. *Proper Maintenance.* Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. *Single and Complete Project.* The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. *Wild and Scenic Rivers.* (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. (b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status. (c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (*e.g.*, National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: *http://www.rivers.gov/.*

17. *Tribal Rights.* No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

18. *Endangered Species.* (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which ''may affect'' a listed species or critical habitat, unless ESA section 7consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur. (b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If preconstruction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA. (c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district

engineer will determine whether the proposed activity ‘‘may affect’’ or will have ‘‘no effect’’ to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps’ determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, he applicant shall not begin work until the Corps has provided notification that the proposed activity will have ‘‘no effect’’ on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps. (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species specific permit conditions to the NWPs. (e) Authorization of an activity by an NWP does not authorize the ‘‘take’’ of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (*e.g.,* an ESA Section 10 Permit, a Biological Opinion with ‘‘incidental take’ provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where ‘‘take’’ means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word ‘‘harm’’ in the definition of ‘‘take’’ means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. (f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required. (g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their worldwide Web pages at *http://www.fws.gov/* or *http://www.fws.gov/ipac* and *http://www.nmfs.noaa.gov/pr/species/esa/* respectively.

19. *Migratory Birds and Bald and Golden Eagles.* The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether ‘‘incidental take’’ permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. *Historic Properties.* (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied. (b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106. (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. (d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106consultation is completed. If the non- Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps. (e) Prospective permittees should be aware that section 110k of the

NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. *Discovery of Previously Unknown Remains and Artifacts.* If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. *Designated Critical Resource Waters.* Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment. (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters. (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. *Mitigation.* The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal: (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (*i.e.,* on site). (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal. (c) Compensatory

mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1⁄10-acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1⁄10-acre or less that require preconstruction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. (d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult to-replace resources (see 33 CFR 332.3(e)(3)). (e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (*e.g.,* conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (*e.g.,* riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses. (f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332. (1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation. (2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)). (3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation. (4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33

CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). (5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided. (6) Compensatory mitigation requirements (*e.g.*, resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33CFR 332.4(c)(1)(ii)). (g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2- acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs. (h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management. (i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. *Safety of Impoundment Structures.* To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. *Water Quality.* Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. *Coastal Zone Management.* In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. *Regional and Case-By-Case Conditions.* The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. *Use of Multiple Nationwide Permits.* The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. *Transfer of Nationwide Permit Verifications.* If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature: When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____

(Transferee)

_____

(Date)

30. *Compliance Certification.* Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include: (a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions; (b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the

permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and (c) The signature of the permittee certifying the completion of the activity and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. *Activities Affecting Structures or Works Built by the United States.* If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a‘ ‘USACE project’’), the prospective permittee must submit a preconstruction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. *Pre-Construction Notification.* (a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the, additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either: (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or (2) 45 calendar days have passed from the district engineer’s receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is ‘‘no effect’’ on listed species or ‘‘no potential to cause effects’’ on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee’s

right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2). (b) *Contents of Pre-Construction Notification:* The PCN must be in writing and include the following information:
(1) Name, address and telephone numbers of the prospective permittee;
(2) Location of the proposed activity;
(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposedactivity;
(4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (*e.g.,* a conceptual plan), but do not need to be detailed engineering plans); (5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate; (6) If the proposed activity will result in the loss of greater than 1⁄10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan. (7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act; (8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for

listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act; (9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the ''study river'' (see general condition 16); and (10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project. (c) *Form of Pre-Construction Notification:* The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals. (d) *Agency Coordination:* (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal. (2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of streambed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes. (3) When agency coordination is required, the district engineer will immediately provide (*e.g.*, via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the preconstruction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were

considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5. (4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act. (5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of preconstruction notifications to expedite agency coordination.

2017 APPROVED
NATIONWIDE PERMIT REGIONAL GENERAL CONDITIONS
FOR SOUTH CAROLINA (REVISED)

The following Regional Conditions have been approved by the Charleston District for the Nationwide Permits (NWP) published in the January 6, 2017, Federal Register as authorized under General Condition #27. Regional conditions are authorized to modify NWPs by adding conditions on a generic basis applicable to certain activities or specific geographic areas. Certain terminologies used in the following conditions are identified in *italics* and are defined in the above referenced Federal Register under Definitions.

Note: The acronym "*PCN*" used throughout the Regional Conditions refers to *Pre-Construction Notification*.

For All Nationwide Permits:

1. The applicant must implement *best management practices* during and after all construction to minimize erosion and migration of sediments off site. These practices may include use of devices capable of preventing erosion and migration of sediments in waters of the United States., including wetlands. These devices must be maintained in a functioning capacity until the area is permanently stabilized. All disturbed land surfaces must be stabilized upon project completion. Stabilization refers to the minimization of erosion and migration of sediments off site.

2. All wetland and stream crossings must be stabilized immediately following completion of construction/installation and must be aligned and designed to minimize the *loss of waters of the United States.*

3. Necessary measures must be taken to prevent oil, tar, trash, debris and other pollutants from entering waters of the United States, including wetlands that are adjacent to the authorized activity.

4. Any excess excavated materials not utilized as authorized back fill must be placed and contained on uplands and permanently stabilized to prevent erosion into waters of the United States, including wetlands.

5. Placement and/or stockpiling (double handling) of excavated material in waters of the United States, including wetlands, is prohibited unless specifically authorized in the nationwide permit verification. Should double handling be authorized, the material must be placed in a manner that does not impede circulation of water and will not be dispersed by currents or other erosive forces.

6. Once project construction is initiated, it must be carried to completion in an expeditious manner in order to minimize the period of disturbance to aquatic resources and the surrounding environment.

7. If you discover any previously unknown historic, cultural or archeological remains and

artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent *practicable*, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places. Archeological remains consist of any materials made or altered by man, which remain from past historic or prehistoric times (i.e., older than 50 years). Examples include old pottery fragments, metal, wood, arrowheads, stone implements or tools, human burials, historic docks, *structure*s, or non-recent (i.e., older than 100 years) vessel ruins.

8. Use of nationwide permits does not obviate requirements to obtain all other applicable Federal, State, county, and local government authorizations.

9. No NWP is authorized in areas known or suspected to have sediment contamination, with the exception of NWP 38, and NWP 53 when used in combination with NWP 38.

10. In accordance with General Condition #31, "Activities Affecting *Structure*s or Works Built by the United States," a *PCN* must be submitted if a NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE" project"). See General Condition #32 for *PCN* content and timing requirements and particularly paragraph (b)(10) for an activity that requires permission from the Corps pursuant to 33 U.S.C. 408. An activity in South Carolina that requires section 408 permission is not authorized by a NWP until the Charleston District issues the section 408 permission to alter, occupy, or use the USACE project, and the District Engineer issues a written NWP verification.

11. For all proposed activities that would be located in or adjacent to an authorized Federal Navigation project, as listed in Regional Condition #18, the *PCN* must include project drawings that have the following information: a) location of the edges of the Federal channel; b) setback distances from the edge of the channel; c) the distance from watermost edge of the proposed *structure* or fill to the nearest edge of the channel and the Mean High and Mean Low water lines; and d) coordinates of both ends of the watermost edge of the proposed *structure* or fill (NAD 83 State Plane Coordinates in decimal degrees). This notification requirement is in addition to the *PCN* requirements listed in General Condition #32.

12. For all proposed activities that would be located in waters that are designated critical habitat under section 7 of the Endangered Species Act, and waters that are proposed critical habitat, the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32. Refer to the following National Oceanic and Atmospheric Administration (NOAA) Fisheries website for the most up-to-date information regarding Critical Habitat designations under the jurisdiction of the National Marine Fisheries Service (NMFS):
http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/

13. For all proposed activities that would be located within a FEMA designated floodway, the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32.

14. The permittee must comply with all FEMA regulations and requirements. The permittee is advised that the National Flood Insurance Program (NFIP) prohibits any development within a designated floodway within the FEMA Special Flood Hazard Area (SFHA), including placement of fill, without a "No Impact Certification" approved by the local NFIP flood plain manager. If the proposed action is located in a designated FEMA SFHA (e.g.,100 year flood plain), the permittee must coordinate with the local NFIP flood plain manager and comply with FEMA requirements prior to initiating construction. A list of NFIP floodplain managers may be found at: http://www.dnr.sc.gov/water/flood/index.html.

15. The permittee must comply with all FEMA regulations and requirements. The permittee is advised that development activities in a designated FEMA Special Flood Hazard Area (SFHA) are subject to the floodplain management regulations of the National Flood Insurance Program (NFIP). If the proposed action is located in a designated FEMA SFHA (e.g.,100 year flood plain), the permittee must coordinate with the local NFIP flood plain manager and comply with FEMA requirements prior to initiating construction. A list of NFIP floodplain managers may be found at: http://www.dnr.sc.gov/water/flood/index.html.

For Specific Nationwide Permits:

16. **For NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51 and 52,** in accordance with General Condition # 22(a), Designated Critical Resource Waters, the discharges of dredged or fill material into waters of the United States within, or directly affecting, critical resource waters, including wetlands adjacent to such waters, are NOT authorized by these NWPs. Note: The ACE Basin National Estuarine Research Reserve and the North Inlet Winyah Bay National Estuarine Research Reserve are Designated Critical Resource Waters.

17. **For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38 and 54,** in accordance with General Condition # 22(b), Designated Critical Resource Waters, a *PCN* is required for any activity proposed in designated critical resource waters including wetlands adjacent to those waters. Refer to General Condition #32 for *PCN* requirements. Note: The ACE Basin National Estuarine Research Reserve and the North Inlet Winyah Bay National Estuarine Research Reserve are Designated Critical Resource Waters.

18. **For NWPs 1, 3, 5, 7, 8, 10, 11, 12, 13, 14, 15, 19 and 36,** the prospective permittee must submit a *PCN* to the District Engineer for any activity that would be located in or adjacent to an authorized Federal Navigation project. These Federal navigation areas include Adams Creek, Atlantic Intracoastal Waterway (AIWW), Ashley River, Brookgreen Garden Canal, Calabash Creek Charleston Harbor (including the Cooper River and Town Creek), Folly River, Georgetown Harbor (Winyah Bay, Sampit River, and Bypass Canal), Jeremy Creek, Little River Inlet, Murrells Inlet (Main Creek), Port Royal Harbor, Savannah River, Shem Creek

(including Hog Island Channel & Mount Pleasant Channel), Shipyard Creek, Village Creek and the Wando River.

19. **For NWPs 3, 11, 12, 13, 14, 15, 20, 22 and 33,** temporary *structure*s, fills, and/or work, including the use of temporary mats, are only authorized for a period of 90 days per temporary impact area and/or phase of the overall project. The permittee may submit a written request at least 15 days prior to the expiration of the original period of 90 days requesting an extension of up to an additional 90 days. The Charleston District Engineer may extend the 90-day period up to an additional 90 days, not to exceed more than a total of 180 days, where appropriate. After expiration of the authorized period (i.e., initial 90 days or up to an additional 90 days), all temporary *structure*s, fills, and/or work, including the use of temporary mats, for the temporary impact area and/or phase of the overall project must be removed and the disturbed areas restored to pre-disturbance conditions. Activities that require the use of temporary *structure*s, fills, and/or work, including the use of temporary mats, in excess of 180 days will require Individual Permit authorization from the Corps prior to construction.

20. **For NWPs 3, 11, 12, 13, 14, 15, 20, 22 and 33,** that require *PCN*s and that involve temporary *structure*s, fills, and/or work, including the use of temporary mats, the *PCN* must include a written description and/or drawings of the proposed temporary activities that will be used during project construction. This requirement is in addition to the *PCN* requirements listed in General Condition #32.

21. **For NWPs 29, 39, 40, 42, 43, 44, 51 and 52,** impacts to stream beds** must be provided in both linear feet and acreage.

22. **NWPs 12, 14, 29, 39, 43, 51 and 52,** will not be used in conjunction with one another for an activity that is considered a *single and complete project.*

23. **For NWPs 12, 14, 29, 39, 46, 51 and 52,** all *PCN*s must include appropriately sized and positioned culverts that meet the requirements of General Conditions #2, #9 and #10 for each individual crossing of waters of the United States. This requirement is in addition to the *PCN* requirements listed in General Condition #32.

24. **For NWPs 12, 14, 29, 39, 46, 51 and 52,** that include the new construction and/or replacement of culverted road crossings, at a minimum, the width of the base flow culvert(s) shall be approximately equal to the average channel width and will not reduce or increase stream depth. This is a minimum requirement that does not replace local and State requirements for roadway design.

25. **For NWPs 12, 14, 18 and 27,** the *discharge* must not cause the *loss* of more than 300 linear feet of stream bed**, unless for *intermittent* and *ephemeral* stream beds the District Engineer waives the 300 linear foot limit by making a written determination concluding that the *discharge* will result in no more than minimal adverse environmental effects.

26. **For NWPs 12, 14, 18 and 27,** the *discharge* cannot cause the *loss* of more than 300 linear feet

of *perennial stream* beds**.

27. **For NWPs 12, 14, and 18,** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32, prior to commencing the activity if the proposed *discharge* will impact more than 25 linear feet of streambed. This notification requirement is in addition to the *PCN* requirements listed in General Condition #32.

28. **For NWP 3,** paragraph (a) and (c) activities, the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition # 32, if the proposed *discharge* of dredged or fill material will cause the loss of greater than 1/10-acre of waters of the United States or if the proposed *discharge* of dredged or fill material will be located within a special aquatic site, which includes but is not limited to, wetlands, mudflats, vegetated shallows, *riffle and pool complex*es, sanctuaries, and refuges.

29. **For NWP 3,** paragraph (a) activities, the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition # 32, for the repair, rehabilitation or replacement of existing utility lines constructed over *navigable waters* of the United States (i.e., Section 10 waters) and existing utility lines routed in or under *navigable waters* of the United States (i.e., Section 10 waters), even if no *discharge* of dredged or fill material occurs.

30. **For NWP 3,** paragraph (b) activities, excavation of accumulated sediment or other material is not authorized in areas within the immediate vicinity of existing *structure*s (e.g., private or commercial dock facilities, piers, canals dug for boating access, marinas, boat slips, etc.).

31. **For NWPs 7 and 12,** the associated intake *structure* must be screened to prevent entrainment of juvenile and larval organisms, and the inflow velocity of the associated intake *structure*s cannot exceed 0.5 feet/second.

32. Activities authorized by **NWP 7** must occur in the immediate vicinity of the outfall, and must be necessary for the overall construction or modification of the outfall. **NWP 7** shall not be used to authorize ancillary activities such as construction of access roads, installation of utility lines leading to or from the outfall or intake *structure*s, construction of buildings, distant activities, etc.

33. **For utility line activities authorized by NWP 12** (**as well as utility lines associated with projects authorized by NWP 29 and 39)** that involve horizontal directional drilling beneath *navigable waters* of the United States (i.e., section 10 waters), the *PCN* must include a proposed remediation plan (i.e., frac-out plan). This requirement is in addition to the *PCN* requirements listed in General Condition #32.

34. **For utility line activities authorized by NWP 12 (as well as utility lines associated with projects authorized by NWP 29 and 39),** excavated material shall be returned to the trench and any remaining material shall be relocated and retained on an upland disposal site. Substrate containing roots, rhizomes, seeds, and other natural material must be kept viable and replaced at the surface of the excavated site. Impacted wetlands will be replanted with native wetland

species or allowed to naturally re-vegetate from the replaced substrate, as long as the resulting vegetation is native.

35. **For utility line activities authorized by NWP 12 (as well as utility lines associated with projects authorized by NWP 29 and 39),** stream banks that are cleared of vegetation will be stabilized using bioengineering techniques and/ or the planting of deep-rooted native species.

36. **For utility line activities authorized by NWP 12 (as well as utility lines associated with projects authorized by NWP 29 and 39),** construction techniques to prevent draining, such as anti-seep collars, will be required for utility lines buried in waters of the United States when necessary. If no construction techniques to prevent draining are proposed, the prospective permittee must provide appropriate documentation to support that such techniques are not required to prevent drainage of waters of the United States.

37. **For NWP 12,** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32 prior to commencing the activity if the activity will involve temporary *structure*s, fills, and/or work. To be complete, the *PCN* must also include the specifications of how pre-construction contours will be re-established and verified after construction. This notification requirement is in addition to the notification criteria listed for this NWP.

38. **For utility line activities authorized by NWP 12, (as well as utility lines associated with projects authorized by NWP 29 and 39),** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32, prior to commencing the activity if the activity will involve maintained utility crossings. To be complete, the *PCN* must also include a justification for the required width of the maintained crossing that impacts waters of the United States. This notification requirement is in addition to the notification criteria listed for this NWP.

39. **For NWP 12,** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32 prior to commencing the activity if the activity will involve the construction of a sub-station in waters of the United States. To be complete, the *PCN* must also include a statement of avoidance and minimization for the *loss of waters of the United States* impacted by the utility line sub-station. This requirement is in addition to the *PCN* requirements listed in General Condition #32.

40. **For NWP 12,** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32 prior to commencing the activity if the activity will involve the permanent conversion of forested wetlands to herbaceous wetlands. To be complete, the *PCN* must also include the acreage of conversion impacts of waters of the United States and a *compensatory mitigation* proposal or a statement of why *compensatory mitigation* should not be required. This requirement is in addition to the *PCN* requirements listed in General Condition #32.

2017 APPROVED
NATIONWIDE PERMIT REGIONAL GENERAL CONDITIONS
FOR SOUTH CAROLINA (REVISED)

41. **For NWP 13 activities, NWP 54 activities, and living shoreline projects authorized by NWP 27** that require submittal of a *PCN*, the *PCN* must include the following information:

    a. Habitat type along the shoreline;
    b. The presence of stabilization *structure*s in the vicinity of the project;
    c. Cause/s, extent, and approximate rate of erosion (if known);
    d. Site specific information which may include: shoreline orientation, slope, bank height, tidal range, nearshore bathymetry, fetch, substrate stability, etc.;
    e. Rationale for selecting the preferred stabilization technique;
    f. A statement that structural materials toxic to aquatic organisms will not be used and if stone is proposed, a statement that only clean stone, free of exposed rebar, asphalt, plastic, soil, etc., will be used; and
    g. A statement that filter fabric will be used as appropriate when stone or other heavy material is proposed.

    These requirements are in addition to the *PCN* requirements listed in General Condition #32.

42. Projects qualifying for **NWP 27 and/or NWP 54** will require coordination with appropriate Federal, State, and local agencies. The coordination activity will be conducted by the Corps of Engineers. Agencies will generally be granted 15 days to review and provide comments unless the District Engineer determines that an extension of the coordination period is reasonable and prudent.

43. **For NWP 29,** the *loss of waters of the United States* is limited to a maximum of ¼-acre for a single family residence.

44. **For NWPs 29 and 39,** the *discharge*s of dredged or fill material for the construction of *stormwater management facilities* in *perennial streams* are not authorized.

45. **For NWP 33,** the prospective permittee must submit a *PCN* to the District Engineer in accordance with General Condition #32, for temporary construction, access, and dewatering activities that occur in non-tidal waters of the United States, including wetlands. In addition, the *PCN* shall include a restoration plan.

46. **For NWP 36,** only one boat ramp may be constructed on a single lot or tract of land (e.g., each lot within a subdivision).

47. **For NWP 38,** the *PCN* must contain the following information:

    a. documentation that the specific activities are required to effect the containment, stabilization, or removal of hazardous or toxic waste materials as performed, ordered, or sponsored by a government agency with established legal or regulatory authority;

    b. a narrative description indicating the size and location of the areas to be restored, the work involved and a description of the anticipated results from the restoration; and

c. a plan for the monitoring, operation, or maintenance of the restored area.

This requirement is in addition to the *PCN* requirements listed in General Condition #32.

48. **For NWP 41,** a *PCN* must be submitted to the District Engineer for projects that require mechanized land clearing in waters of the United States, including wetlands, in order to access or perform reshaping activities.

49. **NWP 41** is prohibited in channelized streams or stream relocation projects that exhibit natural stream characteristics and/or perform natural stream functions.

50. **For NWP 48,** changing from bottom culture to floating or suspended culture will require submittal of a *PCN* to the District Engineer. Additionally, new aquaculture activities involving suspended or floating culture will require submittal of a *PCN* to the District Engineer. Refer to the *PCN* requirements listed in General Condition #32. Note: If the District Engineer determines that the proposed floating or suspended culture will result in more than minimal adverse environmental effects, an Individual Permit will be required for the proposed activity.

51. **For NWP 48,** when a new commercial shellfish aquaculture activity will occur adjacent to property that is not owned by the prospective permittee, the activity will require submittal of a *PCN* to the District Engineer. The *PCN* must include the following information in addition to the *PCN* requirements listed in General Condition #32:

    a. A map or depiction that shows the adjacent property(ies) and adjacent property owners' contact information. Note: This information may be obtained online from the applicable county's tax information pages.

    b. A signed letter(s) of "no objection" to the proposed commercial shellfish activity from each of the adjacent property owner(s). Each letter shall include the name, mailing address, property address, property Tax Map Parcel (TMS) number, and signature of the property owner.

52. **For NWP 53,** the *PCN* must include a Tier I evaluation, in accordance with the Inland Testing Manual, for the project area immediately upstream of the low-head dam. If the Tier I evaluation indicates contaminated sediments are present, a Tier II evaluation may be required.

53. **For NWP 54 projects and living shoreline and/or oyster restoration projects authorized by NWP 27,** the *PCN* must include the following information in addition to the *PCN* requirements listed in General Condition #32:

    a. A plan view project sketch that shows the proposed project footprint; the Mean High Water (MHW) Line; the Mean Low Water (MLW) Line; marsh line (if applicable); shoreline; width of the waterway at the project location; location of adjacent *structure*s,

such as docks and boat ramps (if applicable); distance of the project footprint from the MHW line; distance of the project footprint from adjacent *structure*s; and proposed location of informational or navigation markers. Refer to c. and d. below, if applicable. Note: Refer to Regional Condition #11 if the proposed project is located in or adjacent to an authorized Federal Navigation project for the additional information that will be required.

b. A cross-section sketch that shows the height of the proposed project above substrate and the water depth at MHW Line and MLW Line in relation to the proposed project.

c. For projects that are 18 inches or less in height above substrate AND consist of hard *structure*s or fill material, such as, but not limited to, riprap, oyster castles, bagged oyster shell and wooden sills, informational signs to alert boaters to the presence of the project area will be required. The *PCN* must include a depiction and description of proposed informational signs. The signs must be made of reflective material or must include reflective tape on the sign or sign post. The signs must be located at each end of the project area and at 100-foot increments along the project area, if applicable. Note 1: Projects that include ONLY the use of loose shell will not require the installation of informational or navigational signs. Note 2: The prospective permittee shall be made aware that the U.S. Coast Guard (USCG) may require the project area to be marked. Prior to commencing work, the permittee shall contact the USCG at U. S. Coast Guard Charleston District Seven, Waterways Management Branch, 909 SE 1st Ave, Suite 406, Miami, FL 33131, or by phone at 305-415-6755 or 305-415-6750, regarding possible markers and/or lighting requirements. The permittee shall install all markers and/or lighting as required by the USCG. In the event that the USCG does not require markers or lighting, the permittee shall mark the project area with Corps approved informational signs as described above. Note 3: These requirements will be added to the NWP verification as special conditions.

d. For projects that are more than 18 inches in height above substrate AND consist of hard *structure*s or fill material, such as, but not limited to, riprap, oyster castles, bagged oyster shell, and wooden sills, the prospective permittee must mark the project area with diamond-shaped white day markers with orange border and black print stating “Danger Obstruction”. The signs shall be located at each end of the project area and at 100-foot increments along the project area, if applicable. Note 1: Projects that include ONLY the use of loose shell will not require the installation of informational or navigational signs. Note 2: Prior to commencing work, the permittee shall contact the USCG at U. S. Coast Guard Charleston District Seven, Waterways Management Branch, 909 SE 1st Ave, Suite 406, Miami, FL 33131, or by phone at 305-415-6755 or 305-415-6750, regarding potential project specific approval of the markers. The permittee shall install all markers and/or lighting as required by the USCG. In the event the USCG does not require these or other markers and/or lighting, the “Danger Obstruction” markers are still required by the Corps. Note 3: These requirements will be added to the NWP verification as special conditions.

2017 APPROVED
NATIONWIDE PERMIT REGIONAL GENERAL CONDITIONS
FOR SOUTH CAROLINA (REVISED)

** For the purpose of these regional conditions, the term “stream bed” also includes features determined to be a “tributary” and a “relatively permanent water.”

Note 1: For the purpose of these regional conditions, bankfull is defined as the top-of-bank to top-of bank of the channel in a cross-sectional view.

Note 2: Regional conditions # 14, #15, and #53d were revised on September 7, 2017.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E

Addenda

THIS PAGE INTENTIONALLY LEFT BLANK

GRAND STRAND WATER & SEWER AUTHORITY

SPECIFICATIONS

INTERNATIONAL DRIVE BOOSTER PUMP STATION

SRF PROJECT NO. 2620004-25

GSWSA PROJECT NO. 629-01

GMC PROJECT NO. CGRE190054

PREPARED BY:

GMC

SOUTH CAROLINA
GOODWYN, MILLS & CAWOOD, INC.
No. 0339
CERTIFICATE OF AUTHORIZATION

Goodwyn, Mills and Cawood, Inc.
617 East McBee Avenue
Suite 200
Greenville, SC 29601
T 864.527.0460
www.gmcnetwork.com

SOUTH CAROLINA
REGISTERED PROFESSIONAL
NO. 31119
5/29/2020
ENGINEER
D. TYLER MORGAN

May 2020

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 10 00 - 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. Phased construction
4. Contractor-furnished
5. Access to site
6. Coordination with occupants
7. Work restrictions
8. Specification and drawing conventions
9. Miscellaneous provisions

B. Related Requirements:

1. Section 01 50 00 - Temporary Facilities and Controls for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: **International Drive Booster Pump Station**

1. Project Location: **Conway, South Carolina**

B. Owner: **Grand Strand Water & Sewer Authority**

1. Owner's Representative(s): **Christy Everett – Chief Operations Officer**

C. Engineer: **Goodwyn Mills & Cawood – Greenville, South Carolina**

D. Engineer’s Consultants: The Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Architecture – **Goodwyn Mills & Cawood – Greenville, SC**

2. Structural Engineering – **Timmerman Structural Engineering Group – Columbia, SC**

3. Mechanical and Plumbing – **Swygert & Associates – Cayce, SC**

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The construction and modifications consist of the following:

a. Clearing and grubbing, civil/site work, etc.
b. Installation of 42-inch suction and discharge piping.
c. System connections to existing transmission mains.
d. Installation of new booster pump station and yard piping.
e. Installation of pumps (Furnished by Owner)
f. Installation of ATS and emergency generator (Furnished by Owner).
g. Miscellaneous valving and piping.
h. Electrical work and controls.

B. Type of Contract:

1. Project will be constructed as a single design-bid-build contract.

1.5 PHASED CONSTRUCTION

A. Before commencing the Work, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates, and move-in dates of Owner's personnel for Startup.

1.6 CONTRACTOR-FURNISHED AND INSTALLED PRODUCTS

A. Contractor shall furnish all products indicated in the bid documents. The Work includes unloading, handling, storing, and protecting Contractor-furnished products as directed and turning them over to Owner at Project closeout.

1.7 EQUIPMENT FURNISHED BY OWNER

A. The Owner will provide the following equipment:

1. 125 HP Horizontal Split Case Pumps (4 total) and Variable Frequency Drives (4 total)

a. Vendor: Patterson Pump Company

2. 1250 kW Diesel Generator

a. Vendor: Blanchard Power Systems

3. 2000A Automatic Transfer Switch (ATS)

a. Vendor: Blanchard Power Systems

4. SCADA Panel and Antenna

    a. Vendor: Grand Strand Water & Sewer Authority

1.8 WORK BY OWNER

A. General: Cooperate fully with Owner so that 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. Work by Owner includes:

1. SCADA Integration

1.9 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor’s use of Project site is limited only by Owner's right to perform work or to retain other Contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and loading areas, and entrances serving premises clear and available to Owner, Owner's employees, neighboring utility providers, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.10 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Engineer will prepare a Certificate of Substantial Completion for each specific phase of the project.
2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

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.

B. On-Site Work Hours: Working hours are not limited; CONTRACTOR shall contact the ENGINEER when working hours are extended beyond normal business hours or when weekend construction is expected to occur.

C. Existing Utility Interruptions: All proposed Work associated with existing infrastructure must be coordinated in advance with Owner. A minimum of 72 hours notice must be provided to Owner.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to neighbors with the Owner.

1. Obtain Engineer's written permission before proceeding with disruptive operations.

E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1.12 ADVERSE WEATHER

A. General

1. Notice of rain delay days with the documentation of the aforementioned sources herein and on-site records must be submitted by the Contractor to the Inspector/Engineer on the first working day of every month for the previous month or at the monthly construction meeting as determined at the preconstruction meeting.

B. Definition

1. Adverse weather is defined as the occurrence of a condition that prevents construction activity exposed to weather conditions or access to the site for more than four (4) hours in a day.
2. Adverse weather may also include, if appropriate, "dry-out" or "mud" days.
3. Adverse weather includes days that temperature does not rise above the required temperature for a construction activity.

C. Qualifications

1. Adverse weather conditions having a direct effect on construction progress are to be handled as follows:

a. Precipitation is to be measured by the Contractor using a precipitation gauge on-site. For each month, the number of days (24 hours) that the site experiences precipitation of 0.10 inches or more shall be totaled, confirmed with the Owner/Inspector, and reported to the Engineer.

b. For each month, the total number of days of 0.10 inches or more of precipitation shall be compared to the number of expected days for that month. The number of expected days of 0.10 inches or more of precipitation shall be established as follows:

1) Identify National Oceanic and Atmospheric (NOAA) weather stations as shown at https://gis.ncdc.noaa.gov/maps/ncei within a 100-mile radius of the project location.

a) If multiple weather stations are found within 100 miles of the project site, the weather station that is the closest to the site shall be used. Compile rain data from the previous 5 years and total the number of days with precipitation of 0.10 inches or more.

b) If a weather station is not found within a 100-mile radius of the site, the following schedule shall be used:

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
6	6	6	5	7	6	9	9	7	6	6	7
(Data from NOAA, > 0.10" Daily Precipitation, January 2015 – December 2019, Myrtle Beach, SC)											

c. Rain delay days will be approved by the Engineer and added to the contract duration only if they exceed the number of expected days for that given month.

2. Adverse weather conditions having an indirect effect due to precipitation are to be handled as follows:

a. Precipitation that occurs beyond the standard baseline which results in "dry-out" or "mud" days.

1) The standard baseline is based on the NOAA's Point Precipitation Frequency (PPF) Estimate for the construction area using the latitude and longitude for a 1-year average recurrence interval and a 60-min time period. This can be found at http://dipper.nws.noaa.gov/hdsc/pfds/.

3. Adverse weather conditions due to temperature are as follows:

1) Cold Weather concreting shall be per ACI 306.

a) The Contractor shall have a calibrated thermometer onsite which is logged by the inspector and Contractor prior to any concrete pours during cold weather.

4. Adverse weather conditions due to wind speeds are as follows:

a. Wind speeds exceeding those permissible to use equipment or to perform certain tasks safely, including but not limited to operating crane(s) or other aerial equipment for construction or erection of a building structure.

1) The Contractor shall have a calibrated wind speed gauge on-site.

5. Adverse weather conditions resulting in compromised project site conditions are as follows:

    a. Project site conditions such as mud, pooling of water, ice, or standing snow subsequent to the actual precipitation days, prevent the performance of activities such as, but not limited to, mass grading, building pad grading, foundations, piping, excavations, backfill, concrete, masonry, etc. operations.

D. Weather Delay Days

1. Adverse weather delay day may be counted if adverse weather prevents work on the project during an event where:

    a. Precipitation days for a specific month is greater than the recorded monthly average for a project location indicated above.

        1) The number of average rain days shall be subtracted from the number of recorded rain days and the difference shall be the allotted time.

    b. Precipitation for a given day is greater than the NOAA's PFF estimate indicated above.

        1) One (1) day for each day or consecutive days of precipitation that exceeds the standard baseline.

    c. Precipitation of 3.0 inches over a 24-hour period.

        1) The number of allotted days shall be at the discretion of the Engineer/Owner based on site conditions, working conditions, and type of construction.
        2) Temperature per ACI 306.

E. Exceptions

1. The Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that "dry-out" or "mud" days are not eligible to be counted as an Adverse Weather Delay Day until the standard baseline is exceeded. Hence, the Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable construction activities are expected to be prevented and suspended.

F. Record Keeping

1. All Adverse Weather events shall be recorded by the on-site management team.
2. On-site records of daily rain and/or temperature readings shall be kept by the Contractor and may be accepted to verify weather and/or temperature variations which prevent earthwork, foundation and slabs, and/or roofing materials installation. The Inspector shall also be required to maintain on-site records of daily rain and/or temperature.

1.13 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 General 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.

1.14 WARRANTIES

A. Warranties shall conform to the requirements of the General Conditions.

B. All equipment supplied by the Contractor under these Specifications shall be warranted by the Contractor and the equipment manufacturers for a period of one (1) year. Warranty period shall commence on the date of Substantial Completion.

C. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail due to workmanship, design and materials during the warranty period, it shall be replaced by the Contractor and the unit(s) restored to service at no expense to the Owner.

D. The manufacturer’s warranty period shall run concurrently with the Contractor’s warranty or guarantee period. No exception to this provision shall be allowed. The Contractor shall be responsible for obtaining equipment warranties from each of the respective suppliers or manufacturers for all the equipment specified.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 15 00 – MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 GENERAL

A. For the information and guidance of bidders, the following explanation of the bid form items is made. The omission or reference to any item in this description shall not, however, alter the intent of the bid form or relieve the Contractor of the necessity of furnishing such as a part of the Contract. The quantities set forth in the bid form are approximate and are given to establish a uniform basis for the comparison of bids. The Owner reserves the right to increase or decrease the quantity of any class or portion of the work during the progress of construction in accordance with the terms of the Contract. Unit prices are used as a means of computing the final figures for bid and contract purposes, for periodic payments for work performed, for determining value of additions or deletions and wherever else reasonable.

B. The Contractor shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of materials and equipment required for this installation and is not intended to exclude products equal in quality and similar in design.

C. Payment shall be made on the basis of work actually performed toward the completion of each item in the Contract proposal and construction cost breakdown, such work including, but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, cleanup, and all other appurtenances to complete the construction and installation of the work to the configuration and extent as shown on the Drawings and described in the Specifications.

D. The Contractor shall assume responsibility for all materials and equipment stored, protection of his product and compliance with all federal, state and local safety regulations.

E. The Contractor will be paid only for satisfactorily installed and tested quantities. All material order quantities shall be taken from field measurements after approval from the Engineer. The Owner will not pay for excess leftover materials. All quantities derived or measurements taken from project plan sheets shall be considered estimates only.

F. All excavation shall be bid on an “unclassified” basis unless it can be classified as “Rock” as specified in Section 31 23 16.26 of these specifications. All costs for this type of work must be included in the amounts bid in the Proposal. No extra payment will be made for muck excavation or the removal of any wet, unstable, or unsuitable soil. Should any unsuitable soil be encountered, the contractor is responsible for procuring suitable material for pipe trench backfill in those areas and all costs for this work must be included in the amounts bid in the proposal. The contractor is required to inspect the area to his satisfaction prior to turning in a bid proposal.

1.2 BID ITEMS

A. Mobilization

1. Work performed under this item shall consist of preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; and for other work, operations or costs which are of necessary incurred prior to the beginning of construction. Bond costs, license fees, lump sum insurance premiums, and other such items of expense may be included but any item that will be subsequently paid for as project work or material on hand shall be excluded.
2. Payment shall be made at the lump sum contract price as stated in the bid documents. The cost of mobilization for each section of work shall not exceed three percent (3%) of the total amount for the respective section. Should an amount exceeding three percent be submitted in the bid, the amount will be revised to three percent.

B. Erosion and Sediment Control

1. Payment under this item shall consist of installation, maintenance, inspection and removal of all erosion and sedimentation controls shown; as well as any additional measures needed to ensure proper erosion and sedimentation control and regulatory compliance including minor grading.
2. Payment shall be made at the lump sum contract price as stated in the bid documents. The Contractor will be responsible for paying any fines from South Carolina DHEC or any other regulatory body as a result of inadequate erosion control measures.

C. Clearing and Grubbing

1. Payment under this item shall include cost for all clearing and grubbing activities including but not limited to; removal of trees, vegetation, stumps, and grubbings from the right-of-way to a minimum depth of 18 inches, and proper disposal of the debris.
2. No debris shall be pushed to the sides of easements or onto adjacent property. No burning will be allowed by the Owner unless permitted by the local and state authorities. No stumps, logs, or grubbings are to be buried on the cleared right-of-way.
3. Land exposure shall be minimized in terms of area and time. The contractor shall be responsible for complying with all BMP's for Erosion/Sedimentation Control during clearing and grubbing operations.
4. Payment shall be made at the lump sum contract price as stated in the bid documents.

D. Seeding and Restoration

1. Payment under this item shall include cost for all cleanup, grassing and landscaping including but not limited to all materials, labor and equipment to furnish and install final topsoil, limestone, fertilizer, seed, mulch, asphalt, and other materials; cleanup of vegetation, construction debris, stones and other debris prior to seed bed preparation and mulching; seed bed preparation; applying and covering limestone, fertilizer, and seed; applying mulch; holding mulch; watering; maintenance and mowing.
2. All disturbed grassed areas along the sewer main route must be reestablished to original condition by seeding or solid sod (Any new sod/seed must match pre-disturbed grass species and shall be to the satisfaction of the Owner and Engineer).

3. All costs associated with restoring structures and facilities (roadway signs, landscaping, fences, etc.) to pre-construction conditions shall be included in the bid item titled "Seeding and Restoration".
4. All ornamental shrubbery, landscaping plants, and fences disturbed shall be replaced or restored to original condition and all costs related to this work shall be included in the bid item titled "Seeding and Restoration".
5. Payment shall be made at the lump sum contract price as stated in the bid documents. Any cleanup, grassing, and seeding due to disturbance outside of the construction easement will be the responsibility of the contractor.

    a. The Engineer shall be the sole judge as to whether lawns are acceptable.
    b. Acceptable seeded areas shall be deemed areas with a vigorous and uniform stand of grass with bare areas less than 5 square feet in size. All areas which fail to provide a uniform stand of turf shall be treated (planted, as specified) repeatedly until a uniform stand of grass of at least 70% coverage is attained with no bare areas greater than five square feet.

E. Earthwork and Grading

1. Work under this item shall include, but is not limited to, costs for equipment, labor, and material required to complete all grading, excavation, site preparation, backfill, as required to complete the work as specified on the plans and in accordance with the contract documents.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

F. 6" Crusher Run and Filter Fabric

1. Work under this item shall include, but is not limited to, costs for equipment, labor, and material required to complete all final preparation, geotextiles, initial crusher run, and final crusher run surface to a depth of 6" as required to complete the work as specified on the plans and in accordance with the contract documents.
2. Payment shall be made at the unit price per square yard of 6" crusher run and filter fabric as stated in the bid documents.

G. Fencing and Gates

1. Work performed under this item shall include furnishing all equipment, materials and labor required to construct and/or modify fencing and gates at the locations shown on the plans and in accordance with the Contract Documents.
2. Payment shall be made at the unit price per linear foot of chain link fence and gates as stated in the bid documents.

H. Maintain Existing Road/Dust Control

1. Work performed under this item shall include furnishing all equipment, materials and labor required to adequately control the level of dust as specified in the land disturbance permit.
2. Work performed under this item shall include furnishing all equipment, materials, and labor required to import material, grade, regrade, improve, and maintain the existing access road so as to leave it in equal or better condition after construction in accordance with the Contract Documents.

3. Payment shall be made at the lump sum contract price as stated in the bid documents.

I. Existing 24" System Connection (Cut In)

1. Work performed under this item shall include furnishing all labor, materials, and equipment to cut in the Existing 24" System Connection, including but not limited to, coordination, preparation, dewatering, excavation, backfill, bell clamps on each side of connection, restrained joint pipe, backfill, compaction, filling, and flushing, and required to complete the necessary system connections as shown on the plans and stated in the Contract Documents.
2. The price for the fittings will be paid for in the unit price for each fitting.
3. The price for the valves will be paid for in the unit price for each valve.
4. The price for the restrained joint pipe will be paid for in the unit price per linear foot of pipe.
5. Payment shall be made at the lump sum contract price to cut in the Existing 24" System Connection installed as shown in drawings and stated in the bid documents and accepted by Owner.

J. Existing 30" System Connection (Cut In)

1. Work performed under this item shall include furnishing all labor, materials, and equipment to cut in the Existing 30" System Connection, including but not limited to, coordination, preparation, dewatering, excavation, backfill, bell clamps on each side of connection, restrained joint pipe, backfill, compaction, filling, and flushing, and required to complete the necessary system connections as shown on the plans and stated in the Contract Documents.
2. The price for the fittings will be paid for in the unit price for each fitting.
3. The price for the valves will be paid for in the unit price for each valve.
4. The price for the restrained joint pipe will be paid for in the unit price per linear foot of pipe.
5. Payment shall be made at the lump sum contract price to cut in the Existing 30" System Connection installed as shown in drawings and stated in the bid documents and accepted by Owner.

K. C900 DR25 PVC Pipe (Bid Form Items 11-15)

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 12-in., 24-in., 30-in., 36-in., and 42-in. C900 DR25 PVC watermain and appurtenances including but not limited to site preparation, excavation, pipe laying and joining (including through bores), required thrust restraint, backfill, tracer wire installation, restrained joints, dewatering, cleaning, testing, and final grading as shown on the drawings and specified herein.
2. Payment shall be made at the unit price per linear foot of pipe installed as stated in the bid documents.

L. Class 150 DIP (Bid Form Items 16-18)

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 24-in., 36-in., and 42-in. ductile iron watermain and appurtenances including but not limited to; site preparation, excavation, pipe laying and joining (including through bores), required thrust restraint, polyethylene encasement,

backfill, tracer wire installation, restrained joints, dewatering, cleaning, testing, and final grading as shown on the drawings and specified herein.

2. Payment shall be made at the unit price per linear foot of pipe installed as stated in the bid documents.

M. Misc. Pump Station Piping

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install all miscellaneous pump station piping including, but not limited to, all piping, flange fittings, accessory kits, gaskets, paint, supports, and other appurtenances located within the pump station and not specifically called out in other line items as indicated on the project drawings and the bid documents.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

N. Fittings (Bid Form Items 20-40)

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install DIP fittings including, but not limited to, site preparation, excavation, megalugs, polyethylene encasement, accessory kits, trench backfill, dewatering, and testing.
2. Payment shall be made at the unit price per each fitting installed and accepted as stated in the bid documents.

O. Ball Valves (Bid Form Items 41-42)

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install ball valves including, but not limited to, site preparation, excavation, laying and joining, backfill, valve boxes, valve markers, restraints, pressure testing, backfill, and final grading.
2. Payment shall be made at the unit price per each ball valve installed and accepted as stated in the bid documents.

P. Air Release Valves (Bid Form Items 43-44)

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install Air Release Valves including, but not limited to, site preparation, excavation, furnishing and installation of enclosure (if required), laying and joining, backfill, restraints, pressure testing, and final grading.
2. Payment shall be made at the unit price per each Air Release Valve installed and accepted as stated in the bid documents.

Q. Gate Valves (Bid Form Items 45-46)

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install 8-in. and 12-in. gate valves including but not limited to; site preparation, excavation, laying and joining, backfill, valve boxes, valve markers, restraints, pressure testing, backfill, and final grading.
2. Payment shall be made at the unit price per each gate valve installed and accepted as stated in the bid documents.

R. Butterfly Valves (Bid Form Items 47-52)

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install 12-in., 14-in., 24-in., 30-in., 36-in., and 42-in. butterfly valves including but not limited to; site preparation, excavation, laying and joining, backfill, valve boxes, valve markers, restraints, pressure testing, backfill, and final grading.
2. Payment shall be made at the unit price per each butterfly valve installed and accepted as stated in the bid documents.

S. 12” Tilted Disc Check Valve

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install 12” Tilted Disk Check Valves in accordance with the contract documents, plans, specifications and details, including, but not limited to, laying and joining, supporting, adjusting, wiring, and painting as indicated on the drawings and specified herein.
2. Payment shall be made at the unit price per each 12” Tilted Disk Check Valve installed and accepted as stated in the bid documents.

T. 36” Swing Check Valve

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install 36” Swing Check Valves in accordance with the contract documents, plans, specifications and details, including, but not limited to, laying and joining, supporting, adjusting, wiring, and painting as indicated on the drawings and specified herein.
2. The price for the precast structure will be paid for in the unit price for each precast vault and hatch.
3. Payment shall be made at the unit price per each 36” Tilted Disk Check Valve installed and accepted as stated in the bid documents.

U. Drain Line Piping and Components

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install all drain line piping and components including, but not limited to, piping, valves, fittings, drains, inlets, excavation, backfill, compaction, testing, and final cleaning as shown on the drawings and specified herein.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

V. Water Line Piping and Components

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install all water line piping and components including, but not limited to, water tap, service line, valves, fittings, yard hydrants, excavation, backfill, compaction, testing, and final cleaning as shown on the drawings and specified herein.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

W. Sump Pump

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install Sump Pump including, but not limited to, installation of pump and floats, wiring, testing, and final cleaning as shown on the drawings and specified herein.
2. Payment shall be made at the unit price for each Sump Pump installed as stated in the bid documents.

X. Booster Pump Station Building

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install the Booster Pump Station Building including, but not limited to, insulated concrete masonry units, steel reinforcement, tie-downs, grout, cold formed metal trusses, sheathing, insulation, under slab vapor retarder, standing seam metal roofing, siding, joint sealant, doors, metal framing, gypsum board, interior and exterior painting, hardware, penetrations, lighting, cleaning, and all other materials and incidentals, labor, tools, and equipment necessary to complete the work.
2. Payment shall be at the lump sum price for the Booster Pump Station Building as stated in the bid documents.

Y. Structural Concrete

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install all Structural Concrete including, but not limited to, form work and accessories, concrete, aggregate, water, admixtures, patching compounds, water stops, penetrations, grout, joint systems, curing compounds, coatings, steel reinforcement, select backfill, structural backfill, foundation conditioning stone, #57 stone, fabric, and all other materials and incidentals, labor, tools, and equipment necessary to complete the work.
2. Payment shall be at the lump sum price for Structural Concrete as stated in the bid documents.

Z. Removable Bollard

1. Work performed under this item shall include furnishing all labor, materials and equipment necessary to furnish and install Removable Bollards in accordance with the contract documents, plans, specifications and details, including but not limited to; installation, cleaning, and adjusting as indicated on the drawings and specified herein.
2. Payment shall be made at the unit price per each Removable Bollard installed and accepted as stated in the bid documents.

AA. Precast Vault and Hatch

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install Precast Vault and Hatch structures including, but not limited to, base slabs, risers, tops, aggregate, pipe connectors, water, admixtures, water stops, grout, joint systems, reinforcement steel, select backfill, structural backfill, foundation conditioning stone, #57 stone, fabric, hatches, sleeves, wall piping, steps, and all other materials and incidentals, labor, tools, and equipment necessary to complete the work.

2. Payment shall be made at the unit price for each Precast Vault and Hatch as stated in the bid documents.

BB. Electrical

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install Electrical components at the project location including, but not limited to, Owner coordination, conduit, wiring, panels, transformers, risers, inspections, racks, testing, and all other accessories necessary for a complete, operational, electric system.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

CC. Instrumentation and Control

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install instrumentation components from equipment to the Owner supplied SCADA panel. Work includes, but is not limited to; Owner coordination, conduit, wiring, panels, inspections, racks, testing, and all other accessories necessary for a complete, operational, instrumentation system.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

DD. Generator and ATS Installation

1. Work performed under this item shall include all equipment, labor, and materials necessary to install a generator and automatic transfer switch (Supplied by Owner) at the location shown on the plans and in accordance with the contract documents.
2. Payment shall be at the lump sum contract price as stated in the bid documents.

EE. Antenna Tower

1. Work performed under this item shall include all equipment, labor, and materials required to install a SCADA antenna tower at the location shown on the plans and in accordance with the contract documents.
2. Owner will complete all wiring of the antenna. The antenna will be supplied by Owner.
3. Payment shall be made at the lump sum contract price as stated in the bid documents.

FF. Electrical Service Allowance

1. Work performed under this item shall be an allowance used to pay local electric utility to run the electrical service to the pump station.
2. The Lump Sum amount bid shall be equal to $50,000.
3. Payment shall be made only after approval by the Owner and any unused portion shall revert to the Owner.

GG. Wall Hung HVAC Unit

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install Wall Hung HVAC Units including, but not limited to, coordination, delivery, handling, installation, conduit, wiring, thermostat, testing, and all other accessories necessary for a complete, operational, HVAC system.

2. Payment shall be made at the unit price for each Wall Hung HVAC Unit installed as stated in the bid documents.

HH. 3 Ton Hoist Crane

1. Work performed under this item shall include all labor, materials, and equipment necessary to furnish and install the 3 Ton Hoist Crane including, but not limited to, coordination, delivery, handling, installation, connections, conduit, wiring, controls, testing, training, painting, and all other accessories necessary for a complete, operational, hoist crane.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

II. Pump Installation

1. Work performed under this item shall include all labor, materials, and equipment necessary to install horizontal split case pumps (Supplied by Owner) including, but not limited to, Owner coordination, supplier coordination, conduit, wiring, supporting, installation, alignment, start-up, testing, and all other accessories necessary for a complete, operational, pumping system.
2. The price for the pump pad will be paid for in the unit price for structural concrete.
3. Payment shall be at the unit price for each pump installed and accepted by the Owner as stated in the bid documents.

JJ. Electronic Pressure Transmitter

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install Electronic Pressure Transmitters including, but not limited to, installation, wiring, calibration, supporting, cleaning, and adjusting as indicated on the drawings and specified herein.
2. Payment shall be made at the unit price per each Electronic Pressure Transmitter installed and accepted as stated in the bid documents.

KK. Pressure Gauge

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install Pressure Gauges including, but not limited to, installation, cleaning, and adjusting as indicated on the drawings and specified herein.
2. Payment shall be made at the unit price per each pressure gauge installed and accepted as stated in the bid documents.

LL. Chlorine Analyzer

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install a Chlorine Analyzer including, but not limited to, installation, calibration, wiring, supporting, cleaning, and adjusting as indicated on the drawings and specified herein.
2. Payment shall be made at the unit price per each Chlorine Analyzer installed and accepted as stated in the bid documents.

MM. Insertion Flow Meter

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install an insertion flow meter including but not limited to, laying and joining, supporting, adjusting, wiring, and painting as indicated on the drawings and specified herein.
2. The price for the precast structure will be paid for in the unit price for each precast vault and hatch.
3. Payment shall be made at the unit price per each Insertion Flow Meter installed and accepted as stated in the bid documents.

NN. 1" Schedule 80 PVC Pipe

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 1-in. Schedule 80 PVC pipe, fittings, and appurtenances including but not limited to, site preparation, excavation, pipe laying and joining, backfill, flushing, testing, as shown on the drawings and specified herein.
2. Payment shall be at the unit price per linear foot of pipe installed, to include the length of fittings, as stated in the bid documents.

OO. 6" Schedule 80 PVC Casing Pipe

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 6-in. Schedule 80 PVC casing pipe, including, but not limited to site preparation, excavation, pipe laying and joining, backfill, and sealing as shown on the drawings and specified herein.
2. Payment shall be at the unit price per linear foot of pipe installed as stated in the bid documents.

PP. Tapping Saddle (Bid Form Items 76-78)

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 1-in., 8-in., and 12-in. Tapping Saddle on distribution piping including, but not limited to, excavation, installation of saddle, corporation stop, connection to existing main, backfill of trench, and testing in accordance with the bid documents.
2. Payment shall be made at the unit price per each Tapping Saddle installed and accepted as stated in the bid documents.

QQ. Flanged Coupling Adapter (Bid Form Items 79-81)

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install 12-in., 14-in., and 36-in. Flanged Coupling Adapters on distribution piping in accordance with the bid documents.
2. Payment shall be made at the unit price per each Flanged Coupling Adapter installed and accepted as stated in the bid documents.

RR. Hydrant Assembly

1. Work performed under this item shall include all labor, materials, equipment necessary to furnish and install the Hydrant Assembly as shown on the drawings and in accordance with the contract documents.
2. Payment shall be made at the unit price per each Hydrant Assembly installed and accepted as stated in the bid documents.

SS. Blow Off Assembly

1. Work performed under this item shall include all labor, materials, equipment necessary to furnish and install the Blowoff Assembly as shown on the drawings and in accordance with the contract documents.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

TT. Water Sampling Assembly

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install a Water Sampling Assembly including, but not limited to, tapping saddle, sample line, fittings, enclosure, stone base, excavation, installation, and backfill of trench in accordance with the Contract Documents.
2. Payment shall be made at the unit price per each Water Sampling Assembly installed and accepted in accordance with the bid documents.

UU. Concrete for Pipe Encasement

1. Work performed under this item shall include all labor, materials and equipment necessary to furnish and install Concrete Encasement around buried pipe including, but not limited to, excavation, protection of bolts, forming, pouring, curing, protecting concrete, and backfill of excavation in accordance with the Contract Documents.
2. Payment shall be made at the lump sum contract price as stated in the bid documents.

VV. Unsuitable Soils (As Directed by Engineer)

1. Work performed under this item shall include all labor, materials and equipment necessary to remove and replace existing soils unsuitable for project design requirements including, but not limited to, soil stabilization, hauling, and proper disposal of excavated unsuitable materials.
2. Payment shall be made at the unit price per cubic yard of Unsuitable Soil and removed and properly disposed of offsite, as directed by the Engineer.

WW. Miscellaneous Concrete (As Directed by Engineer)

1. Work performed under this item shall include furnishing and placement of miscellaneous concrete as directed by the Engineer.
2. Payment shall be made at the unit price per cubic yard for each cubic yard placed as directed by the Engineer.

XX. Rip-Rap (As Directed by Engineer)

1. Work performed under this item consist of the installation of Rip-Rap, in addition to that shown on the Drawings, as directed by the Engineer.
2. Rip-Rap shall be placed only at the direction of the Engineer and only to the limits established and authorized by the Engineer.
3. After placement, day tickets shall be submitted to the Engineer for approval and shall be used to determine the amount of payment under this pay item.
4. Payment shall be made at the unit price per ton installed as stated in the bid documents, as directed by the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 15 00

SECTION 01 26 00 - 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 1 – General Requirements

1.3 MINOR CHANGES IN THE WORK

A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer 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 Engineer are not instructions either to stop work in progress or to execute the proposed change.
2. Within 10 days 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.
    e. Quotation Form: Use forms acceptable to Engineer.

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 Engineer.

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. Proposal Request Form: Use form acceptable to the Engineer.

1.5 CHANGE ORDER PROCEDURES

A. Change Order Procedures shall conform to the requirements of the General Conditions.

B. A change in the project work that is consistent with the objective of the project and outside the scope of the project requires the execution and approval of a Change Order.

C. On Owner's approval of a Work Changes Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor on form included in the bid documents.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: Engineer may issue a work Change Directive on form included in Project Manual. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 29 00 - 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. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 01 32 00 "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 Engineer at earliest possible date, but no later than 14 days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

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 where a submittal is required.

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 Contract Documents used (EJCDC, AIA, etc.).
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 the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

      1) Labor.
      2) Materials.
      3) Equipment.

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. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

   a. Include separate line items under contractor and principal subcontracts for Project closeout requirements in an amount totaling no less than 2.5% of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item 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. If required, include 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. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

10. Schedule Updating: Update and resubmit the schedule of values before the next Applications 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 by engineer and contractor 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 Engineer by the 25th day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

    1. Submit draft copy of Application for Payment five days prior to due date for review by Engineer.

D. Application for Payment Forms: Use form consistent with Contract Documents (EJCDC, AIA, etc.) for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

F. 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.

G. 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 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.

H. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Engineer 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.

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. Products list (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of building and other local/state permits.
7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
8. Report of preconstruction conference.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Architect issues 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. "Contractor's Affidavit of Payment of Debts and Claims."
5. "Contractor's Affidavit of Release of Liens."
6. "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. 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.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 31 00 - 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. Coordination drawings.
3. Requests for Information (RFIs).
4. Project Web site.
5. Project meetings.

B. Each contractor shall participate in coordination requirements.

C. Related Requirements:

1. Section 01 32 00 - Construction Progress Documentation, for preparing and submitting Contractor's construction schedule.

1.3 DEFINITIONS

A. RFI: Request from Engineer seeking information required by or clarifications 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: No less than 15 days 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 addresses and

telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office and at existing treatment facility. Keep list current at all times.

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. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUESTS FOR INFORMATION (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 in the form specified.

1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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.
5. Name of Engineer
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. 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. RFI Forms: As acceptable to the Engineer.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer Action: Engineer will review each RFI, determine action required, and respond. Allow seven working days for Engineer’s response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

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 Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
3. Engineer'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 Section 01 26 00 - Contract Modification Procedures.

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within five days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within five 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.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within seven days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days before mobilization.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Engineer, 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. Sustainable design requirements.
m. Preparation of record documents.
n. Use of the premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer and Owner of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.

t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 90 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, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; 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 completing sustainable design documentation.
e. Requirements for preparing operations and maintenance data.
f. Requirements for delivery of material samples, attic stock, and spare parts.
g. Requirements for demonstration and training.
h. Preparation of Contractor's punch list.
i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
j. Submittal procedures.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at minimum monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities 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: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's 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.

F. Coordination Meetings: Conduct Project coordination meetings as necessary. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these

meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor 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) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - 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. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Weekly construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.
8. Periodic construction photographs.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.
3. Section 01 70 00 "Execution and Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
4. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Startup construction schedule.

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

D. Construction Reports: Submit, at minimum, monthly intervals.

E. Material Location Reports: Submit at monthly intervals.

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

G. Special Reports: Submit at time of unusual event.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed 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 process or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
2. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 30 for startup and testing.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

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. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Environmental control.

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

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 (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.

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

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10% percent increments within time bar.

2.3 REPORTS

A. Monthly Construction Reports: Prepare a Monthly construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.

2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within two day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

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 two days 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. As the Work progresses, indicate final completion percentage for each activity.

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

3.2 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. 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 Engineer.

C. Periodic Construction Photographs: Take photographs at necessary intervals with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

D. Engineer-Directed Construction Photographs: From time to time, Engineer will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as project record documents. Retain subparagraph below if date stamp is not required.

1. Do not include date stamp.

END OF SECTION 01 32 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 32 33 - 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.
3. Final completion construction photographs.
4. Preconstruction video recordings.

B. Related Requirements:

1. Section 01 33 00 - Submittal Procedures, for submitting photographic documentation.
2. Section 01 79 00 - Demonstration and Training, for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Section 02 41 16 - Structure Demolition, for photographic documentation before building demolition operations commence.
4. Section 02 41 19 - Selective Structure Demolition, for photographic documentation before selective demolition operations commence.

1.3 CAPTURE OF DIGITAL DOCUMENTATION

A. Key Plan: Develop key plan of Project site and building with notation of vantage points marked for location and direction of each photograph or video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs for Existing Conditions and Construction Documentation:

1. Digital Camera: Minimum sensor resolution of 6 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Date photograph was taken.

d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
e. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings:

1. Identification: With each submittal, provide the following information:

a. Name of Project.
b. Name and address of photographer.
c. Date video recording was recorded.
d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
e. Weather conditions at time of recording.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Upon request submit the following:

1. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 6 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
2. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to Engineer.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Contractor shall take construction photographs throughout the duration of the project.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images, if requested, 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 Engineer.

D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Engineer.

1. Flag construction limits before taking construction photographs.
2. Take photographs to show existing conditions adjacent to property before starting the Work.
3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take photographs at necessary intervals with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as project record documents. Retain subparagraph below if date stamp is not required.

1. Do not include date stamp.

END OF SECTION 01 32 33

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Verification of Submitted Material: Verify field measurements, field construction criteria, catalog numbers, and similar data, including those by subcontractors, prior to submission.

1. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineer's review of submittals.
2. By approving and submitting shop drawings, samples, or other product data, Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers, and similar data. Further the Contractor represents that he has checked and coordinated submittals with the requirements of the project and of the Contract Documents.

C. Deviations: Notify the Engineer, in writing at the time of submission, of deviations in submittals from the requirements of the Contract Documents, and submit written justification of the proposed deviations in letter form as an attachment to the appropriate submittal.

D. Begin no work that requires submittals until return of submittals with Engineer's stamp and initials or signature indicating "No Exceptions Taken", "Make Corrections Noted", or "Note Markings".

E. Project work, materials, fabrication, and installation shall conform to the final reviewed and returned submittal.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. All submittals shall be sent to the following address to the attention of the Engineer listed on the Drawings.

US Postal Service, UPS, FedEx, etc.

Goodwyn, Mills & Cawood, Inc.
617 East McBee Avenue, Suite 200
Greenville, SC 29601

C. 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 printed 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 written recommendations/
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with specified referenced standards.
    l. Testing by recognized testing agency.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: The CONTRACTOR shall submit to the ENGINEER enough copies for his/her use plus three (3) additional copies for the ENGINEER to distribute to the OWNER and Field Representative.

D. 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. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.

h. Schedules.
i. Design calculations.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

E. 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 appropriate Specification Section.

3. 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 the CONTRACTOR.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit 3 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The ENGINEER will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of samples: Submit one Sample to be retained at the Project site.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by the ENGINEER for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

C. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

D. 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.

E. ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

F. Submittals Schedule: Make all submittals far enough in advance of scheduled dates for installation so as to provide time for reviews, securing necessary approvals, possible revision and resubmittal, and placing orders and securing delivery.

G. For each submittal for review, allow 14 days excluding delivery time to and from Contractor.

H. Resubmittal Review: Allow the same amount of days for review of each resubmittal as for the initial review.

I. Sequential Review: Where sequential review of submittals by Engineer, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

J. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

K. Submittal Identification numbering system: The Contractor shall utilize and shop drawing submittal identification numbering system in the following manner:

1. Each submittal shall be sequentially numbered beginning with one (1) through the last submittal number. Re-submittals shall list the prior submittal number followed by “Rev” and the revision number.
2. The next six (6) to nine (9) digits shall be the applicable Specification section number.
3. The next submittal identification shall be the submittal title.

4. A typical submittal number would be as follows:

    a. "10-312316.13-Excavation Protection Plan" – Initial submittal
    b. "10Rev1-312316.13-Excavation Protection Plan" – First re-submittal

5. Requests for Information (RFIs) shall utilize the identification numbering system as shop drawings except RFIs will have a separate sequential numbering system.

L. Identification: Place a cover page or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on cover page or title block.
2. Submittal identification number.
3. Provide a space to record CONTRACTOR'S review and approval markings and action taken by ENGINEER.
4. Include the following information on stamp for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of ENGINEER.
    d. Name and Address of CONTRACTOR.
    e. Name of manufacturer.
    f. Other necessary identification.

M. When revised for resubmission, identify changes made since previous submission.

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

1. Resubmit submittals until they are marked:

    a. "No Exceptions Taken"
    b. "Make Corrections Noted"
    c. "Note Markings"

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

P. Use for Construction: Use only final submittals with mark indicating action taken by ENGINEER as noted above.

Q. Submittals not requested will not be recognized nor processed.

R. Incomplete Submittals: Architect/Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Architect/Engineer.

END OF SECTION 01 33 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 40 00 - 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:

1. Quality control.
2. Testing and inspection services.
3. Manufacturers' field services.
4. Shop Testing.
5. Field Testing.

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 Engineer, 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.

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 Engineer.

C. 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.

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

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

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

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

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

1.4 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will employ the services of a Resident Project Representative (RPR)

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all specified services and testing not specifically identified to be provided by Contractor related to the design of mixes, products and equipment, to Engineer's review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests.

1. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract

1.5 ACCEPTABLE TESTING AGENCIES

A. S&ME, Inc.

B. Or Pre-Approved Equal

1.6 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 Engineer for a decision before proceeding.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate 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.

E. 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.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

1.9 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. 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.

1.10 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. 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.

F. 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 48 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.

G. 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 01 33 00 "Submittal Procedures."

H. 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.

I. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer 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.

J. 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.

K. 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.

L. 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, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

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 Engineer.
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 Engineer'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 01 70 00 "Execution and Closeout Requirements."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 50 00 - 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. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Engineer, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Sewer service use charges shall be by the Contractor utilizing portable facilities.

C. Water Service: Water-service use charges for water used by all entities for construction operations shall be by the Contractor.

D. Electric Power Service: Electric-power-service use charges for electricity used by all entities for construction operations shall be by the Contractor.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction (DHEC), whichever is more stringent.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

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.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

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. Provide each facility ready for use when needed to avoid delay. 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. No connection to sewer is available.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. 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.

E. 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.

F. 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 according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

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 approved, HEPA-filter-equipped vacuum equipment.

G. 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. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

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

1. Install electric power service overhead or underground or as indicated.

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

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Final Completion.

B. 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.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

2. Maintain all access roads and restore to pre-construction condition after completing work.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 32 12 16 "Asphalt Paving."

D. 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.

E. Parking: Provide temporary parking areas for construction personnel.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted. Subcontractors are not authorized to have signage.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary construction signs as required by funding agencies.
b. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

G. 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 Section 01 70 00 "Execution and Closeout Requirements."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

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 Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with authorities having jurisdiction, and requirements specified in Section 31 25 00 “Erosion and Sedimentation Controls.”

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. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

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.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

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

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

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.

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

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.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Engineer.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

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. Owner reserves right to take possession of Project identification signs.
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.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 70 00 "Execution and Closeout Requirements."

END OF SECTION 01 50 00

SECTION 01 60 00 - 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.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. 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 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
    b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 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.

1.6 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.

1.7 PRODUCT WARRANTIES

A. Warranty requirements shall conform with the General Conditions followed by Specification Section 01 10 00.

1.8 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," Engineer 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 requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

7. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered,

8. 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. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

1.9 COMPARABLE PRODUCTS

A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied,

Engineer 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 Engineers and owners, if requested.
5. Samples, if requested.
6. The Contractor shall also include in the price bid the modifications necessary for the comparable product to be utilized. This includes but is not limited to, electrical and mechanical changes, engineering time to assess the changes, modifications to buildings, programmable controls and structural modifications.

PART 2 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Field engineering.
2. Closeout procedures.
3. Starting of systems.
4. Demonstration and instructions.
5. Testing, adjusting, and balancing.
6. Project record documents.
7. Operation and maintenance data.
8. Manual for materials and finishes.
9. Manual for equipment and systems.
10. Spare parts and maintenance products.
11. Product warranties and product bonds.
12. Examination.
13. Preparation.
14. Execution.
15. Cutting and patching.
16. Protecting installed construction.
17. Final cleaning.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.2 FIELD ENGINEERING

A. Employ land surveyor registered in state of South Carolina acceptable to Engineer.

B. Locate protect survey control and reference points. Promptly notify Architect/Engineer of discrepancies discovered.

C. Control datum for survey is indicated on Drawings.

D. Verify setbacks and easements; confirm Drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.

F. Submit copy of certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

A. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

B. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.3 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:

1. Submit operation and maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When Contractor considers Work to be substantially complete, submit to Engineer:

    a. Written certificate that Work, or designated portion, is substantially complete.
    b. List of items to be completed or corrected (initial punch list).

2. Within seven days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
3. Should Engineer determine that Work is not substantially complete:

    a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
    b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
    c. Engineer will re-inspect Work.

d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer and Owner's inspection.

4. When Engineer finds that Work is substantially complete, Engineer will:

a. Prepare Certificate of Substantial Completion on EJCDC C-625 - Certificate of Substantial Completion accompanied by Contractor's list of items to be completed or corrected as verified and amended by Architect/Engineer and Owner (final punch list).
b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.

5. After Work is substantially complete, Contractor shall:

a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When Contractor considers Work to be complete, submit written certification that:

a. Contract Documents have been reviewed.
b. Work has been examined for compliance with Contract Documents.
c. Work has been completed according to Contract Documents.
d. Work is completed and ready for final inspection.

2. Submittals: Submit following:

a. Final punch list indicating all items have been completed or corrected.
b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
d. Accounting statement for final changes to Contract Sum.
e. Contractor's affidavit of payment of debts.
f. Contractor affidavit of release of liens.
g. Consent of surety to final payment.

3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:

1. Within seven days after receipt of request for final inspection, Owner and Engineer will make inspection to determine whether Work or designated portion is complete.
2. Should Engineer consider Work to be incomplete or defective:

a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.

b. Contractor shall remedy stated deficiencies and send second written request to Work is complete.
c. Engineer will re-inspect Work.
d. Redo and Inspection of Deficient Work: Repeated until Work passes inspection.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify Engineer and owner seven days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly, as well as a certificate/field report from the manufacturer from his inspection of the installation.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel as equipment becomes available for use and not later than 14 days prior to date of Substantial Completion.

B. Demonstrate Project equipment and instruct in classroom environment located at the facility. Class shall be instructed by qualified manufacturer's representative who is knowledgeable about the Project.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at designated location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.6 TESTING, ADJUSTING, AND BALANCING

A. Contractor with Engineer approval will appoint and employ services of independent firm to perform testing, adjusting, and balancing. Contractor shall pay for services.

B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, product data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates used.
3. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction as follows:

1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
2. Include locations of concealed elements of the Work.
3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
5. Identify and locate existing buried or concealed items encountered during Project.
6. Measured depths of foundations in relation to finish floor datum.
7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
9. Field changes of dimension and detail.

10. Details not on original Drawings.

G. Submit marked-up paper copy documents to Architect/Engineer with claim for final Application for Payment.

1.8 OPERATION AND MAINTENANCE DATA

A. See Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manuals.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

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

1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.

1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting heights choices to Architect/Engineer for final decision.
2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and nonconforming Work.

4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products according to requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated material to full thickness of penetrated element.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

1. Employ experienced personnel or professional cleaning firm.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces, and vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean Site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 01 70 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 78 23 - 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. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 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. Engineer 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. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Two paper copies. 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 and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 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 Engineer.
8. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
9. 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.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

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, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch and 11 x 17 paper (Z folded); 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," Project title or name and subject matter of contents, and indicate Specification Section number on bottom of spine. 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. 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.

2.3 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.

2.4 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.

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

B. 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.

C. 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.

D. 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 Section 017839 "Project Record Documents."

E. Comply with Section 01 70 00 "Execution and Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - 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.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 01 70 00 "Execution and Closeout Procedures" for general closeout procedures.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Submit copies of marked-up record prints as follows:

a. Initial Submittal:

1) Submit electronic files or one (1) hard copy set. Engineer will review and return, with comments as necessary.

b. Final Submittal:

1) After incorporation of Engineer’s comments, submit electronic files and one (1) hard copy set of final marked-up record prints to the Engineer and electronic files and one (1) hard copy set to the Owner.

c. Engineer will be responsible for generating record drawings based on the Contractor’s marked-up record prints and delivering three (3) hard copy sets to the Owner.

B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

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. Contractor shall maintain a set of marked up prints on the job site for review prior to pay request approval.

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.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. 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 Work Change Directive.
    k. Changes made following Engineer's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

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.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Engineer.
e. Name of Contractor.

2.2 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

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 Engineer's reference during normal working hours.

END OF SECTION 01 78 39

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 81 00 – GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Report of explorations and tests of subsurface conditions at the site.

1.2 RELATED SECTION

A. Section 31 20 00 – Earth Moving

B. Section 31 23 19 – Dewatering

C. Section 31 50 00 – Excavation Support and Protection

1.3 INVESTIGATION

A. Soil and subsurface investigations were conducted at the site, the results of which are to be found in the Report of **GSWSA International Drive PS & Water Main** (GMC Geotechnical Report) issued by Goodwyn, Mills and Cawood (GMC), dated **January 23, 2020**, GMC Project Number **GGRE190018 in Appendix B**.

B. Bidders are urged to examine soils investigation data and to make their own investigation of the site before bidding.

C. Boring results and soil improvement recommendations are included in the plans.

1.4 INTERPRETATION

A. Soil investigation data is provided only for information and the convenience of bidders.

B. Owner and Engineer disclaim responsibility for interpretations of geotechnical data by bidders, as in projecting soil-bearing values, rock profiles, soil stability and the presence, level, and extent of underground water.

C. Bidders are urged to examine the GMC Geotechnical Report that addresses the purpose, basis, and warranties relevant to that report.

D. Owner and Engineer disclaim all responsibility for the existence of other soil and subsurface investigations previously prepared for Owner, Engineer, or others. It is the sole responsibility of the Bidder to obtain other soil and subsurface investigations that may be available for interpretation, at no additional cost to the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 81 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Division 31 – Earthwork
2. Section 32 13 13 – Concrete Paving for concrete pavement and walks.

1.3 DEFINITIONS

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

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete Subcontractor.
    e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, steel reinforcement installation, methods for achieving

specified floor and slab flatness and levelness concrete repair procedures, and concrete protection.

1.5 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 color finishes, normal weight aggregates, fiber reinforcement, reglets, waterstops, vapor retarder/barrier, and form liners.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

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. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semi-rigid joint filler.
12. Joint-filler strips.
13. Repair materials.

C. Material Test Reports: From a qualified testing agency.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Placing drawings indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.

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

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

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

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

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

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

C. Testing Agency Qualifications: 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.

1.8 DELIVERY, STORAGE, AND HANDLING

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

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

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain average concrete temperature below 90 deg F at time of placement. Maximum concrete temperature at time of placement shall be 95 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.
3. ACI 350.
4. ACI 308.

2.2 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. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

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. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void (Carton) Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

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

H. Form-Release Agent: Commercially formulated (maximum VOC content of 350 mg/L) 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.

I. 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 ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

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

B. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60, deformed bars, assembled with clips.

C. Plain-Steel Wire: ASTM A 1064, as drawn.

D. Deformed-Steel Wire: ASTM A 1064.

E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064, flat sheet.

G. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from galvanized-steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

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

B. Zinc Repair Material: ASTM A 780.

C. 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. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.5 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, Type I or Type II.

a. The cement shall be low alkali, less than 0.60 percent. All cement used in concrete that will be in contact with wastewater shall have a tricalcium aluminate ($Ca_3Al_2O_6$) content of less than 8 percent.
b. Use one brand of cement throughout the Project unless otherwise acceptable to the Engineer.

2. Fly Ash: ASTM C 618, Class F or C.

C. Normal-Weight Aggregates: ASTM C 33, 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. Normal weight river gravel and natural sand are acceptable for use as aggregate materials in concrete. All normal weight aggregates shall conform to ASTM C33.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.

D. Lightweight Aggregate: ASTM C 330, 1-inch-nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C 260.

F. 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, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

G. Water: ASTM C 94 and potable.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

B. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.7 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes.

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

    a. Sika Greenstreak
    b. Williams Products, Inc.
    c. JP Specialties, Inc.
    d. Or approved equal.

2. Profile: Ribbed with center bulb and/or Ribbed without center bulb.
3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes.

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

    a. BoMetals, Inc.
    b. Sika Greenstreak.
    c. JP Specialties, Inc.
    d. Or approved equal.

2. Profile: Ribbed with center bulb and/or Ribbed without center bulb.
3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

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

a. Barrier-Bac; Inteplast Group, Ltd.
b. JP Specialties, Inc.
c. Sika Greenstreak.
d. Or approved equal.

D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

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

a. Adeka Ultra Seal/OCM, Inc.
b. Sika Greenstreak.
c. Or approved equal.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.9 FLOOR AND SLAB TREATMENTS

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

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

a. BASF Corporation; Construction Systems.
b. Euclid Chemical Company (The); an RPM company.
c. Kaufman Products, Inc.
d. Sika Corporation.
e. SpecChem, LLC.
f. Or approved equal.

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

a. BASF Corporation; Construction Systems.
b. Euclid Chemical Company (The); an RPM company.
c. W. R. Meadows, Inc.
d. Or approved equal.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

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

a. BASF Corporation; Construction Systems.
b. Euclid Chemical Company (The); an RPM company.
c. L&M Construction Chemicals, Inc.
d. TK Products.
e. Or approved equal.

G. 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 floor covering.

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

a. BASF Corporation; Construction Systems.
b. Dayton Superior.
c. Euclid Chemical Company (The); an RPM company.
d. L&M Construction Chemicals, Inc.
e. W. R. Meadows, Inc.
f. Or approved equal.

H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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

a. BASF Corporation; Construction Systems.
b. Dayton Superior.
c. Euclid Chemical Company (The); an RPM company.
d. L&M Construction Chemicals, Inc.
e. W. R. Meadows, Inc.

f. Or approved equal.

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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

a. Dayton Superior.
b. Euclid Chemical Company (The); an RPM company.
c. L&M Construction Chemicals, Inc.
d. W. R. Meadows, Inc.
e. Or approved equal.

2.11 RELATED MATERIALS

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

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, nonload bearing or Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. 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.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.

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

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

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: -As indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.55.
3. Slump Limit: 3 inches. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Foundation Walls: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.50
3. Slump Limit: 3 inches. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.50
3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
4. Slump Limit: 3 inches, plus or minus 1 inch.
5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
8. Maximum W/C Ratio: 0.50.

D. Suspended Slabs: Normal-weight concrete.

1. Minimum Compressive Strength: A**s** indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
4. Slump Limit: 3 inches, plus or minus 1 inch.
5. Air Content: 4 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
6. Air Content: –4.5 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
8. Maximum W/C Ratio: 0.50.

E. Water Retaining Structures.

1. Minimum Compressive Strength: A**s** indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 535 lb/cu. yd.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

6. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

F. Concrete Toppings: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated in Structural General Notes at 28 days.
2. Minimum Cementitious Materials Content: 600 lb/cu. yd.
3. Slump Limit: 3 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd.

G. Building Frame Members: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

H. Building Walls: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated in Structural General Notes at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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

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

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

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

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

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

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

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

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

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

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

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

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

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete with a 72 hour pour back for adjacent pours. 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.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

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

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

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

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 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 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 on Contractor's submitted and approved construction joint layout. 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.

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 as soon as cutting action does 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. 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 one side of joint.

3.8 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 fabricated joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

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

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

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

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

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

3.10 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. N/A.

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 not exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Apply to the top of exposed concrete walls and the outside exposed face to 1' below grade on all new concrete structures and new concrete additions.

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. 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 resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces-where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

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 Engineer before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-

place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

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

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 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: 4000 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 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: Required for all water retaining structures. Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: For non-liquid retaining structures and floors only. Comply with ASTM C171. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies in writing that the curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: For non-liquid retaining structures and floors only. Comply with ASTM C171. 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 JOINT FILLING

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

1. Defer joint filling until concrete has aged at least three (3) month(s). Do not fill joints until construction traffic has permanently ceased.

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

C. Install semi-rigid 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.

3.15 WET TESTING

A. General

1. All new, water-retaining concrete structures shall be tested for water-tightness by the testing procedure described below and in accordance with ACI 350.1.
2. All testing work shall be performed by the Contractor in the presence of the Engineer. The Engineer shall be notified at least five (5) days in advance of the time at which testing will be performed.

B. Testing Water

1. Water for wet testing shall be furnished by the Contractor. The source of the water must be approved by the Engineer prior to filling of the structure. As a general rule, plant effluent water is acceptable for use as testing water; however, this must be confirmed by the Engineer.
2. Once testing is complete, testing water shall be disposed of in a manner acceptable to the Engineer and, unless otherwise permitted by the Engineer, shall not be allowed to enter other parts of the system.

C. Test Equipment

1. All temporary equipment needed for wet testing must be provided by the Contractor (e.g. connections between the structure to be tested and the water source, pumping equipment, metering devices, pressure or vacuum gauges, temporary flanges, valves, bulkheads, bracing, blocking, and other equipment that may be necessary to perform the testing).
2. All temporary equipment shall be removed upon satisfactory completion of wet testing.

D. Test Preparation

1. Unless otherwise specified, wet testing shall be performed after installation of pipe sleeves and before placement of backfill, cleaning, disinfection, installation of process equipment, or any other activities that would hinder visual inspection of the structure during the test.
2. Exposed concrete surfaces of the structure (including the floor) shall be cleaned of all foreign material and debris prior to the test. Standing water in or outside the structure that would interfere with the observation of the exposed concrete surfaces of the structure shall be removed. The concrete surfaces and concrete joints shall be thoroughly inspected for potential points of leakage, and those areas shall be repaired prior to filling the structure with water.
3. Adjacent structures having common walls shall be tested individually at different times to allow examination of the dividing walls for leaks.
4. Pipe connections or openings to structures, if not provided with drip tight valves, shall be temporarily plugged during testing. Where slide gates, sluice gates or similar devices are located, the Contractor shall provide bulkheads or the means to make them drip tight, and shall measure any leakage.
5. Filling of the structure shall not begin before the designed compressive strength of all concrete elements of the structure has been reached or before fourteen (14) days after all concrete walls or base slabs have been placed.

E. Test Procedure

1. Soaking Period: Fill the unlined concrete structure to 1 foot above the maximum operating water surface level and maintain that water level for a minimum of 72 hours, to minimize absorption of water into the concrete during testing. Identify and repair all visible leaks during the soaking period.
2. Testing Period: At the end of this soaking period, once all leaks have been repaired and the water level brought back to the required elevation, the testing period shall begin. Mark the water level with a weight suspended from a string and measure its elevation with a surveyor's level. Allow the structure to sit for a minimum of 48 hours. Following this period, identify and repair all visible leaks. Record and submit to the Engineer measurements of the water level at the beginning and end of the testing period.
3. Evaporation/Precipitation: During the testing period, suspend a bucket or pan in the structure and fill it halfway with testing water. Record and submit to the Engineer measurements of the water level at the beginning and end of the testing period, for use in accounting for any evaporation and precipitation that may have occurred during testing.

F. Leakage

1. Leakage requiring repair shall be defined as any moisture on the exterior surface of the structure, ranging from damp spots to dripping or trickling to shooting streams of water. All visible leakage is to be repaired even if magnitude is within allowable leakage.
2. Allowable leakage: For unlined tanks with a side-water depth of 25 feet or less, the net loss of water volume (including evaporation/precipitation) shall not exceed 0.1 percent in 24 hours.

G. Test Conclusion

1. If the leakage observed during testing (including evaporation/precipitation) is less than the allowable leakage, the structure shall be considered sufficiently water-tight. If it is greater than the allowable, the structure shall be drained, necessary repairs shall be made, and the structure shall be re-tested.

3.16 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 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by 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 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. 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 blending with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. 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 Engineer’s approval, using epoxy adhesive and patching mortar.

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

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

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

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

D. 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 one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    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; 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, 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; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. 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.
8. 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.
9. 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.

10. 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.
11. 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 or by other methods as directed by Engineer.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing for laboratory and office buildings.

F. For floors required for sloping, the slope must be within 1/16” tolerances of that required in the plans.

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 30 00

SECTION 03 60 00 - GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement grout.
2. Rapid-curing epoxy grout.
3. Nonshrink cementitious grout.

B. Related Requirements:

1. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

B. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
6. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
7. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
8. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):

1. CRD-C621 - Non-Shrink Grout.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information regarding grout.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit instructions for mixing, handling, surface preparation, and placing epoxy-type and nonshrink grouts.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.5 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Maximum Conditions: Do not perform grouting if temperatures exceed manufacturer’s recommendations.

C. Minimum Conditions: Maintain minimum temperature per the manufacturer before, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT GROUT

A. Portland Cement: Comply with ASTM C150, Type I and II.

B. Water:

1. Potable.
2. No impurities, suspended particles, algae, or dissolved natural salts in quantities capable of causing:

    a. Corrosion of steel.
    b. Volume change increasing shrinkage cracking.
    c. Efflorescence.
    d. Excess air entraining.

C. Fine Aggregate:

1. Washed natural sand.
2. Gradation:

    a. Comply with ASTM C33.
    b. Represented by smooth granulometric curve within required limits.

3. Free from injurious amounts of organic impurities according to ASTM C40.

D. Mix:

1. Portland cement, sand, and water.
2. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID-CURING EPOXY GROUT

A. Manufacturers:

1. L&M Construction Chemicals
2. Sika Corporation
3. WR Meadows

B. Description:

1. High-strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
2. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids, and alkalis.

C. Performance and Design Criteria:

1. Compressive Strength:

    a. 12,000 psi at seven days.
    b. Comply with ASTM C579.

2. Minimum Tensile Strength:

    a. 2,000 psi.
    b. Comply with ASTM C307.

3. Coefficient of Expansion:

a. 30x10-6 inch per degree F.
b. Comply with ASTM C531.

4. Shrinkage:

a. None.
b. Comply with ASTM C827.

2.3 NONSHRINK CEMENTITIOUS GROUT

A. Manufacturers:

1. Euclid Chemical Company
2. Sika Corporation
3. L&M Construction Chemicals

B. Description:

1. Pre-mixed and ready-for-use formulation requiring only addition of water.
2. Nonshrink, non-corrosive, nonmetallic, non-gas forming, and no chlorides.

C. Performance and Design Criteria:

1. Certified to maintain initial placement volume or expand after set, and to meet following minimum properties when tested according to CRD-C621 for Type D nonshrink grout:

a. Setting Time:

1) Initial: Approximately two hours.
2) Final: Approximately three hours.
3) Comply with ASTM C191.

b. Maximum Expansion: 0.10 to 0.40 percent.
c. Compressive Strength:

1) One-Day: 4,000 psi.
2) Seven-Day: 7,000 psi.
3) 28-Day: 10,000 to 10,800 psi.
4) Comply with CRD-C621.

2.4 FORMWORK

A. As specified in Section 03 30 00 – Cast-In-Place Concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify areas to receive grout.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by brushing, hammering, chipping, or other similar means until sound and clean concrete surface is achieved.

C. Roughen concrete lightly, but not to interfere with placement of grout.

D. Remove foreign materials from metal surfaces in contact with grout.

E. Align, level, and maintain final positioning of components to be grouted.

F. Saturate concrete surfaces with clean water, and then remove excess water.

3.3 INSTALLATION

A. Formwork:

1. Construct leak proof forms anchored and shored to withstand grout pressures.
2. Install formwork with clearances to permit proper placement of grout.
3. As specified in Section 03 30 00 – Cast-In-Place Concrete.

B. Mixing:

1. Portland Cement Grout:

a. Use proportions of two parts sand and one part cement, measured by volume.
b. Prepare grout with water to obtain consistency to permit placing and packing.
c. Mix water and grout in two steps:

1) Premix using approximately 2/3 of water.
2) After partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing two to three minutes.

d. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
e. Do not add additional water after grout has been mixed.

f. Minimum Compressive Strength: 2,400psi in 48 hours and 7,000psi in 28 days.

2. Rapid-Curing Epoxy Grout:

a. Mix and prepare according to manufacturer instructions.
b. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

3. Nonshrink Cementitious Grout:

a. Mix and prepare according to manufacturer instructions.
b. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

4. Mix grout components in proximity to Work area and transport mixture quickly and in manner not permitting segregation of materials.

C. Placing of Grout:

1. Place grout material quickly and continuously.
2. Do not use pneumatic-pressure or dry-packing methods.
3. Apply grout from one side only to avoid entrapping air.
4. Do not vibrate placed grout mixture or permit placement if area is being vibrated by nearby equipment.
5. Thoroughly compact final installation and eliminate air pockets.
6. Do not remove leveling shims for at least 48 hours after grout has been placed.

D. Curing:

1. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.
2. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
3. After grout has attained its initial set, keep damp for minimum three days.

3.4 FIELD QUALITY CONTROL

A. Inspection and Testing:

1. Comply with ACI 301 and as specified in Section.
2. Submit proposed mix design of each class of grout to Engineer of Record for review prior to commencement of Work.
3. Tests of grout components may be performed to ensure compliance with specified requirements.

END OF SECTION 03 60 00

SECTION 042200 - INSULATED CONCRETE MASONRY UNITS

PART 1 GENERAL

1.01 Summary
A. Section Includes
1. Insulated masonry wall units (CMU's)

1.02 SUBMITTALS

A. Samples: Submit samples to Architect for review prior to constructing job-site mock-ups, delivering materials to Site or commencing Work in this Section.
1. Provide samples of each type and weight classification of concrete masonry units, to be used on Project showing range of texture of exposed surfaces for units.
2. Units provided to Project shall match these samples.

B. Product Data: Indicate methods of fabrication and installation for the insulated concrete masonry units.

C. Certificates: Submit certification to the Architect prior to delivery of concrete masonry units to jobsite, signed by Concrete Masonry Unit Manufacturer, stating that the concrete masonry units to be supplied: 1) shall meet the specified requirements for concrete masonry units for exterior building wall construction, and; 2) are suitable for proposed usage.

D. Test Reports:
1. Submit test results for concrete masonry units for exterior building wall construction to be used to Architect in accordance with specifications.
2. Test results shall clearly indicate:
a. Types of materials and composition.
b. Classification of concrete masonry unit in accordance with ASTM C90 requirements.
3. Able to provide independent quality assurance test results for concrete masonry units manufactured and tested within a calendar year.

1.03 QUALITY ASSURANCE

A. Standards:
1. Comply with the requirements of ACI 530.1/ASCE6/TMS 602 unless modified by requirements in the Contract Documents.

B. Regulatory Requirements: Masonry materials and workmanship shall meet requirements of building codes which are applicable to jurisdiction in which Project is located.

C. Pre-installation Meetings:
1. A preconstruction meeting between the electrician and the mason shall be conducted to ensure that the electrical plan is accurate and complete.
2. A preconstruction meeting between the window and door supplier and the mason shall be conducted to coordinate the installation of windows and doors.
3. A preconstruction meeting between the plumber and the mason shall be conducted to ensure that the plumbing plans (water and waste) are accurate and complete.

4. A preconstruction meeting between other subcontractors/ suppliers that will have embeds within the masonry and the mason shall be conducted to ensure that the location of the embeds are understood and embeds are accurate and complete.

1.03 DELIVERY, STORAGE AND HANDLING

A. Transport and handle masonry units in such a manner as to prevent chipping and breakage. Complying with ASTM C 90 standards section 7.1, 7.2, 7.2.1.

B. Deliver and store materials in dry, protected areas.

C. Keep free of stain or other damage.

1.04 PROJECT/SITE CONDITIONS

A. Hot Weather Requirements:
1. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
2. Do not spread mortar beds more than 4 feet ahead of placing block units.
3. Place block units within one minute of spreading mortar.

B. Cold Weather Requirements:
1. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
2. Fully protect concrete masonry units against freezing by a weather-tight covering which shall also prevent accumulation of ice.
3. Do not lay concrete masonry units when temperature of surrounding atmosphere is below [Insert number of degrees F, unless adequate protection is provided.

C. Field Measurements:
1. Verify measurements shown on Drawings by taking field measurements.
2. Proper fit and attachment of concrete masonry units is required.

1.05 SCHEDULING AND SEQUENCING

A. Coordination: Coordinate with other Trades whose Work relates to concrete masonry unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulated Masonry wall Units – BASIS OF DESIGN
a. Insulated Masonry Units as manufactured by Omni block, or comparable product by one of the following manufacturers or distributors:
i. Parker Block
ii. Adams Product Group
iii. Georgia Masonry Supply

2.02 MATERIALS

A. General Requirements for Insulated Concrete Masonry Units Omni Block
   1. Concrete masonry units shall meet ASTM C90 requirements.
   2. Finishes and appearance will comply with ASTM C90 standards section 7.1, 7.2, 7.2.1.
   3. Units shall be in the same condition in wall as they were upon delivery.
   4. Block Design:
      a. Unit sizes shall be 8 by 8 by 16 inches, 8 by 12 by 16 inches or as shown on Drawings.
      b. No direct cross webs (thermal path shall be extended to approximately 16 inches).
      c. Offset cross webs shall create 2 rows of cells (interior and exterior) that are individually filled with molded EPS insulation inserts.
   5. Surface of units shall be clean and free from dirt when laid in walls.
   6. Provide special block sizes and shapes required or as shown on Drawings.

B. Architectural Omni Block
   1. Concrete masonry units shall meet ASTM C 90 requirements.
   3. Finish and Textures: Smooth Face for a painted finish.
   5. Colors: Manufacturer's standard color

C. Accessory Units: Provide units as required for doors, control joints, bond beams, lintels, pilaster, caps and other locations as required with a minimum of block cutting. Accessory units shall match adjacent unit color and texture unless noted otherwise. Units shall match samples submitted to Architect for review.

D. Water Repellents: Acceptable CMU Manufacturer: Unit Masonry shall be produced by a BASF Admixtures (Master Builders) Certified CMU Producer using a Rheopel Admixtures series product (Master Builders Brand).
   1. Concrete Masonry Units with Rheopel Admixture series product, added at the time of manufacturing: complying with ASTM C 90.

E. Substitutions: Not permitted.

2.03 ACCESSORIES

A. Reinforcing Steel: As specified under Section 03200.

B. Control Joints:
   1. Rubber: Extruded, solid section, ASTM D2000 2AA-805 with a durometer hardness of 70 or 80 when tested per ASTM D2240.
   2. Polyvinyl Chloride (PVC): ASTM D2287, Type PVC 654-4 with a durometer hardness of 85 (+5) when tested per ASTM D2240, minimum tensile strength of 1750 psi with minimum 300 percent elongation per ASTM D638, and cold crack brittleness of 50 degrees F per ASTM D746.
   3. Sizes and Profiles: As indicated on Drawings.

C. Mortar and Grout: As specified under Section 04065.

D. Water - Repellent Admixture: Mortar admixture shall be Rheopel Mortar Admixtures (Master Builders brand) as produced by BASF Admixtures (Master Bulders).

E. Substitutions: Not permitted

F. Surface Bond (if required): Cementitious, fiber reinforced compound that has epoxies, water proofers, and Silica sand as its main ingredients. Supply in pre-mixed bags that require water as the only additive.

G. Masonry Wall Insulation:
1. Molded Expanded Polystyrene (EPS) inserts manufactured by Omni Block Inc.
2. R-4 per inch.
3. UL Listed "non-toxic" product.
4. Recyclable.
5. Non CFC
6 Fluted for moisture migration.
7. Designed and sized to fit into Omni Block's designed cavity in block for inserts.
8. Inserts are to include non-mortar interfering indents (vertically and horizontally).

H. Steel Lintels: As indicated or scheduled on Structural Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall examine supporting structure and conditions under which unit masonry is to be installed, and notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Finish and appearance of CMU's will comply with ASTM C90 standard section 7.1, 7.2, 7.2.1.

C. Do not build on frozen Work; remove and replace unit masonry Work damaged by frost or freezing.

D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

3.02 PREPARATION

A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.

3.03 ERECTION, INSTALLATION, APPLICATION

A. General Requirements for Concrete Masonry Walls:

1. Workmanship: Provide Standard Level workmanship and select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

2. Lay units in uniform and true courses, level and plumb to height indicated on Drawings.

3. Insulation Inserts:
   a. Insulation inserts shall be placed in all exterior cells and shall be installed in interior cells that are not filled with grout and rebar as the wall is laid up (each course).
   b. Interior inserts shall overlap from block-to-block at each course of block.

4. Lay concrete unit masonry in such a way that cracks are not formed at time unit is placed in wall.

5. Units shall not be wetted before being used and shall be laid dry.

6. Adjusting Units:
   a. Units shall be adjusted to be level, plumb and straightened into final position in wall while mortar is still soft and plastic enough to ensure a good bond.
   b. Avoid over-plumbing and pounding of corners and jambs to fit stretcher units after they are set in position.
   c. If position of unit is shifted after mortar has stiffened, or bond is broken or cracks are formed, re-lay unit in new mortar.

6. Bearings on Walls: Provide 3 courses of solid units or grouted hollow masonry units below steel bearing plates or beams bearing on walls. Extend bearings each side of contact with load as required to properly transfer loads into wall.

7. Openings: Provide openings in masonry walls where required or indicated. Steel lintels shall be provided unless otherwise noted.

8. Cutting of masonry: When required, exposed block units shall be cut with a power driven Carborundum or diamond disc blade saw. When using "wet" cutting methods, clean water shall be used on exposed units.

9. Bond pattern shall be regular running bond unless indicated otherwise on the drawings. Bond shall be plumb throughout face of wall.

11. Tolerances: Standard Level of Quality for dimension and locations of elements, lines and levels, and joints.

12. See also "A Field Guide to building with Omni Block" available at www.omniblock.com.

B. Bonding:
   1. Bond pattern shall be regular running bond unless indicated otherwise on the drawings.

2. Bond shall be plumb throughout face of wall.

C. Bearing Wall Intersections:
1. Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
2. One wall shall terminate at face of other wall with a control joint at intersection.
3. Provide sealing of control joint as specified in Section 07900.

D. Control Joints:
1. Provide control joints, as detailed, at vertical masonry walls where such walls exceed 40 feet in length. In long length of walls, provide joints at approximately 24 feet on center and within 32 inches of each outside corner.
2. Control joints shall be continuous full height of walls.
3. At bond beams, control joints shall separate both block and grout; however, steel reinforcing shall be continuous.
4. Control joints shall not occur at wall corners, intersections, ends, within 24 inches of concentrated points of bearing or jambs or over openings unless specifically indicated on Structural Drawings.
5. Control joint materials shall be held back from finished surface as required to allow for sealant and back-up materials.

E. Vertical Reinforcing and Bond Beam Reinforcing:
1. Place in accordance with requirements of Drawings.
2. Vertical Reinforcement: Provide continuous reinforcing full height of wall at wall ends, corners, intersections, jambs of openings and each side of control joints. Vertical reinforcing shall match and lap dowels which are at top of foundation walls and precast concrete beams.
3. Bond Beams: Provide horizontal reinforcing of 2 bars in minimum 8 inch deep grouted continuous bond beam at roof and elevated floor lines.
4. Parapets: Provide horizontal reinforcing of 1 bar in minimum 8 inch deep grouted continuous bond beam at top of parapets.
5. Bond Beam and Parapet Reinforcing at Vertical Control Joints: Place bars continuous through control joint and wrap mastic tape around bars for 18 inches each side of control joint.
6. Bond Beam and Parapet Reinforcing at Corners and Wall Intersections: Provide bent bars to match reinforcing at corners and wall intersections.
7. Lap splices in reinforcing not less than 40 bar diameters for #7 and larger bars; 30 bar diameters for #6 and smaller bars.
8. Use spacers to position reinforcing steel in center of grout at center of wall as required by code.

F. Grouting:
1. Reinforcing steel is to be in place and inspected before grouting starts.
2. Vertical cells to be filled shall have vertical alignment to maintain a continuous cell area.
3. Keep cell to be grouted free from mortar.
4. Fill cells solidly with grout in lifts not to exceed 4 feet.
5. Grout may be poured by hand bucket, concrete hopper or through a grout pump.
6. Do not wet down grout space prior to pouring of grout.
7. Stop pours 1-1/2 inches below top of cell to form a key at pour points.

8. Grout shall be consolidated by mechanical vibration during placing before loss of plasticity in a manner to fill grout space. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches or less in height shall be mechanically vibrated, or rodded.
9. Grout barrier below bond beams shall be continuous wire lath or other approved material.
10. Grout beams over openings and bond beams in a continuous operation.
11. Solidly grout in place bolts, anchors and other items within wall construction.
12. Fully grout jambs and head of metal door frames connected to masonry. Filling of frames shall be done as each 2 feet of masonry is laid.
13. Use extreme care to prevent grout or mortar from staining face of the masonry.
14. Immediately remove grout or mortar which is visible on face of masonry.

G. Surface Bonding (optional):
1. Interior:
a. Interior surface bond shall be applied to seal the wall. Surface bond shall be troweled onto the wall with a semi-smooth coat.
b. Dampen surface of wall evenly to obtain uniform suction.
c. Windows are to be securely fastened into place when the surface bond is applied onto the wall, over the window sill and up to the window itself to provide an airtight seal around the window.

3.04 CLEANING

A. Daily Cleaning: Keep walls clean. Soiled masonry from mortar and grout spills which will be exposed to view at completion of Project shall be cleaned immediately with stiff fiber brushes until wall is free of dropped or spattered grout.

B. Remove scaffolding and equipment used in Work.

C. Clean up debris, refuse and surplus material and remove from premises.

3.05 PROTECTION

A. Furnish temporary protection for exposed masonry corners subject to injury.

B. Carefully cover tops of walls left incomplete at conclusion of day's Work with tarpaulins or other approved covering.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 054400 - COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cold-formed steel framing in the form of the following:

1. Cold-formed steel trusses for roofs.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel trusses.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.

4. Mechanical fasteners.
5. Miscellaneous structural clips and accessories.

D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified 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."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Aegis Metal Framing.
2. MarinoWARE.
3. TrusSteel; an ITW company.
4. USA Frametek.
5. WESTCO Steel Systems, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel trusses.

B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
   a. Roof Trusses: Vertical deflection of 1/360 of the span.

3. Design trusses to provide for movement of truss members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).

C. Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:

1. Floor and Roof Systems: AISI S210.
2. Lateral Design: AISI S213.
3. Roof Trusses: AISI S214.

2.3 COLD-FORMED STEEL TRUSS MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST50H (ST340H).
2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90)

2.4 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.

1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.

2.5 TRUSS ACCESSORIES

A. Fabricate steel-truss accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design

load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel trusses to structure.
2. Type: Torque-controlled expansion anchor OR Torque-controlled adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

D. Power-Actuated Fasteners: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M, MIL-P-21035B or SSPC-Paint 20.

B. Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

2.8 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.

   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual truss members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting trusses and 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 INSTALLATION

A. Install bridge, and brace cold-formed steel trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.
1. Anchor trusses securely at all bearing points.
2. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's Technical Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
    a. Install bridging at all gypsum ceiling panel edges for panel support.

B. Install cold-formed steel trusses and accessories true to line and location, and with connections securely fastened.

1. Erect trusses with plane of truss webs plumb and parallel to each other. Align and accurately position trusses at required spacings.
2. Erect trusses without damaging truss members or connections.
3. Fasten cold-formed steel trusses by welding or mechanical fasteners.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

C. Install temporary bracing and supports to secure trusses and support loads equal 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 trusses are secured.

D. Truss Spacing: 24 inches (610 mm).

E. Do not alter, cut, or remove truss members or connections of trusses.

3.3 ERECTION TOLERANCES

A. Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 FIELD QUALITY CONTROL

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

1. Cold-Formed Steel Trusses Spanning 60 ft. (18,288 mm) or Longer: Verify temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed according to the approved truss submittal package.
2. See Structural Drawings for Special Inspection Requirements.

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

C. Cold-formed metal trusses will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION 054400

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Composite nail base insulated roof sheathing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

   1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
   2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. including list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

B. Testing Agency Qualifications:
1. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified according to ASTM E 329 for testing indicated, and certified by Air Barrier Association of America, Inc.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood unless otherwise indicated and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Vented, Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type II, Class 1, with DOC PS 2, Exposure 1 oriented strand board adhered to spacers on one face.

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. Atlas Molded Products; a Division of Atlas Roofing Corporation.
   b. Cornell Corporation.
   c. Dow Chemical Company (The).
   d. Johns Manville; a Berkshire Hathaway company.
   e. Rmax, Inc.

2. Polyisocyanurate-Foam Thickness: 3-1/2 inches (89 mm).
3. Oriented-Strand-Board Nominal Thickness: 7/16 inch (11.1 mm).
4. Spacers: Wood furring strips or blocks not less than 3/4 inch (19 mm) thick and spaced not more than 12 inches (300 mm) o.c.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. For roof sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.

E. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of

sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.5 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

B. Underlayment: Provide continuous ice and watershield underlayment over composite nail base insulated roof sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate 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. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 NAIL BASE INSULATED ROOF SHEATHING INSTALLATION

A. Comply with manufacturer's written instructions.

B. Apply continuous ice and watershield underlayment to sheathing. Apply flashing tape to overlap both flashing and sheathing.

END OF SECTION 061600

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Spray polyurethane foam insulation.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to 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.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER 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. Guardian Building Products, Inc.
3. Johns Manville; a Berkshire Hathaway company.
4. 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.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
2. Provide R-Value listed on the drawings.

2.2 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide Dow Chemical Company, Styrofoam CM2045 or compatible products by one of the following:
   a. SES Foam, LLC.
   b. BASF Corporation.
   c. Gaco Western LLC.
   d. Icynene Inc, MD-C-200.

2. Physical and Performance Properties:
   a. Minimum density of 2.0 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).
   b. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
      1) Air Barrier Association of America evaluated to exceed ABAA, ASHRAE 90.1 and IECC air leakage requirements when tested in accordance with ASTM E2357.
   c. Vapor Permeance: Minimum Class II vapor retarder 0.1 – 1.0 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   d. Adhesion to Substrate: Minimum 30 lbf/sq. in. (207 kPa) when tested according to ASTM D 4541.

e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   1) Thermal Barrier: Include 15-minute Thermal Barrier of all spray foam products.
f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

3. Location: Use Spray Foam Insulation tin cavity of masonry construction behind exterior veneer and to seal penetrations in walls and to infill gaps, etc.
.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 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.

3.3 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. Glass-Fiber 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.
   a. For cavities that are not filled, support batts to flanges of metal studs.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Locate insulation on the exterior side of the cavity and install retaining wires that prevent the insulation from sagging inside the cavity.

4. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically to flanges of metal studs.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
   a. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Confirm compatibility with other adjacent materials. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 07 26 00 – UNDER SLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Products furnished under this section, and installed in coordination with related sections include the following:
   1. Vapor Retarder, seam tape, vapor proofing mastic, pipe boots, detail strip for installation under concrete slabs.

B. Related Sections:
   1. Division 03 Section "Cast-In-Place Concrete" for concrete floor slabs.

1.3 SUBMITTALS

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

B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain primary materials and accessories through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit vapor retarder to be installed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 PLASTIC VAPOR RETARDER

A. Basis-of-Design Product: Subject to compliance with requirements, furnish and install products by W.R. Meadows, or comparable products meeting performance requirements and properties by other manufacturers:
   1. Stego Industries, LLC
   2. Insulation Solutions, Inc.

B. Vapor retarder membrane that meets or exceeds the following properties:

1. Permeance rating: ASTM E 96 or ASTM F 1249, meets permeance requirements for both new material, and after ASTM E-1745 mandatory conditioning tests (ASTM E 154; Sections 8, 11, 12, 13): Comply with ACI 302.1R
   a. New material: Less than 0.01 perms (gr/ft^2/hr/in-Hg).
   b. After conditioning: Less than 0.01 perms (gr/ft^2/hr/in-Hg).
2. Water Vapor Retarder: ASTM E 1745, Class A
3. Minimum thickness : 15 mils
4. Manufactured from prime virgin resins.
5. Woven materials are not acceptable.

2.2 MISCELLANEOUS MATERIALS

A. Provide all Miscellaneous materials from the same source as the vapor retarder membrane manufacturer / supplier. Confirm compatibility.

B. Seam Tape: ASTM E 96, Water Vapor Transmission Rate 0.3 perms or lower. Tape all seams, joints and penetrations.

C. Vapor Proofing mastic: ASTM E 96, Water Vapor Transmission Rate 0.3 perms or lower.

D. Pipe boots: Construct pipe boots from vapor retarder material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine slab base course, with Installer present, for compliance with requirements for surface stability and other conditions affecting performance of work.
   1. Proceed with vapor retarder installation only after base course construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Coordinate installation of the under-slab vapor retarder in conjunction with the drawings and with the work specified in Division 3, Section 03 30 00 "Cast-In-Place Concrete".

B. Comply with manufacturer's written recommendations and ASTM E 1643-98 (2005), unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of vapor retarder.
   1. Unroll vapor retarder with the longest dimension parallel in the direction of the concrete pour.
   2. Lap vapor retarder over footings or seal to foundation walls.
   3. Overlap joints 6 inches and seal with manufacturer's tape.
   4. Seal all penetrations (including pipes) per manufacturer's instructions.
   5. Do not penetrate the vapor retarder except where necessary for reinforcing steel and permanent utilities.
   6. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with seam tape.

END OF SECTION 07 26 00

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 10 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

G. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.
2. Hail Resistance: MH.

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 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.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

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. Architectural Metal Systems.
   b. CENTRIA Architectural Systems.
   c. Garland Company, Inc. (The).
   d. MBCI.
   e. Morin - A Kingspan Group Company.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   a. Nominal Thickness: 0.034 inch (0.86 mm).
   b. Exterior Finish: Three-coat fluoropolymer.
   c. Color: Dark Green or Forest Green; As selected by Architect from manufacturer's full range.

3. Clips: Two-piece floating to accommodate thermal movement.
   a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

4. Panel Coverage: 16 inches (406 mm).

5. Panel Height: 1.75 inches (44 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

3. Manufacturers: Subject to compliance with requirements, provide Grace Ice & Water Shield self-adhering underlayment or products in compliance with the requirements by one of the following:

a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
b. GCP Applied Technologies Inc.
c. Henry Company.
d. Owens Corning.

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels 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 panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match the wall color (Beige), as selected by the Architect from the Manufacturer’s full range of standard colors.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. 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 (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. 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 panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Aluminum Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
4. Stainless-Steel Panels: Use stainless-steel fasteners.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing 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.
4. Watertight Installation:
   a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
   b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
   c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: 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 panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. 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.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fiber-cement soffit

B. Section Includes fiber-cement trim or PVC trim

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Verification: For each type, color, texture, and pattern required.
1. 12-inch- (300-mm-) long-by-actual-width Sample of soffit.
2. 12-inch- (300-mm-) long-by-actual-width Samples of trim and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement soffit.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement panel and PVC trim required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to 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. CertainTeed Corporation.
b. James Hardie Building Products, Inc.
c. Nichiha Architectural Panels.

B. Nominal Thickness: Not less than 5/16 inch (8 mm).

C. Pattern: In sheets of width noted on the drawings with smooth texture.

D. Ventilation: Provide perforated soffit.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement or PVC decorative accessories as indicated:
1. Fascia.
2. Trim.

C. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

1. Finish for Aluminum Flashing: High-performance organic finish.

D. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
3. For fastening fiber cement, use stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement soffit and related accessories.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 24 inches (600 mm) o.c. and / or as recommended by the material manufacturer.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Solvent-release-curing joint sealants.
5. Acoustical joint sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency indicating that sealants comply with requirements.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

E. Field-Adhesion-Test Reports: For each sealant application tested.

F. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: 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: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants 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 Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.

2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.

3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   c. Pecora Corporation; 890.
   d. Sika Corporation, Construction Products Division; SikaSil-C990.
   e. Tremco Incorporated; Spectrem 1.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
   b. Tremco Incorporated; Vulkem 45.

2.4 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, Class 1; tested in deionized water unless otherwise indicated

B. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
   b. Tremco Incorporated; Vulkem 45.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advanced Materials - Silicones; Sanitary SCS1700.
   d. May National Associates, Inc.; Bondaflex Sil 100 WF.
   e. Tremco Incorporated; Tremsil 200 Sanitary.

2.6 POLYSULFIDE JOINT SEALANTS

A. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolastic Polysulfide Sealant.
   b. Pecora Corporation; Synthacalk GC-2+.

2.7 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Bostik, Inc.; Chem-Calk 300.
   b. Pecora Corporation; BC-158.
   c. Tremco Incorporated; Tremco Butyl Sealant.
2. Location: mastic under thresholds.

2.8 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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 Building Systems; Sonolac.
   b. Bostik, Inc.; Chem-Calk 600.
   c. Pecora Corporation; AC-20+.
   d. Tremco Incorporated; Tremflex 834.

2.9 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 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, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, 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. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

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.

3.3 INSTALLATION OF JOINT SEALANTS

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

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. 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.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. 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.

F. 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.

4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate and one test for each 1000 feet (300 m) of joint length thereafter.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. 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.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.

1. Joint Locations:
   a. Control and expansion joints in brick pavers.
   b. Isolation and contraction joints in cast-in-place concrete slabs.
   c. Joints between different materials listed above.
2. Polysulfide Joint Sealant: Multicomponent, nonsag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion - JS-2.

1. Joint Locations – pedestrian and vehicular paving
2. Urethane Joint Sealant: Immersible, single component, pourable, traffic grade.
3. Polysulfide Joint Sealant: Immersible, multicomponent, nonsag, traffic grade.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-3.

1. Joint Locations:
   a. Construction joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Joints between metal panels.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
   f. Control and expansion joints in ceilings and other overhead surfaces.
2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50**.**
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-4.

1. Joint Locations:
   a. Isolation joints in cast-in-place concrete slabs.
2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-5.

1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50**.**
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-6.

1. Joint Locations:
   a. Vertical joints on exposed surfaces of interior unit masonry and partitions.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces **JS-7**.

1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces JS-8.

1. Joint Location:
   a. Acoustical joints where indicated.
2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Include a Door Hardware Schedule for each door.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Republic Doors and Frames.
4. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861.

1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches (44.5 mm.)
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 (Z180) or A60 (ZF180) coating.
   d. Edge Construction: Continuously welded with no visible seam.
   e. Core: Steel stiffened.
      1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.7 mm), with minimum G60 (Z180 or)A60 (ZF180) coating.
   b. Construction: Full profile welded.

4. Exposed Finish: Prime.

2.3 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 (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) 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. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 088000 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

4. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
      1) Two anchors per jamb up to 60 inches (1524 mm) high.
      2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
   b. Compression Type: Not less than two anchors in each frame.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.8 DOOR HARDWARE

A. Door Hardware: Furnish door hardware to complete installation including lockset, closer, thresholds, etc.
1. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
a. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
b. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. CONTINUOUS HINGES
1. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
2. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
1) Pemko Products Company; an ASSA ABLOY Group company.
2) Hager Companies.
3) Stanley Commercial Hardware; Div. of The Stanley Works.

C. MECHANICAL LOCKS AND LATCHES
1. Lock Functions: As indicated in door hardware schedule and below:
a. Mechanical Lock : Dormakaba Simplex L1021, Simplex Mechanical Pushbutton Lock.
1) Key Override required – verify with Owner.
b. Construction: Heavy-duty cylindrical lock housing with cast front housing, unified trim plate, and fixed ADA-compliant levers.
c. Vandal resistant, solid metal pushbuttons
2. Lock Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
3. Lock Trim:
a. Description: As indicated in Schedule.
b. Levers: Manufacturer’s Standard Lever.
c. Finish: Satin Chrome (26D).
4. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

D. LOCK CYLINDERS

1. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
   a. Manufacturer: Same manufacturer as for locking devices.
   b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      1) Corbin Russwin; an ASSA ABLOY Group company.
   c. Lock system must be compatible with organizations lock and keying system.
2. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable removable; face finished to match lockset.
   a. Providing keying system that matches the owners existing system.
3. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
4. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
   a. Existing System:
      1) Master key or grand master key locks to Owner's existing system.

E. SURFACE CLOSERS

1. 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.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      1) Norton; an ASSA ABLOY Group company.
      2) SARGENT Manufacturing Company; an ASSA ABLOY Group company.
      3) Yale Security Inc.; an ASSA ABLOY Group company.

F. MECHANICAL STOPS AND HOLDERS

1. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast aluminum base metal.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      1) Rockwood Manufacturing Company.
      2) Baldwin Hardware Corporation.
      3) Hager Companies.

G. DOOR GASKETING

1. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) 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.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      1) Pemko; an ASSA ABLOY Group company.
      2) National Guard Products.
      3) Pemko Manufacturing Co.; an ASSA ABLOY Group company.

H. THRESHOLDS

1. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      1) Pemko Manufacturing Co.; an ASSA ABLOY Group company.
      2) Hager Companies.
      3) National Guard Products.

I. FINISHES

1. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

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. 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.
   b. Install frames with removable stops located on secure side of opening.
   c. Install door silencers in frames before grouting.
   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   f. Field apply bituminous coating to backs of frames that will be 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 power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. In-Place Concrete or Masonry Construction: Use this method only if necessary. Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

5. 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 (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:
   a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).

c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).

d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

D. Hardware: Comply with the manufacturer's installation requirements with hollow-metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulated service doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.

2. Testing: According to ASTM E 330/E 330M or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108.

3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20-lbf/sq. ft. (960-Pa) wind load, acting inward and outward.

B. Windborne-Debris Impact Resistance: Provide overhead coiling doors that pass ASTM E 1886 missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone 3 for enhanced protection.

1. Large-Missile Test: For overhead coiling doors located within 30 feet (9.1 m) of grade.

2. Small-Missile Test: For overhead coiling doors located between 30 feet (9.1 m) and 60 feet (18.3 m) above grade.

C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Cookson Company.
   b. Cornell.
   c. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283 or DASMA 105.

D. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu (0.881 K x sq. m/W).

E. Door Curtain Material: Galvanized steel.

F. Door Curtain Slats: Flat profile slats of 3-1/4-inch (83-mm) center-to-center height.
1. Insulated-Slat Interior Facing: Metal.
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from hot-dip galvanized steel or aluminum extrusions and finished to match door.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish Galvanized steel.

1. Shape: Round.

2. Mounting: Face of wall.

J. Locking Devices: Equip door with slide bolt for padlock.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside only.

K. Manual Door Operator: Chain-hoist operator.

1. Provide operator with through-wall shaft operation.

L. Curtain Accessories: Equip door with weatherseals.

M. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm); and as required.

2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized-steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.

2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

2.8 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

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

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, and soffits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATION SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners, firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
   b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: For framing sections greater than 12'-0" tall, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      2) MBA Building Supplies; Slotted Deflecto Track.
      3) Steel Network Inc. (The); VertiTrack VTD Series.
      4) Superior Metal Trim; Superior Flex Track System (SFT).

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

F. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
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- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.2 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.

2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
   b. Depth: As indicated on Drawings.

3. Dimpled Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
   b. Depth: As indicated on Drawings.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
   a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

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.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

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. 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.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Interior gypsum board Ceiling.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, thicknesses, finishes, joining, attachment devices, relationship of adjoining work and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement.

C. Samples: For the following products:

1. Aluminum Trim Accessories: Full-size Sample minimum 12-inch- (300-mm-) long for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

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

1. CertainTeed Gypsum inc.
2. National Gypsum Company.
3. USG Corporation.

B. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X for use where indicated.

2. Core: /8 inch (15.9 mm), Type C for use on ceilings, all locations unless noted otherwise

3. Long Edges: Tapered.

4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, or paper-faced galvanized steel sheet.

2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   e. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles for control joints

1. Basis-of-Design Product: Subject to compliance with requirements, provide Gordon, Inc. or comparable product by one of the following
   a. Fry Reglet Corp.
   b. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

3. Finish: Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

4. Accessories:
   a. Inserts
   b. Alignment devices
   c. End closures
   d. Reveals / control joints

5. Fabrication:
   a. Provide extruded aluminum trims of design, profile and function as indicated. Select trims to suit reveal width and depth in 10'-0" lengths to reduce the number of end joints.
   b. Provide pre-welded and soldered, mitered intersections here reveal changes direction or abuts other trim.
   c. In drywall construction when post-applied attachment flanges are used, trims must be slotted with a minimum of 0.375 square inches per lineal foot of flange to properly bond with the bedding compound and drywall.
   d. All attachment flanges are perforated to allow for attachment to the structure a minimum of 8" o.c.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper or mesh

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. 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.

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Moisture- and Mold-Resistant Type: For use at ceilings in all areas.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.

2. LC-Bead: Use at exposed panel edges.

D. Aluminum Trim: Install in locations indicated on Drawings and per approved shop drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Not Used.
   2. Level 2: Not Used.
   3. Level 3: Not Used.
   4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated, and at panel surfaces to receive wall coverings.
      a. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting."
   5. Level 5: Not Used.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Concrete masonry units (CMU).
   2. Galvanized metal and steel.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

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

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by Sherwin-Williams Company (The) or, subject to compliance, products by one of the following:
1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. 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.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer's full range and as indicated on drawings.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

1. Sherwin Williams A24W200 Block Surfacer
2. Sherwin Williams Loxon Acrylic Block Surfacer

2.4 METAL PRIMERS

A. Primer, Galvanized, Water Based: MPI #134.

1. Sherwin Williams B66-310 Pro-Industrial Pro-Cryl Universal Primer.

2.5 WATER-BASED PAINTS

A. Light Industrial Coating, Exterior, Water Based, Gloss (Gloss Level 6): MPI #164.

1. Sherwin Williams B66-650 Pro Industrial 0 VOC Acrylic Coating – Semi-Gloss

2.6 ELASTOMERIC PAINTS

A. Texture Elastomeric High Build Coating

1. Sherwin Williams ConFlex XL – A5-800 Series

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

1. Concrete: 12 percent.
2. Masonry (CMU): 12 percent.

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

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

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

3.2 PREPARATION

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

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

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

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

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

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

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

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."

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

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

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

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

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

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.

3.4 FIELD QUALITY CONTROL

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

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

3.5 CLEANING AND PROTECTION

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

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

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

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

3.6 EXTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Luxon Acrylic Block Surfacer
   b. Intermediate Coat: Sherwin Williams ConFlex XL – A5-800 Series – High Build
   c. Topcoat: Sherwin Williams ConFlex XL – A5-800 Series – Fine Texture High Build.

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:

   a. Prime Coat: Primer, galvanized, water based, MPI #134.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 6), MPI #164.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete masonry units (CMU).
   2. Steel.
   3. Galvanized metal.
   4. Gypsum board.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

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

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by Sherwin-Williams Company (The) or, subject to compliance, products by one of the following:
1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. 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.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.

D. Colors: Match Architect's samples and as indicated in drawings.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.
1. Sherwin Williams B25W25 PrepRite Block Filler Interior / Exterior Latex

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.
1. Sherwin Williams B28W600 ProGreen 200 Low VOC Interior Latex Primer

2.5 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: MPI #107.
1. Sherwin Williams B66-310 Pro-Industrial Pro-Cryl Universal Primer

B. Primer, Galvanized, Water Based: MPI #134.
1. Sherwin Williams B66-310 Pro-Industrial Pro-Cryl Universal Primer

2.6 WATER-BASED PAINTS

A. Pro Industrial Pre-catalyzed, Interior, Water Based Epoxy, Gloss (Gloss Level 3): MPI #151.

1. Sherwin Williams K45-150 Pro Industrial 0 VOC Acrylic Coating – Egg-Shell
2. Waterborne Epoxy latex on all CMU walls and drywall ceilings

2.7 URETHANE ALKYD ENAMEL PAINTS

A. Urethane Alkyd Enamel, Interior, (Gloss Level 6):

1. Sherwin Williams B54-W00151 Pro Industrial Urethane Alkyd Enamel.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

1. Concrete: 12 percent.
2. Masonry (CMU): 12 percent.
3. Gypsum Board: 12 percent.

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

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

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

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

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

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

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

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

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

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

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer**.** but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

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

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

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

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

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

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

1. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

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

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

3.5 CLEANING AND PROTECTION

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

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

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

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

3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Latex System:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
a. Intermediate Coat: Pro Industrial Pre-catalyzed, Water Based Epoxy, MPI #151
b. (2) Topcoats: Pro Industrial Pre-catalyzed, Water Based Epoxy, MPI #151

B. Steel Substrates: (Not Used unless noted otherwise)

1. Pro Industrial Coating System:

a. Prime Coat: Pro-Industrial Pro-Cryl Universal Primer, water based MPI #107.
b. Intermediate Coat: Pro Industrial Urethane Alkyd Enamel, matching topcoat.
c. Topcoat: Pro Industrial Urethane Alkyd Enamel, matching topcoat

C. Galvanized-Metal Substrates:

1. Pro Industrial Coating System:

a. Prime Coat: Pro-Industrial Pro-Cryl Universal Primer, water based MPI #107.
b. Intermediate Coat: Pro Industrial Urethane Alkyd Enamel, matching topcoat.
c. Topcoat: Pro Industrial Urethane Alkyd Enamel, matching topcoat

D. Gypsum Board and Wood Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Pro Industrial Pre-catalyzed, Water Based Epoxy, MPI #151
c. Topcoat: Pro Industrial Pre-catalyzed, Water Based Epoxy, MPI #151

END OF SECTION 099123

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: High-performance coatings and special preparation of surfaces.

1. Use high performance coating systems specified in this section to finish water tank components, unless otherwise indicated. Without restricting volume or generality, work to be performed under this section may include, but is not limited to:

    a. Exterior steel
    b. Interior steel
    c. Exterior concrete
    d. Interior concrete
    e. Piping, hangers, and supports
    f. Exposed bare pipes (including color coding)

2. Painting or finishing is not needed for following:

    a. Surfaces or materials specifically scheduled or shown on Drawings to remain unfinished
    b. Items provided with factory finish.
    c. Equipment nameplates, fire rating labels, and operating parts of equipment

3. Materials and products having factory-applied primer shall not be considered factory finished.

B. Related Requirements:
1. Section 09 91 13 – Exterior Painting: for exterior painting of building surfaces and accessories
2. Section 09 91 23- Interior Painting: or interior painting of building surfaces and non-process related accessories

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials:

1. ASTM D16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products

B. SSPC: The Society for Protective Coatings:

1. SSPC - Painting Manual, Volume 2: Systems and Specifications.
2. SSPC-Paint 16 - Coal Tar Epoxy-Polyamide Black (or Dark Red).
3. SSPC-SP 2 - Hand Tool Cleaning.
4. SSPC-SP 3 - Power Tool Cleaning.

5. SSPC-SP 5 - White Metal Blast Cleaning.
6. SSPC-SP 6 - Commercial Blast Cleaning.
7. SSPC-SP 7 - Brush-Off Blast Cleaning.
8. SSPC-SP 10 - Near-White Metal Blast Cleaning.
9. SSPC-SP 11 - Power Tool Cleaning to Bare Metal.

C. National Association of Pipe Fabricators

1. NAPF 500-03-01 Solvent Cleaning
2. NAPF 500-03-02 Hand Tool Cleaning
3. NAPF 500-03-03 Power Tool Cleaning
4. NAPF 500-03-04 Abrasive Blast Cleaning of Ductile Iron Pipe
5. NAPF 500-03-05 Abrasive Blast Cleaning of Cast Ductile Iron Fittings

1.3 PREINSTALLATION MEETINGS

A. Section 01 31 00 – Project Management and Coordination.

B. Convene minimum two weeks prior to commencing Work of this Section.

C. Schedule a conference and inspection to be held on-site before field application of coating systems begins.

D. Conference shall be attended by Contractor, Owner's Representative, Engineer, coating applicators, and a representative of coating material manufacturer.

E. Topics to be discussed at meeting shall include:

1. A review of Contract Documents and accepted shop drawings shall be made and deviations or differences shall be resolved.
2. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
3. Establish which areas on-site will be available for use as storage areas and working area

F. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work should be completed before coating application can begin.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit manufacturer information indicating coating materials, manufacturer’s name, product name, product number, performance ratings, curing times, mixing, thinning and application requirements.

a. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.

b. Submit manufacturer's Material Safety Data Sheets (MSDS) and other safety requirements.

C. Samples: Submit one color chart/color samples, illustrating colors for selection.

D. Schedule: Contractor shall submit a schedule of items that will receive high-performance coatings per Specification 09 96 00.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer Instructions: Submit special procedures, perimeter conditions requiring special attention.

G. Quality Assurance Submittals:

1. Certificates:

a. Coatings manufacturer shall certify that coating materials utilized are "non-lead" (less than 0.06% lead by weight in dried film) as defined in Part 1303 of Consumer Product Safety Act.
b. Provide certification that specialized equipment as may be required by manufacturer for proper application of coating materials shall be utilized for work of this Section.
c. Provide manufacturer's certification that products to be used comply with specified requirements and are suitable for intended application.

2. Manufacturer's Instructions:

a. Submit manufacturer's installation procedures which shall be basis for accepting or rejecting actual installation procedures.

H. Qualifications Statements:

1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Submit maintenance and cleaning requirements for coatings, repair and patching techniques.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Extra Stock Materials:

1. Furnish 1 gal of each color of each type of coating specified, for Owner's maintenance use.

2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.7 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified to NSF 61.

B. Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements for finishes at time of application.

1.8 QUALIFICATIONS

A. Provide products from a company specializing in manufacture of high performance coatings with a minimum of 10 years experience.

B. Applicator shall be trained in application techniques and procedures of coating materials and shall demonstrate a minimum of 2 years successful experience in such application.

1. Maintain, throughout duration of application, a crew of painters who are fully qualified to satisfy specified qualifications.

C. Single Source Responsibility:

1. Materials shall be products of a single manufacturer or items standard with manufacturer of specified coating materials.
2. Provide secondary materials which are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Container Labeling: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Inspection:

1. Accept materials on Site in manufacturer's sealed and labeled containers.
2. Inspect for damage and to verify acceptability.

D. Store materials in ventilated area and otherwise according to manufacturer instructions.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not install materials when temperature is below 35°F or above 110°F.

C. Refer to specific product information sheets for minimum surface temperature requirements. Surface temperatures shall be at least 5°F (15°C) above dew point and in a rising mode.

D. Subsequent Conditions: Maintain above temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Relative humidity shall be no higher than 85%.

F. For exterior spray application, wind velocity shall be less than 15 mph (25 kph).

G. Atmosphere shall be relatively free of airborne dust.

H. Restrict traffic from area where coating is being applied or is curing.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Include coverage for bond to substrate, and degradation of chemical resistance.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS

A. Manufacturers:

1. Tnemec Company, Inc.
2. Sherwin Williams Company
3. Carboline
4. Or Approved Equal.

2.2 COMPONENTS

A. Coatings:

1. Description:

a. Complete multicoat systems formulated and recommended by manufacturer for intended applications and in indicated thicknesses.
b. Specified number of coats does not include primer or filler coat.

2. Lead content: None.
3. Chromium Content as Zinc Chromate or Strontium Chromate: None.
4. Maximum VOC Content: As required by applicable regulations.
5. Colors: As selected from manufacturer's standard colors.

B. Epoxy Coating:

1. Modified Polyamine Epoxy

   a. Usage: A thick film, 100% solids, abrasion-resistant lining designed for wastewater immersion and fume environments. Provides low permeation to H2S gas, protects against MIC and provides chemical resistance to severe wastewater environments.
   b. Exposure: Severe.
   c. Number of Coats: See schedule.
   d. Finish: Gloss.
   e. Minimum Solids Content: 100% (mixed).
   f. Minimum Dry Film Thickness Per Coat: See schedule.
   g. Perma-Glaze, Series 435, as manufactured by Tnemec, or DuraPlate 5900, as manufactured by Sherwin Williams.
   h. Primer: See schedule.

2. Modified Polyamine Epoxy Mortar

   a. Usage: A 100% solids, hybrid epoxy mortar designed for severe wastewater immersion and fume environments. Specifically formulated to withstand high levels of hydrogen sulfide gas (H2S), sulfuric acid (H2SO4), as well as other gases common to sewer exposures. Aggregate reinforcement provides additional resistance to abrasions and impacts.
   b. Exposure: Severe.
   c. Number of Coats: See schedule.
   d. Finish: Gloss.
   e. Minimum Solids Content: 100% (mixed).
   f. Minimum Dry Film Thickness Per Coat: See schedule.
   g. Perma-Shield H2S, Series 434, as manufactured by Tnemec, or DuraPlate 5900 Mortar, as manufactured by Sherwin Williams.
   h. Primer: See schedule.

3. Glass Flake Modified Polyamine Epoxy

   a. Usage: Abrasion resistant, high solids, epoxy coating which offers high-build edge protection and excellent corrosion resistance. Contains glass flake and aluminum oxide for improved film integrity.
   b. Exposure: Severe.
   c. Number of Coats: See schedule.
   d. Minimum Solids Content: 82.0 ± 2.0%
   e. Minimum Dry Film Thickness Per Coat: 8 -18 mils DFT
   f. Epoxoline, Series 142, as manufactured by Tnemec, or Macropoxy 5500LT, as manufactured by Sherwin Williams.
   g. Primer: See schedule.

4. Modified Polyamine Epoxy

a. Usage: NSF Approved, abrasion resistant, high solids, epoxy coating which offers high-build edge protection and excellent corrosion resistance.
b. Exposure: Severe.
c. Number of Coats: See schedule.
d. Minimum Solids Content: 82.0 ± 2.0%
e. Minimum Dry Film Thickness Per Coat: 4 -18 mils DFT
f. Epoxoline, Series 141, as manufactured by Tnemec, or Macropoxy 5500LT, as manufactured by Sherwin Williams.
g. Primer: See schedule.

5. Surface Tolerant Modified Polyamidoamine Epoxy

a. Usage: High-build coating with superior wetting for marginally prepared rusty steel and tightly adhering old coatings. Excellent abrasion-, chemical- and corrosion-resistance. Perfect foundation for aliphatic-polyurethanes. NOT FOR IMMERSION SERVICE.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Finish: Semi-gloss.
e. Minimum Solids Content: 84.0 ± 2.0% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Chembuild, Series 135, as manufactured by Tnemec, or Macropoxy 5500 LT, as manufacturd by Sherwin Williams.
h. Primer: See schedule.

6. NSF Approved Pure Polyamide Epoxy

a. Usage: Potable water coating which offers high-build edge protection and allows for application at a wide range of temperatures (down to 35°F or 2°C). For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps and equipment in potable water service.
b. NSF Certification: Yes
c. Exposure: Moderate.
d. Number of Coats: See schedule.
e. Minimum Solids Content: 56.0 ± 2.0%
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Pota-Pox, Series 20 or 20HS, as manufactured by Tnemec, or Macropoxy 646 PW, as manufactured by Sherwin Williams.
h. Primer: See schedule.

7. Polyamidoamine Epoxy

a. Usage: Potable water and wastewater primer which offers high-build edge protection and allows for application at a wide range of temperatures (down to 35°F or 2°C). For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps and equipment in potable water service.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Color: 1211 Red – Ductile Iron Pipe
e. Minimum Solids Content: 67.0 ± 2.0% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.

g. Pota-Pox Plus, Series N140, as manufactured by Tnemec, or Macropoxy 5500LT, as manufactured by Sherwin Williams.
h. Primer: See schedule.

8. High-Build Epoxy Coating – Pure Polyamide Epoxy

a. Usage: Application characteristics in adverse and varied conditions.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Finish: Satin.
e. Minimum Solids Content: 56.0% +/- 2.0% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Hi-Build Epoxoline, Series 66 or 66HS, as manufactured by Tnemec, or Macropoxy 646 Fast Cure, as manufactured by Sherwin Williams.
h. Primer: See schedule.

9. Waterborne Acrylic Epoxy

a. Usage: High performance coating suitable for concrete, steel and other commonly used building materials. Features include high-build, low odor, non-yellowing white and fade resistant colors; easy cleanup and stain-, abrasion-, chemical- and moisture-resistance. Good exterior performance.
b. Exposure: Moderate
c. Number of Coats: See schedule.
d. Color: Refer to Tnemec Color Guide.
e. Finish: Satin.
f. Minimum Solids Content: 44.0 ± 2.0% (mixed)
g. Minimum Dry Film Thickness Per Coat: See schedule.
h. H.B. Tneme-Tufcoat, Series 113, as manufactured by Tnemec, or Pro Industrial Water Based Epoxy.
i. Primer: See schedule.

10. Modified Polyamine Epoxy

a. Usage: High-solids moisture tolerant epoxy used for priming concrete, wood and drywall. Also as a stand-alone one-coat clear floor sealer.
b. Exposure:
c. Number of Coats: See schedule.
d. Color: Clear. Can be field-tinted (Series 820 Field Tint) in 16 StrataShield colors and certain custom colors. Sherwin Williams products is available in clear standard and customer colors
e. Minimum Solids Content: 100% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Epoxoprime, Series 201, as manufactured by Tnemec, or General Polymers 3746, as manufactured by Sherwin Williams.
h. Primer: See schedule.

11. Modified Polyamine Epoxy

a. Usage: A multi-purpose epoxy coating that can be used as a primer, broadcast, slurry/broadcast, mortar, grout coat, and topcoat. Excellent application properties with good flow and self-leveling characteristics. Protects concrete surfaces from impact, abrasion and mild chemicals.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Color: Clear or pigmented. Can be factory or field-tinted (Series 820 Field Tint) in 16 StrataShield colors and certain custom colors. Reference Sherwin Williams data sheets for color details
e. Minimum Solids Content: 100% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Power-Tread, Series 237, as manufactured by Tnemec, or General Polymers 4080 (FasTop 12S), as manufactured by Sherwin Williams.
h. Primer: See schedule.

12. Modified Novolac Epoxy

a. Usage: A multi-purpose resin for fiberglass reinforced mat secondary containment systems. Protects against chemicals, thermal cycling, impact and abrasion.
b. Exposure: Severe/moderate
c. Number of Coats: See schedule.
d. Color: 00GR Gray or clear from Sherwin Williams.
e. Minimum Solids Content: 100% (mixed)
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Chembloc, Series 239SC, as manufactured by Tnemec, or Cor-Cote HCR, as manufactured by Sherwin Williams.
h. Primer: See schedule.

C. Polyurethane Coating:

1. Modified Aromatic Polyurethane Primer

a. Usage: A single component, surface tolerant, NSF approved, moisture-cured resin, containing micaceous iron oxide and zinc to function as a primer which is field and shop friendly. Exposure: Moderate.
b. Number of Coats: See schedule.
c. Color: 1216 Greenish-Gray.
d. Minimum Solids Content: 61.0 ± 2.0% (mixed).
e. Minimum Dry Film Thickness Per Coat: See schedule.
f. Omnithane, Series 1, as manufactured by Tnemec, or Corothane 1 GalvaPac 1K or 2K Zinc Primer, as manufacturd by Sherwin Williams.
g. Primer: See schedule.

2. Aromatic Urethane, Zinc-Rich Primer

a. Usage: A two-component, moisture-cured, zinc-rich urethane primer for the interior and exterior steel surfaces. Exposure: Moderate.
b. Color: Greenish-gray.
c. Minimum Solids Content: 63.0 ± 2.0% (mixed).
d. Metallic Zinc Content: 83% minimum in dried film. ASTM D 522 Type III Zinc dust.

e. Standard of Quality: Hydro-Zinc, Series 91-H_20, as manufactured by Tnemec, or Corothane 1 GalvaPac 1K or 2K Zinc Primer, as manufactured by Sherwin Williams.
f. Primer: See schedule.

3. Aliphatic Acrylic Polyurethane

a. Usage: A coating highly resistant to abrasion, wet conditions, corrosive fumes and exterior weathering. High build quality combines with project specific primers for two-coat, labor saving systems. Fast curing options are available; see Curing Time below. NOT FOR IMMERSION SERVICE.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Finish: Gloss.
e. Minimum Solids Content: 66 ± 2.0% (mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Endura-Shield, Series 1095, as manufactured by Tnemec, or Acolon 218 HS, as manufactured by Sherwin Williams.
h. Primer: See schedule.

4. Aliphatic Moisture Cured Urethane

a. Usage: Extremely hard, chemical-resistant urethane floor coating with superb wear characteristics. Excellent resistance to abrasion, wet conditions, corrosive fumes and chemical contact. Excellent gloss and color retention. Low odor characteristic allows for use near occupied space. Note: For horizontal surfaces only.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Finish: Semi-gloss.
e. Minimum Solids Content: 92 ± 2.0% (clear mixed).
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Everthane, Series 248, as manufactured by Tnemec, or Amorseal Rexthane 1, as manufactured by Sherwin Williams.
h. Primer: See schedule.

5. Polyurethane Modified Concrete

a. Usage: High performance designed to reduce moisture vapor emissions prior to the application of non-breathing, polymer floor topping finishes. Must be able to withstand up to 20lbs moisture vapor transmission and 99% RH.
b. Exposure: Moderate/Severe
c. Number of Coats: See schedule.
d. Finish: Matt.
e. Minimum Solids Content: 100%%.
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Everthane, Series 241 MVT, as manufactured by Tnemec, or General Polymers FasTop 12S, as manufactured by Sherwin Williams.
h. Primer: See schedule.

D. Alkyd Coating:

1. Alkyd

    a. Usage: High gloss industrial enamel offering good flow, hiding and protection for recommended surfaces in mild to moderately severe exposures. Not for use on surfaces that are continually wet or sweat frequently.
    b. Exposure: Mild to moderately severe.
    c. Number of Coats: See schedule.
    d. Finish: Gloss.
    e. Minimum Solids Content: 49.0 ± 2.0%.
    f. Minimum Dry Film Thickness Per Coat: See schedule.
    g. Hi-Build Tneme-Gloss, Series 2H, as manufactured by Tnemec, or Industrial Enamel, as manufactured by Sherwin Williams.
    h. Primer: See schedule.

2. Phenolic Alkyd

    a. Usage: Lead- and chromate-free, fast-drying, corrosion-resistant primer that accepts a variety of high-performance topcoats. Ideally suited for steel fabricators, OEM's and field applications where "dry-fall" characteristics are desired. Note: Not recommended for immersion.
    b. Exposure: Moderate.
    c. Number of Coats: See schedule.
    d. Color: 77 Red or 78 Gray.
    e. Minimum Solids Content: 58.0 ± 2.0%.
    f. Minimum Dry Film Thickness Per Coat: See schedule.
    g. Chem-Prime H.S., Series 37H, as manufactured by Tnemec, or Kem Bond HS Primer, as manufactured by Sherwin Williams.
    h. Primer: See schedule.

E. Acrylic

1. HDP Acrylic Polymer

    a. Usage: Water-based, low VOC, High Dispersion Pure acrylic polymer coating providing excellent long term protection in both interior/exterior exposures. May be applied by spray, brush or roller over a variety of solvent and waterborne steel primers. May also be used over many aged coatings. It is mildew resistant and exhibits very good gloss and color stability. Application methods include "dry-fall" under certain conditions (See Application). Note: Series 1029's "dry-fall" characteristics help reduce the potential for overspray problems on buildings and surrounding property.
    b. Exposure: Moderate.
    c. Number of Coats: See schedule.
    d. Color: Refer to Tnemec Color Guide.
    e. Minimum Solids Content: 40.0 ± 2.0%.
    f. Minimum Dry Film Thickness Per Coat: See schedule.
    g. Enduratone, Series 1029, as manufactured by Tnemec, or SherCryl HPA, as manufactured by Sherwin Williams.
    h. Primer: See schedule.

2. Modified Waterborne Acrylate

a. Usage: Flexible, breathable coating primarily for concrete and masonry that can fill and bridge minor hairline cracks. Excellent elastomeric protection against driving rain, alternate freezing-thawing and UV light. Series 156 can also be used as a low cohesive stress overcoat for aged oil or alkyd systems.
b. Exposure: Moderate.
c. Number of Coats: See schedule.
d. Color: Refer to Tnemec Color Guide.
e. Minimum Solids Content: 50.9 ± 2.0%
f. Minimum Dry Film Thickness Per Coat: See schedule.
g. Enviro-Crete, Series 156, as manufactured by Tnemec, or ConFlex XL Smooth, as manufactured by Sherwin Williams.
h. Primer: See schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.

B. Examine areas and conditions under which application of coating systems shall be performed for conditions that will adversely affect execution, permanence, or quality of coating system application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes until moisture content of surface is below following limits:

1. Masonry Surfaces: 12% maximum
2. Vertical Concrete Surfaces: 12% maximum
3. Horizontal Concrete Surfaces: 8% maximum

D. Correct conditions detrimental to timely and proper execution of Work.

E. Do not proceed until unsatisfactory conditions have been corrected.

F. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.

B. Protection:

1. Take precautionary measures to prevent fire hazards and spontaneous combustion. Remove empty containers from Site.

2. Place cotton waste, cloths and hazardous materials in containers, and remove from Site daily.
3. Provide drop cloths, shields, and other protective equipment.
4. Protect elements surrounding work of this section from damage or disfiguration.
5. As Work proceeds, promptly remove spilled, splashed, or splattered materials from surfaces.
6. During application of coating materials, post Wet Paint signs.
7. During application of solvent-based materials, post No Smoking signs.

C. Clean surfaces of loose foreign matter.

D. Remove substances that would bleed through finished coatings; if removal is not possible, seal surface with shellac.

E. Remove finish hardware, fixture covers, and accessories and store.

F. Existing Painted and Sealed Surfaces:

1. Remove loose, flaking, and peeling paint, and feather edge and sand smooth edges of chipped paint.
2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

G. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Surfaces shall be mechanically cleaned to remove passivation and to provide a uniform 1.0 mil anchor profile.

H. Ferrous Metal:

1. Surfaces shall be free of residual deposits of grease, rust, scale, dirt, dust, and oil.

   a. Immersion Service: SSPC-SP 10 Near White Blast Cleaning
   b. Non-Immersion Service: SSCP-SP 6 Commercial Blast Cleaning.

2. Field Repair of Shop Primed Surfaces:

   a. Non-Immersion Service: Remove all dirt, dust, chalk, oil, grease, as well as any other foreign matter by solvent cleaning (SSPC-SP 1) and/or power washing. All areas damaged during transportation, construction or installation shall be cleaned in accordance with SSPC-SP 11 Power Tool Cleaning to Bare Metal or SSPC-SP 6 Commercial Blast Cleaning. All edges shall be feathered. All surfaces shall be clean and dry prior to coating
   b. Immersion Service: Remove all dirt, dust, chalk, oil, grease, as well as any other foreign matter by solvent cleaning (SSPC-SP 1) and/or power washing. All areas damaged during transportation, construction or installation shall be cleaned in accordance with SSPC-SP 10 Near White Blast Cleaning. All edges shall be feathered. The remainder of the intact shop primer shall be cleaned in accordance with SSPC-SP 7 Brush-Off Blast Cleaning to provide a minimum, uniform, anchor profile of at least 1.0 mil. In order to prevent injury to surrounding painted areas, blast cleaning may necessitate use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If

damage is too extensive to touch-up, item shall be re-cleaned and coated or painted. All surfaces shall be clean and dry prior to receiving the specified finish coat(s).

3. For surfaces not shop primed, surfaces shall be cleaned in compliance with specifications of Steel Structures Painting Council as indicated in Schedule of Coating Systems below.

3.3 APPLICATION

A. Comply with MPI - Architectural Painting Manual.

B. Apply primer to each surface, unless specifically not required by coating manufacturer.

C. Apply coating systems in compliance with manufacturer's instructions and using application method best suited for obtaining full, uniform coverage of surfaces to be coated.

D. Apply primer, intermediate, and finish coats to comply with wet and dry film thickness and spreading rates for each type of material as recommended by manufacturer.

1. Application rates in excess of those recommended and fewer numbers of coats than specified shall not be accepted.

E. Number of coats specified shall be minimum number acceptable. Apply additional coats as needed to provide a smooth, even application.

1. Closely adhere to re-coat times recommended by manufacturer. Allow each coat to dry thoroughly before applying next coat. Provide adequate ventilation for tank interior to carry off solvents during drying phase.

F. Employ only application equipment that is clean, properly adjusted, and in good working order, and of type recommended by coating manufacturer.

G. After surface preparation, interior weld seams shall receive a stripe coat applied by brush.

H. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping.

I. Apply coatings to specified thicknesses.

J. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish.

K. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspecting and Testing: Comply with MPI - Architectural Painting Manual.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from Site.

C. Clean surfaces immediately of overspray, splatter, and excess material.

D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 SCHEDULE

A. Interior Service

1. Non-Submerged Ductile Iron:

a. Surface Preparation: Abrasive blast to remove all contaminants.

1) Primer:

a) Tnemec: Series N140-1211 Pota-Pox Plus
b) Sherwin Williams: Macropoxy 5500LT
c) Carboline: Carboguard 635
d) Dry Film Thickness: 6.0 – 8.0 (Carboline: 4.0 - 6.0)

2) Intermediate:

a) Tnemec: Series 66 Epoxoline
b) Sherwin Williams: Macropoxy 646 Fast Cure **Note (1), (2)**
c) Carboline: Carboguard 635
d) Dry Film Thickness: 3.0 – 5.0 (Carboline: 4.0 - 6.0)

3) Finish Coat:

a) Tnemec: Series 1095 Endura-Shield
b) Sherwin Williams: Acrolon 218 HS
c) Carboline: Carbothane 8845
d) Dry Film Thickness: 2.0 – 3.0

4) Total Dry Film Thickness: 11.0 – 16.0

Note (1) Series 66 may be interchanged with Series 161 when surface temperature is below 50 degrees (21degrees C) or when faster recoat is desired
Note (2) 66HS Epoxoline may be substituted for 66 Epoxoline.

2. Non-Submerged Ferrous Metals & Ductile Iron (Frequently Sweating Pipe):

a. Surface Preparation: Abrasive blast to remove all contaminants. Shop primed surfaces shall be scarified prior to application of the intermediate coat.

1) Primer:

a) Tnemec: Series N140-1211 Pota-Pox Plus
b) Sherwin Williams: Macropoxy 5500 LT
c) Dry Film Thickness: 6.0 – 8.0

2) Intermediate:

a) Tnemec: Series 20 Pota-Pox
b) Sherwin Williams: Macropoxy 646 Fast Cure
c) Dry Film Thickness: 4.0 – 6.0

3) Insulation Coating:

a) Tnemec: Series 971 Aerolon
b) Sherwin Williams: Heat Flex 3500
c) Dry Film Thickness: 100 - 150

4) Finish Coat:

a) Tnemec: Series 72T Endura-Shield
b) Sherwin Williams: SherCryl HPA
c) Dry Film Thickness: 2.0 – 3.0

5) Total Dry Film Thickness: 11.0 – 16.0

3. Non-Submerged Ferrous Metals & Ductile Iron (Thermal Resistance Up to 325ºF):

a. Surface Preparation: SSPC-SP6/NACE No. 3 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils. **Note (1)**

1) 1st Coat:

a) Tnemec: Series 1224 Epoxoline WB5
b) Sherwin Williams: Heat Flex 1200
c) Dry Film Thickness: 5.0 – 8.0

2) 2nd Coat:

a) Tnemec: Series 971 Aerolon Acrylic
b) Sherwin Williams: Heat Flex 3500
c) Dry Film Thickness: 50.0

3) 3rd Coat:

a) Tnemec: Series 971 Aerolon Acrylic
b) Sherwin Williams: Heat Flex 3500
c) Dry Film Thickness: 50.0

4) 4th Coat:

a) Tnemec: Series 72T EnduraShield
b) Shewin Williams: SherCryl HPA
c) Dry Film Thickness: 2.0 – 5.0

5) Total Dry Film Thickness: 109.0 – 113.0

Note (1) Abrasive blast cleaning generally produces the best coating performance. If conditions will not permit this, Series 1224 may be applied to SSPC-SP2 or SSPC-SP3 Hand or Power Tool Cleaned surfaces
Note(2) Apply Heat Flex 3500 in accordance with manufacturer's product data sheet to achieve recommended dry film thickness.

4. Previously Painted Non-Submerged Ferrous Metals & Ductile Iron:

a. Surface Preparation: Clean all surfaces of all dirt, dust, chalk, and any other foreign matter that may interfere with the adhesion of the proposed coating system. Clean all corroded areas in accordance with SSPC-SP 3 Power Tool Cleaning. Feather Edges. Spot Prime all areas cleaned to bare metal.

1) Spot Prime:

a) Tnemec: Series 135 Chembuild
b) Sherwin Williams: Macropoxy 5500 LT
c) Carboline: Carboguard 635
d) Dry Film Thickness: 3.0 – 5.0 (Carboline: 4.0 - 6.0)

2) Full Prime:

a) Tnemec: Series 135 Chembuild
b) Sherwin Williams: Macropoxy 5500 LT
c) Carboline: Carboguard 635
d) Dry Film Thickness: 2.0 – 3.0 (Carboline: 4.0 - 6.0)

3) Finish Coat:

a) Tnemec: Series 1095 Endura-Shield
b) Sherwin Williams: Acrolon 218 HS
c) Carboline: Carbothane 8845
d) Dry Film Thickness: 2.0 – 3.0 (Carboline: 3.0 - 5.0)

B. COLOR SYSTEM MATERIAL INDENTIFICATION

1. The color system shall be selected by the Owner.

END OF SECTION 09 96 00

THIS PAGE INTENTIONALLY LEFT BLANK

DIVISION 26

ELECTRICAL SPECIFICATIONS

PREPARED BY

John Averrett, PE

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 00 00 - ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work under this item of the Contract shall include the furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete electrical systems, including exterior and interior of buildings as shown on the drawings and specified herein.

B. The CONTRACTOR shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by the manufacturer, trade name, or catalog number establishes the quality standards of materials and equipment required for this installation and is not intended to exclude products equal in quality and similar in design. Where two or more designations are listed, choice shall be optional with the Contractor. The Engineer reserves the sole right to decide the equality of materials proposed for use in lieu of those specified.

1.2 RELATED DOCUMENTS:

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

1.3 CODES, PERMITS, AND INSPECTIONS

A. Comply with applicable laws of the community, with latest edition of NEC where not in conflict with those laws, and with the service rules of the local utility company. Obtain and pay for all permits required. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.4 DRAWINGS AND SPECIFICATIONS

A. Consider as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Engineer in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions; verify all dimensions and existing conditions.

1.5 CONFLICTS, COORDINATION AND CHANGES

A. In the event that interferences or conflicts develop, the ENGINEER shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, the electrical sub-contractor who is using common space such as mechanical rooms, chases, ceiling space, etc., shall coordinate his work with all other trades and other parts of his own work. If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the ENGINEER and secure his decision in writing.

1.6 SUBMITTALS

A. The Electrical Contractor shall submit five copies of a list of items proposed for use. The Electrical Contractor shall also submit five copies of catalog data and shop drawings on proposed substitutions and on panelboards, exhaust fans, transformers, motor control centers, switchboards, light fixtures, electric heaters, safety switches, surge suppressors, lightning arrestors, etc. Where substitutions alter the design or space requirements, the Electrical Contractor shall defray all items of cost for the revised design and construction including costs of all allied trades involved.

B. The Electrical Contractor shall include in his submittals layout drawings of all electrical rooms, layout drawings of all common space rooms, and/or layout drawings of all backboards or any other space where electrical equipment is mounted showing that he has taken into account other trades that may share this space.

C. Record Drawings: Provide, and in such detail as required.

D. Operations and Maintenance Manuals: Provide, and in such detail as required.

1.7 WARRANTY

A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material which may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall be new and shall be listed as approved by the Underwriter's Laboratories, Inc. in every case where a standard has been established for the particular type of material in question. All work shall be executed in workmanlike manner and shall present a neat and mechanical appearance when completed.

2.2 ELECTRICAL SERVICE

A. General: Coordinate with Utility Company. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations. The Electrical Contractor shall be responsible for including all fees associated with bringing power to this site in their original bid. A copy of the bill showing the cost to provide the electrical service shall be given to the owner for verification of the cost.

B. Characteristics of Service: New 277/480 volt, 60 cycle, 3 phase, 3 wire, with a ground.

C. Metering: Obtain from Utility Company.

D. Main Service Equipment: Install as per the Riser Diagram and per the Utility Company's regulations.

E. Service Feeder: Install as per the Riser Diagram and per the Utility Company's regulations.

F. Transformer: Coordinate with Utility for correct size of service transformer prior to INSTALLATION connection.

PART 3 - EXECUTION

3.1 VISIT TO SITE

A. Before submitting a bid, visit the site and ascertain all existing conditions. Make such adjustments in work as are required by the actual conditions encountered.

3.2 CUTTING AND CHASING

A. Where possible all work shall be built in as the job progresses. Where this is not possible, secure approval and do necessary cutting, chasing, etc. required. Do not cut through any structural members without securing approval in advance; such holes shall be neatly cut or drilled – not chipped.

3.3 TRENCHING AND BACKFILLING

A. Do all excavating necessary for installation of work; backfill trenches and excavations after work has been installed and inspected. Backfill within the building and under paved areas shall meet compaction requirements and fill material shall be pit run gravel or similar granular material.

3.4 ELECTRICAL SERVICE INSTALLATION

A. Project Conditions: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated.

B. Notify Project Manager and Owner no fewer than seven days in advance of proposed interruption of electrical service.

C. Indicate method of providing temporary electrical service.

D. Do not proceed with interruption of electrical service without Project Manager's written permission.

3.5 SALVAGE MATERIAL

A. All metals and devices removed from the project that can be returned for scrap shall be the property of the owner. Owner shall have first right of refusal on all items that are to be demolished, removed or scrapped from the project. Contractor shall provide a list of such items in written form to the owner. Prior to the contractor salvaging any material for his own gain, the contractor shall obtain written approval from the owner.

END OF SECTION 260000

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 04 44A – PUMP STATION CONTROL PANEL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the requirements for the International Drive Booster Pump Station control panel specified in this project.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 26 05 26
2. Section 26 05 53
3. Section 26 05 19
4. Section 26 43 13

1.3 SUBMITTALS

A. Submit the following information in accordance with Section 01 33 00, Section 01 78 20:

1. Shop Drawings showing layout and dimensions
2. Product Data
3. Installation Instructions
4. O&M Manuals

PART 2 - PRODUCTS

2.1 PUMP STATION CONTROL PANEL

A. Each pump control panel shall be housed in a NEMA 3R cabinet with back panel and hinged inner-door and including external feet for mounting to galvanized equipment mounting frame. The pump control panel shall be suitable as service entrance use- S.E. label. All components shall have a UL label for purpose intended and the panel shall be UL listed in compliance with UL508A. The panel shall also be constructed in accordance with NFPA 70E. Heat generated by all equipment shall be accounted for and **ventilation supplied** so as not to exceed 40 degree C ambient operating temperature. Panel Supplier shall submit heat load calculations and ventilation requirement calculations for verification by Engineer. Cabinets by Schaefer, Hoffman, Rittal or equal.

B. A surge protection device shall be installed on the incoming feed to the panel, see specification 26 43 13 for more details.

C. A power distribution block shall be installed to accept dual feeds in a range of #14-#4 incoming line conductors. The distribution side shall have a minimum of 6 branches with a range of #14-#2. Square D Class 9080 LB series or Bussman, Phoenix Contact, or approved equal.

D. A green run pilot shall be provided for each pump. Siemens #52PE4C3, 30mm type, as well as, a red motor failure pilot, and a white normal power on pilot. May also be SquareD, Cutler-Hammer, or approved equal.

E. Pilot lights for each pump shall activate if the following occurs:

1. Pump #1 Fails
2. Pump #2 Fails
3. Pump #3 Fails
4. Pump #4 Fails

F. A hand-off-automatic switch for each pump shall be provided on the inner door. Siemens #52SXBAB / 2-52BAK or equal complete with all contact blocks required. May also be SquareD, Cutler-Hammer, or approved equal.

G. The control relays required shall be Siemens #3TX 71 plug-in type with socket base with number of poles and contacts as required to perform functions desired. May also be SquareD, Cutler-Hammer, or approved equal.

H. A dual channel time delay relay, Finder 84 series or approved equal, shall be installed for the lockout of pumps #3 & #4 in the event of transfer to emergency power. Pump #3 shall not start for a minimum of 30 seconds from the time pumps #1 & #2 start and emergency power is active while pump #4 shall not start for a minimum of 30 seconds after pump #3. Load stepping shall be achieved as follows (if equipment is not listed here, it is assumed to be in step 1):

1. Step 1
   a. Pump #1
   b. Pump #2
2. Step 2
   a. Pump #3
3. Step 3
   a. Pump #4

I. A space heater with thermostat shall be furnished to prevent moisture from accumulating in the control panel and connected to the control power panel. Rating shall not exceed 200 watts at 120V.

J. All control and power conductors from each component shall terminate in numbered terminal blocks equal to Siemens #8WA2, SquareD, Cutler-Hammer, or approved equal with box lugs sized as required din rail mounted. A point-to-point number wiring diagram shall be supplied showing internal and remote interconnections with each control panel in a seal pouch inside

each unit. All wiring to be numbered at both terminations and a descriptive list made of the numbered terminations shall be supplied.

K. A phase failure relay shall be installed to monitor the power to the panel. Loss of phase shall signal loss of phase and phase sequence monitoring reversal signal to the controller and stop the pumps from running. The relay shall be Siemens #3UG30-13-1BP60 series. May also be SquareD, Cutler-Hammer, or approved equal.

L. An elapsed time meter for each pump motor shall be provided on the inner/door. The flush mounted gasketed hour meter shall provide runtime indication up to 99,999.9 hours. The display shall have a 4.8mm x 10.6mm 6 digit LCD display 120 volt. The unit shall be ENM, Omron, Honeywell, Eaton, or approved equal complete with all mounting hardware.

M. A Ground Fault 15 Amp, 120V receptacle P&S #1594, or approved equal, shall be mounted on the inner door for maintenance purposes and connected to the control power panel.

N. Should the drop out of any pump/VFD occur, a mechanical indicator, visible on the inner door, will indicate the pump motor has been shutdown. Pump motors shall remain locked out until the condition has been corrected and the circuit manually reset. Automatic reset of protection circuitry is not considered acceptable.

O. A Micrologix 1400 PLC, or approved equal, complete with all expansion modules required to satisfy the I/O requirements listed in this specification shall be supplied in the control panel and shall be installed and programmed to operate all motors associated with this control panel. Contractor shall prepare all wiring and terminals to transmit all I/O to future SCADA Panel by owner.

1. I/O Requirements:

a. Digital Inputs:

1) Motor #1 Hand Position
2) Motor #1 Auto Position
3) Motor #1 Running
4) Motor #1 Failed
5) Motor #2 Hand Position
6) Motor #2 Auto Position
7) Motor #2 Running
8) Motor #2 Failed
9) Motor #3 Hand Position
10) Motor #3 Auto Position
11) Motor #3 Running
12) Motor #3 Failed
13) Motor #4 Hand Position
14) Motor #4 Auto Position
15) Motor #4 Running
16) Motor #4 Failed
17) Check Valve #1 Open Position
18) Check Valve #1 Closed Position
19) Check Valve #2 Open Position
20) Check Valve #2 Closed Position
21) Check Valve #3 Open Position
22) Check Valve #3 Closed Position
23) Check Valve #4 Open Position

24) Check Valve #4 Closed Position
25) Low Flow Check Valve Open Position
26) Low Flow Check Valve Closed Position
27) Generator Running
28) Generator Failed
29) Generator Low Fuel Alarm
30) ATS Position – Utility
31) ATS Position – Emergency
32) ATS Power Failure
33) Pump Station High Temperature Alarm

b. Digital Outputs:

1) Motor #1 Call to Start
2) Motor #2 Call to Start
3) Motor #3 Call to Start
4) Motor #4 Call to Start

c. Analog Inputs:

1) Motor #1 Speed Reference
2) Motor #1 Instantaneous Current
3) Motor #2 Speed Reference
4) Motor #2 Instantaneous Current
5) Motor #3 Speed Reference
6) Motor #3 Instantaneous Current
7) Motor #4 Speed Reference
8) Motor #4 Instantaneous Current
9) Total Station Flow
10) Instantaneous Chlorine Level
11) Instantaneous Suction Pressure #1
12) Instantaneous Suction Pressure #2
13) Instantaneous Discharge Pressure #1
14) Instantaneous Discharge Pressure #2

d. Analog Outputs:

1) Motor #1 Speed Command
2) Motor #2 Speed Command
3) Motor #3 Speed Command
4) Motor #4 Speed Command

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Duplex Control Panel in accordance with manufacturer's recommendation and as shown on drawings.

END OF SECTION 26 04 44A

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 26 05 23 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
2. Section 27 15 13 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.3 DEFINITIONS

A. PV: Photovoltaic.

B. RoHS: Restriction of Hazardous Substances.

C. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer's authorized service representative.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

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

1. Belden Inc.
2. General Cable Technologies Corporation.
3. Okonite Company (The).
4. Southwire Company.
5. Or Approved Equal.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type NM: Comply with UL 83 and UL 719.
2. Type RHW-2: Comply with UL 44.
3. Type SE: Comply with UL 854.
4. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
5. Type THHN and Type THWN-2: Comply with UL 83.
6. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
7. Type UF: Comply with UL 83 and UL 493.
8. Type XHHW-2: Comply with UL 44.
9. .

F. Shield:

1. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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

1. 3M Electrical Products.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; a brand of Emerson Industrial Automation.
4. TE Connectivity Ltd.
5. Thomas & Betts Corporation; A Member of the ABB Group.
6. Or Approved Equal.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

E. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

F. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

G. PV Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

F. Feeders in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

G. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

J. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

K. Branch Circuits in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application.

M. VFC Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, which will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. All wire terminations at motor leads and at motor starters shall be made with insulated ring or fork type terminals and insulated for 600 volts with heat shrink sleeves.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors feeding the following critical equipment and services for compliance with requirements:

3. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:

      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.

   c. Inspect compression-applied connectors for correct cable match and indentation.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.

f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
g. Continuity test on each conductor and cable.
h. Uniform resistance of parallel conductors.

4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

E. Cables will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1. In addition to items specified in Section 01 70 00 "Contract Closeout," include the following:

a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1) Test wells.
2) Ground rods.
3) Ground rings.
4) Grounding arrangements and connections for separately derived systems.

b. Instructions for periodic testing and inspection of grounding features at ground rings and test well based on NFPA 70B.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

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

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. O-Z/Gedney; a brand of Emerson Industrial Automation.
4. Thomas & Betts Corporation; A Member of the ABB Group.
5. Or Approved Equal.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with socket set screw.

J. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

K. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

L. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

M. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

N. Straps: Solid copper, copper lugs. Rated for 600 A.

O. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.

P. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

Q. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

H. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical

service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 3/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level shall be no more than ten (10) OHMS at all locations covered by these specifications, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

F. Grounding system will be considered defective if resistance is more than ten (10) OHMS and it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Report measured ground resistances that exceed values as listed on the plans.

I. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.

2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Projectors.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

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

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

B. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

C. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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

        1) Hilti, Inc.
        2) MKT Fastening, LLC.
        3) Or Approved Equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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

        1) B-line, an Eaton business.
        2) Hilti, Inc.

3) MKT Fastening, LLC.
4) Or Approved Equal.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 09 91 13 "Exterior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. CGRC: PVC Coated Galvanized Rigid Conduit.

C. PVC: Schedule 40 Poly Vinyl Chloride Conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. Allied Tube & Conduit; a part of Atkore International.
2. O-Z/Gedney; a brand of Emerson Industrial Automation.
3. Perma-Cote.
4. Plasti-Bond.
5. Southwire Company.
6. Thomas & Betts Corporation; A Member of the ABB Group.
7. Wheatland Tube Company.
8. Or Approved Equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

H. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

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

1. CANTEX INC.
2. RACO; Hubbell.
3. Thomas & Betts Corporation; A Member of the ABB Group.
4. Or Approved Equal.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fiberglass:

1. Comply with NEMA TC 14.
2. Comply with UL 2515 for aboveground raceways.
3. Comply with UL 2420 for belowground raceways.

D. ENT: Comply with NEMA TC 13 and UL 1653.

E. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

F. LFNC: Comply with UL 1660.

G. Rigid HDPE: Comply with UL 651A.

H. Continuous HDPE: Comply with UL 651A.

I. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

J. RTRC: Comply with UL 2515A and NEMA TC 14.

K. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

L. Fittings for LFNC: Comply with UL 514B.

M. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. Hoffman; a brand of Pentair Equipment Protection.
2. Square D.
3. Rittal
4. Or Approved Equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 12 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

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

1. Allied Moulded Products, Inc.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Or Approved Equal.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

F. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

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

    a. Hubbell Incorporated; Wiring Device-Kellems.
    b. Panduit Corp.
    c. Wiremold / Legrand.
    d. Or Approved Equal.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

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

    a. Hubbell Incorporated.
    b. Panduit Corp.
    c. Wiremold / Legrand.
    d. Or Approved Equal.

2.6 BOXES, ENCLOSURES, AND CABINETS

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

1. Crouse-Hinds, an Eaton business.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Hubbell Incorporated; Wiring Device-Kellems.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Plasti-Bond.
6. Thomas & Betts Corporation; A Member of the ABB Group.
7. Wiremold / Legrand.
8. Or Approved Equal.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.

N. Gangable boxes are allowed.

O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 12 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

P. Cabinets:

1. NEMA 250, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

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

   a. Oldcastle Precast, Inc.
   b. Quazite: Hubbell Power Systems, Inc.
   c. Or Approved Equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC,.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, unless otherwise noted.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: GRC.
2. Exposed, Not Subject to Severe Physical Damage: GRC.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: GRC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from PVC to GRC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Excavation & Grading" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Excavation & Grading."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Excavation & Grading."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 26 05 74 "Overcurrent Protective Device Arc-Flash Study" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on a white field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 240-V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral: White or gray.
6. Color for Equipment Grounds: Green.
7. Colors for Isolated Grounds: Green with white stripe.

C. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:

1. Identify system voltage with black letters on a white background.

E. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 LABELS

A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

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

a. Brady Corporation.
b. Brother International Corporation.
c. Panduit Corp.
d. Or Approved Equal.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES

A. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

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

a. Brady Corporation.
b. Panduit Corp.
c. Or Approved Equal.
d. All wires and cables shall have heat-shrink identification at all terminations and splices.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

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

a. Carlton Industries, LP.
b. Panduit Corp.
c. Or Approved Equal.

B. Underground-Line Warning Tape:

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

a. Brady Corporation.
b. Seton Identification Products.
c. Or Approved Equal.

2. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

4. Tag: Type I:

a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Thickness: 4 mils.
d. Weight: 18.5 lb/1000 sq. ft..
e. Tensile according to ASTM D 882: 30 lbf and 2500 psi.

5. Tag: Type II:

a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

b. Width: 3 inches.
c. Thickness: 12 mils.
d. Weight: 36.1 lb/1000 sq. ft.
e. Tensile according to ASTM D 882: 400 lbf and 11,500 psi.

6. Tag: Type ID:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

7. Tag: Type IID:

a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 8 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 34 lb/1000 sq. ft.
f. Tensile according to ASTM D 882: 300 lbf and 12,500 psi.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

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

a. Brady Corporation.
b. Carlton Industries, LP.
c. Seton Identification Products.
d. Or Approved Equal.

2.7 SIGNS

A. Metal-Backed Butyrate Signs:

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

    a. Brady Corporation.
    b. Marking Services, Inc.
    c. Or Approved Equal.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches.

2.8 CABLE TIES

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

1. Marking Services, Inc.
2. Panduit Corp.
3. Or Approved Equal.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

M. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

W. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

X. Metal Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

Y. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

Z. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

AA. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

BB. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

CC. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

DD. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch-high, black letters on 20-inch centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 30-foot maximum intervals.

D. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

J. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

K. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

L. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

M. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.

3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

N. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

O. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

P. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

Q. Arc Flash Warning Labeling: Self-adhesive labels.

R. Operating Instruction Signs: Metal-backed, butyrate warning signs.

S. Emergency Operating Instruction Signs: Metal-backed, butyrate warning signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

T. Equipment Identification Labels:

1. Indoor Equipment: Metal-backed butyrate signs.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchgear.
e. Switchboards.
f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Substations.
h. Emergency system boxes and enclosures.
i. Motor-control centers.
j. Enclosed switches.
k. Enclosed circuit breakers.
l. Enclosed controllers.
m. Variable-speed controllers.

n. Push-button stations.
o. Power-transfer equipment.
p. Contactors.
q. Remote-controlled switches, dimmer modules, and control devices.
r. Battery-inverter units.
s. Battery racks.
t. Power-generating units.
u. Monitoring and control equipment.
v. UPS equipment.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching and dimming controls.
4. Indoor occupancy and vacancy sensors.
5. Switchbox-mounted occupancy sensors.
6. Digital timer light switches.
7. High-bay occupancy sensors.
8. Extreme temperature occupancy sensors.
9. Outdoor motion sensors.
10. Lighting contactors.
11. Emergency shunt relays.

B. Related Requirements:

1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment will be attached.
3. Items penetrating finished ceiling, including the following:

a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Control modules.

B. Field quality-control reports.

C. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On manufacturer's website. Provide names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control software.
b. Faulty operation of lighting control devices.

2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

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

1. Cooper Industries, Inc.
2. Leviton Manufacturing Co., Inc.
3. TE Connectivity Ltd.
4. Or Approved Equal.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70 and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Programs: Eight on-off set points on a 24-hour schedule.
5. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
7. Astronomic Time: All channels.
8. Automatic daylight savings time changeover.
9. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

C. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic time dial.
6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

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

1. Cooper Industries, Inc.
2. Leviton Manufacturing Co., Inc.

3. TE Connectivity Ltd.
4. Or Approved Equal.

B. Description: Solid state, with SPST dry contacts rated for 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Fifteen-second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
6. Failure Mode: Luminaire stays ON.

C. Description: Solid state, with SPST dry contacts rated for 1800 VA inductive, to operate connected load, complying with UL 773, and compatible with CFL and LED lamps.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.
6. Failure Mode: Luminaire stays ON.

D. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A, to operate connected load, complying with UL 773, and compatible with luminaire.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Mounting: 1/2-inch threaded male conduit.
5. Failure Mode: Luminaire stays ON.
6. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

    a. LED status lights to indicate load status.
    b. Plenum rated.

7. Power Pack: Digital controller capable of accepting three RJ45 inputs with two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for 13-A ballast or LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.

a. With integral current monitoring
b. Compatible with digital addressable lighting interface.
c. Plenum rated.

2.3 LIGHTING CONTACTORS

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

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a business of Emerson Network Power.
3. General Electric Company.
4. Square D.
5. Or Approved Equal.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as scheduled, matching the NEMA type specified for the enclosure.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

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

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies. Coordinate locations with all disciplines to ensure there are no conflicts.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

A. Comply with NECA 1.

B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transformers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity to prevent rusting of materials during storage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Square D
B. EATON
C. General Electric
D. Or Approved Equal.

2.2 Source Limitations: Obtain each transformer type from single source from single manufacturer.

2.3 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

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

C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.

D. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

E. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

F. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

G. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.4 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Totally enclosed, nonventilated.

1. NEMA 250, As shown on the plans: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

F. Taps for Transformers 3 kVA and Smaller: One 5 percent tap above normal full capacity.

G. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

I. Insulation Class, Smaller than 30 kVA: 185 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.

J. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150-deg C rise above 40-deg C ambient temperature.

K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

3. Unit shall meet requirements of NEMA TP 1 when tested according to NEMA TP 2 with a K-factor equal to one.

L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.

M. Neutral: Rated 200 percent of full load current for K-factor rated transformers.

N. Wall Brackets: Manufacturer's standard brackets.

O. Fungus Proofing: Permanent fungicidal treatment for coil and core.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 26 05 53 "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

1. Resistance measurements of all windings at the rated voltage connections and at all tap connections.
2. Ratio tests at the rated voltage connections and at all tap connections.
3. Phase relation and polarity tests at the rated voltage connections.
4. No load losses, and excitation current and rated voltage at the rated voltage connections.
5. Impedance and load losses at rated current and rated frequency at the rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation Resistance Tests:

    a. High-voltage to ground.
    b. Low-voltage to ground.
    c. High-voltage to low-voltage.

9. Temperature tests.

B. Factory Sound-Level Tests: Conduct prototype sound-level tests on production-line products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

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

3.2 INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.
2. Brace wall-mounted transformers as specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

B. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Construct concrete bases according to Section 03 30 00 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base according to manufacturer's written instructions.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections with the assistance of a factory-authorized service representative.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

F. Remove and replace units that do not pass tests or inspections and retest as specified above.

G. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

H. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 24 13 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.
8. Mimic bus.

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

D. Delegated Design Submittal:

1. For arc-flash hazard study.
2. For arc-flash labels.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

a. Routine maintenance requirements for switchboards and all installed components.
b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and connect factory-installed space heaters to temporary electrical service to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400.

1.9 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

   a. Ambient Temperature: Not exceeding 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

C. Unusual Service Conditions: NEMA PB 2, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

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

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

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

1. SIEMENS Industry, Inc.; Energy Management Division.
2. Square D; by Schneider Electric.
3. EATON.
4. Or Approved Equal.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NEMA PB 2.

F. Comply with NFPA 70.

G. Comply with UL 891.

H. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Panel mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

I. Front- and Side-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.

2. Branch Devices: Panel mounted.
3. Section Alignment: Front aligned.

J. Front- and Rear-Accessible Switchboards:

1. Main Devices: Drawout mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

K. Nominal System Voltage: 480Y/277 V.

L. Main-Bus Continuous: As shown on the plans.

M. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

N. Indoor Enclosures: Steel, NEMA 250, Type 12.

O. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

P. Outdoor Enclosures: Type 3R or 4X as shown on the plans.

1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
2. Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each section, with provisions for padlocking.
3. Doors: Personnel door at each end of aisle, minimum width of 30 inches; opening outwards; with panic hardware and provisions for padlocking. At least one door shall be sized to permit the largest single switchboard section to pass through without disassembling doors, hinges, or switchboard section.
4. Accessories: Fluorescent lighting fixtures, ceiling mounted; wired to a three-way light switch at each end of aisle; ground-fault circuit interrupter (GFCI) duplex receptacle; emergency battery pack lighting fixture installed on wall of aisle midway between personnel doors.
5. Walk-in Aisle Heating and Ventilating:

a. Factory-installed electric unit heater(s), wall or ceiling mounted, with integral thermostat and disconnect and with capacities to maintain switchboard interior temperature of 40 deg F with outside design temperature of 0 deg F.

b. Factory-installed exhaust fan with capacities to maintain switchboard interior temperature of 100 deg F with outside design temperature of 90 deg F.
c. Ventilating openings.
d. Thermostat: Single stage; wired to control heat and exhaust fan.

6. Power for Space Heaters, Ventilation, Lighting, and Receptacle: Include a control-power transformer, with spare capacity of 25 percent, within the switchboard. Supply voltage shall be 120 V ac.
7. Power for space heaters, ventilation, lighting, and receptacle provided by a remote source.

Q. Barriers: Between adjacent switchboard sections.

R. Insulation and isolation for main and vertical buses of feeder sections.

S. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in switchboard.

T. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

U. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

V. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

W. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.

X. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

Y. Pull Box on Top of Switchboard:

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

Z. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
3. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
4. Copper feeder circuit-breaker line connections.
5. Tin-plated aluminum feeder circuit-breaker line connections.
6. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
7. Ground Bus: 1/4-by-2-inch-hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
8. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
9. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

10. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
11. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

AA. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

BB. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

CC. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long and short time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
h. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

B. Insulated-Case Circuit Breaker (ICCB): 80 percent rated, unless otherwise noted, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.
b. Time adjustments for long- and short-time pickup.
c. Ground-fault pickup level, time delay, and I^2t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

5. Remote trip indication and control.
6. Communication Capability: Web enabled integral Ethernet communication module and embedded Web server with factory-configured Web pages (HTML file format). Provide functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Control Voltage: 120-V ac.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

D. Fuses are specified in Section 26 28 13 "Fuses."

2.4 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

B. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.

C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Overhead Circuit-Breaker Lifting Device: Mounted at top front of switchboard, with hoist and lifting yokes matching each drawout circuit breaker.

C. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

D. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 26 05 48.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.6 IDENTIFICATION

A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on a photoengraved nameplate.

1. Nameplate: At least 0.032-inch-thick anodized aluminum, located at eye level on front cover of the switchboard incoming service section.

B. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on an engraved laminated-plastic (Gravoply, Or Approved Equal) nameplate.

1. Nameplate: At least 0.0625-inch-thick laminated plastic (Gravoply, Or Approved Equal), located at eye level on front cover of the switchboard incoming service section.

C. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.

D. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

E. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.

F. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

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

3.2 INSTALLATION

A. Install switchboards and accessories according to NECA 400.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. 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.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.
6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Install spare-fuse cabinet.

I. Comply with NECA 1.

3.3 CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in Section 26 25 00 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

B. Comply with requirements for terminating cable trays specified in Section 26 05 36 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

C. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

D. Support and secure conductors within the switchboard according to NFPA 70.

E. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

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

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Acceptance Testing:

    a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
    b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front and rear panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Switchboard will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 26 24 13

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.
4. Electronic-grade panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.

2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
7. Finishes:

a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

G. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
7. Split Bus: Vertical buses divided into individual vertical sections.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures,

wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Ten percent.

L. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

M. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

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

1. SIEMENS Industry, Inc.; Energy Management Division.
2. Square D; by Schneider Electric.
3. EATON.
4. Or Approved Equal.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: As indicated on plans.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Branch Overcurrent Protective Devices: Fused switches.

H. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

2.4 LOAD CENTERS

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

1. SIEMENS Industry, Inc.; Energy Management Division.
2. Square D; by Schneider Electric.
3. EATON.
4. Or Approved Equal.

B. Load Centers: Comply with UL 67.

C. Mains: Circuit breaker or lugs only, as indicated on plans.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.

F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. SIEMENS Industry, Inc.; Energy Management Division.
2. Square D; by Schneider Electric.
3. EATON.
4. Or Approved Equal.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

    a. Inverse time-current element for low-level overloads.
    b. Instantaneous magnetic trip element for short circuits.
    c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

    a. RMS sensing.
    b. Field-replaceable rating plug or electronic trip.
    c. Digital display of settings, trip targets, and indicated metering displays.
    d. Multi-button keypad to access programmable functions and monitored data.
    e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    f. Integral test jack for connection to portable test set or laptop computer.
    g. Field-Adjustable Settings:

        1) Instantaneous trip.
        2) Long- and short-time pickup levels.
        3) Long and short time adjustments.
        4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
j. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
k. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
l. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
m. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
n. Multipole units enclosed in a single housing with a single handle.
o. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
p. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
2. Fused Switch Features and Accessories:

a. Standard ampere ratings and number of poles.
b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.
c. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407.

D. Equipment Mounting:

1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
3. Comply with requirements for seismic control devices specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

G. Mount top of trim 90 inches above finished floor unless otherwise indicated.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

J. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.

K. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

M. Install filler plates in unused spaces.

N. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

P. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Do not perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 27 13 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes work to accommodate utility company revenue meters.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of meter.
2. For metering infrastructure components.
3. For metering software.

B. Shop Drawings: For electricity-metering equipment.

1. Include elevation views of front panels of control and indicating devices and control stations.
2. Include diagrams for power, signal, and control wiring.
3. Wire Termination Diagrams and Schedules: Include diagrams for power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include series-combination rating data for modular meter centers with main disconnect device.
5. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices used. Describe characteristics of network and other data communication lines.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: In addition to items specified in Section 01 70 00 "Contract Closeout," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Device address list.
5. Hard copies of manufacturer's operating specifications, user's guides for software and hardware, and PDF files on a USB storage device of hard-copy Submittal.
6. Meter data sheet for each meter, listing nameplate data and serial number, accuracy certification, and test results.
7. Meter installation and billing software startup report.

1.6 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Construction Manager shall be notified and issued written permission no fewer than five days in advance of proposed interruption of electrical service.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metering equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Damage from transient voltage surges.

2. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.
3. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for eight years, that failed in service due to transient voltage surges.

1.9 COORDINATION

A. Electrical Service Connections:

1. Coordinate with utility companies and utility-furnished components.

a. Comply with requirements of utility providing electrical power services.
b. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with UL 916.

2.2 UTILITY METERING INFRASTRUCTURE

A. Install metering accessories furnished by the utility company, complying with its requirements.

B. Utility-Furnished Meters: Connect data transmission facility of metering equipment installed by the Contractor.

1. Data Transmission: Transmit pulse data over control-circuit conductors, classified as Class 1 per NFPA 70, Article 725. Comply with Section 26 05 23 "Control-Voltage Electrical Power Cables."

C. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

D. Meter Sockets:

1. Comply with requirements of electrical-power utility company.
2. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

2.3 ELECTRICITY METERS

A. Obtain metering equipment from the local Utility Company and coordinate exact site requirements with the Utility Company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install modular meter center according to switchboard installation requirements in NECA 400.

D. Install arc-flash labels as required by NFPA 70.

E. Wiring Method:

1. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive labels, with text as required by NFPA 70.
2. Equipment Identification Labels: Self-adhesive labels with clear protective overlay.

END OF SECTION 26 27 13

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2. USB charger devices.
3. GFCI receptacles.
4. SPD receptacles.
5. Hazardous (classified) location receptacles.
6. Twist-locking receptacles.
7. Pendant cord-connector devices.
8. Cord and plug sets.
9. Toggle switches.
10. Decorator-style convenience.
11. Wall switch sensor light switches with dual technology sensors.
12. Wall switch sensor light switches with passive infrared sensors.
13. Wall switch sensor light switches with ultrasonic sensors.
14. Digital timer light switches.
15. Residential devices.
16. Wall-box dimmers.
17. Wall plates.
18. Floor service outlets.
19. Poke-through assemblies.
20. Prefabricated multioutlet assemblies.
21. Service poles.

1.3 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

H. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

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

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

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

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour/Legrand (Pass & Seymour).
d. Or Approved Equal.

2.3 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

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

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour/Legrand (Pass & Seymour).
d. Or Approved Equal.

2.4 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Hazardous (Classified) Locations Receptacles: Comply with NEMA FB 11 and UL 1010.

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

    a. EGS/Appleton Electric.
    b. Killark.
    c. Or Approved Equal.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole, Two Pole, Three Way, and Four Way:

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

        1) Hubbell Incorporated; Wiring Device-Kellems.
        2) Leviton Manufacturing Co., Inc.
        3) Pass & Seymour/Legrand (Pass & Seymour).
        4) Or Approved Equal.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Coordinate all equipment and device locations with all other trades prior to installation.
2. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
3. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
4. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
5. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.

3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

F. Wiring device will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 26 27 26

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

    a. Control circuits.
    b. Motor-control centers.
    c. Panelboards.
    d. Switchboards.
    e. Enclosed controllers.
    f. Enclosed switches.

2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 70 00 "Contract Closeout," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bussman.
B. Cooper.
C. Or Approved Equal.
D. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting.

5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
7. Type T: 600-V, zero- to 800-A rating, 200 kAIC, very fast acting.

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

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: As indicated on the plans.
2. Feeders: As indicated on the plans

3. Motor Branch Circuits: [As indicated on the plans.
4. Large Motor Branch (601-4000 A): Class L, time delay.
5. Power Electronics Circuits: As indicated on the plans.
6. Other Branch Circuits: As indicated on the plans.
7. Control Transformer Circuits: Class CC, time delay, control transformer duty.
8. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 70 00 "Contract Closeout," include the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

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

1. Square D; by Schneider Electric.
2. Siemens
3. Or Approved Equal.

B. Type HD, Heavy Duty:

1. Single or Double throw.
2. Three pole.
3. 600-V ac.
4. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
5. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.4 NONFUSIBLE SWITCHES

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

1. Square D; by Schneider Electric.
2. Siemens
3. Or Approved Equal.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12), unless otherwise indicated on plans.

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

E. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wash-Down Areas/Corrosive Environment: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's

published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

H. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

SECTION 26 43 13 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

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

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

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

1. Surge Suppression Incorporated.
2. Eaton
3. Or Approved Equal.

B. SPDs: Comply with UL 1449, Type 1.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 1000 V.
3. Line to Line: 1000 V.

G. SCCR: Equal or exceed 200 kA.

H. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

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

1. Surge Suppression Incorporated.
2. Eaton.
3. Or Approved Equal.

B. SPDs: Comply with UL 1449, Type 1.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Neutral to Ground: 1200 V for 480Y/277 V.
4. Line to Line: 2000 V for 480Y/277 V

F. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

G. SCCR: Equal or exceed 200 kA.

H. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 4X.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install SPD’s in the following locations:

1. Service entrance equipment
2. Motor Control Centers
3. Control Panels
4. Distribution Panelboards and Switchboards
5. All locations indicated on the plans.

C. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

D. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not

splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

E. Use crimped connectors and splices only. Wire nuts are unacceptable.

F. Wiring:

1. Power Wiring: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 26 43 13

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 51 19 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following types of LED luminaires:

1. Linear industrial.
2. Lowbay.
3. Strip light.
4. Surface mount, linear.
5. Surface mount, nonlinear.
6. Suspended, linear.
7. Suspended, nonlinear.
8. Materials.
9. Finishes.
10. Luminaire support.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

2. Luminaire Schedule located on plan sheets.

DEFINITIONS

C. CCT: Correlated color temperature.

D. CRI: Color Rendering Index.

E. Fixture: See "Luminaire."

F. IP: International Protection or Ingress Protection Rating.

G. LED: Light-emitting diode.

H. Lumen: Measured output of lamp and luminaire, or both.

I. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

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

B. Standards:

1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.
7. User Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

C. CRI of minimum70. CCT of 3000 K.

D. Rated lamp life of 50,000 hours to L70.

E. Lamps dimmable from 100 percent to 0 percent of maximum light output.

F. Internal driver.

G. Nominal Operating Voltage: 120 V ac, 240 V ac, 277 V ac Multi-Tap.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

H. Housings:

1. Extruded-aluminum or steel housing and heat sink.
2. Clear anodized powder-coat painted finish.

2.2 LINEAR INDUSTRIAL

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 5,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Housing and heat sink rated to the following:

1. IP 66.
2. CSA C22.2 No 137.

2.3 STRIP LIGHT

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.4 SURFACE MOUNT, LINEAR

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.5 SURFACE MOUNT, NONLINEAR

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.6 SUSPENDED, LINEAR

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

2.7 SUSPENDED, NONLINEAR

A. Approved Manufacturer:

1. H. E. Williams.
2. Phillips.
3. Or Approved Equal.

B. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.8 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic glass or diffuse glass clear, UV-stabilized acrylic
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.

4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum or steel housing and heat sink.
2. Powder-coat painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.9 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.10 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 1/4-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and replacing.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with pendant mount with 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.

2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Owner.

END OF SECTION 26 51 19

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 52 19 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

a. Testing Agency Certified Data: For indicated luminaires and signs, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires and signs shall be certified by manufacturer.
b. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each product and for each color and texture specified.

D. Samples for Initial Selection: For each type of luminaire with factory-applied finishes.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment will be attached.
5. Size and location of initial access modules for acoustical tile.
6. Items penetrating finished ceiling including the following:

a. Other luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Ceiling-mounted projectors.
e. Sprinklers.
f. Access panels.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Product Certificates: For each type of luminaire.

D. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Provide seismic qualification certificate for each piece of equipment.

E. Product Test Reports: For each luminaire for tests performed by a qualified testing agency.

F. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires and signs in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Power Unit Batteries: Five (5) years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

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

B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Lamp Base: Comply with ANSI C81.61.

G. Bulb Shape: Complying with ANSI C79.1.

H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.

1. Emergency Connection: Operate one lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
    b. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
    c. Humidity: More than 95 percent (condensing).
    d. Altitude: Exceeding 3300 feet.

4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

5. Battery: Sealed, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.3 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

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

   a. H.E. Williams/Phillips.
   b. Lithonia Lighting; Acuity Brands Lighting, Inc
   c. Or Approved Equal.

2. Emergency Luminaires: As indicated on Drawings.

C. Emergency Lighting Unit:

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

   a. H.E. Williams/Phillips.
   b. Lithonia Lighting; Acuity Brands Lighting, Inc
   c. Or Approved Equal.

2. Emergency Lighting Unit: As indicated on Drawings.

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

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

   a. H.E. Williams/Phillips.
   b. Lithonia Lighting; Acuity Brands Lighting, Inc
   c. Or Approved Equal.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Conduit: Rigid galvanized steel, minimum 3/4 inch in diameter.

2.6 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

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

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service:

1. Charge emergency power units and batteries minimum of 24-hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.

a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 26 52 19

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 56 19 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

F. Mockups: For exterior luminaires, complete with power and control connections.

1. Obtain Engineer's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Engineer prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

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

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 70. CCT of 3000 K.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120 V ac or 277 V ac.

L. In-line Fusing: On the primary for each luminaire.

M. Lamp Rating: Lamp marked for outdoor use.

N. Source Limitations: Obtain luminaires from single source from a single manufacturer.

O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

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

1. Lithonia Lighting; Acuity Brands Lighting, Inc.
2. Philips Lighting Company.
3. H.E. Williams.
4. Or Approved Equal.

B. Comply with UL 773 or UL 773A.

C. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 LUMINAIRE TYPES

A. Area and Site:

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

a. H.E. Williams.
b. Lithonia Lighting; Acuity Brands Lighting, Inc.
c. Or Approved Equal.

2. Luminaire Shape: As indicated on plans.
3. Mounting: As indicated on plans.
4. Luminaire-Mounting Height: As indicated on plans.
5. Distribution: As indicated on plans.
6. Diffusers and Globes: Tempered Fresnel glass.
7. Housings:

a. Extruded-aluminum housing and heat sink.
b. Powder-coat finish to match color indicated on drawings..

B. Roadway:

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

a. H.E. Williams.
b. Lithonia Lighting; Acuity Brands Lighting, Inc.
c. Or Approved Equal

2. Luminaire-Mounting Height: As indicated on the drawings.

3. Mounting Type: Arm.
4. Distribution: As indicated on the drawings.
5. Diffusers and Globes: As indicated on the drawings.
6. Housings:

a. Extruded-aluminum housing and heat sink.
b. Powder-coat finish to match color indicated on drawings.

2.5 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.6 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

a. Color: As indicated on the drawings.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected from manufacturer's standard catalog of colors.

b. Color: Match Engineer's sample of manufacturer's standard color.
c. Color: As selected by Engineer from manufacturer's full range.

2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Engineer, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.

b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Owner.

END OF SECTION 26 56 19

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
8. Initial erosion and sedimentation control.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally 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 larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

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

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and as indicated on Drawings. Defined by a circle concentric with each tree with a radius 105 times the diameter of the drip line unless otherwise indicated.

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

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct on site

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

E. Burning: Not allowed.

1.6 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's property offsite.

C. Utility Locator Service: Notify “Call Before You Dig” for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant protection measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material on-site for construction area as indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Contractor will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities, if required.
2. Contractor will arrange to shut off indicated utilities that cannot be cut off by contractor (gas, electric, communication).

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer’s written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Arrange for temporary pumping if necessary, for sewer main work.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and stockpile in areas approved by Engineer.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 4 inches, or per Geotechnical Report, in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 1 inch in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning: Not allowed.

C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
2. Section 31 20 00 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Pump Station site.

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.

4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 311000 "Site Clearing during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks monthly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 31 2319

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction Entrance/Exits
2. Diversion Channels.
3. PAM
4. Rock Energy Dissipator.
5. Rock Barriers.
6. Sediment Control: including silt fences, inlet protection, etc.
7. Sediment Traps.
8. Silt Fences

B. Related Sections:

1. Section 310516 - Aggregates for Earthwork.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:

1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on joint filler, joint sealer, admixtures, curing compounds, and geotextiles.

C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work according to State of South Carolina Department of Transportation standards.

B. All necessary precautions to prevent erosion and siltation, as required by the South Carolina Department of Health and Enviornmental Control (SCDHEC) and Horry County stormwater permit. Standard construction practices shall be followed.

1.6 COMPLIANCE AND COST

A. The Contractor shall be responsible for compliance with all Federal and State regulations and statutes as relate to Stormwater Permitting, erosion control and compliance with a CBMP plan. This shall include all permitting, CBMP plan, and required inspections.

B. It is the Contractor’s responsibility to obtain all required stormwater permits for the project and include all cost in Contract Price.

C. All stormwater field materials, appurtenances, and labor shall be included in the price bid, separately from the allowance for Erosion Control Inspection. This allowance also does not include costs associated with the preparation of a BMP plan and environmental agency fees.

D. Contractor shall include all costs associated with products used to implement and maintain the Erosion and Sediment Control Plan in his bid. Additional monies will not be allocated to the Contractor by the Owner for erosion and sediment control measures not noted in the plans.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials according to State of Alabama Department of Transportation standards.

B. Rock: As specified in Section 310516 Aggregates for Earthwork. Furnish according to State of Alabama Highways standards.

C. Geotextile Fabric: Furnish according to State of Alabama Highways standards.

2.2 CONCRETE MATERIALS AND REINFORCEMENT

A. Cement: As specified in Section 033000 – Cast-in-Place Concrete.

2.3 POLYACRYLAMIDE (PAM)

A. Only the anionic form of PAM shall be used. PAM and PAM mixtures shall be environmentally benign, harmless to fish, wildlife, and plants.

B. Anionic PAM in pure form shall have less than or equal to 0.05% acrylamide monomer by weight, as established by the FDA and US EPA.

2.4 Mats and Blankets (ECB's)

A. 3:1 Slopes and flatter

1. ECB must be rated for shear stresses up to 1.55 lbs/sq ft, must weigh at least 0.50 lbs/yd^2, and the netting made of biodegradable polypropylene or FibreNet™ material

B. 1.5:1 to 3:1 Slopes

1. ECB must be rated for shear stresses up to 1.75 lbs/sq ft, must weigh at least 0.73 lbs/yd^2, and the netting made of biodegradable polypropylene or FibreNet™ material

C. Acceptable manufacturer

1. American Excelsior Company, Arlington, TX
2. Or approved equal

D. Inlet Protection Products

1. Drop Inlets

a. Silt Savers
b. Dandy Sacks

2. Curb Inlet

a. Dandy Curb
b. Gutter Eel

3. The filter shall be a weighted sediment tube filter with a diameter of 9.5-inches at the ends and tapering to 5 inches in the center. Lengths shall be 6 to 9 feet with a build-in triangular overflow for relief during high-intensity storm events.

a. Unit Weight: 13 lbs/ft
b. Interior Filter
c. Materials: Shredded, recycled tire rubber particles with less than 2% metal and the rubber shall be washed during manufacturing.
d. Particle Size: ½ inch to ¾ inch particle size
e. Geotextile Bag

1) Percent Open Area: 8%
2) Apparent Opening Size: 30 U.S. Sieve
3) Grab Tensile Strength: 400 lbs
4) Flow Rate: 115 gal/min/ft2
5) Puncture Strength: 125 lbs

E. Fiber Rolls

1. Fiber rolls should be prefabricated rolls or rolled tubes of geotextile fabric. When rolling the tubes, make sure each tube is at least 8 inches in diameter. Bind the rolls at each end and every 4 feet along the length of the roll with jute-type twine

F. Silt Fence

1. The height of a silt fence shall not exceed 36 inches (0.9 m). Storage height and ponding height shall never exceed 18 inches (0.5 m).
2. The standard-strength filter fabric shall be stapled or wired to the fence, and 6 inches (0.2 m) of the fabric shall extend into the trench.
3. Type A Silt Fence

a. A wire mesh support fence shall be fastened securely to the upslope side of the posts (between the posts and fabric) using heavy duty wire staples at least ½" (12.7mm) long and ¾" wide, tie wires or hog rings. The wire shall extend into the trench a minimum of 6 inches (51 mm) and shall not extend more than 36 inches (0.9 m) above the original ground surface.
b. Posts shall be 4' long steel that each weigh at least 5.2 lbs.

4. Type B Silt Fence

a. The spacing between posts shall be a maximum of 6', and the filter fabric shall be stapled or wired directly to the posts.
b. Posts may be soft wood 2x4, oak 2x2, or steel as indicated for Type A Silt Fence

2.5 PIPE MATERIALS

A. Pipe: Corrugated steel, as specified in the State Highways standards.

2.6 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted stabilized soil is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 POLYACRYLAMIDE (PAM)

A. The maximum application rate of PAM in pure form shall not exceed 200 lbs/ace/year. Over application of PAM can lower infiltration rates or suspend solids in water, and, therefore, over application should be avoided.

B. Users of PAM shall obtain and follow all MSDS requirements.

C. The manufacturer or supplier shall provide written application methods for PAM and PAM mixtures. The application shall provide uniform coverage to the target area.

3.3 MATS AND BLANKETS

A. After the site has been shaped and graded to the approved design, prepare a seedbed free from clods and rocks more than 1 inch in diameter, and any foreign matter that will prevent the contact of the mat with the soil surface.

B. Lime, fertilizer, and seed shall be applied in accordance with seeding or other type of planting plan as suggested by the ENGINEER.

C. Erosion control blanket products should be installed in accordance with the manufacturer’s recommendations and specifications, including check slots and stapling materials.

D. Anchor product so that a continuous, firm contact with the soil surface/seed bed is maintained. This is best accomplished on slopes by working from the bottom to the top.

3.4 SEDIMENT CONTROL

A. Filter Ring/Rock Filter Ring

1. Mechanical or hand placement of fiber rolls/straw wattles/stone shall be required to uniformly surround the structure to be supplemented.
2. The filter ring may be constructed on natural ground surface, excavated surface, or on machine compacted fill.
3. When placed below a storm drain outlet, it shall be constructed so that it does not allow water to back up into the storm drain.

B. Inlet Protection Products

1. For information on installation, refer to the manufacturers' drawings provided by the distributor. Strict adherence to the manufacturers' suggested installation procedures is required for proper inlet protection.

C. Fiber Rolls

1. On slopes, install fiber rolls along the contour with a slight downward angle at the end of each row to prevent ponding at the midsection. Turn the ends of each fiber roll upslope to prevent runoff from flowing around the roll. Install fiber rolls in shallow trenches dug 3 to 5 inches deep for soft, loamy soils and 2 to 3 inches deep for hard, rocky soils.
2. Determine the vertical spacing for slope installations on the basis of the slope gradient and soil type. A good rule of thumb is:

   a. 1:1 slopes = 10 feet apart
   b. 2:1 slopes = 20 feet apart
   c. 3:1 slopes = 30 feet apart
   d. 4:1 slopes = 40 feet apart

3. For soft, loamy soils, place the rows closer together. For hard, rocky soils, place the rows farther apart. Stake fiber rolls securely into the ground and orient them perpendicular to the slope. Drive the stakes through the middle of the fiber roll and deep enough into the ground to anchor the roll in place. About 3 to 5 inches of the stake should stick out above the roll, and the stakes should be spaced 3 to 4 feet apart. A 24-inch stake is recommended for use on soft, loamy soils. An 18-inch stake is recommended for use on hard, rocky soils.

D. Rock Filter Dam

1. The center of the rock dam should be at least 6" lower than the outer edges of the dam at the channel banks. Side slopes shall be 2:1 or flatter. The top width of the dam should be at least 6'.
2. The dam should not be higher than the channel banks or the elevation of the upstream property line.
3. Set a marker stake to indicate the clean out elevation.

3.5 CONSTRUCTION ENTRANCE/EXIT

A. The entrance/exit must be excavated to a depth of 3" and cleared of all vegetation and roots.

B. If the action of the vehicle travelling over the gravel pad does not sufficiently remove the mud, the tires should be washed prior to entrance onto public rights-of-way. When washing is necessary, it should be done on an area stabilized with crushed stone.

C. A geotextile fabric underliner should be placed the full length and width of the entrance.

3.6 ROCK ENERGY DISSIPATOR

A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

1. Nominal Placement Thickness per NCSA Class:

a. R7: 36 Inches
b. R6: 30 Inches
c. R5: 24 Inches
d. R4: 18 Inches
e. R3: 12 Inches

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.7 ROCK BARRIER

A. Determine length required for ditch or depression slope and excavate, compact and foundation area to firm, even surface.

B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicated thickness.

3.8 SEDIMENT TRAPS

A. Clear site, as indicated.

B. Construct trap by excavating and forming embankments as indicated in the drawings.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipator.

E. When required, obtain borrow excavation for formation of embankment.

F. Mulch seeded areas with hay.

3.9 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.10 FIELD QUALITY CONTROL & INSPECTIONS

A. Section 014000 - Quality Requirements and 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. It is the Contractor’s responsibility to perform all required inspections in accordance with all Authorities having Jurisdiction.

E. Contractor is responsible for continually maintaining all temporary erosion control measures until permanent measures are properly installed and performing as required.

3.11 CLEANING

A. Section 017000 - Execution and Closeout Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.12 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 31 25 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

D. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

1.5 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

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, Termidor.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

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

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.

3. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include semiannual maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 313116

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 05 63 - PRECAST CONCRETE VAULTS AND CHAMBERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete utility structures.
2. Access hatches.

B. Related Requirements:

1. Section 03 30 00 - Cast-in-Place Concrete
2. Division 31 – Earthwork
3. Division 33 – Utilities

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO HB-17 - Standard Specifications for Highway Bridges.
2. AASHTO M306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B. American Concrete Institute:

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
2. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.
2. AWS D1.4 - Structural Welding Code - Reinforced Steel.

D. National Precast Concrete Association:

1. NPCA Plant Certification Program.
2. NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data for frames and covers, steps, component construction, features, configuration, and dimensions.

C. Shop Drawings:

1. Indicate structure locations, elevations, sections, equipment supports, piping, conduit, sizes and elevations of penetrations, and block-outs/knockouts.
2. Indicate design, construction and installation details, typical reinforcement and additional reinforcement at openings.

D. Submit concrete mix design for each different mix.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for custom fabrications.

G. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

I. Qualifications Statements:

1. Submit qualifications for manufacturer.

1.4 QUALITY ASSURANCE

A. Obtain precast concrete utility structures from single source.

B. Perform structural design according to ACI 318.

C. Perform Work according to NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.

D. Conform to following material and fabrication requirements:

1. Single Cell Box Culverts: ASTM C1433.
2. Other Structures: ASTM C913.

E. Perform welding according to following:

1. Structural Steel: AWS D1.1.
2. Reinforcing Steel: AWS D1.4

F. Perform Work according to National Precast Concrete Association (NPCA) standards.

G. Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete. Drawings shall bear the stamp of the P.E.

1.5 QUALIFICATIONS

A. Manufacturer: Certified by NPCA Plant Certification Program prior to and during Work of this Section.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years' documented experience.

C. Welders and Welding Procedures: AWS qualified within previous 12 months for employed weld types.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Do not deliver products until concrete has cured **5** days or has attained minimum **75** percent of specified 28-day compressive strength.

C. Inspection: Accept precast structures on Site in manufacturer's original packaging and inspect for damage.

D. Comply with precast concrete manufacturer instructions for unloading, storing, and moving precast structures.

E. Lift structures from designated lifting points.

F. Storage:

1. Store precast concrete manholes, drainage structures, vaults, and chambers to prevent damage to Owner's property or other public or private property.
2. Repair property damaged from materials storage.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Design structures for minimum loads conforming to ASTM C857 and ASTM C890.

B. Roof Live Load: Comply with following loading conditions, including impact load:

1. Heavy Traffic:

a. ASTM C857, A-16.
b. Maximum 16,000 lb. each wheel.

2. Medium Traffic:

a. ASTM C857, A-12.
b. Maximum 12,000 lb. each wheel.

3. Light Traffic:

a. ASTM C857, A-8.
b. Maximum 8,000 lb. each wheel.

4. Walkway Traffic:

   a. ASTM C857, A-0.3.
   b. Maximum 300 psf.

2.2 PRECAST CONCRETE VAULTS AND CHAMBERS

A. Manufacturers:

1. Armorcast Products Company
2. Hanson Pipe and Precast
3. Manarch Products, Inc.
4. Old Castle Precast, Inc.
5. Or Approved Equal

B. Precast Concrete Vaults and Chambers: Reinforced precast concrete.

1. As shown on the Drawings

2.3 FRAMES AND COVERS

A. Manufacturers:

1. Barry Pattern & Foundry Company
2. EJ Iron Works
3. Neenah Foundry, U.S. Foundry, Castings Inc.
4. McKinley Iron Works, Inc.
5. Or Approved Equal

B. Description:

1. Construction: ASTM A48, Class 30B cast iron or other material as shown on the plan drawings.
2. Frame for cover: Shall be cast in place by the precast concrete manufacture or blocked-out for field installation of frame per dimensions required for the opening.

2.4 ACCESS HATCHES

A. Manufacturers:

1. The Bilco Company.
2. U.S.F. Fabrication.
3. Halliday Products.
4. Or Approved Equal.

B. Access Hatch:

1. All access hatches shall be double or single leaf as shown on the drawings. Automatic doors shall be equipped with a minimum of two stainless steel hinges with stainless steel pins. Each door leaf shall also have spring operators with a positive hold open arm that engages

automatically in fully open position, and a non-corrosive release handle. Doors shall open with a maximum lift force of 9 lbs. When closed, doors shall not protrude above the operating surface in which they are installed. Include slam lock feature with removable key.

2. Door leaves shall be 1/4-inch aluminum checkered plate reinforced with structural aluminum channels, capable of withstanding 300 pounds per square foot uniform load with minimal deflection for non-vehicular loading service. When subject to vehicular traffic, cover shall be reinforced to support an AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span.
3. The gutter frame provided shall be of 1/4-inch aluminum with an anchor flange around the perimeter. Frame shall incorporate a 1 ½" threaded drain fitting and neoprene gasket.
4. The drain coupling shall be located in an appropriate corner of each channel frame away from the access steps.
5. Factory finish shall be mill finish.
6. Hardware shall be stainless steel.
7. Any surface or portion of the frame contacting concrete shall receive a bituminous coating.
8. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release and close the cover with one hand. Gates in the open position shall create a physical pedestrian barrier around the opening.
9. Doors, which are to receive flooring, shall be smooth plate. Doors which will not receive flooring shall be checkered plate.
10. All access hatches opening into depths greater than 6' shall be equipped with fall protection grating system conforming to OSHA 29 CFR 1926.502 (cc) requirements. Design shall assure that the fall through protection is in place before the doors can be closed. Grate shall be painted with an OSHA type safety orange paint.

2.5 MATERIALS

A. Concrete: As specified in Section 03 30 00 – Cast-In-Place Concrete.

B. Admixtures: As specified in Section 03 30 00 – Cast-In-Place Concrete.

C. Concrete Reinforcement: As specified in Section 03 30 00 – Cast-In-Place Concrete.

2.6 FABRICATION

A. Fabricate precast concrete utility structures conforming to ACI 318 and NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.

B. Fabricate precast concrete utility structures with knock-out panels, embedded items (frames, etc.), and openings to size and configuration as indicated on Drawings.

C. Construct forms to provide uniform precast concrete units with consistent dimensions.

D. Clean forms after each use.

E. Reinforcing:

1. Install reinforcement by tying or welding to form rigid assemblies.
2. Position reinforcement to maintain minimum ½ inch cover.
3. Secure reinforcement to prevent displacement while placing concrete.

F. Position and secure embedded items to prevent displacement while placing concrete.

G. Deposit concrete in forms and consolidate concrete without segregating aggregate.

H. Provide initial curing by retaining moisture using one of following methods:

1. Cover with polyethylene sheets.
2. Cover with burlap or other absorptive material and keep continually moist.
3. Apply curing compound according to manufacturer instructions.

I. Provide final curing according to manufacturer's standard.

J. Remove forms without damaging concrete.

K. Tension reinforcement tendons as required to achieve design load criteria.

L. Exposed Ends at Stressing Tendons: Fill recess with non-shrink grout, trowel flush.

2.7 MIXES

A. Concrete:

1. Design Mix shall be as specified in Section 03 30 00 – Cast-In-Place Concrete.

2.8 FINISHES

A. Reinforcing Steel, Wire and Wire Fabric, Concrete and Steel shall be as specified in Section 03 30 00 – Cast-In-Place Concrete.

2.9 ACCESSORIES

A. Membrane Curing Compound: ASTM C309, Type 2, Class A.

B. Steps:

1. Formed steel-reinforced polypropylene rungs.
2. Diameter: 3/4 inch.
3. Width: 10 inches, minimum.
4. Spacing: 15 inches o.c. vertically or as indicated on Drawings.

C. Inserted and Embedded Items:

1. Structural Steel Sections:

a. Comply with ASTM A36.
b. Finish: As shown or called for on the plans or in related specification sections

D. Bearing Pads:

1. High density plastic, Vulcanized elastomeric compound molded to size, Neoprene (Chloroprene), or Tetrafluoroethylene (TFE); Shore A Durometer; 1/8 inch (3 mm) thick, smooth both sides.

E. Joint Sealants and Joint Gaskets:

1. Gasket Joints for Circular Concrete Pipe:

a. ASTM C443.
b. Gaskets: Oil-resistant rubber.

2. External Sealing Bands:

a. Comply with ASTM C877.
b. Material: Type I, rubber and mastic.

3. Preformed Joint Sealants for Concrete Pipe and Box Sections: Comply with ASTM C990
4. Elastomeric Joint Sealants:

a. Comply with ASTM C920.
b. Material: Polyurethane.
c. Grade NS, Class 35.

F. Pipe Entry Connectors: Comply with ASTM C923.

G. Grout:

1. Provide grout as per section 03 60 00 - Grout
2. Cement Grout: Portland cement, sand, and water mixture with stiff consistency to suit intended purpose.
3. Non-Shrink Grout:

a. Description: Premixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing agents.
b. Conform to ASTM C1107.
c. Minimum Compressive Strength: 2,400 psi in 48 hours, and 7,000 psi in 28 days.

H. Bituminous Coating:

1. Manufacturers:

a. Carboline Company; a subsidiary of RPM International
b. Duron, Inc.
c. Laurence, C.R. Co., Inc.
d. Or Approved Equal

2. As specified in Section 09 96 00 – High-Performance Coatings

2.10 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:

1. Perform following tests for each 100 cu. yd. of concrete placed with minimum one set of tests each week:

   a. Slump: Comply with ASTM C143.
   b. Compressive Strength: ASTM C31 and ASTM C39.
   c. Air Content: Comply with ASTM C231 or ASTM C173.
   d. Unit Weight: Comply with ASTM C138.

2. Make test results available to Engineer/Owner upon request.

C. Inspection:

1. Visually inspect completed precast structures for defects.
2. Repair defects on surfaces exposed to view to achieve uniform appearance.
3. Repair honeycomb by removing loose material and applying grout to produce smooth surface flush with adjacent surface.
4. Repair of major defects not allowed

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that items provided by other Sections of Work are properly sized and located.

B. Verify correct size and elevation of excavation.

C. Verify that subgrade and bedding are properly prepared, compacted, and ready to receive Work of this Section.

3.2 PREPARATION

A. Mark each precast structure by indentation or using waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

B. Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.

C. Do not install structures if Site conditions induce loads exceeding weight capacity of structures.

D. Inspect precast concrete structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Install underground precast utility structures according to ASTM C891.

B. Lift precast concrete structures at lifting points designated by manufacturer.

C. When lowering structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.

D. Install precast concrete base to elevation and alignment as indicated on Drawings.

E. Install precast concrete utility structures to elevation and alignment as indicated on Drawings.

F. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members

G. Maintain temporary bracing in place until final support is provided. Protect members from staining

H. Provide temporary lateral support to prevent bowing, twisting, or warping of members

I. Adjust differential camber between precast members to tolerance before final attachment

J. Install bearing pads

K. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12

L. Assembly of Multi-section Structures:

1. Lower each section into excavation.
2. Clean joint surfaces.
3. Install watertight joint seals according to manufacturer instructions using gasket joints, external sealing bands, preformed joint sealants, elastomeric joint sealants, grout, as required.

M. Remove knockouts or cut structure to receive piping without creating openings larger than required to fit pipe; fill annular space with grout.

N. Pipe Connections:

1. Connect pipe to structure and seal watertight.
2. Cut pipe flush with interior of structure.

O. Base/Foundation slab:

1. Grout to achieve slope to exit piping.
2. Trowel smooth.
3. Contour to form continuous drainage channel as indicated on Drawings.

P. Paint exterior with two coats of bituminous interior coating at rate of per coating manufacturer for each coat.

Q. Frame and Cover and Access Hatch:

1. Set level, without tipping, to elevations as indicated on Drawings.
2. Set cover and access hatch 3 inches above finished grade for structures located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.
3. Connect drain from access hatch frame to storm drainage system.

R. Touch up damaged galvanized coatings.

S. Backfill excavations for structures as specified in Division 31.

3.4 ERECTION TOLERANCES

A. Erect members level and plumb within allowable tolerances

B. Conform to PCI MNL-116S.

C. Design and erect to the following tolerances:

1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch/10 feet and 3/8 inch in 100 feet, non-cumulative.
2. Maximum Offset from True Alignment between Members: 1/4 inch.
3. Maximum Variation from Dimensions Indicated on Reviewed Shop Drawings: Plus or minus 1/8 inch.

D. Exposed Joint Dimension: 3/8 inch plus or minus 1/4 inch.

E. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise. Execute modifications as directed

3.5 FIELD QUALITY CONTROL

A. Comply with Section 01 00 00

B. Perform vacuum test and exfiltration test as specified in Division 33.

END OF SECTION 33 05 63

SECTION 33 12 16 - WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Valves.
2. Valve boxes.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C504 – Rubber-Seated Butterfly Valves 3 In. (75 mm) Through 72 In. (1,800 mm).
2. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm through 600-mm) NPS.
3. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
4. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

C. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
4. ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings.

1.3 SUBMITTALS

A. Product Data: Manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.

B. Shop Drawings: Description of proposed installation.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

D. Manufacturer Instructions: Installation requirements, including storage and handling procedures.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:

1. Qualifications for manufacturer and installer.
2. Manufacturer's approval of installer.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.

B. Perform Work according to AWWA and GSWSA standards.

C. Manufacturer: Company specializing in manufacturing products specified in this Section with three years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves and accessories for shipment according to applicable AWWA standards.

B. Seal valve and ends to prevent entry of foreign matter.

C. Storage:

1. Store materials in areas protected from weather, moisture, or other potential damage.
2. Do not store materials directly on ground.

D. Handle products carefully to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.1 GATE VALVE

A. Comply with the following:

1. AWWA
2. GSWSA Standard Specifications for Water System Standards 4.6, 4.7, and 4.10.

B. Manufacturers:

1. Mueller

2. American Flow Control
3. Or approved equal

C. Description:

a. Comply with AWWA C509.
b. Body: Ductile iron.
c. Seats: Resilient.
d. Stem:

1) Type: Non-rising.
2) Material: Bronze.

D. Operation
1. Gate valves for buried service to be mechanical joint with 2-inch operating nut.
2. Gate valves for above ground service to be flanged with 12-inch operating wheel.

2.2 BUTTERFLY VALVE

A. Comply with the following:

1. AWWA C504, Class 150
2. GSWSA Standard Specifications for Water System Standards 4.6, 4.7, and 4.10.

B. Manufacturers:

1. Milliken; Henry Pratt Company, Aurora, IL
2. DeZurik, Sartell, MN
3. Or approved equal

C. Description:

1. Minimum Working Pressure: 150 psig.
2. Shaft: Bearings shall be non-metallic and permanently lubricated.
3. Seats:

a. Mounting: On body for valves 24 inches and smaller.
b. Type: Field replaceable for valves larger than 30 inches.

4. Packing: V-type packing with a minimum of 4 sealing rings.
5. End Connections: For above ground use flanged end valves of short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical connections to be used for below ground operation.

D. Operator:
1. Butterfly valves for buried service to be mechanical joint with 2-inch operating nut.
2. Butterfly valves for above ground service to be flanged with 12-inch operating wheel and position indicator.

E. Materials:

1. Body: Cast iron, ASTM A126.
2. Stem: Stainless steel.
3. Disc: Cast iron, ASTM A48, Class 4C.
4. Seats:

    a. Type: Resilient and replaceable.
    b. Material: Buna N for water, or as required for other services

5. Seating Surfaces: Type 316 stainless steel.
6. Bearings: Aluminum Bronze, ASTM B148, C954
7. Connecting Hardware: Type 316 stainless steel.

F. Finishes: As specified in Section 09 96 00 – High-Performance Coatings.

2.3 TILTED DISC CHECK VALVES

A. Manufacturers:
1. Valmatic (Series 9800) – Elmhurst, IL.
2. Approved Equal.

B. Description:

1. Type: Tilting disc check valves with off-center pivot.
2. Size: as shown on the drawings.
3. Valves Larger than 6 Inches: Include a top mounted dashpot for opening and closing speed control.
4. Minimum Working Pressure: 150 psig.
5. Maximum Fluid Temperature: 85 deg. F.

C. Body:

1. Material: Cast iron, ASTM A126 or Ductile iron, ASTM A636.
2. Style: Two piece.
3. End Connections:

    a. Flanged.
    b. Comply with ASME B16.1.
    c. Class: 125.

D. Seats:

1. Material: Aluminum Bronze ASTM B271.
2. Tilting Angle: 55 degrees.

E. Disc:

1. Material: Ductile iron, ASTM A536.
2. Pivot Pin and Bushing: Aluminum bronze, ASTM B505.

F. Finishes: Valve interior and exterior shall be coated with NSF61 certified fusion bonded epoxy conforming to AWWA C550.

G. Accessories:

1. Top mounted dashpot: The valve shall be equipped with a factory mounted dashpot with independently adjustable opening and closing speed adjustment. Opening and closing stroke shall be adjustable over a range of 5 to 30 seconds. The closing stroke shall include an internal cylinder cushioning for the last 10% of the closing stroke. The dashpot shall be removable without removing the valve from service.
2. Disc position indicator.
3. NEMA 4 DPDT limit switch shall be provided for remote monitoring of valve position.
4. Connecting Hardware: Type 304 stainless steel.

2.4 COMBINATION AIR VALVES

A. Manufacturers:

1. A.R.I.
2. Crispin Valves; Berwick, PA
3. Val Matic
4. Or Approved Equal

B. Description

1. Comply with AWWA C512
2. Comply with GSWSA standard specifications except as modified herein.
3. Valve to be suitable for potable water service.
4. Working pressure range: 3 psi to 200 psi or greater.
5. Connections: 3” and ½” Threaded
6. Where High Flow (HF) is designated on the drawings, the air & vacuum component, shall be designed with a float and large orifice such that high velocity air will not blow the float shut. All other valves shall have a rolling seal.

C. Materials

1. Body and Cover: Cast iron, ASTM A126 or Ductile iron, ASTM A536.
2. Float, Seat, and Trim: Type stainless steel.
3. Seats: Buna-N.
4. Seals: Buna-N.

2.5 SWING CHECK VALVES

A. Manufacturers:

1. Dezuirk
2. Or Approved Equal

B. Description:

1. Comply with AWWA C508 and GSWSA specifications
2. Minimum Working Pressure: 200 psig for 2" - 12" and 150 psig for 14" - 36"
3. Type: Swing, resilient seated with outside lever and adjustable weight.
4. Comply with AWWA C508.
5. Swing check valves shall be used for water service.
6. Minimum Working Pressure: 200 psig for 2" - 12" and 150 psig for 14" - 36"
7. Flow area: Full open, equal to connecting nominal pipe diameter.
8. Check valves 6 inches and larger: Furnish with adjustable air cushion chambers.
9. Mounting: Horizontal or vertical.
10. End Connections: Integral flange ends shall be ANSI B16.1 Class 125, suitable for horizontal or vertical installation.

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc, Disc Arm: Ductile iron, ASTM A536
3. Body Seat: Replaceable, Type 316 ASTM A276 with Buna-N renewable seat ring
4. Shaft: Type 303 Stainless Steel ASTM A582
5. Disc Seat: Buna-N
6. Lever and Counterweight: Ductile Iron, ASTM A536
7. Hinge Pin and Key: Type 316 Stainless Steel
8. Rubber Components: Buna-N
9. Connecting Hardware: Type 304 stainless steel.

D. Finishes: As specified in Section 09 96 00 High-Performance Coatings.

2.6 RUBBER-SEATED BALL VALVES

A. Manufacturers:

1. Henry Pratt Company; Aurora, IL
2. Or approved equal

B. Smaller Than 4 Inches:

1. Comply with MSS SP 110.
2. Body:

    a. Type: Two piece.
    b. Material: Bronze.

3. Ball: Stainless steel.
4. Port: Full.
5. Seats: PTFE.
6. Stem: Blowout proof.
7. End Connections: Threaded, with union.
8. Operator: as scheduled
9. Finishes: As specified in Section 400551 - Common Requirements for Process Valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that invert elevations **of existing work** prior to excavation and installation of valves are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

1. Notify Architect/Engineer not less than 2 days in advance of proposed utility interruption.
2. Do not proceed without written permission from Architect/Engineer.

3.3 INSTALLATION

A. Perform trench excavation, backfilling, and compaction as specified in GSWSA Standard Specifications for Water Distribution System.

B. Install valves in conjunction with pipe laying.

C. Set valves plumb.

D. Provide buried valves with valve boxes installed flush with finished grade.

E. Installation Standards: Install Work according to AWWA standards.

F. Disinfection of Water Piping System:

1. Flush and disinfect system according to GSWSA and SCDHEC standards.

3.4 FIELD QUALITY CONTROL

A. Perform pressure testing on water distribution system according to GSWSA & SCDHEC standards.

B. Hydrostatically test check valves at twice rated pressure according to AWWA C508.

C. Permitted Leakage at Indicated Working Pressure: None.

D. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer’s representative.

3. Repair damaged coatings with material equal to original coating.

END OF SECTION 33 12 16

SECTION 33 13 00 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Disinfection of potable water transmission system.
2. Testing and reporting of results.

B. Related Requirements:

1. Section 224000 - Plumbing Fixtures: Disinfection of building domestic water piping systems.
2. Section 331116 - Site Water Utility Distribution Piping: Product and execution requirements for installation and testing of site domestic water distribution piping.
3. Section 332100 - Water Supply Wells: Product and execution requirements for installation, testing, and disinfection of water wells.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA B300 - Hypochlorites.
2. AWWA B302 - Ammonium Sulfate.
3. AWWA B303 - Sodium Chlorite.
4. AWWA C651 - Disinfecting Water Mains.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels.

C. Certify that cleanliness of water distribution system meets or exceeds GSWSA requirements.

D. Certify that water conforms or fails to conform to bacterial standards of GSWSA.

E. Certify that water conforms to quality standards of GSWSA.

F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for water treatment firm and testing firm.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Submit bacteriologist's signature and authority associated with testing.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA C651 and GSWSA specifications.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

2.2 INSTALLATION

A. Provide and attach required equipment to perform Work of this Section.

B. Perform disinfection of water distribution system and installation of system and pressure testing as specified in GSWSA Standard Specifications

C. Maintain disinfectant in system for 24 hours.

D. Replace permanent system devices that were removed for disinfection.

2.3 FIELD QUALITY CONTROL

A. Disinfection, Flushing, and Sampling:

1. Disinfect pipeline installation according to AWWA C651.
2. Use of liquid chlorine is not permitted.
3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
4. Disposal:

    a. Legally dispose of chlorinated water.
    b. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

5. After final flushing and before pipeline is connected to existing system or placed in service, employ an approved independent testing laboratory to sample, test, and certify that water quality meets quality standards of GSWSA.

END OF SECTION 33 13 00

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 40 05 06 - COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe penetrations.
2. Restrained joints.
3. Braided flexible connections.
4. Expansion joints.
5. Expansion loops.
6. Sleeve-type couplings.
7. Wall sleeve.

B. Related Requirements:

1. Section 05 50 00 - Metal Fabrications
2. Section 09 96 00 – High-Performance Coatings
3. Division 40 – Process Interconnections

C. Conform to the requirements of Section 40 05 13 – Common Requirements for Process Piping

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe.
2. AWWA C227 Bolted, Split-Sleeve Restrained and Nonrestrained Couplings for Plain-End Pipe.

B. American Welding Society:

1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

C. ASME International:

1. ASME A13.1 - Scheme for the Identification of Piping Systems.
2. ASME B31.3 - Process Piping.
3. ASME B31.9 - Building Services Piping.
4. ASME Boiler and Pressure Vessel Code (BPVC), Section IX - Welding, Brazing, and Fusing Qualifications.

D. ASTM International:

1. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
4. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

E. Expansion Joint Manufacturers Association, Inc.:

1. EJMA Standards.

F. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

G. UL:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 1479 - Fire Tests of Through-Penetration Firestops.
3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.

PART 2 - PRODUCTS

2.1 PIPE PENETRATIONS

A. Flashing:

1. Metal Flashing:

a. Material: 304 stainless steel.
b. Thickness: 26 gage.

2. Metal Counterflashing:

a. Material: 304 stainless steel.
b. Thickness: 22 gage.

3. Flexible Flashing Materials:

a. Material: Butyl sheet, PVC sheet, or Compatible with service conditions.
b. Thickness: 47 mils.

4. Caps:

a. Material: 304 stainless steel.
b. Minimum Thickness: 22 gage, and 16 gage at fire-resistive elements.

B. Sleeves:

1. Sleeves for Pipes through Non-fire-rated Floors:

    a. Material: 304 stainless steel.
    b. Thickness: 0.0625 inch minimum

2. Sealant:

    a. As specified in Section 07 92 00 - Joint Sealants.

C. Mechanical Sleeve Seals:

1. Manufacturers:

    a. Flexicraft Industries, PipeSeal
    b. GPT (Link-Seal)
    c. Or Approval Equal

2. Description:

    a. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve.
    b. Connection: Bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.2 RESTRAINED JOINTS

A. Flange Adapter (Set Screws)

1. Manufacturer:

    a. EZ Flange Adapter (EBAA Iron, Inc.)
    b. Uni-Flange, series 400 (0R series 420)
    c. Ford Meter Box Company, Inc. (Nappco, Inc.)
    d. Star Pipe Series 400
    e. Or Approved Equal.

2. Description:

    a. The uniflange assembly shall be used only in instances shown on the drawings. If the Contractor proposes to use uniflanges at other locations, he shall first obtain approval from the Engineer.
    b. The uniflange shall consist of a Ductile Iron ASTM A536 Grade 65-45-12 flange with ANSI B16.1 Class 125 & 250 or ANSI B16.5 Class 150 & 300 drillings.
    c. The standard gasket of Buna S for water and wastewater shall be supplied.
    d. The uniflange class shall be suitable for the pressure service. (2”-12” = 250 psi, 14”-24” = 150psi, >24” = 100 psi)

B. Flange Adapter-Restrained

1. Manufacturer:

a. SERIES 2100 MEGAFLANGE adapter, as produced by EBAA Iron, Inc.,
b. StarFlange Series 3200
c. Or Approved Equal.

2. Description:

a. Restrained flange adapters may be used in lieu of threaded, or welded, flanged spool pieces. Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10.
b. Restraint for the flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.
c. The flange adapter shall be capable of deflection during assembly, or permit lengths of pipe to be field cut, to allow a minimum of 0.6" gap between the end of the pipe and the mating flange without affecting the integrity of the seal.
d. Flange Adapters shall be fully restrained and shall incorporate a wedge style grip.
e. Allowable working pressures shall have a minimum as follows: 3"-16" = 350psi, 18"-24" = 250 psi, 30"-48" = 150psi.

C. Adapter with Wedge Restraints for Mechanical Joint pipe.

1. Manufacturer:

a. Uni-Flange Series 1400, by Ford Meter Box Company
b. StarGrip 3000 by Star Pipe Products
c. Megalug Series 1100 by EBBA Iron Sales, Inc.
d. Or Approved Equal.

2. Description:

a. Restraint for standardized mechanical joints shall be incorporated into the design of the follower gland and shall impart multiple points of wedge action against the pipe, increasing its resistance as the pressure increases.
b. The restrained joint shall incorporate a wedge style restraint system. Restraints with set screws will not be acceptable.
c. The assembled joint shall maintain its flexibility after burial and shall maintain its integrity by a controlled and limited expansion of each joint during the wedging action.
d. Restraining glands shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12.
e. Wedges shall be contoured to properly fit on the pipe, and shall be manufactured of ductile iron, heat treated to a minimum hardness of 370 BHN. Dimensions of the glands shall be such that they can be used with the standardized mechanical joint bell and tee head bolts conforming to the requirements of ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of latest revision.
f. Twist-off heads shall be incorporated in the design of the wedge actuating screws to ensure proper torque.
g. The mechanical joint restraining device shall have a water working pressure rating of 250 psi minimum with a safety factor of at least 2:1 against separation when tested in a dead-end situation
h. Allowable working pressures shall be as follows: 3"-16" = 350psi, 18"-36" = 250psi.

2.3 BRAIDED FLEXIBLE CONNECTIONS

A. Manufacturers:

1. Flexicraft Industries
2. Flex-Weld, Inc.
3. Hyspan Precision Products, Inc.
4. Or Approved Equal.

B. Steel or Stainless Steel Piping:

1. Inner Hose: Corrugated stainless steel as indicated.
2. Exterior Sleeve: Braided or stainless steel as indicated.
3. Pressure Rating: Minimum 150 psig at 50 degrees F and sufficient for service condition.
4. Fittings: Flanged, unless otherwise noted.
5. Size: Use pipe-sized units.
6. Maximum Offset: 3/4inch on each side of installed center line.

C. Copper Piping:

1. Inner Hose: Corrugated Bronze.
2. Exterior Sleeve: Braided bronze.
3. Pressure Rating: Minimum 150 psig at 70 degrees F and sufficient for service condition.
4. Fittings: Threaded with union, Soldered, or As specified for pipe joints.
5. Size: Use pipe-sized units.
6. Maximum Offset: 3/4 inch on each side of installed center line.

2.4 EXPANSION JOINTS

A. Manufacturers:

1. Flexicraft Industries
2. Flex-Weld, Inc.
3. Hyspan Precision Products, Inc.
4. Or Approved Equal

B. Performance and Design Criteria:

1. Bellow Design: According to Section C of EJMA Standards.

C. Stainless-Steel Compensator Type:

1. Pressure Rating: 50 psig WOG at 250 degrees F for aeration air piping, all others shall be 200 psig WOG at 250 degrees F.
2. Maximum Compression: 1-3/4 inches.
3. Maximum Extension: 1/4 inch.
4. Joint: Flanged, unless otherwise noted.
5. Size: Use pipe-sized units.
6. Application: Aeration air piping 4-inch and larger or steel piping 3 inches and smaller.

D. External Ring-Controlled Stainless-Steel Bellows Type:

1. Pressure Rating: 200 psig WOG at 250 degrees F.
2. Maximum Compression: 1-1/4 inches.
3. Maximum Extension: 3/8 inch.
4. Maximum Offset: 5/16 inch.
5. Joint: Flanged.
6. Size: Use pipe-sized units.
7. Accessories: Internal flow liner.
8. Application: Steel piping 3 inches and larger.

E. Single-Arch Rubber Type:

1. Body: Neoprene with nylon fabric reinforcement.
2. Working Pressure: 150 psig.
3. Maximum Temperature: 200 degrees F.
4. Maximum Compression: 1 inch.
5. Maximum Elongation: 5/8 inch.
6. Maximum Offset: 1/2 inch.
7. Maximum Angular Movement: 30 degrees.
8. Joint: 304 stainless steel tapped backing rings.
9. Size: Use pipe-sized units.
10. Accessories: Control rods.
11. Application: Steel piping 2 inches and larger.

F. Bronze Compensator Type:

1. Description: Bronze with anti-torque device, limit stops, and internal guides.
2. Pressure Rating: 200 psig WOG at 250 degrees F.
3. Maximum Compression: 3 inches.
4. Maximum Extension: 1/4 inch.
5. Size: Use pipe-sized units.
6. Application: Copper piping.

2.5 EXPANSION LOOPS

A. Provide expansion loops as indicated on Shop Drawings.

2.6 SLEEVE-TYPE COUPLINGS

A. Manufacturers:

1. Dresser Piping Specialties
2. The Macomb Group
3. US Pipe Fabrication

B. Description:

1. Comply with AWWA C219.

2. Middle Ring: Epoxy Coated Steel.
3. Followers: Epoxy Coated Steel.
4. Gaskets:

    a. Material: Buna-N, EPDM, or Compatible with service conditions.
    b. Comply with ASTM D2000.

5. Bolts: AWWA C111, Epoxy Coated Steel.

2.7 WALL SLEEVE

A. Manufacturers:

1. Sigma – Omni-Sleeve.
2. American
3. Or Approved Equal.

B. Description:

1. Wall and floor pipe penetrations of ductile iron piping systems shall be made by means of a sleeve capable of being bolted directly to the formwork to prevent misalignment. Seal of annular space shall be by means of a confined rubber gasket, so as not to be affected by vibration and capable of withstanding up to 100 psig. Sleeve shall be manufactured from Ductile Iron with an integrally cast water stop.

2.8 DISMANTLING JOINTS

A. Manufacturers:

1. Romac
2. Smith-Blair
3. Or approved equal

B. Description:

1. Dismantling joints are to be used to facilitate removal and installation of flanged piping, fittings, or equipment.

2.9 FINISHES

A. Prepare ferrous metal piping appurtenances for field finishes as specified in Section 099600 – High-Performance Coatings.

2.10 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

1. Provide shop inspection and testing of completed assemblies.

B. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Shop Drawings.

C. Inspect existing flanges for nonstandard bolthole configurations or design and verify that new pipe and flanges mate properly.

D. Verify that openings are ready to receive sleeves.

E. Verify that pipe plain ends to receive sleeve-type couplings or flange adapters are smooth and round for 12 inches from pipe ends.

F. Verify that pipe outside diameter conforms to sleeve manufacturer's requirements.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Cleaning: Thoroughly clean end connections before installation.

C. Close pipe and equipment openings with caps or plugs during installation.

D. Surface Preparation: Clean surfaces to remove foreign substances.

3.3 INSTALLATION

A. According to ASME B31.3 for process piping and ASME B31.9 for building services piping.

B. Coating: Finish ferrous metal piping appurtenances as specified in Section 09 96 00 – High-Performance Coatings for service conditions.

C. Pipe Penetrations:

1. Flashing:

a. Provide flexible flashing and metal counterflashing where piping penetrates weatherproofed or waterproofed walls, floors, and roofs.
b. Flash floor drains with topping over finished areas with lead, 10 inches clear on sides, with minimum 36-by-36-inch sheet size.
c. Fasten flashing to drain clamp device.

2. Sleeves:

a. Exterior Watertight Entries: Seal with mechanical sleeve seals.
b. Set sleeves in position in forms and provide reinforcement around sleeves.
c. Size sleeves large enough to allow for movement due to expansion and contraction and provide for continuous insulation wrapping.
d. Extend sleeves through floors 1/2 inches above finished floor level and calk sleeves.
e. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent Work with insulation and calk airtight.
f. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.
g. Install stainless-steel escutcheons at finished surfaces.

D. Firestopping:

1. Placement: Place intumescent coating in sufficient coats to achieve rating required.
2. Fire-Rated Surfaces:

a. Seal opening at floor, wall, partition, ceiling and roof.
b. Install sleeve through opening and extend beyond minimum of 1 inch on both sides of building element.
c. Size sleeve, allowing minimum of 1 inch void between sleeve and building element.
d. Pack void with backing material.
e. Seal ends of sleeve with UL-listed, fire-resistive silicone compound to meet fire rating of structure penetrated.

3. Non-rated Surfaces:

a. Seal opening through non-fire-rated floor, wall, partition, ceiling and roof.
b. Install sleeve through opening and extend beyond minimum of 1 inch on both sides of building element.
c. Size sleeve to allow minimum of 1 inch void between sleeve and building element.
d. Install type of firestopping material recommended by manufacturer.
e. Occupied Spaces:

1) Install escutcheons, floor plates, or ceiling plates where conduit penetrates non-fire-rated surfaces in occupied spaces.
2) Occupied spaces include rooms with finished ceilings and rooms where penetration occurs below finished ceiling.

f. Exterior Wall Openings below Grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place according to manufacturer instructions.
g. Interior Partitions:

1) Seal pipe penetrations at where indicated.

2) Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

E. Flexible Connections: Install flexible couplings at connections to equipment and where indicated on Shop Drawings.

F. Expansion Joints:

1. Install flexible couplings and expansion joints at connections to equipment and where indicated on Drawings.
2. If expansion joint is supplied with internal sleeve, indicate flow direction on outside of joint.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. After installation, inspect for proper supports and interferences.

D. Repair damaged coatings with material equal to original coating.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Keep equipment interior clean as installation progresses.

END OF SECTION 40 05 06

SECTION 40 05 07 - HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Structural attachments.
4. Pipe guides.
5. Guides
6. Anchors
7. Elbow and Flange Supports

B. Related Requirements:

1. Section 03 30 00 - Cast-in-Place Concrete
2. Division 05 – Metals
3. Section 07 92 00 – Joint Sealants
4. Section 09 96 00 – High-Performance Coatings

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B31.1 - Power Piping.
2. ASME B31.9 - Building Services Piping.

B. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
3. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
4. ASTM A181 - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code Steel - Reference Manual.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.

1.3 COORDINATION

A. Section 01 31 00 – Project Management and Coordination

B. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.4 PREINSTALLATION MEETINGS

A. Section 01 31 00 – Project Management and Coordination

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog data including load capacity.

C. Shop Drawings: Indicate system layout with location - including critical dimensions, sizes, and pipe hanger and support locations - and detail of trapeze hangers, anchors, and guides.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Welders' Certificate: Submit welders' certification of compliance with ASME Section IX or AWS D1.1, verifying qualification within previous 12 months.

F. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings with design calculations and assumptions for load carrying capacity of trapeze, multiple pipe, and riser support hangers.
2. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.
3. Submit sizing methods or calculations sealed by a registered professional engineer.

G. Manufacturers' Instructions: Submit special procedures and assembly of components.

H. Qualifications Statements:

1. Submit qualifications for manufacturer, fabricator, installer, and licensed professional.
2. Submit manufacturer's approval of installer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Spare Parts:

1. Furnish one set of manufacturer's recommended spare parts.

1.7 QUALITY ASSURANCE

A. Perform Work according to applicable authority and/or AWS D1.1 for welding hanger and support attachments to building structure.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years' documented experience.

B. Fabricator: Company specializing in fabricating products specified in this Section with minimum five years' documented experience.

C. Installer: Company specializing in performing Work of this Section with minimum five years' documented experience and approved by manufacturer.

D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of South Carolina.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.

C. Protect products from weather and construction traffic, dirt, water, chemical, and damage by storing in original packaging.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls

B. Provide ventilation in areas receiving solvent-cured materials.

1.11 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.12 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish five-year manufacturer's warranty for pipe hangers and supports.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Description:

1. Horizontal-Piping Hangers and Supports

a. General: Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports of MSS type and size indicated, bolts (if any) and washers; comply with MSS SP-58 and manufacturer's published product information. Where MSS type or size is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with MSS SP-69 and manufacturer's published product information; size hangers and supports properly for piping including insulation (if any). Provide copper-plated hangers and supports for uninsulated copper-piping systems. Provide 304 stainless steel supports and hangers for stainless steel piping systems.

2. Vertical-Piping Clamps

a. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps of MSS type and size indicated; comply with MSS SP-58 and manufacturer's published product information. Where MSS type or size is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with MSS SP-69 and manufacturer's published product information. Size clamps properly for piping, including insulation (if any). Provide copper-plated clamps for copper-piping systems. Provide 304 stainless steel supports and hangers for stainless steel piping systems.

3. Hanger-Rod Attachments

a. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments of MSS type and size indicated; comply with MSS SP-58 and manufacturer's published product information. Where MSS type or size is not indicated, provide proper selection determined by Installer for installation requirements, and comply with MSS SP-69 and manufacturer's published product information. Size attachments properly for piping, including insulation (if any). Provide copper-plated hanger-rod attachments for uninsulated copper-piping systems. Provide 304 stainless steel supports and hangers for stainless steel piping systems.

4. Structural Attachments

a. General: Except as otherwise indicated, provide factory-fabricated building attachments of MSS type and load-rating indicated; comply with MSS SP-58 and manufacturer's published product information. Where MSS type or load-rating is not indicated, provide proper selection determined by Installer for installation requirements, and comply with MSS SP-69 and manufacturer's published product information. Size units properly for the piping loading.

B. Performance and Design Criteria:

1. General

a. Design, size and locate piping support systems throughout facility, whether shown or not.
b. Piping smaller than 30 inches: Supports are shown only where specific types and locations are required; additional pipe supports may be required.
c. Piping 30 inches and Larger: N/A
d. Meet requirements of MSS SP 58 and ASME B31.1 or as modified by this Section.

2. Pipe Support Systems

a. Design pipe support systems for gravity and thrust loads imposed by weight of pipes or internal pressures, including insulation and weight of fluid in pipes.
b. Maximum Support Spacing and Minimum Rod Size: In accordance MSS SP 58 Table 3 and Table 4.

3. Anchoring Devices: Design, size and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support.
4. Vertical Sway Bracing: 10-foot maximum centers or as shown.
5. Existing Support Systems: Use existing supports systems to support new piping only if Contractor can show they are adequate for additional load, or if they are strengthened to support additional load. Allow for expansion and contraction of piping while eliminating undue stress on piping appurtenances and equipment.
6. Provide linkage to permit lateral or axial movement where anticipated.
7. Where horizontal pipe movement is greater than ½ inch, or where hanger rod deflection from the vertical is greater than 4 degrees from cold to hot position of pipe, hanger rod and structural attachment shall be offset to maintain rod vertical in hot position.
8. Heat Transmission: Design supports, hangers, anchors, and guides to prevent excessive heat from being transmitted to building structure, equipment, or piping appurtenances.
9. Riser Supports: Support risers on each floor with riser clamps and lugs, independent of connected horizontal piping.
10. Point Loads:

a. Support plastic piping containing meters, valves, appurtenances, and other point loads on both sides.
b. Avoid point loads on plastic piping by providing extra wide pipe saddles or galvanized steel shields.

2.2 HANGERS

A. Clevis: MSS SP 58, Type 1

1. Shall be used for the suspension of non-insulated pipe or insulated with B3151 shield or Anvil ISS

a. Shall be used for the suspension of non-insulated pipe or insulated with B3151 shield or Anvil ISS

1) B-Line; Figure B3100, 1/2 inch to 30 inches
2) Anvil: Figure 260 for steel pipe and Figure 590, 1/2 inch to 30 inches
3) Insulated Steel Pipe; B-Line; Figure B3100 with B3151 shield, ½ inch through 16 inches
4) Insulated Steel Pipe; Anvil; Figure 260 with insulated saddle system (ISS), ½ inch through 12 inches
5) Or Approved Equal

b. Adjustable Swivel Split-Ring Pipe Clamp: MSS SP 58, Type 6

a. Shall be used for suspension of non-insulated stationary pipe

1) B-Line; Figure B3171, : ¾ inch through 8 inches
2) Anvil; Figure 104, : ¾ inch through 8 inches
3) Or Approved Equal

c. Steel Yoke Pipe Rolls and Roller Supports: MSS SP 58, Type 41 or Type 43

a. Shall be used to support pipe where movement may occur due to thermal expansion

1) B-Line; Figure B3110 for sizes 2 inches through 24 inches and Figure B3114 for 30 inches.
2) Anvil; Figure 181 for sizes 2-1/2 inches through 24 inches and Figure 171 for sizes 1 inch through 30 inches
3) Or Approved Equal

d. Pipe Rollers and Supports: MSS SP 58, Type 44

a. Shall be used to support pipe where movement may occur due to thermal expansion when ceiling suspension is impractical

1) B-Line; Figure B3120, sizes 2 inches through 24 inches
2) Anvil; Figure 175, sizes 2 inches through 30 inches
3) Or Approved Equal

2.2 HANGER RODS

A. Hanger Rods:

1. ASTM A576, steel.
2. Threaded both ends or Threaded one end or All-thread.
3. Diameter: ASME B31.1; as indicated on Drawings.

2.3 STRUCTURAL ATTACHMENTS

A. Welded Steel Wall Bracket: MSS SP 58, Type 33 (heavy duty)

1. Anvil; Figure 199, 3,000-pound rating.
2. B-Line; Figure B3067, 3,000-pound rating.

3. Or Approved Equal

B. Adjustable "J" hanger MSS SP 58, Type 5:

1. Anvil; Figure 67, sizes ½ inch through 8 inches.
2. B-Line: Figure B3690, sizes ½ inch through 8 inches.
3. Or Approved Equal

C. Channel Type

1. General Use

a. Unistrut
b. Anvil: Power Strut
c. B-Line; Strut System
d. Or Approved Equal

2.4 PIPE SADDLES

A. Provide 90-degree to 120-degree pipe saddle for pipe 6 inches and larger with baseplates drilled for anchors bolts.

1. Sizes 20 inches through 60 inches, Piping Technology & Products, Inc.; Figure 2000.
2. Or Approved Equal

B. Saddle Supports, Pedestal Type

1. Minimum standard weight pipe stanchion, saddle, and anchoring flange.
2. Nonadjustable Saddle: MSS SP, Type 37 with U-bolt

a. B-Line; Figure B3090, sizes 3/4 inch through 36 inches with B3088S base
b. Anvil: Figure 259; sizes 4 inch through 36 inches with Figure 63C base
c. Or Approved Equal

3. Adjustable Saddle: MSS SP 58, Type 38 without clamp

a. B-Line; Figure B3093, sizes 1 inch through 36 inches with Figure B3088S base.
b. Anvil: Figure 264, sizes 2-1/2 inch through 36 inches with Figure 62C base.
c. Or Approved Equal

2.5 CHANNEL TYPE SUPPORT SYSTEMS

A. Channel Size: 12-gauge, 1-5/8-inch wide minimum steel, or 1-1/2-inch wide, minimum FRP.

B. Members and Connections: Design for loads using one-half of manufacturer's allowable loads.

C. Fasteners: Vinyl ester fiber, polyurethane base composite nuts and bolts, or encapsulated steel fasteners.

D. Manufacturers and Products:

1. General Use

    a. B-Line; Strut System.
    b. Unistrut
    c. Anvil; Power-Strut.
    d. Or Approved Equal

2.6 CLAMPS AND BEAM ATTACHMENTS

A. Beam Clamps:

1. Shall be used for suspending hanger rod from flanged beam and shall distribute the load equally on both sides of the beam.
2. MSS SP-58 Type 21, Type 28, Type 30
3. ASTM A36, steel or ASTM A181, forged steel.
4. Clamp Size: Based on load to be supported and load configuration.
5. Anchoring: Locknuts and cup-point set screws.
6. Reversible top or bottom flange.
7. Manufacturers:

    a. B-Line;
    b. Anvil;
    c. Or Approved Equal

B. Offset Clamps:

1. Shall be used to support pipe offset from the floor or wall.
2. Double leg, two-piece.

    a. B-Line; B3148; sizes ¾ inch through 12 inches
    b. Anvil; Figure 103; sizes ¾ inch through 8 inches
    c. Or Approved Equal

C. Welded Beam Attachment: MSS SP 58, Type 22

1. B-Line; FigureB3083, sizes 3/8”-16 through 2”-4 ½ rod
2. Anvil: Figure 66, sizes 3/8 inch through 3-1/2 inch

2.7 ELBOW AND FLANGE SUPPORTS

A. Elbow and Adjustable Stanchion: Sizes 2 inches through 18 inches, Anvil; Figure 62C base or approved equal

B. Elbow with Nonadjustable Stanchion: Sizes 2-1/2 inches through 42 inches, Anvil; Figure 63A or 63B base or approved equal.

C. Flange Support with Adjustable Base: Sizes 2 inches through 24 inches, Standon; Model S89 or approved equal.

2.8 PIPE GUIDES

A. Intermediate Guides:

1. Type: Hold down pipe guide

a. Shall prevent longitudinal or lateral movement of pipe

a. B-Line; Figure B3256 sizes 2 inch through 30 inches
b. Or Approved Equal

2. Type: U-bolts with 4 hex nuts to provide nominal 1/8 inch to ¼ inch clearance around pipe; MSS SP 58 Type 24

a. Shall be used for support, anchor, or guide of pipe

a. B-Line; Figure B3188 and Figure B3188NS, sizes ½ inch through 30 inches
b. Anvil; Figure 137 and Figure 137S, sizes ½ inch through 36 inches
c. Or Approved Equal

B. Alignment Guides:

1. Type: Spider

a. Shall direct thermal expansion of insulated or non-insulated pipe in direction permitted by expansion joints or loops
b. Two or more guides shall be used on both sides of expansion joint or loop

a. B-Line; Figure B3281 through B 3287, sizes 1-1/2 inch through 24 inches
b. Anvil; Figure 255, sizes ½ inch through 24 inches
c. Or Approved Equal

2.9 PIPE ANCHORS

A. Type: Anchor chair with U-bolt strap

1. Shall be used to anchor pipe to structure

a. B-Line; Figure 3147A and 3147B, sizes ½ inch through 24 inches
b. Or Approved Equal

2.10 ACCESSORIES

A. Anchor Bolts:

1. Size and Material: ½-inch minimum diameter, and as specified in Section 0 55 00, Metal Fabrications.
2. Bolt Length (Extension Above Top of Nut):

a. Minimum Length: Flush with top of nut preferred. If not flush, shall be no more than one thread recessed below top of nut.
b. Maximum Length: No more than a full nut depth above top of nut.

B. Dielectric Barriers:

1. Plastic coated hangers, isolation cushion, or tape.
2. Manufacturer:

a. B-Line; B1999 Vibra Cushion.
b. B-Line; Iso Pipe, Isolation Tape.
c. Or Approved Equal

C. Insulation Shields:

1. Type: Galvanized steel or stainless steel, MSS SP 58, Type 40.
2. Manufacturers:

a. B-Line; Figure B3151, sizes ½ inch through 24 inch.
b. Anvil; Figure 167, sizes ½ inch through 24 inches.
c. Or Approved Equal

D. Welding Insulation Saddles:

1. Type: MSS SP 58, Type 39.
2. Manufacturers:

a. B-Line; Figure Series B3160, sizes ½ inch through 24 inches.
b. Anvil; Figure Series 160, sizes 1 inch through 36 inches.
c. Or Approved Equal

E. Plastic Pipe Support Channel:

1. Type: Continuous support for plastic pipe and to increase support spacing
2. Manufacturer

a. B-Line; Figure Series B3106V, sizes ½ inch through 6 inches with Figure B3106 Vee bottom hanger.
b. Or Approved Equal

F. Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP 58.

G. Attachments:

1. Concrete Insert: MSS SP 58, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports.
2. Concrete Attachment Plates:

a. B-Line; Figure B3084, Figure B3085, or Figure B3086 with B3201 to attach center lug.
b. Anvil: Figure 47, Figure 49, or Figure 52.
c. Or Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination.

B. Verify field dimensions as indicated on Drawings.

3.2 INSTALLATION

A. Obtain permission from Engineer before using powder-actuated anchors.

B. Obtain permission from Engineer before drilling or cutting structural members.

C. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 in and larger.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of or recessed into and grouted flush with slab.

D. Pipe Hangers and Supports:

1. Install according to: MSS SP 58.
2. Support horizontal piping as indicated on Drawings.
3. Install hangers with minimum 1/2 in space between finished covering and adjacent Work.
4. Place hangers within 12 in of each horizontal elbow.
5. Use hangers with 1-1/2 in minimum vertical adjustment.
6. Support horizontal cast iron pipe adjacent to each hub, with 5 ft maximum spacing between hangers.
7. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.
8. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
9. Support riser piping independently of connected horizontal piping.
10. Provide copper-plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
11. Design hangers for pipe movement without disengagement of supported pipe.
12. Support piping independently so that equipment is not stressed by piping weight or expansion in piping system.
13. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
14. Support no pipe from pipe above it.

15. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
16. Provide welded steel brackets where piping is to be run adjacent to building walls or columns.
17. Do not use adhesive anchors for attachment of supports to ceiling or walls.
18. Use beam clamps where piping is to be suspended from building steel.
19. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
20. Install lateral supports for seismic loads at changes in direction.
21. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
22. Insulated Piping: Provide two bolted clamps designed to accommodate insulated piping.
23. Use offset clamps where pipes are indicated as offset from wall surfaces.
24. Repair mounting surfaces to original condition after attachments are completed.

E. Insulation:

1. Provide clearance in hangers and from structure and other equipment for installation of insulation.
2. Conform to 40 42 13 - Process Piping Insulation.

F. Equipment Bases and Supports:

1. Provide housekeeping pads as detailed on Drawings.
2. Using templates furnished with equipment, install anchor bolts and accessories for mounting and anchoring equipment.
3. Construct supports of steel members or formed steel channel. Brace and fasten with flanges bolted to structure.
4. Provide rigid anchors for pipes after vibration isolation components are installed. Comply with

G. Prime Coat:

1. Prime coat exposed steel hangers and supports.
2. Conform to Section 09 96 00 – High-Performance Coatings.
3. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.3 ATTACHMENTS

A. Standard Pipe Supports

1. Horizontal Suspended Piping:

a. Single Pipes: Clevis hangers or adjustable swivel split-ring.
b. Grouped Pipes: Trapeze hanger system.

2. Horizontal Piping Supported from Walls:

a. Single Pipes: Wall brackets, or attached to wall, or to wall mounted framing with anchors.
b. Stacked Piping: Wall mounted framing system and "J" hangers acceptable for pipe smaller than 3-inch.
c. Pipe clamp that resists axial movement of pipe through support is not acceptable. Use pipe rollers supported from wall bracket.

3. Horizontal Piping Supported from Floors/Roof:

a. Saddle Supports:

1) Pedestal Type, elbow and flange.
2) Provide minimum 1-1/2-inch grout beneath baseplate.

b. Floor Mounted Channel Supports:

1) Use for pipe smaller than 3-inch running along floors and in trenches at pipe elevations lower than can be accommodated using pedestal pipe supports.
2) Attach channel framing to floors with baseplate on minimum 1-1/2-inch nonshrink grout and with anchor bolts.
3) Attach pipe to channel with clips or pipe clamps.

c. Concrete Cradles: Use for pipe larger than 3 inches along floor and in trenches at pipe elevations lower than can be accommodated using stanchion type.

4. Vertical Pipe: Support with wall bracket and elbow support, or riser clamp on floor penetration

B. Standard Attachments:

1. New Concrete Ceilings: Concrete inserts, concrete attachment plates, or concrete anchors as limited below:

a. Single point attachment to ceiling allowed for only ¾-inch rod and smaller (8 inches and smaller pipe).
b. Where there is vibration or bending considerations, do not connect a single pipe support hanger rod directly to a drilled concrete anchor (single point attachment) regardless of size.

2. Existing Concrete Ceilings: Channel type support with minimum of two anchor points, concrete attachment plates or concrete anchors as limited below:

a. Single point attachment to ceiling is allowed only for ¾-inch rod and smaller (8 inches and smaller pipe).
b. Where there is a vibration or bending considerations do not connect a single pipe support hanger rod directly to a drilled concrete anchor (single point attachment) regardless of size.

1) These lines include air operated diagram pumps and other lines.

c. Steel Beams: I-beam clamp or welded attachments.

d. Wooden Beams: Lag screws and angel clips to members not less than 2-1/2 inches thick
e. Concrete Walls: Concrete inserts or brackets or clip angles with concrete anchors.
f. Concrete Beams: Concrete inserts, or if inserts are not used attach to vertical surface similar to concrete wall. Do not drill into beam bottom.

C. Saddles for Steel or Concrete Pipe: Provide 90-degree to 120-degree pipe saddle for pipe sizes 6 inches and larger when installed on top of steel or concrete beam or structure, pipe rack, trapeze, or where similar concentrated point supports would be encountered.

D. Intermediate and Pipe Alignment Guides:

1. Provide pipe alignment guides, or pipe supports that provide same function, at expansion joints and loops.
2. Guide pipe on each side of expansion joint or loop at 4 pipe and 14 pipe diameters from each joint or loop.
3. Install intermediate guides on metal framing support systems not carrying pipe anchor or alignment guide.

E. Accessories:

1. Insulation Shield: Install on insulated piping with oversize rollers and supports.
2. Welding Insulation Saddle: Install on insulated steel pipe with oversize rollers and supports.
3. Dielectric Barrier:

a. Provide between painted and galvanized carbon steel members and copper or stainless-steel pipe or between stainless steel supports and nonstainless steel ferrous metal piping.
b. Install rubber wrap between submerged metal pipe and oversized clamps.

F. Pipe Hanger Spacing:

1. Pipe Material: Ductile Iron Pipe

a. Size: 8 Inches and Under
b. Maximum Hanger Spacing: Maximum span limited to that for standard weight steel pipe for water service.

1) MSS SP 58 Table 3

c. Hanger Rod Diameter: MSS SP 58 Table 4

2. Pipe Material: Ductile Iron Pipe

a. Size: 10 Inches and Larger
b. Maximum Hanger Spacing: Maximum span limited to 20 feet.

1) MSS SP 58 Table 3

c. Hanger Rod Diameter: MSS SP 58 Table 4

3. Pipe Material: ABS.

    a. Maximum Hanger Spacing: 4 feet.
    b. Hanger Rod Diameter: 3/8 inch.

4. Pipe Material: Aluminum.

    a. Maximum Hanger Spacing: 10 feet.
    b. Hanger Rod Diameter: 1/2 inch.

5. Pipe Material: Cast iron.

    a. Maximum Hanger Spacing: 5 feet.
    b. Hanger Rod Diameter: 5/8 inch.

6. Pipe Material: Cast Iron, with 10-foot length of pipe.

    a. Maximum Hanger Spacing: 10 feet.
    b. Hanger Rod Diameter: 5/8 inch.

7. Pipe Material: CPVC.

    a. Size: 1 inch and smaller.
    b. Maximum Hanger Spacing: 3 feet.
    c. Hanger Rod Diameter: 1/2 inch.

8. Pipe Material: CPVC.

    a. Size: 1-1/4 inches and larger.
    b. Maximum Hanger Spacing: 4 feet.
    c. Hanger Rod Diameter: 1/2 inch.

9. Pipe Material: Copper tube.

    a. Size: 1-1/4 inches and smaller.
    b. Maximum Hanger Spacing: 6 feet.
    c. Hanger Rod Diameter: 1/2 inch.

10. Pipe Material: Copper tube.

    a. Size: 1-1/2 inches and larger.
    b. Maximum Hanger Spacing: 10 feet.
    c. Hanger Rod Diameter: 1/2 inch.

11. Pipe Material: Fiberglass:

    a. Maximum Hanger Spacing: 4 feet.
    b. Hanger Rod Diameter: 1/2 inch.

12. Pipe Material: Polybutylene.

    a. Maximum Hanger Spacing: 2.7 feet.

b. Hanger Rod Diameter: 3/8 inch.

13. Pipe Material: Polypropylene.

    a. Maximum Hanger Spacing: 4 feet.
    b. Hanger Rod Diameter: 3/8 inch.

14. Pipe Material: PVC.

    a. Maximum Hanger Spacing: 4 feet.
    b. Hanger Rod Diameter: 3/8 inch.

15. Pipe Material: Steel.

    a. Size: 3 inches and smaller.
    b. Maximum Hanger Spacing: 12 feet.
    c. Hanger Rod Diameter: 1/2 inch.

16. Pipe Material: Steel or Stainless Steel.

    a. Size: 4 inches and larger.
    b. Maximum Hanger Spacing: 12 feet.
    c. Hanger Rod Diameter: 5/8 inch.

END OF SECTION 40 05 07

SECTION 40 05 19 - DUCTILE IRON PROCESS PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ductile-iron pipe and fittings.
2. Accessories.

B. Related Requirements:

1. Section 09 96 00 – High-Performance Coating
2. Division 40 – Process Interconnections

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
6. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.
7. AWWA C153/A21.53 - Ductile-Iron Compact Fittings.
8. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B31.3 - Process Piping.

C. ASTM International:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.

D. SSPC - The Society for Protective Coatings:

1. SSPC SP 6/NACE No. 3 - Commercial Blast Cleaning.

E. GSWSA Standard Specifications

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Manufacturers:

1. US Pipe.
2. American.
3. Or Approved Equal.

B. Piping:

1. Comply with AWWA C151 and GSWSA Specifications.
2. Diameter and Class: As indicated below:

Pipe Size (in)	Pressure Class
12” and Smaller	350
14” – 24”	250
30” and Larger	150

C. Joints:

1. Pressure Rating: Same as that of connected piping.
2. Mechanical:

    a. Comply with AWWA C110 and AWWA C111.
    b. Glands: Ductile iron with asphaltic coating.
    c. Use Tee-head or non-hex head bolts and head nuts for joint makeup and gasket seating. Bolts & Nuts shall be carbon steel coated with corrosion inhibiting fluoropolymer composite material.
    d. Mechanical joint fittings shall be furnished with sufficient quantities of accessories as required for each joint.
    e. All mechanical joints shall be restrained.

3. Push On: Comply with AWWA C111.
4. Flanged: Comply with AWWA C115 with gaskets and bolts conforming to AWWA C115, Appendix A.
5. Gaskets for mechanical and push-on type joints shall conform to ANSI A21.11 and AWWA C111, Gaskets shall be SBR, neoprene, or EPDM.
6. Gaskets for flange joints shall conform to ANSI A21.15 and AWWA C115. Gaskets shall be neoprene or EPDM.
7. Gaskets for joints above 250 psi shall be Toruseal gaskets as manufactured by American specially designed for a working pressure of 350 psi.

D. Fittings:

1. Comply with AWWA C153, ductile iron.
2. Pressure Rating, Pipes 12 Inches and Smaller: 250 psig.

2.2 FINISHES

A. Interior Coating

1. Cement-mortar lining, AWWA C104; standard thickness.

B. Outside Coating:

1. Buried: Asphaltic; 1-mil thick, minimum, in accordance with AWWA C151 / ANSO A21.51.
2. Exposed: As specified in Section 09 96 00 - High-Performance Coatings.

2.3 ACCESSORIES

A. Jackets:

1. AWWA C105, polyethylene jacket.
2. All buried ductile iron pipe shall receive polyethylene jacketing.

B. Dielectric Fittings: Provide between dissimilar metals.

C. Pipe Identification Labels

1. Identification for Process Piping: As specified in Section 40 05 53 - Identification for Process Piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Buried Service: Install pipe as specified in:

1. Grand Strand Water & Sewer Authority – “Water System Standard and Specification”.
2. AWWA C600 – Installation of Ductile Iron Water Mains and their Appurtenances.

B. Exposed Service: Install pipe as specified in:

1. Install according to ASME B31.3.
2. Fittings:

a. Clean gasket seats thoroughly and wipe gaskets clean prior to installation.
b. Install fittings according to manufacturer instructions.
c. Tighten bolts progressively, drawing up bolts on opposite sides until bolts are uniformly tight; use torque wrench to tighten bolts to manufacturer recommendations.

3. Provide required upstream and downstream clearances from devices as indicated.

C. Tap ductile-iron piping only with service saddle, tapping boss of a fitting or valve body, or equipment casting.

D. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means acceptable to the Engineer.

E. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining so as to leave a smooth end at right angles to the axis of the pipe.

F. Where pipe is laid on a grade of ten (10) percent or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

3.2 JOINING OF PIPE

A. Flanged Joints

1. Flanges conforming to AWWA C110 can be joined with Class 125 B16.1 flanges shown in ANSI B16.1 but not with Class 250 B16.1 flanges.
2. Flange joints should be fitted so that the contact faces bear uniformly on the gasket. The joint should be made with relatively uniform bolt stress.
3. Set flange bolts beyond finger tightness with an indicating torque wrench to insure equal tension in all bolts. Tighten bolts such that those 180 degrees apart or directly opposite are torqued in sequence.

B. Push-On Joint

1. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends upstream.
2. Pipe 8 inches in diameter and larger shall be socketed by fork tools or jacks.
3. Pipe cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. The spigot ends of field cut pipe shall be tapered back 1/8 inch at an angle of about 30 degrees to the barrel of the pipe with a coarse file or portable grinder. All sharp or rough edges that may injure the rubber gasket shall be removed in this operation.
4. Whenever it is desirable to deflect push-on joint pie, the amount of deflection shall not exceed the maximum limits according to Table 4 in AWWA C600.

C. Mechanical Joints:

1. Mechanical joints shall be in accordance with AWWA C600 and the manufacturer's instructions.
2. Bell ends shall be laid upstream.
3. Bolts shall be tightened to the specified torque. Under no condition shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to obtain greater leverage.
4. Final tightening of bolts shall be with a torque wrench to insure equal tension in all bolts.
5. Bolts shall not be over-stressed to compensate for poor assembly.

3.3 PLACEMENT OF FITTINGS

1. Pipeline fittings, plugs, and caps shall be furnished and installed of the type indicated and at the location shown on the Drawings or as directed by the Engineer. It shall be the responsibility of the Contractor to furnish and install all proper size pipe bends for both horizontal and vertical deflections that are required to construct the pipeline to the line and grade as shown on the construction drawings or as set by the Engineer.

3.4 POLYETHYLENE ENCASEMENT

A. The Contractor shall use Method A of ANSI/AWWA A21.5/C105 to install polyethylene encasement on all ductile iron pipe and ductile iron fittings.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Test Pipe (other than air lines) per Section GSWSA Standard Specifications.

3.6 DISINFECTION OF POTABLE WATERLINES

A. Follow requirements of GSWSA – “Water System Standards and Specifications”.

B. Following the testing procedure and after all corrections and adjustments have been made, all potable waterlines, both hot and cold water systems, shall be disinfected in strict accordance with the following procedure:

1. Disinfection shall conform to ANSI/AWWA C-651, latest revision. The Engineer and Owner shall be notified 48 hr in advance of the disinfection procedure. Also, the flushed solution shall be disposed of as directed by the Engineer and Owner.

END OF SECTION 40 05 19

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 40 70 23 – PROCESS CONTROL NARRATIVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Process control narratives for Booster Pump Station.

B. This section is intended to provide information to the Contractor about anticipated pump station operations.

C. Related Requirements:

1. Division 01 – General Requirement
2. Division 26 – Electrical
3. Division 40 – Process Interconnections

1.2 REFERENCES

A. International Society of Automation (ISA)

B. National Institute of Standards and Technology (NIST)

1.3 DEFINITIONS/ACRONYMS

A. Definitions are defined as follows:

1. AUTO vs MANUAL: The PLC will not attempt to control any device that is in the LOCAL MANUAL position. When in REMOTE, the device will be controlled through the PLC based on the automatic logic.

    a. Local Manual – operator input at local device
    b. Local Auto – algorithm input at local device

2. ALARM: Indicate the alarm condition on appropriate HMI displays, and add to the HMI alarm summary display. Upon acknowledgement, indicate the alarm condition on appropriate HMI displays and the alarm summary display. Remove acknowledged alarms from the alarm summary once they are cleared. Log alarm occurrence, acknowledgement, and clearance in the alarm log file.
3. ON (RUNNING): The equipment or adjustable speed motor is ON when the equipment or motor drive ON status contact is closed. A constant speed motor is ON when a motor normally open auxiliary contact (M-Contact) from the motor starter is closed.
4. TREND: At intervals appropriate for the variable being trended (JCESD standard is one-minute intervals), place the current value of analog variable, along with a time and date stamp, into a historical trend file for that variable. Display the trend on selectable HMI screens with appropriate scaling and units.

5. CLOSE FAIL: A valve is commanded-to-close, but is not confirmed closed within a preset time. Unless otherwise noted, a valve is confirmed closed by receiving Closed limit switch contact from the valve.
6. POSITION FAIL: A modulating valve is commanded to a set point position, but the valve is not confirmed to be within a preset percentage of set point within a preset time.
7. OPEN FAIL: A valve is commanded-to-open, but is not confirmed open within a preset time. Unless otherwise noted, a valve is confirmed open by receiving OPEN limit switch contact from the valve.
8. RUN FAIL: A motor is commanded-to-run, but is not confirmed running within a preset time. Unless otherwise noted, running is confirmed by receiving an ON-status M-contact from the starter's auxiliary contact.
9. START: Issue a maintained Run command.
10. STOP: Cease the maintained Run command.
11. TOTALIZE: Integrate flow type variable with respect to time. Unless otherwise noted, includes password protected operator reset that sets the totalized value to zero.
12. ELAPSED RUN TIME: Calculate the total time (in tenths of an hour) that a motor or piece of equipment has been in operation. For equipment and constant speed motors, use starter M-contacts to detect when the equipment or motor is running. For adjustable speed motors, use ON status contacts from the drive that close when the drive is in operation. For valves, calculate the time that the valve is open. Unless otherwise noted, include password protected operator reset that sets elapsed run times to zero.
13. CYCLE COUNT: Count the number of cycles a piece of equipment, valve, or motor undergoes. For equipment and motors, one cycle is defined as the transition from OFF to ON. For valves, one cycle is defined as the transition from CLOSED to OPEN.
14. INTERLOCKS: Safety interlocks are designed to prevent damage to equipment and injury to plant personnel. Hard-wired interlocks, such as high temperatures and pump overloads will stop the equipment and prevent it from running, until the alarm condition has been reset in the field. Software (PLC generated) interlocks, such as pump watchdogs or valve failure alarms, must be reset by the Operator at the HMI, before the equipment is allowed to be operated again in any REMOTE mode.

B. Acronyms are defined as follows:

1. HMI: Human Machine Interface
2. LCP: Local Control Panel
3. MCC: Motor Control Center
4. PID: Proportional-Integral-Derivative
5. P&ID: Process and Instrumentation Diagram
6. PLC: Programmable Logic Controller
7. SCADA: Supervisory Control and Data Acquisition
8. VFD: Variable Frequency Drive

1.4 SYSTEM DESCRIPTION

A. The control loop descriptions provide the functional requirements of the control loops represented in the Contract Documents.

1. Descriptions are provided as follows:

a. Control system overview and general description.

b. Major equipment to be controlled.
c. Major field mounted instruments (does not include local gauges).
d. Manual control functions.
e. Automatic control functions/interlocks.
f. Major indications provided at local control panels and motor starters/VFD's.
g. Remote indications and alarms.

B. The control loop descriptions are not intended to be an inclusive listing of all elements and appurtenances required to execute loop functions but are rather intended to supplement and complement the Drawings and other Specification Sections.

1. The control loop descriptions shall not be considered equal to a bill of materials.

C. Provide instrumentation hardware and software as necessary to perform control function specified herein and shown on Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. The Process & Instrumentation Diagrams (P&ID's) in the Drawings do not indicate all PLC and/or SCADA functions. Major requirements and elements are illustrated.

B. Index for Process Control Narratives:

1. International Drive Booster Pump Station

C. Equipment/Communication Failure

1. In the event of a plant power failure, the SCADA will store the active setpoints and duty statuses, allowing the Operator to restart the plant with the prior configuration.
2. In the event of a communication failure between a PLC and the HMI, the continued operation of the equipment will depend on the equipment control mode prior to the communications failure, as defined below:

a. If the equipment was operating in Remote Auto mode prior to the communications failure, the PLC will continue to operate the equipment based on the Operators defined process setpoints. The state of the equipment can be changed if the Operator switches the equipment to Local mode at the equipment's local control panel and start/stops equipment, using field mounted controls.
b. If the equipment was operating in Remote Manual mode prior to the communications failure, the equipment will revert to Remote Auto mode upon loss of communication continuing operation, using the last known setpoints.
c. If the equipment was operating in Local Manual mode, it is the Operator's responsibility to manually operate this device or place it back into Remote Auto or it will not function via PLC control.

d. When running in Local Manual mode, the device will continue operating in its current state (running/stopped) until a hard-wired interlock stops the equipment.
e. Any failed equipment will issue an alarm. Vendor package control panels that lose communication with their parent PLC (Remote Auto) will trigger a communication alarm, and continue to operate locally, if possible.

3. An alarm will be displayed at the HMI, indicating the failed communication link.

3.2 PROCESS CONTROL NARRATIVES

A. International Drive Booster Pump Station

1. General:

a. The process control narrative describes the operation of the booster pump station and other equipment.
b. The pumps are designed to operate as two (2) duty pumps and two (2) standby.
c. In the event of low pressure, additional pumps will come online to satisfy demand.

2. Major Equipment:

a. Pumps: P1010, P1020, P1030, and P1040
b. Insertion Flow Meter (FE1001)

3. Major Instrumentation:

a. Suction Line Pressure Transducer (PI1001)
b. Discharge Line Pressure Transducer (PI1004)

4. Control Strategy:

a. Local Manual:

1) Control is from Hand/Off/Auto selector switch on the LCP

a) In Hand, the pump starts and ramps up to the speed set at the local interface module located on the VFD.
b) In Off, the pumps cannot be started from any location

b. Remote Manual: n/a
c. Local Auto

1) In Auto, the operator enters the desired downstream pressure and desired pump assignments: LEAD, LAG. Pump speed is controlled to maintain a constant downstream pressure.
2) The pump ramp up/down rate for a change in setpoint will be an operator adjustable time limit.
3) Two (2) lead pumps will be called to come online at 60% turndown initially.
4) The two (2) lead pumps will start and ramp up to an initial speed of 60% setpoint. Once the pump reaches speed set point, maintained for time

setpoint, the speed will be automatically adjusted to maintain the pressure setpoint. The speed of the two pumps will continue to increase to 94%.

5) In the event that the two (2) lead pumps cannot reach the desired discharge pressure at setpoint within an operator adjustable time limit, the first LAG pump will start and ramp up to an initial operator adjustable speed setpoint. Once the pump reaches the speed setpoint, maintained for time setpoint, the speed of all pumps will be automatically adjusted to 80% (at the same speed) to maintain the pressure setpoint. The speed of the three pumps will continue to increase to 100% to maintain pressure setpoint.

6) In the event that the three (3) pumps cannot reach the desired discharge pressure at setpoint within an operator adjustable time limit, the second LAG pump will start and ramp up to an initial operator adjustable speed setpoint. Once the pump reaches the speed setpoint, maintained for time setpoint, the speed of all pumps will be automatically adjusted to 95% (at the same speed) to maintain the pressure setpoint. The speed of the four pumps will continue to increase to 100% to maintain pressure setpoint.

7) Once the pressure is maintained for an operator adjusted duration, the pump with the most hours will ramp down to 94%. If pressures continue to be maintained, the pump will continue to ramp down over the operator adjusted time setpoint.

8) If the pressure continues to be maintained with three pumps for an operator adjusted duration, the pump remaining with the most hours will ramp down to 80%. If pressures continue to be maintained, the pump will continue to ramp down over the operator adjusted time setpoint.

9) Once the lead pumps drops below an operator adjustable speed, and is maintained for a time setpoint, a shut down will be initiated for the pumps for an operator adjustable time limit.

10) If a pump is not available upon initial assignment or the pump fails during operation, it will be replaced in the pump sequence by the next available pump.

11) Pumps will be auto rotated in the sequence every 24 hours or on pump shutdown. Operator shall be able to select an operational mode so that operation of the pumps alternate and are shut off or at midnight of each day so that the run times of the pumps are equalized throughout their lifecycles.

12) Pump operating speeds can be seen in the Table below:

Pumps	Low Flow	High Flow	Low Hz	High Hz	Low RPM	High RPM	Low %	High %
2	6,000	11,000	36	56.4	740	1,160	60%	94%
3	11,000	14,000	48	60	987	1,234	80%	100%
4	14,000	15,300	56.4	60	1160	1,234	94%	100%

13) Operator Entry

a) Desired pump assignment (LEAD, LEAD, LAG1, LAG2)
b) Desired discharge pressure (0-100 psi)
c) Desired ramp up/down rate (0 – 300 SECONDS)
d) Desired duration maintaining pressure (0-600 SECONDS)
e) Desired operational speed (50 – 100%)
f) Desired LEAD pump speed maintenance duration (0 – 60 SECONDS)
g) Desired LAG pump speed maintenance duration (0 – 60 SECONDS)

h) Desired pump rotation (ON/OFF)

d. Interlocks:

1) Software Interlocks:

a) n/a

2) Hardwired Interlocks:

a) Discharge Line Pressure Transducer (PI1004) Low pressure set point (Starts pumps)
b) Discharge Line Pressure Transducer (PI1004) High pressure set point (Stops pumps)
c) Suction Line Pressure Transducer (PI1001) Low pressure set point (Stops pumps)

e. Alarms

1) Discharge Pressure P&ID Low Pressure
2) Discharge Pressure P&ID High Pressure
3) Suction Pressure P&ID Low Pressure
4) Pump 1 Fail
5) Pump 1 Fail-to-Start
6) Pump 2 Fail
7) Pump 2 Fail-to-Start
8) Pump 3 Fail
9) Pump 3 Fail-to-Start
10) Pump 4 Fail
11) Pump 4 Fail-to-Start

f. PLC/LCP

1) Flow Meter P&ID Flow Rate
2) Flow Meter P&ID Flow Daily Total
3) Discharge Line Pressure P&ID Pressure
4) Suction Line Pressure P&ID Pressure
5) Pump 1 P&ID Hand
6) Pump 1 P&ID Remote
7) Pump 1 P&ID Running
8) Pump 1 P&ID Speed
9) Pump 2 P&ID Hand
10) Pump 2 P&ID Remote
11) Pump 2 P&ID Running
12) Pump 2 P&ID Speed
13) Pump 3 P&ID Hand
14) Pump 3 P&ID Remote
15) Pump 3 P&ID Running
16) Pump 3 P&ID Speed
17) Pump 4 P&ID Hand
18) Pump 4 P&ID Remote

19) Pump 4 P&ID Running
20) Pump 4 P&ID Speed
21) Alarms

g. SCADA:

1) To be provided by Owner

END OF SECTION 40 70 23

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 40 71 13 – ELECTROMAGNETIC FLOW MEASURING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Electromagnetic flow meters for permanent installations both above and below ground. The meters shall utilize bipolar pulse DC coil excitation to measure voltage induced by the flow of conductive liquid through a magnetic flux. The voltage shall be linearly proportional to flow velocity from 0.033 to 33 feet per second.

B. Related Sections:

1. Control and Information Systems Scope and General Requirements.
2. Powered Instruments, General.

1.2 SUBMITTALS

A. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer's certifications, Manufacturer's Field Reports.

B. Product Data:

1. Dimensional drawings.
2. Materials of construction.
    a. Sensor
    b. Liner
    c. Electrodes
    d. Process Connection
3. Measurement accuracy.
4. Range and range ability.
5. Enclosure Rating.
6. Classification Rating.
7. Power.
    a. Voltage
    b. Wattage
8. Output options.

1.3 QUALITY ASSURANCE

A. Manufacture instruments in facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the Manufacturer.

B. Any instruments that are not stored in strict conformance with the Manufacturer's recommendation shall be replaced.

1.5 PROJECT OR SITE CONDITIONS

A. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.

1.6 CALIBRATION AND WARRANTY

A. The meter shall have standard one year warranty from date of shipment. If the meter is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.

1.7 MAINTENANCE

A. Provide all parts, materials, etc. necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.

1.8 LIFECYCLE MANAGEMENT

A. Instrument documentation, like original calibration certificates, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.

PART 2 - PRODUCTS

2.1 SYSTEMS/ASSEMBLIES

A. Manufacturer:

1. McCrometer – FPI Mag
2. Or approved equal

2.2 MANUFACTURED UNITS

A. The flow meter shall be a full profile insertion sensor and transmitter mounted integral the sensor.
1. The flow meter shall be microprocessor based.

2. The sensor shall be the proper size to measure the design flow rate of the piping and measure bi-directional flow as a standard.
3. The sensor liner and electrode material shall be chosen to be compatible with the process fluid. All fluids require a minimum conductivity of 5 µS/cm.
4. The sensor tube shall be lined with PFA or PTFE as specified based upon the size of the flow meter and the process media conditions.
5. The flow sensing element shall be of an electromagnetic averaging type design and factory calibrated to NIST standards.
6. Electrodes shall be made of 316L SS, Alloy C22, Tantalum, Titanium, or Platinum as specified.
7. Sensor shall be designed for use in potable water.
8. The sensor shall be rated for NEMA 4X as standard.

B. The converter shall be a microprocessor controller mounted remotely as specified in the instrument schedule. The transmitter shall operate on AC (100 to 240V) or DC (24 V) via a dedicated or universal power supply as specified. The transmitter housing will carry a NEMA 4X rating and shall be constructed to prevent moisture ingress, promote corrosion resistance, and be impervious to saline environments.

1. The transmitter shall allow local programming that can be operated via an optical display without opening the compartment.
2. The transmitter display shall indicate simultaneous flow rate and total flow, user-selectable engineering units, and readout of diagnostic remedy messages.
3. The transmitter shall safeguard against entering of invalid data for the particular meter size and all programming parameters shall be access-code protected.
4. The transmitter primary output shall be specified, as:

    a. 4-20mA HART, or
    b. Modbus RS485, or
    c. Profibus PA, or
    d. Foundation Fieldbus, or
    e. EtherNet/IP, or
    f. Profinet
    g. and up to (2) secondary configurable analog I/O slots (freely programmable to 4-20mA in/output, 0-10 kHz pulse/frequency, or status input)

5. The converter shall be provided by the same manufacturer as the insertion meter. Using an external third party signal converter is unacceptable.
6. The transmitter shall internally retain all setup parameters, calibration parameters and accumulated measurements in non-volatile memory in the event of power failure.
7. The transmitter and sensor must support an onboard, ISO traceable means of attested in-situ verification utilizing redundant references to validate measurement quality over the lifespan.

2.3 ACCESSORIES

A. Stainless steel tag – labeled to match the contract documents

B. Provide grounding rings, as per manufacturer's recommendations, if required.

C. Provide sun shield for outdoor installations as required per the instrument schedule.

2.4 REQUIRED INSTRUMENTS

A. FIT/FE-1001

2.5 SOURCE QUALITY CONTROL AND CALIBRATION

A. Electromagnetic flow meters shall be factory calibrated on an ISO 17025 accredited test stand with certified accuracy traceable to NIST per "General Requirements for the Competence of Testing and Calibration Laboratories."

B. Evidence of accreditation must originate from a national verification agency such as A2LA.

C. Each meter shall ship with a certificate of a 2-point calibration report exceeding stated standard accuracy of 0.5% or 0.2% of rate as specified.

D. A real-time computer-generated printout of the actual calibration data points shall indicate apparent and actual flows. The flow calibration data shall be confirmed by the manufacturer and shipped with the meters to the project site.

E. The manufacturer shall provide complete documentation covering the traceability of all calibration instruments.

F. The manufacturer shall provide ISA data sheet ISA-TR20.00.01 as latest revision of form 20F2321. The manufacturer shall complete the form with all known data and model codes and dash out the inapplicable fields. Incomplete data sheets submitted will result in a rejected submittal.

2.6 SAFETY

A. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest addition.

B. Electrical equipment housing shall conform to NEMA 4X classification.

C. Non-intrinsically safe electrical equipment shall be approved by a Nationally Recognized Testing Laboratory (NRTL) such as cCSAus, FM, or UL for the specified electrical area classification.

D. Device failure modes, self-monitoring characteristics and remedy diagnosis shall follow NAMUR standards NE 43 and NE 107.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process conditions.

B. Examine the installation location for the instrument and verify that the instrument will work properly when installed.

3.2 INSTALLATION

A. As shown on installation details and mechanical Drawings.

B. As recommended by the manufacturer's installation and operation manual.

C. Specific attention should be given to the following technical requirements:

1. Verify ground rings (if required) have been installed according to the manufacturer's recommendations.
2. Reduced inlet installations must be accompanied by manufacturer's documented evidence of third party testing and data collection in comparison to a traceable standard.

3.3 FIELD QUALITY CONTROL

A. The ENGINEER shall witness all instrument verifications in the field.

B. Manufacturers Field Services are not required.

3.4 ADJUSTING

A. Verify factory setup of all instruments in accordance with the Manufacturer's instructions.

3.5 PROTECTION

1. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.

    a. The ENGINEER shall be the sole party responsible for determining the corrective measures.

END OF SECTION 40 71 13.13

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 40 73 13 - PRESSURE AND DIFFERENTIAL PRESSURE GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pressure gages.

B. Related Requirements:

1. Section 40 73 64 – Annular Pressure Seals: Isolation of gages from process fluid.

1.2 REFERENCE STANDARDS

A. ASME International:

1. ASME B40.100 - Pressure Gauges and Gauge Attachments.

B. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for system materials and component equipment, including connection requirements.

C. Shop Drawings:

1. Indicate system materials and component equipment.
2. Submit installation requirements and other details.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of equipment and accessories.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Extra Stock Materials:

1. Gages: Furnish 20 percent spare gages, with a minimum of one gage for each range used.

1.6 QUALITY ASSURANCE

A. Ensure that materials of construction of wetted parts are compatible with process liquid.

B. Materials in Contact with Potable Water: Certified to NSF 61 and NSF 372.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish one-year manufacturer's warranty for pressure gages.

PART 2 - PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:
1. Ametek; Model Series 1550
2. Wika; Model Series 716
3. Ashcroft; Model Series 1010

B. Type: Differential - Compound.

C. Dials:

1. Nominal Diameter: 4 inches.
2. Face: White, laminated plastic dials with black graduations.
3. Scale: Extend over arc not less than 270 degrees.
4. Ranges and Graduation Units: As indicated on Drawings.

D. Cases:

1. Liquid filled.
2. Stainless Steel case and wetted parts.
3. Windows:

    a. Material: Clear, shatterproof glass.
    b. Thickness: 1/8 inch.
    c. Provide gasket.

E. Connection:

1. Location: Bottom.
2. Socket:

    a. 1/4-inch NPT male thread.
    b. Extend minimum 1-1/4 inches below gage cases.
    c. Provide wrench flats.

3. Mounting: Stem.

F. Measuring Element:

1. Bourdon Tubes:

    a. Material: Stainless steel to brass socket.
    b. Provide welded, stress-relieved joints.

2. Movement:

    a. Rotary.
    b. Material: Stainless steel.

3. Accuracy:

    a. Comply with ASME B40.100.
    b. Plus and minus 0.5 percent of full-scale range.

G. Adjustment:

1. Provide for zero-reading adjustment.
2. Adjusting Screws: Accessible from rear of case without need for disassembly.

H. Accessories:

1. Shutoff Cocks: Furnished by gage manufacturer.

2.2 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that items provided by other Sections of Work are ready to receive Work of this Section.

3.2 INSTALLATION

A. According to manufacturer instructions.

B. Coordinate location and orientation of gages and seal assemblies with final piping and equipment installations.

C. Ensure that gages are located to be easily read during operation and easily accessible for maintenance.

3.3 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

3.4 DEMONSTRATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 40 73 13

SECTION 40 73 23.26 – ABSOLUTE-PRESSURE AND GAUGE-PRESSURE TRANSMITTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements for an absolute-pressure instrument and a gauge-pressure instrument

B. Related Sections:
   1. List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.
   2. Control and Information Systems Scope and General Requirements.
   3. Power Instruments, General.

1.2 SUBMITTALS

A. Furnish complete product data, shop drawings, test reports, operating manuals, record drawings, Manufacturer's certifications, Manufacturer's Field Reports.

B. Product Data:
   1. Dimensional drawings.
   2. Materials of construction.
   3. Measurement accuracy.
   4. Measurement range.
   5. Enclosure Rating.
   6. Classification Rating.
   7. Power.
   8. Output options.

1.3 QUALITY ASSURANCE

A. Manufacture instruments facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the manufacturer.

1.5 PROJECT OR SITE CONDITIONS

A. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.

1.6 WARRANTY

A. The transmitter shall have a standard one year warranty from date of shipment and if the meter is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.

1.7 MAINTENANCE

A. Provide all parts, materials, fluids, etc. necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.

1.8 LIFECYCLE MANAGEMENT

A. Instrument documentation, like original calibration certificates, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.

PART 2 - PRODUCTS

2.1 PRESSURE TRANSMITTERS

A. Manufacturers:
1. Emerson Process – St Louis, MO – Model 3051CG.
2. Approved Equal.

B. Description:
1. Gauge pressure transmitters shall be of the piezoresistive silicon type with a process-isolated diaphragm with silicone oil fill, microprocessor-based "smart" electronics, and a field adjustable rangeability of 100:1 input range. Span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally. Transmitters shall be NEMA 4X weatherproof and corrosion resistant construction with low-copper aluminum body and 316 stainless steel process wetted parts. Accuracy, including nonlinearity, hysteresis and repeatability errors shall be plus or minus 0.075 percent of calibrated span, zero based. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits. Output shall be linear isolated 4-20 milliamperes 24 VDC. Power supply shall be 24 VDC, two-wire design. Overload capacity shall be rated at a minimum of 25 MPa. Environmental limits shall be -40 to 85 degrees Celsius at 0-100% relative humidity. Each transmitter shall have a stainless steel tag with calibration data attached to body.

2. The piezoresistive silicon pressure sensor shall be mechanically, electrically, and thermally isolated from the process and the environment, shall include an integral temperature compensation sensor, and shall provide a digital signal to the transmitter's

electronics for further processing. Factory set correction coefficients shall be stored in the sensor's non-volatile memory for correction and linearization of the sensor output in the electronics section. The electronics section shall correct the digital signal from the sensor and convert it into a 4-20 mA analog signal for transmission to receiving devices. The electronics section shall contain configuration parameters and diagnostic data in non-volatile EEPROM memory and shall be capable of communicating, via a digital signal superimposed on the 4-20 mA output signal, with a remote interface device. Output signal damping shall be provided, with an adjustable time constant of 0-36 seconds. Total Long-Term Stability (Frequency of Calibration) shall be no less than 0.125% for 2 years.

3. Transmitter shall be furnished with a 4-digit LCD indicator capable of displaying engineering units, % of output, and/or milliamps and mounting hardware as required.

4. Display will also have the options of local pushbuttons capable of full configuration of the transmitter without the need for a secondary device.

5. Transmitter shall be factory furnished with a 316 ss two valve manifold.

2.2 SAFETY

A. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest addition.

B. All devices shall be certified for use in hazardous areas: Class I, II, III Div. 1, 2, Groups A-G; temperature rating T6 (85° C).

C. Electrical equipment housing shall conform to NEMA 4x/6p classification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process condition.

B. Examine the installation location for the instrument and verify that the instrument will work properly when installed.

3.2 INSTALLATION

A. As shown on installation details and mechanical Drawings.

B. As recommended by the manufacturer’s installation and operation manual.

3.3 FIELD QUALITY CONTROL

A. Demonstrate the performance of all instruments to the ENGINEER before commissioning.

B. ENGINEER to witness all instrument calibration verification in the field.

C. Each instrument shall be tested before commissioning and the ENGINEER shall witness the response in the PLC control system and associated registers.

3.4 ADJUSTING

A. Verify set-up and configurations of all instruments in accordance with the Manufacturer's instructions.

3.5 PROTECTION

A. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.
   1. The ENGINEER shall be the sole party responsible for determining the corrective measures.

END OF SECTION 40 73 23.26

SECTION 407363 - DIAPHRAGM SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Diaphragm seals.

B. Related Requirements:

1. Section 407313 - Pressure and Differential Pressure Gauges: Pressure gages requiring isolation from process fluid.
2. Section 407326 - Gauge-Pressure Transmitters: Pressure transmitters requiring isolation from process fluid.

1.2 REFERENCE STANDARDS

A. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for system materials and component equipment, including connection requirements.

C. Shop Drawings:

1. Indicate system materials and component equipment.
2. Submit installation requirements and other details.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Source Quality-Control Submittals: Indicate results of **factory** tests and inspections.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statement:

1. Submit qualifications for manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of equipment and accessories.

1.5 QUALITY ASSURANCE

A. Ensure that materials of construction of wetted parts are compatible with process liquid.

B. Materials in Contact with Potable Water: Certified to NSF 61 and NSF 372.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 WARRANTY

A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish one-year manufacturer's warranty for diaphragm seals.

PART 2 - PRODUCTS

2.1 DIAPHRAGM SEALS

A. Manufacturers:
1. Ashcroft
2. Ametek

3. Approved Equal.

B. Description:

1. Mounting:

a. Directly to pressure gage socket.

2. Wetted Parts and Bolt Materials: Corrosion resistant to process fluid.
3. Provide fill/bleed screw for filling of diaphragm seal.
4. Instrument Connection: NPT, 1/4 inch.
5. Process Connection: NPT, 1/2 inch.
6. Flushing Connection: NPT, 1/4 inch.
7. Working Pressure Rating: Pipeline test pressure.
8. Calibration: Provide cleanout ring to be removed for recalibration or cleaning, without loss of filling liquid or change in calibration.

2.2 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Diaphragm Seals:

1. Factory-assemble, fill, and calibrate entire assembly, including gage, switch or transmitter prior to shipment.
2. Field filling is not acceptable.

C. Provide shop inspection and testing of completed assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that items provided by other Sections of Work are ready to receive Work of this Section.

3.2 INSTALLATION

A. According to manufacturer instructions.

B. Mount only one pressure element per diaphragm seal unless noted otherwise.

3.3 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

3.4 DEMONSTRATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 407363

SECTION 40 75 33 – CHLORINE ANALYZERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Free Chlorine Reagentless Amperometric Electrodes
2. Dual Input Transmitters

B. Related Requirements:

1. Section 26 05 23 – Control Voltage Electric Power Cables: Wiring connections to equipment.
2. Section 26 05 53 - Identification for Electrical Systems: Nameplates.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for system materials and component equipment, including electrical characteristics and connection requirements.

C. Shop Drawings:

1. Indicate size and configuration of assembly, mountings, weights, and accessory connections.
2. Indicate system materials, component equipment, wiring diagrams, and schematics.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.

H. Qualifications Statement:

1. Submit qualifications for manufacturer.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.6 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish one-year manufacturer's warranty for Electrodes and Transmitters.

1.7 PROJECT OR SITE CONDITIONS

A. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.

1.8 CALIBRATION

A. Analyzers and sensors shall arrive pre-calibrated and ready for installation. Calibration information is to be stored in the sensor for automatic download to the transmitter, once connected.

1.9 MAINTENANCE

A. Provide all parts, materials, etc. necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Hach
B. Emerson-Rosemount
C. Prominent
D. Or Approved Equal

2.2 CHLORINE SENSOR

A. Performance criteria (Sensor):

1. Free Chlorine measuring range: 0 to 6 ppm.
2. Response time: Less than or equal to 30 seconds.
3. Maximum measured error: ±2% of the measured value ±0.2 mg/l.
4. Repeatability: ± 2% of the displayed value.
5. Sensor type: Reagentless Amperometric electrode.

B. Environment:

1. Ambient temperature range: 32 to 122 °C.
2. Process temperature range: 32 to 122 °C.
3. pH range for Chlorine - Independent of pH between 7 and 10.
4. Process Connection: 1 in MNPT
5. Sample Flow Required: 1-4 gal/hr.

C. See P&ID: AE/AIT 1001

2.3 TRANSMITTER

A. Dual Input or Single Input as required.

B. Case: Polycarbonate.

C. Display: Four Line Backlit.

D. Outputs:

1. Four 4-20 mA isolated outputs (Fully scalable and independently assigned to Chlorine, temperature and pH).
2. Four alarm relay outputs (programmable and assignable for high-low operation, dead band, setpoint, internal fault or timer).

E. Mounting:

1. All components shall be mounted on a backplate
2. System shall include a constant head flow controller for the sample flow.
3. Sensors shall be prewired to the transmitter

4. Inlet shall include a check valve to ensure that sensors remain submerged in the event of sample flow loss.

2.4 SAFETY

A. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest addition.

B. All devices shall be suitable for operation in a non-hazardous area.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process conditions.

B. Examine the installation location for the instrument and verify that the instrument will work properly when installed.

3.2 INSTALLATION

A. Contractor will install the transmitter and sensor in strict accordance with the manufacturer's instructions and recommendation.

B. Coordinate the installation with all trades to ensure that the mechanical system has all necessary appurtenances for proper installation of instruments.

1. General contractor.
2. Electrical or Instrumentation contractor.
3. Factory trained authorized service provider or representative.
4. Site (owner/operator) personnel.
5. Engineer.

3.3 FIELD QUALITY CONTROL

A. Each instrument shall be tested before commissioning and the Engineer shall witness the interface capability in the PLC control system and associated registers.

1. Each instrument shall provide direct programming capability through the PLC.
2. Each instrument shall be supported with a device profile permitting direct integration in the PLC.

B. The Engineer shall witness all instrument verifications in the field.

C. Manufacturers Field Services Field Services are available for start-up and commissioning by a manufacturer authorized service provider – the warranty against manufacturing defects is three years.

1. Manufacturer field service representative shall verify installation of all installed sensors, cables and transmitters.
2. Manufacturer representative shall notify the Engineer in writing of any problems or discrepancies and proposed solutions.
3. Manufacturer representative shall generate a configuration report for each senor installation following commissioning.

3.4 ADJUSTING

A. Verify factory setup of all instruments in accordance with the Manufacturer's instructions.

3.5 PROTECTION

A. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.

1. The Engineer shall be the sole party responsible for determining the corrective measures.

END OF SECTION 40 75 33

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 41 22 00 - HOISTS AND CRANES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cranes, Hoists and Lifts of the Following Types:

1. Free standing bridge cranes.

1.2 RELATED SECTIONS

A. Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

A. American Institute of Steel Construction (AISC) - Manual of Steel Construction, Part 5, Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

B. American National Standards Institute (ANSI):ANSI B30.11 - Monorails and Underhung Cranes.

C. ASTM International (ASTM):

1. ASTM A36 - Carbon Structural Steel.
2. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/150 ksi Minimum Tensile Strength.
3. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
4. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

D. American Welding Society (AWS) D1.1 - Structural Welding Code.

E. Occupational Safety and Health Administration (OSHA) - Specification 1910.179 - Overhead and Gantry Cranes.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Describe capacities, performance, operation, and applied forces to foundation.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Shop Drawings: Shop drawings showing configuration, dimensions, service area, and construction and installation details.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in designing and manufacturing cranes with 25 years successful experience.

B. Installer Qualifications: Company experienced in assembly and installation of cranes with 5 years successful experience and acceptable to crane manufacturer.

1. Perform welding by certified operators in accordance with AWS D14.1.
2. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.
3. Clearly label crane with rated load capacity. Place label at height and location easily read from floor level and loading position.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

A. Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace assemblies and components that fail in materials and workmanship within warranty period from date of Substantial Completion.
1. 5 years or 10,000 hours warranty for manual push-pull work station crane, jib crane, and gantry crane products to cover defects in materials and workmanship.
2. 2 years or 4,000 hours warranty for motorized tractor products.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufactures: Subject to compliance with requirements, provide products by one of the following Manufactures:
1. Eastern Hoist & Crane
2. Gorbel Inc.,
3. R&M Materials Handling
4. L.K. Goodwyn Co.

2.2 BRIDGE CRANES

A. Performance:

1. Crane shall provide coverage of rectangular area of size indicated on Drawings and consist of:
a. Support structure requiring only primary structural support without longitudinal

or lateral bracing.
b. Two rigid, parallel runways. Cranes with more than two runways or with articulating runways are not acceptable.
c. Rigid, single girder bridge moving perpendicular to runways or monorail. Double girder bridges and ones with articulating or threaded connections are not acceptable.

2. Modular, pre-engineered design: Crane system shall be capable of expansion, disassembly and relocation, and accepting additional or multiple mixed capacity bridges.
a. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11, and OSHA 1910.179.

3. Productivity ratio: Crane shall be designed to manually move load with maximum force of 1/100 load weight.

4. Runway and bridge track: Enclosed type limiting dust and dirt collection on rolling surfaces with maximum deflection of 1/450 span based on capacity plus 15 percent for lifting device weight.

5. Crane operating temperature: 5 to 200 degrees F (-15 to 93 C).

6. Crane shall be designed to withstand:
a. Structural design shall include full rated load capacity plus 15 percent for hoist and trolley weight and 25 percent impact factor for speed of lifting device and weight of tooling.
b. Crane and hoist dead load.
c. Live load capacity equal to net rated hook load: 6,000 Lbs. (3 Tons)
d. Inertia forces from crane and load movement.

B. Free Standing Bridge Crane: Work station, bridge crane with free standing support structure, two runways, bridge moving perpendicular to runways, and equipped with enclosed track, end trucks, hoist trolley, festooning system, bumpers, and other accessories.

1. Construction: Fabricate from ASTM A36 steel sections with finished ends and surfaces.

2. Support structure: Support crane runways with frames consisting of two columns and horizontal header.
a. Columns: Square tubes with bottom base plate and top header plate.
b. Header: Fabricated from two back-to-back channels spaced apart and joined with welded end plates. Provide clamp plates, threaded rods, lock washers, and hex nuts for attaching header to column.
c. Hanger assemblies: Provide each support frame with pair of hanger assemblies that provide a rigid connection for suspending runways. Assembly to consist of clamp angle, clamp plates, threaded rods, lock washers, and hex nuts.

3. Runways: Vierendeel truss fabricated from square steel tubes and enclosed steel track.
a. Track: Enclosed, cold formed, steel box track which serves as bottom cord of runway and permits end trucks and festoon carriers to ride on lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.
b. Splice joint: Provide truss splice plates, channel-shaped track splice joint, bolts,

lock washers, and nuts for joining runway sections. Splice joints must be located within four feet of a support point.

c. Runway Cantilevers: Up to 4 feet (1219 mm) of cantilever is allowed from a hanger location to the end of the runway.

d. Festoon stack section: Provide enclosed track extension to provide for stacking festoon carriers at end of runway.

4. Bridge: Single girder, Vierendeel truss fabricated from rectangular steel tubes and enclosed steel box track; patented truss design for 1000, 2000, and 4000 lb. capacities.
   a. Track serves as bottom cord of bridge and permits hoist trolley and festoon carriers to ride on lower inside flanges.
   b. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

5. Bridge: Enclosed, cold formed steel box track which permits hoist trolleys and festoon carriers to ride along track lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

6. Bridge: Extruded aluminum enclosed track reinforced with extruded aluminum T-beam.
   a. Provide as either one piece extrusion or with separate T-beam bolted to track.
   b. Track: Enclosed, box track designed for trolleys and festoon carriers to ride on lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

7. End trucks: Rigid frame end truck designed to ride inside enclosed runway track and connect to and suspend bridge.
   a. Construction: Stamped steel fabrication with both vertical and horizontal wheels to prevent binding in runway. Designs with welds in tension are not acceptable.
   b. Wheels: Removable, self-centering wheels with sealed lifetime lubricated bearings. Vertical wheels shall be tapered 2 degrees to match track profile. Non-removable or non-tapered wheels are not acceptable. Duracomp 4 wheel material. Steel wheels are not acceptable.
   c. Drop lugs: Provide on both sides of truck to limit truck drop in the event of wheel, axle, or load bar failure.
   d. Connection to the bridge: Provide a rigid connection between bridge and end truck. Articulating connections with threaded hardware are not acceptable.
   e. Designed for easy attachment of peripherals.

8. Hoist trolley: Rigid-body trolley designed to ride inside enclosed track of bridge and to carry hoist and load. Articulating trolleys are not acceptable.
   a. Construction: Two-piece stamped steel body with two wheels each side and tapered clevis positioning hoist hook at center of trolley so load weight is evenly distributed to all four trolley wheels. Provide removable clevis pin of type and size determined by manufacturer for specified capacity. Trolleys with non-removable clevis pins are not acceptable. Holes provided in body for mechanical connections.
   b. Wheels: Removable, self-centering wheels with sealed lifetime lubricated

bearings. Vertical wheels shall be tapered 2 degrees to match track profile. Non-removable or non-tapered wheels are not acceptable. Duracomp 4 wheel material. Steel wheels are not acceptable.

c. Drop lugs: Provide on both sides of trolley to limit trolley drop in the event of wheel, axle, or load bar failure.

d. Designed for easy attachment of peripherals.

9. End stops: Molded composite, resilient bumper installed in runway and bridge tracks to prevent end trucks, hoist trolley, and festoon carriers from rolling out of track. Bolt stops without energy absorbing bumper are not acceptable.

C. Tractor Drive:

1. Provide electric tractor drive for motorized operation of hoist trolley and end truck as indicated or scheduled; Tractor Drive.
   a. Type: Variable frequency drive assembly with worm gear reducer, molded polyurethane tread, and adjustable counter-balance to ensure proper drive wheel alignment.
   b. Speed: 70 feet per minute (21.3 m per minute).
   c. Motor: 1/3 HP, 1800 RPM, 3 phase, 208-460 volt, with thermal overload protection.
   d. Controls: 120 volt control package with transformer, terminal strips, fusing, enclosure, and mounting brackets.
   e. Controls to be field wired to drive motor.

D. Festoon Assemblies:

1. Provide length of cable and/or air hose to supply lifting device. Supply shall be festooned along bridge and runway. Refer to drawings for type and size.

2. Festoon trolleys: Four-wheeled trolleys with pivoting saddle and applicable attachment to support service run on runway or bridge and allowing festooning as end truck or hoist trolley travels.

3. Festoon gliders: T-shaped gliders with adjustable applicable attachment to support service runs on runway or bridge and allowing festooning as end truck or hoist trolley travels.

4. Festoon clamp: Steel clamp assembly attached to track to prevent festoon trolleys and gliders from exiting track.

5. Festoon tow clamp: Steel clamp assembly attached to track to prevent festoon from binding under with end truck or trolley.

2.3 SHOP FINISHING

A. Steel: Steam wash steel crane components with iron phosphate solution and apply blue baked enamel finish.

B. Aluminum: Mill finish.

C. Provide spray can of matching color, air-drying paint for field touch-up.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until support structures have been properly prepared.

B. Design and construction of reinforced concrete footings and slabs as detailed on Drawings and specified in other sections. Verify that accurate crane applied forces and anchor bolt patterns are provided for foundation design.

3.2 INSTALLATION

A. Install units and accessories in accordance with manufacturer's instructions and approved shop drawings. Do not modify crane components in any manner without advance written approval by crane manufacturer.

B. Clearances for Moving Crane Components:
   1. 3 inches (76 mm) minimum vertical clearance from any overhead obstruction.
   2. 2 inches (51 mm) minimum horizontal clearance from any lateral obstruction.
   3. Prior to applying proper torque to the bolts, ensure runways are:
      a. Level to within plus or minus 1/8 inch in 20 feet (3 mm in 6.1 m).
      b. Parallel with opposite runway to within plus or minus (3 mm in 6.1 m).

3.3 FIELD QUALITY CONTROL

A. Perform field quality control testing as recommended by manufacturer. Move bridge and hoist trolley through entire travel to ensure crane is clear of obstructions and moves freely and smoothly. Inspect installed crane. Verify all bolts are tight and lock washers fully compressed.

B. Field test crane and accessories for operating functions. Ensure crane movement is smooth and proper. Adjust as required and correct deficiencies.

C. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer provided matching paint. Protect crane from other construction operations.

3.4 DEMONSTRATING AND TRAINING

A. Provide demonstration and training session for Owner's representative covering operation and maintenance.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SUPPLEMENTAL SPECIFICATIONS

Grand Strand Water & Sewer Authority
Standard Specifications

THIS PAGE INTENTIONALLY LEFT BLANK

GRAND STRAND
WATER & SEWER
AUTHORITY

WATER SYSTEM STANDARDS

AND

SPECIFICATIONS

PREPARED BY:

PLANNING/ENGINEERING DIVISION

GRAND STRAND WATER AND SEWER AUTHORITY

PO BOX 2368

166 JACKSON BLUFF ROAD (29526)

CONWAY SC 29528-2368

JULY 2019

WATER SPECIFICATIONS

TABLE OF CONTENTS

CHAPTER 1

DEFINITIONS, ABBREVIATIONS, AND GENERAL

1.1 INTERPRETATION OF CERTAIN TERMS OR WORDS

Except as specifically defined herein, all words used in these standards have their customary dictionary definitions. For the purposes of this policy, certain words or terms used herein are defined as follows:

1.1.1 Words used in the present tense include the future tense. Words used in the singular include the plural and words used in the plural include the singular.

1.1.2 The work **"shall"** is always mandatory.

1.1.3 The word **"may"** is permissive.

1.1.4 The work **"lot"** includes the work **"plat"** or **"parcel".**

1.1.5 The work **"person"** includes a firm, association, organization, partnership, trust company, or corporation as well as an individual.

1.2 DEFINITIONS

1.2.1 AUTHORITY

The Board of Directors of the Grand Strand Water and Sewer Authority is the governing Authority.

1.2.2 DHEC

Department of Health and Environmental Control of the State of South Carolina.

1.2.3 LOT

A part of a subdivision, or parcel of land used as a building site or intended for such use, immediate or future.

1.2.4 UTILITY RIGHT-OF-WAY/EASEMENT

Private right-of-ways or easements for Authority utilities shall not be deemed dedicated to the Authority but for use of the authority's utilities.

1.2.5 PUBLIC RIGHT-OF-WAY/EASEMENT

Public Right-of-Way or Easement's are considered to mean street right-of-ways or any other public right-of-ways.

1.2.6 ENGINEER

A person registered as a Professional Engineer in good standing with the South Carolina Board of Engineering Examiners.

1.2.7 LAND SURVEYOR

A person registered as a Land Surveyor by the South Carolina Board of Engineering Examiners.

1.2.8 SUBDIVISION

The division of a tract of land into two or more lots for the purpose, whether immediate or future, of sale, legacy, or development. This includes all division of land involving a new street or a change in the arrangement of streets and includes any re-subdivision of land. Subdivision shall also refer to uses of land not ordinarily considered a subdivision but requiring utility installations. Examples of these non-subdivision uses are mobile home parks, multifamily projects, townhouses, and planned unit developments.

1.2.9 DEVELOPER

Any person, firm, corporation, or other legal entity improving property for commercial, industrial, or residential purposes.

1.2.10 PLAT

A map or drawing upon which the development plan is presented for approval.

1.2.11 CONTRACTOR

A person or entity authorized to perform construction by the State of South Carolina Licensing board for contractors. A contractor may not perform work outside of his licensed capacity, this includes well drillers,

water and sewer lines, pump station, and electrical contractors. Where required, all sub-contractors must be certified. The authority reserves the right to accept or reject any contractor or sub-contractor selected to perform work on the systems to be conveyed to the Authority.

1.2.12 DESIGN

The design of water systems shall be done only by persons properly registered under the Professional Engineer's Act of the Business and Professions Code of South Carolina.

All calculations requested by the Authority to verify the design of any portion of the water system shall be submitted to the Authority for their use. Calculations shall be based on rational methods generally accepted by the engineering profession and shall be neatly and legibly done in such form as to enable them to be readily checked.

1.2.13 STANDARD DRAWINGS

Standard drawings, the latest revisions thereof, approved by the Authority for water system construction purposes shall be considered a part of these standards and shall be used in conjunction with these Standards for all subdivision and extension of water system installations. Construction by methods differing from the Standard Drawings which will give equivalent or better results may be approved by the Authority if prior approval or such methods is obtained.

1.2.14 CONFLICTS

In case of conflict between plans, specifications, these Standards or Standard Drawings, precedence shall be given in the following order: (1) Standard Drawings, (2) These Standards, (3) Plans, and (4) Specifications. However, a deviation from the Standard Drawings of these Standards will be approved if a specific note regarding the particular deviation is included on the Plans and Specifications.

1.2.15 CUSTOMER

Customer means any person, firm, association, or governmental agency supplied or entitled to be supplied with sewer service.

1.2.16 OTHER SPECIFICATIONS

Whenever in these Standards other specifications are mentioned, it shall be understood that the materials or methods mentioned shall conform to all requirements of the latest revision of the specifications so mentioned.

1.2.17 PAVED SURFACE

Paved surface includes any pavement used on any street in the county, whether such pavement is composed of concrete, asphalt, oil, gravel, crushed rock or any combination of said forms of pavement.

1.2.18 P.S.I.G.

P.S.I.G. means pounds per square inch, gauge.

1.2.19 PLANS

Plans means all plans, profiles, maps or drawings which show the location, character, dimensions, and details of the work which has been approved for construction by the Engineer.

1.2.20 SERVICE LATERAL

Service lateral means a connection between a water main and user house service.

1.2.21 PUMP STATION

Pump station means a structure and/or pumping facility to facilitate the further transmission of water through the use of pumps and periodic minimal storage.

Those specifications approved by the Engineer for work covered by these specifications.

1.2.22 THESE STANDARDS

These Standards shall mean the standards contained herein.

1.2.23 USER CONNECTION

User connection means the point of connection a user's piping to the Authority's service lateral.

1.2.24 WATER MAIN

Water main means any pipe or conduit that is part of a transmission system and is used to transport or is intended to be able to transport water flow to more than one user connection.

1.2.25 WATER SYSTEM

Water system means the source, facilities, and transmission system and shall include all those facilities of the water system under the control of the Authority up to the customer's connection.

1.2.26 USE OF WATER

Connection of house services to service laterals and subsequent use of water either temporarily or permanently, shall not be allowed prior to acceptance of the water system by the Authority.

1.3 ABBREVIATIONS

Whenever in these standards the following abbreviations are used, the intent and meaning shall be interpreted as follows:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Office.
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute

AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ASAE	American Society of Agriculture Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASTE	American Society of Transportation Engineers
ASTM	American Society of Testing and Materials
AWI	American Welding Society
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers' Bureau
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers' Association
CBMA	Certified Ballast Manufacturers' Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers' Association of America
CRSI	Concrete Reinforcing Steel Institute
FED SPEC	Federal Specifications

HI	Hydraulic Institute
HMI	Hoist Manufacturers' Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
ICEA	Insulated Cable Engineers' Association
JIC	Joint Industry Conferences of Hydraulic Manufacturers'
MMA	Monorail Manufacturers' Association
NBHA	National Builders' Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers' Association
NWMA	National Woodwork Manufacturers' Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both federal and state)
PS	Product Standards Section - US Department of Commerce
RLM	RLM Standards Institute, Inc.
RMA	Rubber Manufacturers' Association
SAE	Society of Automotive Engineers
SDI	Steel Door Institute
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufactures' Association
TCA	Title Council of America

UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
WWPA	Western Wood Products Association
SCDOT	SC Department of Highways and Public Transportation

Unless a particular issue is designated, all references to the above specifications, standards, or methods shall, in each instance, be understood to refer to the issue in effect (including all amendments).

1.4 GENERAL CONTRACTOR REQUIREMENTS

1.4.1 COORDINATION

Contractors shall cooperate in the coordination of their separate activities in a manner that will provide the least interference with the Owner's or Authority's operations and other contractors and utility companies working in the area, and in the interfacing and utility companies working in the area, and in the interfacing and connection of separate elements of any overall project work.

If any difficulty or dispute should arise in the accomplishments of the above, the problem shall be brought immediately to the attention of the Engineer.

All contractors working on site are subject to this requirement for cooperation, and all shall abide by the Engineer's or Authority's decision in resolving project coordination problems without additional cost to the Engineer, Owner or Authority.

1.4.2 SHUTDOWN OF EXISTING OPERATIONS OR UTILITIES

Continuous operation of the Authority's or the Owner's existing services or utilities, or for other work that requires the temporary shutdown of any existing operations or utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the Engineer and the Authority.

All materials and equipment (including emergency equipment) necessary to expedite a tie-in shall be on hand prior to the shutdown of existing services or utilities.

1.4.3 OPERATION OF EXISTING SYSTEM

At no time is it allowed to close off any water lines or take any other action which would affect the operation of the existing system, except as specifically required by the drawing and specifications and after prior approval has been granted by the Authority. Request approval a minimum of five working days in advance of the time that interruption of the existing system is required, and comply with the authority's shut down policy.

1.4.4 SCHEDULING

Plan the work and carry it out with minimum interference to the operation of the existing facilities. Prior to starting the work, confer with the Engineer, the Authority and the Owner's representative to develop an approved work schedule which will permit the facilities to function as normal as practical. A pre-construction conference shall be conducted per Authority Developer Policy in effect. it may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions. The Contractor shall do this work at such times, and at no additional cost to the Authority or Owner. Do not make inspection and test have been completed on the new work and it is found to conform in all respects to the requirements.

Work on existing structures and facilities shall be performed no schedule and in a manner that will permit the existing facility to operate continuously.

1.4.5 EQUIPMENT MAINTENANCE DURING CONSTRUCTION

All equipment installed shall be provided with the manufacturers' recommended oil and lubricants by the Contractor and shall be maintained and operated by the Contractor until final acceptance by the Owner or Authority; however, approval to operate specific equipment on temporary basis until final acceptance is achieved may be obtained from the Authority. Said special circumstances and equipment smut be substantially complete and written request and approval by the Engineer of work must be submitted for the Authority's review and approval or denial.

1.4.6 EQUIPMENT AND SYSTEM TESTING

Functional (or run) testing, in the presence of the manufacturers' representative and/or Engineer, will be required for each item of equipment following installation. Functional testing is defined as that testing necessary to determine if installed equipment and system will operate as intended.

In addition to the functional test, specific performance testing of installed equipment and systems shall be conducted by the Contractor as required in the section specifying the equipment or system.

The Contractor shall furnish all labor, materials, tools, equipment, instruments, and services necessary to perform the functional and performance testing.

1.4.7 PROGRESS OF PIPELINE CONSTRUCTION

The work shall proceed in a systematic manner so that a minimum of inconvenience will result to the public in the course of construction. It is, therefore, necessary to confine operations to as small a length of work area per crew as is practical. Normally, the trenching equipment shall not be farther than 200 feet ahead of each pipe-laying crew or such distance as necessary to provide maximum safety. Backfill the trench so no section of approved pipe is left open longer than is absolutely necessary.

1.4.8 SAFETY

The Contractor will be completely responsible for the safety conditions of the job site including compliance with all applicable laws. Safety conditions will include, but is not limited to, pipe construction, trenching, chemicals, electrical, blasting and other construction procedures or items utilized for the project.

1.4.9 SHOP DRAWINGS AND SUBMITTALS

The Contractor will provide the Authority with two (2) sets of shop drawings for all applicable items.

CHAPTER 2

WATER SYSTEM INSTALLATIONS

2.1 GENERAL

The Contractor shall be responsible for complying with the current South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management (OCRM) regulations and requirements.

The Contractor shall perform all work necessary for or incidental to the performance and completion of water system installations. This work shall be completed as shown on the latest revisions of the standard drawings and as may be specified in contract documents. This work shall include the furnishing of all labor, materials and equipment necessary for a complete and operational system. The Contractor shall be responsible for coordinating the work to assure that the work is completed in an orderly manner.

Although such work may not be specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete water system installation shall be furnished and installed as part of the work.

2.1.1 EXISTING UTILITIES, STRUCTURES, AND OTHER ITEMS

The Contractor will take precautions to prevent any unnecessary damage to existing utilities, structures, property and other items in the work area. Any work resulting in damage to utilities, structures or other items as a direct or indirect result of the Contractor's work shall be the responsibility of the Contractor.

Any liabilities, fines or penalties to the Authority resulting from damage caused by the Contractor or from negligence of the Contractor shall be reimbursed by the Contractor.

The Contractor will be responsible for verifying the location and existence of all underground utilities. Location of utilities on the plans, whether fully and correctly located or partially and/or incorrectly located or omitted will not relieve the Contractor of the responsibility or liability for damage to the utilities. The contractor will be responsible for contacting local utilities for assistance in locating utilities. The Contractor must fully comply with the south Carolina Underground Utilities Damage Prevention Act, General Statutes 58-35 Sections 20 through 120 and all applicable statues and state approved requirements.

The Contractor shall replace and/or repair any drainage culverts necessary to be removed or that have been damaged during work performed. All drainage from ditches or culverts shall be maintained during progression of the work so that any damage to the property, public or private will not result from lack of or diversion of existing drainage courses. At completion of the project, all drainage ditches and culverts will be completely opened and natural drainage restored. it will be the responsibility of the Contractor to replace property corners to proper locations if damaged or destroyed as a result of the Contractor's work.

The Contractor shall be responsible for obtaining a letter of release from SCDOT for work performed n state right-of-ways or from Horry County Public Works for work performed within county right-of-ways. Final release of retainage shall not occur until all letters of release are provided to the Engineer.

Mail Boxes:

Where mail boxes are encountered during the installation of lines, the mail boxes and posts may be carefully removed temporarily only and shall be replaced immediately after backfilling and pipe laying has passed the box location. Said box shall be replaced for use the same day as removed and shall be restored as may be needed to conform to its prior condition with the exception that the distance from the bottom of the box to ground level shall be 43". Any and all necessary replacements of posts and/or boxes needed to conform to this requirement are considered as a part of the overall cost for pipe installation work and no additional compensation will apply.

2.1.2 DEBRIS REMOVAL

All material and debris resulting from clearing operations shall be disposed of by the Contractor as directed by the Engineer and/or Authority.

2.1.3 UNCLASSIFIED EXCAVATION

All excavated material removed for water system installations shall be considered unclassified material.

2.1.4 EXCESS MATERIALS

All excess materials will be disposed of by the contractor at a location or in a manner approved by the Engineer and/or the Authority.

2.1.5 ACCESS

The Contractor during the course of the work will maintain a full access to public or private properties including but not limited to driveways, sidewalks, fire hydrants and streets. The contractor is responsible for coordinating work to minimize any inconvenience to the public as a result of the construction work under this contract. The length of trench open per crew at any one time will not exceed 200 linear feet unless otherwise approved by the Engineer and no section of trench will be left open any longer than is absolutely necessary. Failure to comply with these provisions may necessitate shutdown of the entire project until backfilling of open trenches is performed. The Contractor will be responsible for the safety conditions of the open trench.

2.1.6 WATER SYSTEMS PROTECTION FROM CONTAMINATION

a. Separation from Sewer Systems

Construction shall be in accordance with the South Carolina STATE PRIMARY DRINKING WATER REGULATIONS (R.61-58). In particular R. 61-58.40 (12) addresses separation requirements between water and sewer mains. Refer to Section 4.5.3 of these specifications for further information on this subject.

b. Construction in Contaminated Areas

If a water main must pass through a contaminated site, the construction materials must be suitable to protect the water system from contamination. Also provisions are to be made for suitable disposing of spoil materials in accordance with all applicable local, state, and federal requirements.

During the course of construction if a contaminated area is encountered, this information shall be brought to the engineer's attention so that an evaluation can be made to determine the best course of action to either avoid the area or to make provision for appropriate materials and disposal of spoil. Approval by the Authority and SCDHEC must be outlined before implementing a course of action for such a situation.

c. Material in Contact with Water Mains

All materials and products which come into contact with drinking water must be certified as meeting the specifications of the American National Standards Institute/National Sanitation Foundation. (ANSI/NSF) Standard 61. Drinking Water System Components - Health Effects.

2.1.7 CROSS CONNECTION CONTROL (BACKFLOW PREVENTION DEVICES):

a. There shall be no connection between the distribution system and any pipes, pumps hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system. *(R.61-58.4.D.(14)(a))*

b. No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved back-flow prevention device. *(R.61-58.4.D.(14)(a))*

c. High hazard category cross connections shall require an air gap separation or an approved reduced pressure backflow preventer. (R.61-58.7.F(4))

d. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into the pit. *(R.61-58.7.F.(5))*

e. All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.

f. Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double detector check valve assembly. *(R.61-58.7F.(6))*

2.2 PIPELINE TRENCHING

2.2.1 TRENCHING, GENERAL

a. Trenches will be excavated by the open cut method to a depth shown on the plans and necessary to accommodate the work including bedding. The Contractor shall take precaution to avoid excavating below the

necessary depth in order to maintain existing firm conditions. In the event of over excavation, the trench will be backfilled with approved materials and thoroughly compacted in six (6) inch lifts.

b. Trench widths will be limited to provide ample room for workmen. Trench widths at the top of the pipe will not exceed the total width of the outside diameter of the pipe plus eighteen (18) inches for pipes with outside diameters of thirty-three (33) inches and less, and the total width of the outside diameter of the pipe plus twenty-four (24) inches for pipes with outside diameters greater than thirty-three (33) inches. When sheeting is necessary the allowable trench width will be increased by the thickness of the sheeting.

c. Trench walls shall be cut vertically from the trench bottom to the top of the pipe. Top of trench width shall not exceed a width brought about by a one and one-half (1 1/2) horizontal to one (1) vertical slope from the top of the pipe to the surface of the ground. The maximum allowable top of trench width will be fifteen (15) feet. Any damage to any item, including pavement, as a result of exceeding the allowable trench width, and any liability thereof, will be considered the responsibility of the Contractor.

2.2.2 TRENCHING METHODS

a. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equi-distant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as recommended by manufacturer. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 12 inches above the type of the pipeline. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe and the pipe embedment materials.

b. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of

the trench. Bell holes shall be large enough to permit proper joint installation in the pipe.

c. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade are encountered such material shall be removed and replaced with approved pipe foundation material consisting of gravel or crushed stone of a maximum diameter of 3/4". Cost of approved pipe foundation material shall be included in unit cost of pipe installation.

d. If required by the Engineer, after excavation, the space below the ultimate pipe grade shall be filled with pipe embediment materials consisting of gravel or crushed stone of maximum diameter of 3/4". Embediment shall be a minimum thickness of 4" below piping and up to the springboard of pipe (centerline). Embodiment shall extend the full width of trench and be compacted to proper grade and made ready for pipe laying.

e. Debris encountered in trench excavation for water and other pipelines shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a depth of six (6) inches below the bottom of the pipe for pipes smaller than twenty-four (24) inches in size; eight (8) inches below the bottom of the pipe for pipes twenty-four (24) inches to thirty-six (36) inches in size and twelve (12) inches below the bottom of the pipe for pipes larger than thirty-six (36) inches in size, if debris extends to such depth.

f. Bracing and sheeting will be provided as necessary to comply with trench width requirements of OSHA and other federal, state, and local requirements. The use of drag boxes or similar items may be acceptable provided subsequent moving of the box does not result in cave-ins. Sheeting shall be left in place until the pipe has been placed and back filled in the area of the pipe. Shoring and sheeting if removed must be done in a manner that will not upset pipe construction including creating unacceptable voids in the backfill.

g. The Contractor must take precautions in controlling the width of the trench to prevent unnecessary damage to adjacent roads, utilities and structures and to protect workmen and the public. The Contractor will be responsible for repairs or compensation due to such damage without additional compensation from the Owner.

h. Trenches shall be kept free of water during installation of the pipes. Water shall be disposed of in a manner so as not to damage adjoining private or public properties or in a manner as to be a detriment to public health. Payment for de-watering will be included in the unit price item for the pipe laid.

i. Pipes shall be kept free from any water, trench material or debris from entering the pipe during the pipe laying operation. Pipes shall be plugged with approved pipe plugs at all times to prevent foreign material and contaminated water from entering the pipe when the Contractor's personnel are not in attendance.

2.2.3 SITE GRADING, BACKFILLING, AND COMPACTING

a. The Contractor will stake out and establish proposed elevations of all items including structures, sidewalks, parking areas and utilities and any other layout work necessary for construction of the project. Grading work will be completed in accordance with the plans. Grading operations will be performed only under acceptable weather conditions and soil moisture contents. Final grades of proposed disturbed area will be brought to existing easements, pavement, curb, grassed, water, or other area grades in a manner acceptable to the Engineer's representative even if minor adjustments from plan grades are required.

b. During grading operations, the Contractor will be responsible for maintaining proper drainage and minimizing erosion. The Contractor will be responsible for re-establishing grades due to washout, settlement or other manner prior to acceptance.

c. The Contractor shall use only suitable backfill materials which shall be free from any deleterious materials and as approved by the Engineer and/or the Authority. Backfill will be hand or pneumatic tamped under and around the pipe in six (6) inch lifts up to twenty-four (24) inches above the top of the pipe. Backfill to the top of ground will be in eight (8) inch loose thickness lifts compacted as specified. Any pipe displaced or broken during back filling or compaction will be replaced at the Contractor's expense.

d. Compaction will be to a density of 95 percent of maximum dry density as determined by ASTM-D 698 or AASHTO Method T 99 for paved, concrete, parking or other unpaved areas common to traffic. In other areas of

Department of Highways and Public Transportation right-of-ways, the backfill must be compacted to ninety-five (95) percent of maximum dry density or to a density equal to that prior to the area's disturbances whichever is less. For all other areas, trench backfill will be compacted to a minimum ninety (90) percent of maximum dry density as determined by ASTM - D 698 and AASHTO Method T 99. Maximum dry density will be as determined by the Standard Proctor test.

e. When required by the Engineer, or the Authority, moisture density tests will be performed through a recognized testing laboratory. Should the compacted backfill fail the moisture density tests, the Contractor will uncover backfill until additional tests show adequate density exists. Additional tests at a site of initially failed testing will be paid for by the Contractor. Additional back filling and compaction requirements and bedding requirements are discussed in sections on Pressure Piping and Gravity Piping and are shown on the trench detail drawings.

f. Said work as above described shall be considered as a part of the unit cost items and unless otherwise described no additional compensation will be allowed.

2.3 CONSTRUCTION IN PUBLIC RIGHT-OF-WAY AND EASEMENTS

2.3.1 GENERAL

The Contractor shall perform all work necessary for or incidental to the performance and the completion of construction in all public right-of-ways and easements including but not limited to furnishing all labor, materials, and equipment. This work shall be completed as shown on the drawings and as specified in the contract documents. The Contractor shall be responsible for coordinating the work to assure that the work is completed in a timely and orderly manner.

Attention is directed to the plans for the removal and/or replacement of existing landscaping, shrubs, plantings, miscellaneous storage buildings, fences and lawn areas that might be in conflict with the work or may have been damaged. The Contractor shall replace any and all damaged or removed items with equivalent materials and conditions all to the satisfaction of the property owner and GSWSA.

Although such work may not be specifically shown or specified, all supplementary or miscellaneous items, removed and replaced items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work. Said work as above described shall be considered as a part of the unit cost items and unless otherwise described no additional compensation will be allowed.

2.3.2 ENCROACHMENT PERMITS

The Contractor will not proceed with construction along any South Carolina Department of Transportation (SCDOT) or other local county or municipal right-of-way or easement without approved encroachment permits from the appropriate agency having jurisdiction. The Contractor will keep a copy of approved encroachment permits at the project site at all times during the construction. The Contractors will be responsible for notifying and obtaining through the Engineer necessary encroachments permits from the appropriate agency, SCDOT, the county or municipality prior to initiating construction on any public right-of-way or easement. All work performed in SCDOT right-of-way will be in full accordance with the approved encroachment permits including any "Special Provisions" and SCDOT's "A Policy for Accommodating Utilities on Highway Right-of-Ways," latest edition and these specifications. Contractor shall be responsible for obtaining a letter of release from the appropriate agency stating their acceptance of reconstruction subject to normal warranty periods.

2.3.3 MATERIALS

All materials used within SCDOT right-of-ways will be SCDOT approved and are to be in accordance with SCDOT Standard Specifications for Highway Construction, latest edition. Base course material will be select aggregate base course (SABC) material from approved aggregate pits. Asphaltic concrete will be mix Type 3 (within the range of 6.0 and 6.5 percent liquid asphalt content) and will be mixed in approved batch plant. Asphaltic concrete will weigh a minimum of one hundred and ten (110) pounds per square yard per inch depth of asphalt placed.

2.3.4 PAVEMENT CUT AND PATCH

a. Any pavement cut or damaged during course of construction will be the responsibility of the Contractor and will be repaired by the Contractor. The Contractor must take due caution in controlling pavement damage during necessary pavement cuts as discussed in other sections of these specifications. After back filling of the trench required, for pavement cut,

the Contractor will backfill and compact base material in accordance with Section 306 of the SCDOT Standard Specifications from ten (10) inches below the existing pavement surface to the point flush with the pavement. The Contractor will maintain the cut in good order until such time as the patching is completed. Immediately prior to patching, the Contractor will remove the back filled stone from the point flush with the pavement to the proposed two (2) inch depth of pavement. The Contractor will then trim pavement and cut edges to true line. The pavement will be trimmed an additional six (6) inches beyond the trench edge to provide firm support on undisturbed material for the patch

b. After removal of the stone and trimming of the edges, an asphalt primer will be applied at .25 to .45 gallons per square yard over the entire surface of the stone in the cut and allowed to set. Existing asphalt surfaces contacted with the new asphalt will have applied a thin coat of hot asphalt cement or asphalt thinned with naptha immediately prior to placing of the asphalt. Asphalt joints shall be cut back to form a bond with freshly mixed asphalt and chilled asphalt. For asphalt thickness greater than three (3) inches, the asphalt will be placed in two lifts. The depth of the asphaltic concrete patch will be placed in a minimum of two (2) inches lifts and placed flush with the existing asphalt surface

c. For longitudinal cuts in pavement, the cut will be patched and the entire width of the roadway will be resurfaced for the longitudinal length of the cut. The depth of the resurfacing will be one (1) inch

d. Damage to pavement as a result of exceeding trench width regulations discussed in other sections or in the opinion of the Engineer or the Authority, as a result of Contractor carelessness during construction operations outside the immediate pavement area, will be the responsibility of the Contractor and will be repaired by the Contractor at no cost to the Owner or the Authority

e. All pavement and/or driveway cut and patch shall conform to the standard trench detail adopted by Grand Strand Water and Sewer Authority, SC DOT and Horry County Road Department.

2.3.5 MAINTENANCE OF EXISTING DRAINAGE

a. The Contractor will be responsible for maintaining drainage in all project areas during the course of construction. The contractor will be responsible for damage due to flooding as a result of construction practices. The contractor will take precautions to minimize erosion during construction.

b. The Contractor will be responsible for back filling, re-establishing turf, and restoring all properties including swales, ditches, culverts, etc. to a condition equal to or better than the original, to facilitate drainage.

c. For lines installed under culverts, the Contractor will provide 2,000 psi concrete arch encasement from the spring line of the proposed pipe to four (4) inches above the bottom of the culvert or use D.I.P. as directed by the Engineer or Authority representative. If the minimum distance between the top of the proposed pipe and the bottom of the culvert exceeds the radius of the culvert, the contractor will compact soil around and above the line to 95 percent of the maximum density (modified Proctor) and place 2,000 psi concrete from four (4) inches below the bottom of the culvert to a depth equal to the culvert radius or use D.I.P.

Erosion:

Provisions shall be made to prevent erosion and siltration caused by construction. Temporary grassing, hay bales, silt fences or other methods called for on the plans or as may be required, shall be used.

2.3.6 VEGETATION AND GRASSING

The Contractor will take precautions to avoid any unnecessary damage to trees, shrubbery or other vegetation in the right-of-ways. Shoulders, swales, easements, and other similarly disturbed areas will be grassed if required by the Engineer, the Authority or the Owner in accordance with Section 810 "Seeding" of the SC Department of Transportation Standard Specifications for Highway Construction and as follows: The following would apply if required by the Engineer, the Authority, or the Owner.

a. Seeding schedules will be as specified in SC Department of Transportation Standard Specifications for Highway Construction Section 810 for permanent vegetation - lower state.

b. Commercial fertilizer following ground preparation will be applied at a rate of 500 lbs. per acre Transportation Standard Specifications for Highway Construction and as follows: The following would apply if required by the Engineer, the Authority, or the Owner.

c. Seeding shall be uniformly sown in accordance with seeding schedules within 24 hours of application of fertilizers.

d. When required straw or hay mulch will be uniformly applied at a rate of 2 tons per acre. Emulsified asphalt RS-2 diluted with an equal amount of water will be uniformly applied over the mulch at a rate of .20 gallons per square yard. As an alternate method of seeding, wood cellulose fiber mulch shall be applied at a rate of 1,500 pounds per acre in a mixture of seed and fertilizer with hydraulic equipment in accordance with SC Department of Highways and Public Transportation's Standard Specifications for Highway Construction Section 810.17, Method.

e. A satisfactory stand of perennial grass as permanent vegetation will be developed.

f. Restoration and clean-up will follow immediately after backfill operations.

2.3.7 UNPAVED ROADWAYS

Unpaved or gravel highways of SCDOT, county or local municipality will be stabilized within the trench location for the top twelve (12) inches of backfill with crushed stone or SABC (coquina) mixed with binder after back filling in accordance with Section 2.2.3.

Site Grading, Back filling and Compacting flush with the roadway. Any other unpaved road, side road, driveway, or other area presently stabilized by use of rock material will be stabilized with four (4) inches of crushed stone or coquina after back filling, in accordance to Section 2.2.3 Site Grading, Back filling, and Compacting. Cost of restoring roadways shall be included in unit cost of pipe installation. All trench backfill work shall be in accordance with the applicable trench section standard detail adopted for the project.

2.3.8 TRAFFIC MAINTENANCE SAFETY AND CONTROL

The Contractor must maintain at least one lane of traffic at all times and no trenches will be left open over night. The contractor will receive permission from the local SCDOT Maintenance Engineer or the appropriate representative of the county or local municipality having jurisdiction prior to closing of a roadway. Work will be conducted so as to assure the least possible obstruction to traffic. The convenience of the general public and residences adjacent to the property are of prime importance and shall be provided for in an adequate and satisfactory manner.

All obstructions in right-of-ways will be protected by the Contractor providing signs, barricades and lights. Signs and flagmen in the construction area will comply with the 1972 SCDOT Manual of Uniform Traffic Control Devices for Streets and Highways, Rev. 6-1-76 and all subsequent addendums. All trenches which traffic will pass over will be maintained in a condition that will allow normal vehicular traffic to pass over. Temporary access drives will be provided when necessary.

Barricades and Warning Signs

The contractor shall erect, mark and maintain suitable barricades to protect and maintain public safety. Barricades, warning signs and other safety devices shall meet the requirements of OSHA, South Carolina Department of Transportation and GSWSA requirements. No work will commence until the contractor has secured approval for the agency responsible for the right-of-way in which construction is proposed.

2.3.9 ACCEPTANCE OF WORK

Upon completion of the project, a certification of acceptance of work along the public right-of way or easement will be obtained by the Contractor from all authorities having jurisdiction over right-of-way or easement encroached upon during the course of the project and submitted to the Engineer or the Authority prior to final payment.

2.3.10 WARRANTY

The Contractor will guarantee to the Owner or Authority all materials and equipment furnished and work performed for paving, drainage, grassing and other construction in public right-of-ways and easements for a period of one (1) year from the date of the Engineer's certification of work. For work requiring SCDOT

approval on a SCDOT right-of-way the guarantee will be for two (2) year from the date of certification by terms of the applicable specifications

2.3.11 DUST PREVENTION

Disturbed roads in the construction area will be maintained for dust prevention by water or dust preventative treatment. The contractor shall comply with all applicable environmental regulations.

CHAPTER 3

PIPING AND APPURTENANCES FOR POTABLE WATER SYSTEMS

3.1 GENERAL

This section shall include the furnishing of all types of pipe and other incidentals required for the construction of a complete water system as shown on the drawings and as specified herein.

All piping, valves, fittings, packing, joint materials, fire hydrants, and accessories coming in contact with potable water shall conform to Section C of the AWWA Standards *(R.61-58.4D.(1))* as required by South Carolina Department of Health and Environmental Control regulations as to meeting NSF 14 and 61 and potable drinking water regulations.

Unless otherwise noted, the materials listed below are acceptable to the Owner for use in water distribution systems. Should the Contractor desire to use other materials not listed in these specifications, written permission must be obtained from GSWSA and the Owner's Engineer.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which is normally subjected and be true to detail.

The South Carolina Department of Health and Environmental Control requires the Authority to insert the following statement:

> "All pipe material, solder and flux shall be lead free (less than 0.2 percent lead in solder and flux and less than 8.0 percent in lead in pipes and fittings."

However, it is the policy of the Authority that no piping or appurtenances shall be allowed which contain any measurable lead content.

Asbestos cement pipe shall not be used in potable water systems except in the repair of existing asbestos cement lines. All PVC piping 3" and larger shall be blue in color.

Thermoplastic pipe shall not be used above grade. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, o-rings, and other products used for jointing pipes, setting meters or valves or other appurtenances which will expose the material to the water. Lubricants which support microbiological growth

shall not be used for slip-on joints. The use of solvent-weld PVC pipe and fittings in water mains 4 inches and larger is prohibited.

3.1.1 SUBMITTALS

The Contractor shall submit to the Engineer two (2) copies of all submittal data for review and/or approval. Submittals shall include at a minimum: (1) the manufacturer's name, (2) type of material, (3) ASTM, ANSI, AWWA or other quality standard and (4) pressure class. If the materials do not meet the quality standards specified, the submittals will be rejected and other materials submitted as specified. The contractor must obtain approval of all pipe materials prior to commencing construction.

The Contractor shall submit to the Engineer two (2) copies of a certificate of inspection from the pipe manufacturer that the pipe supplied has been inspected at the plant and meets the requirements of these specifications.

3.1.2 PIPE DELIVERY, STORAGE, AND HANDLING

Truck and shipment units shall be delivered, handled, and maintained in a manner to avoid damage to the pipe. During shipment, piping across the front of the load shall be tarped across the entire front of trailer to prevent contamination by atmospheric conditions or by diesel fumes from truck. Piping found to be partially or wholly shipped uncovered will not be accepted. Pipe found to be contaminated as a result of non-conformance to this requirement will not be accepted for use. The pipe shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination. Pipe shall not be strung out in ditch areas where contamination will occur. The Contractor shall obtain written permission from the Owner to schedule all pipe and material purchases and deliveries from the suppliers designated for the project. Written permission from property owners selected for pipe storage shall be obtained and approved by GSWSA prior to unloading. This Section 3.1.2 includes PVC, Ductile Iron and HDPE piping purchased for potable water use.

3.2 DUCTILE IRON PIPE

3.2.1 GENERAL

Ductile iron shall conform with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subject to a hydrostatic pressure test of at least 500 psi at the

point of manufacture. Pipe dimensions shall conform to Federal Specifications WW-P-41C, Type II, push-on joints; Type III, mechanical joints. Each joint of pipe shall be conspicuously marked on the outside of the barrel to readily identify it from cast iron. Thickness class shall be as required by ANSI A 21.50, AWWA C150, latest revision.

A. JOINTS

1) Mechanical Joints: ANSI Specifications A21.11 (AWWA C-111), latest revision, for three inch pipe and larger, and CEPRA Specification 3-54 and 4-54 for two inch pipe. Bolted mechanical joints shall be used at canal crossings, railroad crossings and where specifically called for on the plans or in the Schedule of Bid Items

2) Push-on Joints: Single gasket push-on type joints shall conform with ANSI A 21.11(AWWA C-111), latest revisions. Push-on joints may be used where mechanical joints are not specifically called for on plans or specified above

3) Flanged Joints: Flanged joints shall be constructed of ductile iron pipe conforming to ANSI/AWWA C115/A 21.15 Class 53 minimum latest revisions.

B. PIPE LINING

Cement mortar lining on the interior shall conform with ANSI A 21.4 (AWWA C-104), latest revision.

C. EXTERIOR COATING

The pipe shall have a standard asphaltic coating on the exterior in accordance with the manufacturer's and AWWA specifications. The final coat shall be continuous and smooth being neither brittle when subjected to low temperatures, nor sticky when exposed to hot sun. The coating shall be strongly adherent to the pipe at all temperatures

3.3 POLYVINYL CHLORIDE (PVC) PIPE (C-900)

3.3.1 GENERAL

For all C900, C905, SDR-PR, PVC piping and in addition to meeting all applicable AWWA and Uni-Bell standards, GSWSA reserves the right to reject any pipe not within the dimensional specification tolerances and may also upon visual inspection reject any pipe found to be not free of blisters, cracks, seams, welds or ripples on the ID and/or OD of the pipe and bell that in the opinion of GSWSA would be in any way detrimental to its intended use and intended purpose of the purchase. All PVC piping shall be blue in color.

PVC Pipe in sizes four (4) inches through (12) inches will be in accordance with the latest edition of AWWA C-900, Class 100 psi, Class 150, and in sizes less than four (4) inches will be in accordance with ASTM D 2241 200 psi SDR 21. PVC pressure piping shall be in accordance with ASTM D 1784 for PVC compounds, ASTM S-3139 for push on joints and ASTM F-477 for rubber gaskets. The pipe furnished will also meet the following specifications.

A. <u>C-900 PVC PIPE WILL BE SDR 25 PRESSURE CLASS 100 OR SDR 18 PRESSURE CLASS 150</u>

All pipe shall meet the requirements of the AWWA C-900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe four (4) inches through twelve (12) inches for water. The pipe will be furnished in twenty (20) feet lengths with smaller lengths comprising no more than fifteen 15 percent of the system installed. The pipe will be cast iron pipe equivalent outside diameters. Joints will be rubber gasket sleeve-type couplings or integral bell (push-on). Pipe bedding requirements will be in accordance with ASTM D 2321 except as modified by these specifications.

Pipe will not fail when tested in accordance with AWWA C-900 for sustained pressure, burst pressure, flattening and extrusion quality. Each section of C-900 must pass a hydrostatic proof test at four times its rated class pressure for a minimum of five seconds

All PVC shall be furnished in factory packaged units and each section of pipe clearly marked with the manufacturer's name pressure class, sizes and appropriate standard. All PVC pipe conveying potable water shall be manufactured with NSF 14 inspection and approval and shall be stamped with the appropriate NSF seal of approval. Pipe not bearing this approval shall be rejected and considered not acceptable.

Tapping C900: C 905 should not be direct tapped. Cutting should be done only with a full circle shell-cutter tool. The shell cutter must have sharp teeth and clean teeth. A full circle tapping sleeve should be used. Hole cut must be circular. Holes cut into PVC C-905 pipes in any method other than above are not acceptable to PVC pipe manufacturers and will void pipe warranty.

Hole cutting by any method other than described above could induce stresses into the pipe wall and even hairline cracks which could cause failure of the pipe under pressure.

B. <u>SDR-PR PVC (3" PVC)</u>

SDR-PR will meet requirements of ASTM D 2241 and will be 200 psi pipe with Standard Dimension Ration of 21 (SDR-21). Pipe will not fail when tested for the appropriate sustained Pressure Rated PVC pipe will include an encasement of sand six (6) inches thick around the full perimeter of pipe. Payment for sand will be included in the unit price bid per linear foot of PVC pipe.

The pipe will be furnished in twenty 20 foot laying lengths with no more than fifteen (15) percent of the system comprised of lengths less than twenty (20) feet.

All pipes will be furnished in factory packaged units and each section of pipe will be clearly marked with the manufacturer's name, pressure class, size appropriate standard. All PVC pipe conveying potable water shall be manufactured with NSF 14 inspection and approval and shall be stamped with the appropriate NSF seal of approval. Pipe not bearing this approval shall be considered unacceptable.

The pipe shall be plainly marked with the following information: manufacturer's name, size, material (PVC) type and grade or compound, NSF Seal, pressure rating and reference to appropriate product standards.

3.4 POLYVINYL CHLORIDE (PVC) PIPE (C-905)

SDR-PR Thickwall C-905 PVC pipe for large diameters, 14" through 48", shall meet all requirements of AWWA C905-97 first edition. Unless otherwise specified, specifications are for DR25 for PVC transmission pipe with Cast Iron outside diameter. Rubber gaskets with pipe lubricant shall be furnished for all joints. Pipe shall be furnished in cast iron pipe equivalent outside diameters with rubber-gasket separate couplings or push-on joints. Pipe and couplings shall not fail when subjected to the following tests; (1) sustained pressure (2) burst pressure (3) flattening and extrusion quality. Tests shall be conducted as outlined in AWWA specifications. Each length of PVC pipe shall pass a hydrostatic integrity test at the factory to 2 times the pressure class of the pipe for 5 seconds.

Pipe shall be furnished in 20 ft. laying lengths. Random lengths shall be a minimum of 10 feet long and shall comprise no more than 15 percent of the length of the piping system. Pipe shall be furnished in factory packaged units, with each joint plainly marked with the manufacturer's name, pressure class, size, etc.

All PVC shall be furnished in factory packaged units and each section of pipe clearly marked with the manufacturer's name pressure class, sizes and appropriate standard. All PVC pipe conveying potable water shall be manufactured with NSF 14 inspection and approval and shall be stamped with the appropriate NSF seal of approval. Pipe not bearing this approval shall be rejected and considered not acceptable.

Tapping C 905: C-905 shall not be direct tapped. Cutting should be done only with a full circle shell cutter tool. The shell cutter must have sharp teeth and clean teeth. A full circle tapping sleeve should be used. Hole cut must be circular. See 4.6.12 Referenced retrievable coupon.

Holes cut into PVC C-905 pipes in any method other than above are not acceptable to PVC pipe manufacturers and will void pipe warranty.

Hole cutting by any method other than described above could induce stresses into the pipe wall and even hairline cracks which could cause failure of the pipe under pressure.

3.4.1

Third Party Certification:

The manufacturer of all PVC pipe supplied to GSWSA shall be subject to random inspection and evaluation by an independent third party in order to assure the purchaser to full compliance with this specification. The third party shall report all findings to GSWSA upon request. The third party selection shall be subject to the approval of GSWSA and shall be provided at no charge.

Testing:

GSWSA shall have free access to that part(s) of the manufacturer's plant involved in work perform to meet requirements of this recommended standard. The manufacturer shall afford the inspector, at no charge, reasonable facilities needed to determine if the pipe meets the requirements of this recommended standard. GSWSA shall have the right to plant inspection for witness testing and conformance to all specifications; all costs including transportation and lodging and meals is to be borne by the manufacturer.

3.5 POLYETHYLENE PIPE FOR WATER MAINS

3.5.1 General

The pipe supplied under this specification shall be SDR 17 (unless specified otherwise) high density polyethylene pipe, and shall conform to ASTMF 714 and ASTM D 1248 (Type III C, Class C, Category 5, P34). Minimum cell classification values shall be 345434C as referenced in ASTM D 3350 - latest edition. The fittings supplied in this specification shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe. To insure compatibility of polyethylene resins, all fittings supplied under this specification shall be of the same manufacture as the pipe being supplied. Polyethylene pipe and fittings shall conform to the latest edition of ANSI/AWWA C901 or C904 for ½" – 3" water service laterals and C906 for 4" – 63" water distribution mains. Material used in manufacture of polyethylene pipe or fittings shall conform to the PE standard code PE 4710.

The pipe shall conform to the physical properties as described herein.

All pipe shall be color coded and/or striped blue (for water) unless otherwise specifically approved. All pipe shall have the manufactured stamped AWWA and have the SDR clearly designated on it.

A. Typical Pipe Physical Properties

PROPERTY	TEST METHOD	UNIT	VALUE
Density	ASTM Method	gms/cc	0.955
Melt Index	ASTM D 1238	gms/10	0.11
	(190/2.16)	min.	
Environmental Stress Cracking Resistance:			
Condition A,B, & C, F-O	ASTM D 1693	hrs.	>5000**
Compressed Ring, F-50	ASTM F 1248	hrs.	>1000
Tensile Strength, Yield	ASTM D 638	psi	3200
Type IV Specimen	(2"/min.)		
Elongation at Break	ASTM 638	%	>750
Type IV Specimen	(2"/min.)		
Vicate Softening Temp.	ASTM D 1525	°F	257
Brittleness Temp.	ASTM D 746	°F	<-180
Flexural Modulus	ASTM D 3350	psi	135,000
Modulus of Elasticity	ASTM D 638	psi	130,000
Hardness	ASTM D 2240	Shore D	65
Coefficient of linear Thermal Expansion:			
Molded Specimen	ASTM D 696	in./in./deg	8.3x10-5
Extruded Pipe			1.2x10-4

Thermal Conductivity	Dynatech-Colora BTU,In./ Thermoconductor ft./2 hrs./deg.F		2.7
Long term Strength:			
73°F	ASTM D 2837	psi	1600
14°F		psi	800
Material Cell			
Classification	ASTM D 3350		345464 C
Material Designation	PPI Recommendation		PE 4710

B. Quality Control

The resin used for manufacturer of the pipe shall be manufactured by the pipe manufacturer, thus maintaining complete control of the pipe quality. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties. GSWSA may request, as part of the quality control records submittal, certification that the pipe produced is represented by the quality assurance testing. Additionally, test results from manufacturer's testing or random sampling by the engineer that do not meet appropriate ASTM standards or manufacturer's representation, may be cause for rejection of pipe represented by the testing. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM D 3350, 10.1.9.

GSWSA may request certified lab data to verify the physical properties of the materials supplied under this specification or may take random samples and have them tested by an independent laboratory. Approved manufactures are Plexco, Driscopipe, CSR, or Authority approved equal.

C. Pipe Delivery, Storage and Handling:

Truck and shipment units shall be delivered, handled and maintained in a manner to avoid damage to the pipe. During shipment, piping across the front of the load shall be tarped across the entire front of trailer to prevent contamination by atmospheric conditions or by diesel fumes from truck. Piping found to be partially or wholly shipped uncovered will not be accepted. Pipe found to be contaminated as a result of non-conformance to this requirement will not be accepted for use. The pipe shall be stored in an open area on high, well-drained land not subject to flooding, mud or other means of contamination. Pipe shall not be strung out in ditch areas where contamination will occur. The Contractor shall obtain written permission from the Owner to schedule all pipe and material purchases and deliveries from the suppliers designated for the project. Written permission from property owners selected for pipe storage shall be obtained and approved by GSWSA prior to unloading. This Section 3.1.2 includes, PVC, Ductile Iron and HDPE piping purchased for potable water use.

D. Rejection:

GSWSA reserves the right to reject any polyethylene pipe and fittings failing to meet any of the requirements of this specification. Per the manufacturer's recommendations, the following apply to all handling and preservation of the pipe: Shipping, hauling, unloading, stringing and installing HDPE should be done with the care necessary to prevent damage to the pipe. Since all plastics are softer than steel, poor handling can result in abrasions, cuts, gouges, punctures and are causes for rejection.

All pipe shall be carefully examined before installation and damaged pipe removed. Damage that results in reduction of the wall thickness by more than approximately 10% should be cut out and discarded as it may impair long-term service life.

Damaged pipe will be repaired by butt fusion only.

E. Pipe Dimensions:

Pipe supplied under this specification shall have a nominal IPS (Iron Pipe Size) O.D. unless otherwise specified. The pipe size and SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by GSWSA

3.5.2 Construction Practices

A. Handling of Pipe

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be done in accordance with the pipe manufacturer's recommendations. The handling of the pipe should be done in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

B. Repair of Damaged Sections

Segments of pipe having cuts or gouges in excess of 10% of the wall thickness of the pipe should be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fashion joining method and as per the specification.

C. Pipe Joining and Directional Boring

Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. All shavings and cuttings resulting from the fusion operation shall be collected from the on job fusion/cutting site and properly removed off and disposed of from the project site. The joining method shall be the butt fusion method and shall be performed by the manufacturer's trained and certified technicians and in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures. Prior approval of fusion equipment and personnel shall be obtained from GSWSA before fusion begins. The contractor shall furnish prior written evidence that the thermal fusion shall be conducted by personnel that have received approved and proper training in the use of fusion equipment according to the recommendations of the pipe supplier and the fusion equipment supplier. The installing contractor shall maintain on file with the Authority a certification of training of personnel operating the approved equipment for fusion and installation work. The Authority reserves the right to reject at any time the contractors proposed or being used, equipment and personnel as applicable to pipe joining and directional boring. The drilling-boring contractor shall receive prior approval of what manufacturer and product the drillers mud is proposed

to be used. The size of the Auger Head shall be approved by the Authority prior to its use.

D. END CONNECTIONS

Special mechanical joint ends will be required for each end. See standard drawings developed for polyethylene installation for special end conditions. This HDPE MJ adapter to be size on size. Any required change in pipe diameter shall be made using DI MJ fittings with restraints. HDPE reducers are not allowed. The HDPE MJ transition adapter DR must match the DR of the HDPE bore pipe being installed.

E. HANDLING OF FUSED PIPE

Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long fused sections. Care should be exercised to avoid cutting or gouging the pipe.

F. INSTALLATION

Trenching, installing, backfilling and testing shall be in accordance with GSWSA specifications and drawings and special method of installation developed for this specific project. An electronically generated profile and plan shall be provided as a part of the overall project as-built for each directional bore where installed. See Standard Drawing WS 4.

3.5.3 FINAL TESTING

After polyethylene piping is installed, back filled and all air removed, the contractor shall apply a hydrostatic pressure of 150 psi or 1.5 times the working pressure as determined by the Authority to the pipe. The test pressure shall be allowed to stand without make-up pressure for a period of time as required by the pipe manufacturer and approved by the engineer to allow for diameter expansion or pipe stretching to stabilize. This stabilization time is approximately 24 hours and will vary depending on field conditions. After the required equilibrium period the test section shall be returned to the original test pressure. All final testing shall be in conformance with GSWSA specifications.

3.6 WROUGHT PIPING

3.6.1 GENERAL

Wrought steel pipe shall conform to ASTM A-53. Wrought iron pipe shall conform to ASTM A-72. All wrought piping shall be standard strength schedule 40 and shall be galvanized inside and outside

3.7 PIPE FITTINGS

For all pipe three (3) inches in diameter and greater, fittings will be ductile iron in accordance with AWWA C110/ANSI A 21.10 latest revisions. Ductile iron fittings will be cement mortar lined in accordance with AWWA C104/ANSI 21.4 with an outside coating. The coating will be of bituminous material approximately one (1) mil thick and will be continuous and smooth and strongly adherent to the fittings. Fittings will be Class 350 up to twenty-four (24) inches and Class 250 for sizes greater than twenty-four (24) inches. Fittings will be marked in accordance with ANSI 21.10. Mechanical joints will be in accordance with ANSI 21.11. Payment weight will be as listed in ANSI 21.10 or AWWA C-110-71. Fittings weights will be without accessories. Fittings shall be American Cast Iron Pipe Company, Tyler Union, Sigma, or approved equal.

The Authority reserves the right to require special interior and/or exterior coating as applicable to certain applications of usage. All coated fittings must meet requirements of NSF-61.

All bends and fittings may be of the compact size in accordance with AWWA C153/A21.53 latest revisions. The fitting manufacturer must be approved prior to placement of any order.

Fittings for pipe less than three (3) inches in diameter will be in accordance with ASTM D 2467 for Schedule 80 fittings

The Authority reserves the right upon inspection of delivered bends and fittings to reject any item not in full conformance to the specifications and that have been damaged (linings or exterior) and/or found to be out of round.

3.8 PIPE INSTALLATION

3.8.1 GENERAL

Pipe shall be installed in accordance with the manufacturer's recommendations and as specified in Chapter 4 of these specifications. Disinfection and pressure testing shall meet the requirements in Sections 4.4 and 4.5

3.8.2 METHOD OF MEASUREMENT

Pipe shall be measured from the bell or connection at the beginning to the bell or connection to the end, per linear foot, complete in place and accepted, including the furnishing of all labor, tools, materials, and equipment necessary for trenching, laying, jointing, testing, sterilizing, back filling, connections to existing mains, and all other necessary

CHAPTER 4

WATER MAIN CONSTRUCTION METHODS

4.1 GENERAL

This section shall include furnishing all labor, tools, equipment and other incidentals required for the construction of the water distribution system as shown on the drawings and as specified herein

The work shall include laying pipe and installing fittings, valves, hydrants, and services, pressure testing, installation of tracer wire, and sterilization of the water distribution system

Materials shall be as specified in previous sections of these specifications.

4.1.1 SHOP DRAWINGS

The Contractor will submit shop drawings as may be specified by the Engineer and the Authority for all pipe and appurtenant items. For piping, the Contractor will submit a notarized sworn statement from the manufacturers stating that inspections and all specified tests have been made and the results comply with the appropriate standards set forth in these specifications

4.2 PIPE AND FITTINGS

Pipe and fittings shall be laid as directed by the engineer, and located as shown on the drawings. No additional payment will be made due to location changes directed in the field by the engineer

Pipe laying for pressure piping will be in accordance with AWWA Standards and manufacturers recommendations and these specifications for delivering, protecting, handling, storing, laying and use of the pipe to be installed.

4.2.1 TRENCHING

The trench shall be dug to the required alignment and depth as shown on the plans or directed by the engineer, and only so far in advance of the pipe laying as the engineer shall permit. The width of the trench shall be kept at a minimum. The depth of the trench shall generally be sufficient to allow a minimum of three feet of cover over the top of the pipe. The bottom of the trench shall be shaped by hand and shall support the pipe for the entire length. It shall be the responsibility of the Contractor to provide adequate bearing for all pipe lines laid in uncertain

soil conditions. If the trench bottom should be softened by flooding, rain or other causes, the unsuitable material shall be removed and replaced with suitable material properly shaped and tamped to grade. The use of timber or other material to support the pipe shall not be accepted.

4.2.2 PIPE LAYING

Water pipe shall be laid in conformance with the standards set forth by AWWA C-600, latest revision. All water pipe shall be laid by experienced workmen with straight lines, even grades, and all joints shall be perfectly fitted. All pipe fittings, valves, hydrants, and accessories shall be carefully lowered into the trench with suitable equipment in a manner that will prevent damage to pipe fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Pipe and accessories shall be inspected for defects prior to their being lowered into the trench. Any defective, damaged or unsound material shall be repaired or replaced as directed by the Engineer. All foreign matter or dirt shall be removed from the interior and machined ends of pipe and accessories before it is lowered into position in the trench. Pipe shall be kept clean by means approved by the engineers, during and after laying.

Pipe will be laid on true lines as according to the plans without any unnecessary bending or wandering of the pipe along the right-of-way. Minimum nominal lengths of eighteen (18) feet for ductile iron and (20) feet for PVC C900 of pipe sections will be used and installed with a minimum of (36”) inches of cover for PVC C900. Ductile iron minimum depth shall be eighteen (18”) of cover.

The trench bottom will be leveled so as to provide a firm, stable, uniform support. Bell holes will be excavated at each joint to assure support is provided along the barrel of the pipe and to permit proper assembly of the joint. Ledge rock, boulders and large stones will be removed within six (6) inches of all sides of the pipe

Joints shall be fitted to insure watertight joints and shall be in conformance with manufacturer recommendations. Transition couplings manufactured per AWWA Standards will be used for joining different type pipes.

4.2.2.1 TRACER WIRE:

Where PVC or Polyethylene pipe is used in water main construction, a continuous #12 gauge blue insulated solid copper tracer wire, approved by the manufacturer for direct burial, shall be installed and taped to the top of the water line. The tracer wire shall terminate at each valve or meter and be arranged to allow connection of equipment for tracking pipe and to prevent interference of operating the valve or meter. Standard underground type electrical wire connectors are to be used where splicing is required. All terminals are to be taped for corrosion and underground deterioration protection. Tracer wire shall be as manufactured by Baron, # 12 AWG, UL, UF, 600V or prior approved equal.

As an alternate, PRO-TRACE copper clad steel conductor tracer wire or prior approved equal may be used. Conductor shall be #12 AWG, blue in color, RoHS compliant and rated for direct burial use at 30 volts.

4.2.2.2 JOINTING MECHANICAL JOINT PIPE

1) Joining Existing Bell and Spigot to New Mechanical Joint: Due to the difficulty that may be encountered in attempts to make such a connection of this type, an adapter having a fitting bell and M.J. socket may be used by the Contractor.

2) Cleaning and Assembling Joints: Clean last 8" outside the spigot, and the inside of the bell of mechanical joint pipe to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint and then paint area clean with an AWWA approved standard lubricant. The ductile iron gland shall then be slipped on the spigot end of the pipe with the extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the standard lubricant and placed on the spigot end with thick edge toward the gland.

3) Bolting of Joints: Push entire section of pipe forward to seat spigot end in the bell. Press gasket into place within the bell, being careful to have the gasket evenly located around the entire joint. Move ductile iron gland along the pipe into position for bolting insert all bolts, and screw nuts up tightly with fingers. Tighten all nuts with a suitable (preferably torque-limiting) in order to produce equal pressure on all parts of the gland.

4.2.2.3 JOINTING RUBBER GASKET PIPE (BELL TITE, TYTON, OR EQUIVALENT)

1) Cleaning Joint Gasket: Clean gasket, spigot and inside of bell thoroughly to remove all dirt and other foreign matter

2) Inserting Gasket: Insert gasket furnished by the pipe manufacturer into the gasket seat in the bell. Gasket shall be properly seated in the grooves provided in the pipe bell.

3) Lubricating Gasket and Pipe Spigot: Using a non-toxic vegetable soap, apply a film by hand to the inside surface of the gasket that comes into contact with the entering pipe and to the first 1" of the spigot end of the entering pipe. Use only lubricant specified by the pipe manufacturer.

4) Final Assembling of Joint: Align entering pipe with the bell to which it is to be joined. Enter the spigot end into the bell until it just makes contact with the gasket. Apply sufficient pressure to force the spigot end past the gasket up to solid contact with the bell.

5) Field Cutting Pipe: When it is necessary to field cut pipe with rubber gaskets, chamfer the cut end 1/8 inch X 30 degrees before inserting into a rubber gasket bell.

6) Fittings: Fittings shall be installed where and as shown on the plans or as directed by the Engineer. All bends (1/16 to 1/4), y-branches, plugs and all other fittings requiring such shall be sufficiently restrained, backed, blocked, or braced to preclude the possibility of their leaking or blowing off the main.

7) Bell joint restraints shall be used on each side of a bend, valve and/or fitting. See Detail Drawing for minimum number to be installed on each side.

4.2.3 MECHANICAL THRUST RESTRAINTS

All turns, fittings, etc., that induce pressure which would cause separation of pipe, breakage, etc., shall be mechanically restrained in such a manner that the pressure to be exerted at the point of restraint is transferred to the pipeline for a distance sufficient to prevent separation, breakage, etc., MJ fittings shall be restrained with restraints such as Romac Grip Ring or Ebaa Iron 2000PV Megalug restraints for PVC

pipe and Series 1100 Megalug for DI pipe or approved equal. Pipe joints shall be restrained with harness or bell restraints such as Ebaa Iron Series 1700 for DI slip joint pipe or Series 1500 or Series 1100 HV for PVC, Romac Grip Ring, JCM Series 600 fusion epoxy coated or, Ford Uni Flange restraints or approved equal. Specialized PVC and DIP restraints are to be used as recommended by the manufacture for each type of pipe being used. See Standard Detail Drawing WS3 for required restraints. All installations shall be in conformance to the manufacturer's requirements and no deviation will be allowed. Two bell restraints shall be required on the two joints either side of a directional bore.

4.2.4 CONCRETE BLOCKING

Concrete thrust blocking shall only be used if approved by GSWSA or mechanical restraints are not feasible. Where mechanical restraints are not feasible, all turns, fittings, etc., that induce pressure which would cause separation of pipe, breakage, etc., shall be blocked with 3,000 lb. concrete. Blocking shall be formed and placed in such a manner that the pressure to be exerted at the point of blocking shall be transferred to firm, undisturbed earth at a maximum load of 2,000 lbs., per square foot. The Contractor shall insure that blocking at all tees, bends, plugs, etc., shall be sufficient to contain all pressure exerted by the pipe up to a pressure of 200 lbs., per square inch hydraulic pressure within the pipe, i.e., pressure at plug = 200 X (area of pipe in inches). Blocking shall be constructed as shown on the detail sheet contained in these specifications. The Contractor shall also be responsible for any damage or repairs caused by blowouts of any insufficiently blocked pipe.

4.2.5 METHOD OF MEASUREMENT

The cost of laying pipe including connection of existing mains, pressure testing, sterilization, and bacteriological testing shall be included in the unit price per foot of pipe measured as previously specified. The cost of setting valves, fittings, water services, etc., shall be included in the cost per unit of the respective item measured as specified.

Blocking for fittings shall be measured by the cubic yard of concrete. This item shall include all labor, equipment, and incidentals necessary to properly block all fittings and bends according to the detailed drawings contained herein.

4.3 BORING UNDER HIGHWAYS AND RAILROADS

4.3.1 GENERAL

This section shall include furnishing all labor, tools, equipment and other incidentals required to bore casing pipe under highways or railroads.

Before starting boring operations, the Contractor shall submit to the Engineer an experience record of the proposed boring sub-contractor. Such record shall include a list of equipment and personnel to be used, and a list of at least five previous successful similar installations under highways or railroads within the past five years. Failure to submit an experience record or submittal of a record not meeting these requirements will be cause for rejection of the boring subcontractor.

4.3.2 BORING

Procedures for boring shall be in accordance with the best accepted methods of the construction and as shown on the plans and specified and detailed in these specifications.

A. Boring under Highways: Lines installed under highways shall be bored as shown on the detail drawings contained in these specifications. Casings will be installed of the type, size, and thickness as specified herein or on the detail drawings. The Contractor shall be responsible for notifying the South Carolina Department of Transportation at least five days prior to any contemplated work and for securing any required permits for performing the work. All work shall be accomplished under the supervision of the Engineer and the District Engineer of the Department of Transportation or his authorized representative.

1) Carrier Pipe: Carrier pipe used under highways shall be of an approved material and installed to the satisfaction of the District Engineer of the Department of Transportation. Carrier pipe shall be of the same material specified for water main construction unless otherwise noted. The carrier pipe shall be restrained at each end with pipe meg-a-lugs and rods welded to the casing per GSWSA standard details. All carrier pipe shall be restrained at each joint within the casing pipe.

2) Casing pipe: The inside diameter of the casing pipe shall not be less than 2 inches greater than the largest outside diameter of the joints and couplings for carrier pipe less than 6" o.d., and 4"

greater for carrier pipe 6" or larger. It shall, in all cases, be great enough to easily remove carrier pipe without disturbing the casing pipe.

a. Pipe Size 8" and Smaller: Schedule 40 wrought steel or wrought iron pipe having a wall thickness as shown below.

Diameter of Pipe (in.)	Schedule 40 Wrought Steel Wall Thickness (in.)	Wrought Iron Wall Thickness (in.)
2	0.203	0.208
4	0.237	0.242
6	0.280	0.286
8	0.322	0.329

b. Pipe Sizes Larger than 8”: Steel pipe casings larger than 8" shall be manufactured from steel than 8” having a minimum yield strength of 35,000 psi with the minimum wall thickness as shown below

Diamter (in.)	Minimum Wall Thickness (in.)
10	0.188
12	0.188
16	0.250
18	0.250

20	0.250
24	0.250
30	0.312
32	0.375
36	0.375

3) Installation: The depth from the roadway surface to the top of the casing pipe at its closest point shall be minimum three feet. The casing pipe ends shall be protected from the entrance of foreign material. The casing pipe shall extend from ditch line to ditch line or toe to toe of till unless otherwise noted on the plans or specified herein. Carrier pipe shall be supported with casing spacers.

Contractors should provide shoring of boring pits and trenches more than 5 feet deep in accordance with the South Carolina Department of Transportation and Federal Occupational Health and Safety Act.

4) Casing Spacers: Casing spacers shall be prefabricated steel with polyethylene insulators capable of being securely fastened to the carrier piping by bolting methods. Casing spacers shall be Cascade, Advance Products, CMI Boyd's Spider Manufacturer or approved equal. A minimum of three spacers shall be used per pipe. See standard GSWSA detail. Submittals for approval shall be made for the use of casing spacers.

B. Borings under Railroads: All work on railroads rights of way shall be done under the supervision of the Chief Engineer of the railroad, or his authorized representative, who shall be notified at least 15 days before construction is begun. In addition, this work shall only be done in the presence of the authorized representative of the Chief Engineer, and no methods shall be use that, in the opinion of the representative, could be hazardous to the railway.

1) Carrier Pipe: Carrier line pipe and joints shall be of the material shown on the details of the railroad encroachment agreements. Carrier pipe shall be of the same material specified for water main construction unless otherwise noted. The carrier pipe shall be restrained at each end with pipe meg-a-lugs and rods welded to the casing per standard details. All carrier piping shall be restrained at each joint within the casing pipe.

2) Casing Pipe: The inside diameter of the casing pipe shall not be less than 2 inches greater than the largest outside diameter of the joints and couplings for the carrier pipe less than 6" o.d. and 4" greater for carrier pipe 6" and larger. It shall, in all cases, be great enough to easily remove carrier pipe without disturbing the casing pipe.

Steel pipe manufactured from steel having a minimum yield strength of 35,000 psi and having a minimum permissible wall thickness as listed below shall be used as casing pipe.

Diamter of Casing Pipe (in.)	**Minimum Wall Thickness (in.)**
10	0.188
12	0.188
16	0.219
18	0.250
20	0.281
24	0.344
30	0.406
32	0.438
36	0.469

3) Installation: The depth from the base of the railway rail to the top of the casing at the closest point shall not be less than 5'. Also, there should not be less than 3 feet from the bottom of the side ditches to the top of the casing pipe. The casing pipe ends shall be protected from the entrance of foreign materials. The casing shall extend 25 feet either side of the centerline of the railroad track unless otherwise noted on the plans or specified herein. Carrier pipe shall be supported with casing spacers. Contractors shall be required to shore all pits used for boring if it is over 5 feet deep.

4) Casing Spacers: Casing spacers shall be prefabricated steel with polyethylene insulators capable of being securely fastened to the carrier piping by bolting methods. Casing spacers shall be Cascade, Advance Products, CMI Boyd's or approved equal. A minimum of three spacers shall be used per pipe. See standard GSWSA details. Submittals shall be made for the use of casing spacers.

4.3.3 METHOD OF MEASUREMENT

Bores shall be measured in linear feet from end to end of casing pipe installed and accepted. This item shall include casing pipe and other materials, tools, equipment, labor and incidentals required to bore and install casing as shown on the details and as directed by the highway or railroad district engineer and/or resident engineer.

4.3.4 AS-BUILTS REQUIREMENTS

The Contractor shall provide within 14 days of completion of all bores (jack and bores as well as horizontal directional drills) the following:

A. Plan review of bore that shows:

1) Project name, project #, bore # and bore description

2) Start location of bore labeled "Start of Bore" with corresponding plan station and measurements to permanent features (edge of pavement, centerline of road, telephone pedestals, power poles, RCP ends, etc.).

3) End of location of bore labeled “End of Bore” with corresponding plan station number and measurement to permanent features (edge of pavement, centerline of road, telephone pedestals, power poles, RCP ends, etc.).

B. Profile view of bore that shows:

1) Project name, project #, bore # and bore description

2) Vertical depths from existing ground plotted beginning with the “Start of Bore” continuing at 10’ intervals until the “End of Bore”

3) Vertical separations shown between bore and all existing utilities (water, sewer, telephone, electric, TV, gas, storm drainage, etc.).

4.4 PRESSURE AND LEAKAGE TESTS

4.4.1 GENERAL

All sections of pressure pipe laid under this contract will be subjected to pressure and leakage testing in accordance with all sections of AWWA C900 and C905 and/or C605 and any and all AWWA latest editions, except as modified in these specifications. The main shall be subjected to a hydrostatic pressure test of 150 pounds per square inch for a period of two hours minimum or a minimum of two times the system working pressure. The test pressure to be used is to be 150 psi unless otherwise approved.

After installation and back filling, the lines will be flushed clean and all air expelled from the lines. The Contractor will provide for at his cost and as may be needed additional and/or new ARV’s and outlets for air removal at all high points in the line to accomplish a complete air free hydrostatic test. Temporary taps may be required to be provided for in order to achieve a complete flush and air removal. Additional permanent and/or temporary air release points that may be required are to be provided for by the contractor and no additional compensation will be provided. The hydrostatic test pressure at the lowest point in the line will be equal to the rated working pressure of the pipe unless otherwise specified under Section I "Special Conditions". The Contractor will be responsible for providing all pumps, connections and any other apparatus including gauges for the proper completion of the testing.

The Contractor will conduct all pressure and leakage tests in the presence of the Engineer's representative and a representative of the Authority. Each section of line between valves will be tested in order to check the tightness of valves for a

period of fifteen (15) minutes. After the first section of line has been tested, the valve will be opened and the second section and valve(s) tested.

The test will proceed in this manner until an entire area is under pressure. Pressure will be maintained over the entire area for a period of two (2) hours. Allowable leakage in the two (2) hour period will be in accordance with the following table:

Allowable Leakage*

(in gallons per hour per 1,000 L.F.)

	Test Pressure			
Pipe Size	**50**	**100**	**150**	**200**
2"	0.11	0.15	0.18	0.21
3"	0.16	0.23	0.28	0.32
4"	0.21	0.30	0.37	0.42
6"	0.32	0.45	0.55	0.64
8"	0.42	0.60	0.74	0.85
10"	0.53	0.75	0.92	1.06
12"	0.64	0.90	1.10	1.27

* For lengths of 18 feet. For lengths of 20 feet multiply allowable leakage by a factor of 0.9. For line sizes not shown in table, the Authority will provide the allowable valve.

Water for testing will be provided by the Authority for line flushing and testing in conformance with the Authority's latest Extension Policy. Water loss due to improper workmanship will be paid for by the Contractor.

4.5 FLUSHING AND DISINFECTION PROCEDURES

4.5.1 FLUSHING NEW WATERLINES

In line with DHEC standards, two pipes full of water are required to pressure test and sterilize the line. This volume of water as metered by the GSWSA, as outlined in the Authority's Extension Policy.

NOTE: TAP VALVES BETWEEN EXISTING LINES AND CONTRACTORS LINES SHALL REMAIN CLOSED AT ALL TIMES. THIS VALVE SHALL BE OPENED ONLY BY REPRESENTATIVES OF THE GSWSA AT THE TIME OF FINAL ACCEPTANCE.

The GSWSA Water Department must monitor this volume of water and measure all water used. No water may be used for this purpose without proper notification and authorization of the GSWSA and proper monitoring of the usage. Metering may be done via hydrant meters installed and controlled by the GSWSA. Meters have the capacity to measure up to 750 GPM will normally be used. Lines requiring larger flows may require 2 or more – metering points.

All systems will be designed to allow for measurements of flushing water via locating fire hydrants and post hydrants at the end of all lines. All water will be billed to the contractor or the owner of the system at the normal rates in effect at the time the water is used.

The exact time the flushing will be allowed will be at the GSWSA's discretion. The Water Department will coordinate with the Inspections Department.

The Water Department will notify the Contractor of the time he will be allowed to flush the system. Flushing during other times will be considered in violation of these procedures and the Contractor may be charged for any water or flushing not authorized and fined according to the Authority's Developer Policy.

Any contractor failing to contact the Inspection Department for coordination and measurement of flushing may also be assessed a fine plus the cost of the estimated volume of water consumed.

All fines and/or water charges so levied in accordance with this procedure must be paid prior to receiving Service Authorization and acceptance of the system by the GSWSA.

The following data is provided as a guide to calculate the flow and volume needed to properly flush a system; minimum velocity is 2.5 ft. per second:

Pipe Size (in.)	Gallons/Ft	Minimun Flow for Flushing (GPM)
3"	0.37	55
6"	1.47	220
8"	2.61	380
10"	4.08	620
12"	5.86	860
16"	10.45	1575

Any deficiencies in the system will be repaired and/or replaced and retested at no cost to the Owner or the Authority.

4.5.2 DISINFECTION

After pressure and leakage tests, all sections of line will be disinfected in accordance with AWWA 651, latest edition, except as modified in these specifications.

NOTE: DISCHARGE OF HIGHLY CHLORINATED WATER INTO WETLANDS OR OTHER SENSITIVE AREAS WILL NOT BE ALLOWED.

The lines will be thoroughly flushed prior to disinfection at a velocity sufficient to clean the lines. The Contractor must take precautions to assure that proper drainage is achieved where flushing water is discharged. No flushing device may be directly connected to any sewer.

Under the supervision of the Authority's Water Department Representative, the contractor will be instructed to open the metered tap valve between the existing and new water lines slightly to allow a constant rate of water to slowly fill the new line. Chlorine will be pumped by continuous feed methods into the line in sufficient quantities to provide a minimum chlorine residual throughout the system of fifty (50) parts per million (ppm). The new line will then be isolated from the existing system for a period of twenty-four (24) hours. All valves and hydrants shall be operated within this period to disinfect the appurtenances. After twenty-

four (24) hours, the treated water will contain no less than 25 mg/l of free chlorine residual through the lines tested. The lines will again be opened after the twenty-four (24) hour period and thoroughly flushed until no chlorine exists as determined by the DPD test administered by the Authority's Water Department Representative.

The contractor or owner shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines, be representative of the water in the newly constructed mains, and shall be collected a minimum of every 1,200 linear feet. A tap will be placed prior to disinfection on the top of the pipe at predetermined locations based on the previous guidelines and will be used by the Authority's Water Department Representative to collect samples for bacteriological quality. No hoses or hydrants will be used in collecting samples. After flushing of the chlorine from the system, the Contractor will provide sterilized bottles and the Authority's Water Department Representative shall take a minimum of two samples with the second sample taken twenty-four (24) hours after the first sample. The sample analysis Department Representative will measure and report the chlorine residual.

The sample results must show the absence of coliform bacteria. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated. Should the analysis show bacteria present, the Contractor is responsible for repeating the disinfection and analysis procedures. The number of sampling points required will be as directed by the Engineer. Once suitable back-to-back bacteriological samples are obtained, the Engineer will be responsible for notifying the South Carolina Department of Health and Environmental Control (DHEC) so that the department can obtain samples necessary to confirm the absence of bacteria. DHEC testing is required prior to placing the lines in service. Disinfection will be required on potable water lines only and not on sewer force mains. The Contractor will be responsible for the cost of water as outlined in the Authority's latest Developer Policy.

4.5.3 WATERLINE AND FORCE MAIN/GRAVITY SEWER LINE SEPARATION

Water line passing over force main or gravity sewer line shall have a minimum clearance of eighteen (18) inches between the outside of the water main and

outside of the sewer line. Where the eighteen (18) inch separation is not possible, both water and force main or gravity sewer lines shall be ductile iron pipe each with a minimum section of eighteen (18) linear feet of pipe centered at the crossing. Suitable bedding of the sewer lines will be provided to the spring line of the water line for a distance of two (2) feet each side of each pipe at the center of the crossing.

Water line passing beneath force main or gravity sewer line shall have a minimum clearance of eighteen (18) inches between the outside of the water main and outside of the sewer main. In addition, both water and force main or gravity sewer lines shall be ductile iron pipe each with a minimum of eighteen (18) linear feet of pipe centered at the crossing. Suitable bedding material shall be provided from the bedding of the water line to the spring line of the sewer line for a distance of two (2) feet each side of each pipe at the crossing.

Horizontal separation between water line and force main or gravity sewer line shall be a minimum of ten (10) feet from the inner edges of each pipe unless otherwise approved by the Authority. Where it is not practical to provide ten (10) feet of horizontal separation, the bottom of the water line shall be placed a minimum of eighteen (18) inches above the top of the force main or gravity sewer line in a separate trench. Where neither the ten (10) feet nor eighteen (18) inches of clearance are practical the water line shall be placed as far as practical horizontally and as high as practical above the force main or gravity sewer line while providing minimum cover and shall consist of ductile iron pipe. Any deviations from the minimal standards for separation and pipe material selection shall be approved by the engineer of work, DHEC and the Authority.

Special Conditions: When it is impossible to obtain the distances specified in SCDHEC *R.61-58.4(D)(12)(a) and (b)* GSWSA may allow an alternative design. Any alternative design shall:

- Maximize the distances between the water main and sewer line and the joints of each;
- Use materials which meet the requirements SCDHEC *R.61-58.4(D)(1)* for the sewer line; and
- Allow enough distance to make repairs to one of the lines without damaging the other.

Drain-fields and Spray-fields: Potable water lines shall not be laid less than 25 feet horizontally from any portion of a waste water tile-field or spray-field, or shall be otherwise protected by an acceptable method approved by SCDHEC.

4.5.4 PAYMENT

Payment when required for pressure pipe will be based on a unit price per linear foot. The unit price will include the furnishing and installation of materials, excavation, bedding, back filling, gaskets, transition couplings, unloading, hauling and placing of the pipe. The unit price will also include tie-ins (wet or dry) to the existing system, valves and other appurtenant items unless otherwise specifically shown as a separate item on the Bid Form. Pipe will be measured for payment along the centerline of the pipe as installed.

4.6 VALVES AND TAPPING SLEEVES

4.6.1 GENERAL

Valves 8" and smaller shall be provided with special support consisting of a sufficiently tamped trench bottom and crushed stone. Valves 10" and larger shall be supported by concrete pads unless otherwise directed by the Engineer. Crushed stone shall be used to encase the valve up to the height of the valve nut. The bid item unit cost for valves shall include the valve, valve box, valve box collar, concrete markers, testing, bedding and any associated appurtenance necessary for a complete, functional installation.

All valve bonnets and stuffing box bolts, studs, washers and nuts shall be “316 stainless steel”. This is applicable to all size valves.

4.6.2 VALVE EXTENSIONS AND MARKERS

Any valve installed at a depth greater than 5' shall have a nut extension installed to within 2' of the surface. Concrete markers shall be installed for all bends, valves and buried facilities. The number of markers required per location shall be determined by the inspector and O&M department.

4.6.3 DOUBLE DISC VALVES

Double Disc Parallel Seat Gate Valves (AWWA). Double disc parallel seat gate valves will be manufactured in accordance with AWWA C-500, latest revision. Valves shall be non-rising stems (NRS) with 2" square operating nut for buried service installations, or outside screw and yoke (OS & T) if noted on plans. Valves shall be manufactured with O-ring stem seals. Valves will be designed for a working pressure of 200 psi for sizes 2" through 12", and 150 psi for valves 14" and larger. Double Disc valves 16" and larger shall be equipped with bypass valves to equalize pressure on both sides of gate. All valves 24" and larger shall be equipped with gearing, rollers, tracks, and scrapers as needed for horizontal installation. Valves bodies will be of heavy cast iron with corrosion resistant parts and coatings, high tensile manganese bronze stems and bronze disc rings. Flanged valves shall be in conformance with ANSI B 16.1, Class 125. Tapping valves shall have flanged inlet end with centering ring and a mechanical joint outlet end. All buried service gate valves shall be fitted with cast iron valve boxes and cover with fully adjustable tops. Double disc gate valves shall be, Mueller, American Flow Control, M & H, Clow, or approved equal.

4.6.4 RESILIENT SEAT OR WEDGE GATE VALVES

Resilient seat gate valves shall be either cast iron or ductile iron body, bonnet, and stuffing box and comply with AWWA C-509 latest revision. External parts will consist of corrosion resistant materials or be protected by corrosion resistant coatings (fusion bonded epoxy) in compliance with AWWA C550. The wedge type valve disc will be cast iron or ductile iron with bronze stem nut and bronze stem, and shall be fully EPDM rubber encapsulated including stem nut area and guides. The operating mechanism shall be equipped with O-ring seals above and below the thrust collar to prevent entrance of contaminants. The stem shall be lubricated in the space between the seals, and shall utilize anti-friction washer above and below the thrust collar. The use of seal cartridges shall not be allowed. Above ground installations shall be mechanical joint with restraints, or, flanged with hand wheels, or as noted on plans. Buried service valves shall be mechanical joint or threaded with 2" square operating nuts. All valves shall be non-rising stems (NRS) and shall open counter-clockwise. Stems shall be bronze in conformance with AWWA C-509 standards. Body to bonnet fastening shall be by hex head nuts and bolts only.

Resilient seat gate valves will be for use in sizes 4" through 12. When open, the valve will provide smooth unobstructed flow with a diameter equal to the nominal

diameter of the valve. The valves will be subject to two hydrostatic tests. The first test will check for leakage across the seat at 200 psi, and the second in the open position for leakage at flanges, body, O-rings at 400 psi. Valves shall be American Flow Control, Mueller, Clow or approved equal.

4.6.5 BUTTERFLY VALVES

All butterfly valves, except as herein otherwise noted, shall conform to AWWA C-504, latest revision. All valve shafts shall be connected to operators by the use of keys and keyways. The use of compression or friction connections is not acceptable.

The seat on disc valve shall be continuous around the periphery of the disc and shall not be penetrated by the valve shaft.

Standard service butterfly valves shall be short body type, Class 150B. Valve disc shall be contoured ASTM A 48, Class 40 cast iron or ASTM A536, Grade 65-45-12 ductile iron. Valve shaft shall be Type 304 stainless steel with self-lubricating, corrosion-resistant sleeve type bearings. Valve seat shall be attached to either the valve body or the disc and shall be of EPDM rubber. Valves shall be equipped with totally enclosed geared operator. Valves shall be flanged with 125 pound full faced flanges drilled in accordance with ANSI B 16.1.

Buried service butterfly valves shall have ANSI/AWWA C111/A21.11 integrally cast mechanical joint ends, and shall be Class 150B. Valves shall be equipped with totally enclosed geared operator. Valves shall have ASTM A126, Class B cast iron body. Valve disc shall be contoured ASTM A 48, Class 40 cast iron or ASTM A536, Grade 65-45-12 ductile iron. Valve shaft shall be Type 304 stainless steel with self-lubricating, corrosion-resistant sleeve type bearings. Valve seats shall be attached to either the valve body or the disc and shall be of EPDM rubber.

Operators shall be equipped with a 2” square operating nut, open left, and have sealed grease case operator to withstand an external groundwater pressure of 10 psi minimum. Valves shall be Henry Pratt, Mueller LineSeal III, Clow, Dezuick, American Flow Control, M & H, or approved equal with manufacturers standard geared operator. Approval of submittals must be obtained prior to purchasing for installation.

4.6.6 RESILIENT SEATED GATE VALVES 14” THROUGH 24”

Valves may be completely ductile bodied, lightweight with compact wall, and shall conform with applicable AWWA standards. The valve shall be 250 psi rated, and 500 psi shell tested, and shall have a ductile iron gate completely encapsulated in EPDM rubber including stem nut area and guides. Shall be capable of horizontal installation where needed for ground line clearance through the use of manufacturers enclosed bevel gear operator mounted directly to the valve by the manufacturer. Valve shall have a fusion bonded epoxy coating inside and out conforming to AWWA C-550. When open the valve shall have a smooth port with no obstructions or cavities to collect debris. Valve body to bonnet shall be fastened by hex head bolts and nuts only. Valve shall be American Flow Control Series 2500, Mueller, M & H, or approved equal. Approval of submittals must be obtained prior to placement of order.

4.6.7 SWING CHECK VALVES

The Contractor will furnish and install swing check valves as shown on the plans which meet the requirements of AWWA C508. For valves four (4) inches and larger, bodies and bonnets will consist of cast iron or cast steel and will be designed to allow removal of the clapper arm and sic assembly through the bonnet opening without requiring removal of the valve from the line. Disc will be of cast iron or cast steel with bronze or alloy disc rings machined into the disc. The seat ring will be bronze or stainless steel and will be threaded for removal with the valve body in line. Clappe arms will be bronze bushed ductile iron. Clapper arm shafts will be manufactured of bronze or high tensile aluminum bronze, will be extended through the body for attachment of the weight or spring and will be capable of being field adjusted. Flanged ends will be faced and drilled in accordance with ANSI B 16.1 Class 125. Valves twelve (12) inches and smaller will have a minimum working pressure rating of 175 psi and 350 psi hydrostatic test pressure and valves larger than twelve (12) will have a corresponding pressure of 150 psi and 300 psi. The valves may be operated by lever and weight or lever and spring as directed by the Engineer.

Check valves for fire systems shall be UL and FM approved detector double check type. External levers are not allowed in UL or FM installations.

4.6.8 BALL CHECK VALVE

The contractor shall furnish and install ball check valves of the type and size indicated on the drawings which meet the requirements of AWWA C507. The

valves shall consist of a gray cast iron Class 35 body and cover and a hollow steel ball with a vulcanized nitride rubber exterior. The ball check valve will have one moving part. The design of the valve shall be such that it keeps solids, stringy material, grit, rags, etc. moving without the need for back flushing. The ball shall clear the waterway providing "full flow" equal to the nominal size. It shall be non-clog. There shall be no outside levers, weights, springs, dash pots or other accessories required for a swing (clapper)type check valve. The ball shall be resistant to grease, petroleum products, animal and vegetable fats, diluted concentration of acids and alkalinize (ph 4-10), tearing and abrasion. Flange drilling shall be according to ANSI B 16.1, Class 125. The ball check valve will be installed in a horizontal or vertical position as shown on the plans. If shown, the valve shall be of the type shown on the plans.

4.6.9 VALVE BOXES

Gate valves will be fitted with cast iron valve boxes and covers with fully screw type adjustable top for all buried installations. Cast iron valve boxes shall be provided for all valves installed underground. The boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping and concrete around the outside per standard drawings. Valve boxes shall have "WATER" clearly marked on top cover.

4.6.10 VALVE EXTENSIONS AND MARKERS

Any valve installed at a depth greater than 5’ shall have a nut extension installed to within 2’ of the surface. An extension shall be permanently attached to valve nut and shall be provided with spacers for vertical alignment within the valve box. Concrete markers shall be installed for all bends, air release valves, valves and fire hydrants. A minimum of two concrete valve markers and/or permanent ties shall be approved as part of the as-built dimensioning process. Markers shall be painted blue. The number of markers, their locations and the number required per location shall be determined by the inspector and O&M Division. See standard details for Valves, Boxes, Extensions and Markers.

4.6.11 DOUBLE CHECK VALVE OR REDUCED PRESSURE BACK FLOW PREVENTOR

Double check valve assemblies or reduced pressure back flow preventors shall be installed as shown on the plans to protect the water supply source from contamination. Each valve will operate independently of each other. Springs will

consist of stainless steel. The assembly shall consist of a one-piece bronze sleeve and seat capable of being disassembled and repaired without removing the unit from the line service. Double check valve assemblies or reduced pressure device must be included on the South Carolina Department of Health and Environmental Control's, "List of Approved Back flow Prevention Devices," latest edition. Installation of the assembly shall be in accordance with manufacturer recommendations and Authority standard drawings and shall be in such a manner as to provide adequate access to the assembly for operation and testing. The assembly provided must be capable of operating in the vertical or horizontal position shown on the plans. Each assembly must be tested by a certified tester upon installation and once annually thereafter or after any repairs.

4.6.12 TAPPING SLEEVES

All tapping sleeves and tapping valves are to be air tested and inspected prior to installation of adjoining pipe systems.

All tapped pipe wall sections “cookie” coupons after tapping shall be retrieved and turned over to the Authority inspector. The Contractor shall verify all taps with the Authority inspector.

A. Mechanical Joint Type

Tapping sleeve to be manufactured from gray cast iron meeting or exceeding ASTM A126 Grade B or ductile iron meeting ASTM A536 Grade 65-45-12 (outlet sizes 14" and larger).

Tapping sleeve to be used in conjunction with a mating tapping valve from same manufacturer. Outlet flange of sleeve to be counter-bored per MSS SP-60 for true alignment of tapping valve and tapping machine. Sizes of outlet to be available through equal opening of sleeve diameters up to 24". Sizes 12" and smaller sleeves must be capable of working on Class ABCD Pipe diameters without changing either half of sleeve. Sizes 14" and larger must be specified as to which class size is needed. All sleeves are to include the end joint accessories and split glands necessary to assemble sleeve to pipe. MJ bolts and nuts are to conform to ANSI/AWWA C111.A21.11. No special tools other than standard socket wrench to be required for assembly of sleeve to main.

Cast or ductile sleeves shall be coated with asphaltic varnish per Federal Specification TT-V-51, Military Specification MIL C-450, or approved equal.

B. Single Seal Type and Stainless Steel

Tapping sleeve to be manufactured from gray cast iron meeting or exceeding ASTM A126 Grade B or fabricated T-304 stainless steel including flange in accordance with ANSI/AWWA C-207 Class D ANSI 316.5 Cl 150. Sleeve to be of the lightweight compact type with sealing effected by a single rectangular gasket used inside the sleeve. No other auxiliary means of sealing ends of sleeve to be necessary.

Tapping sleeve to be used in conjunction with a mating tapping valve from same manufacturer. Outlet flange of sleeve to be counter-bored per MSS SP-60 for true alignment of tapping valve and tapping machine. Sizes of outlet to be available through equal opening of sleeve diameters.

Maximum bolt torque required to seal sleeve to main shall be 90 ft.-lbs. All bolting used shall be equal to ANSI/AWWA C111/A21.11 specifications. Sleeve shall be capable of fitting to PVC, either cast iron or ductile iron pipe, Class ABCD diameters, without changing either half of sleeve. No special tools other than standard socket wrench to be required for assembly of – sleeve to main.

Cast sleeves shall be coated with asphaltic varnish per Federal Specification TT-V-51, Military Specification MIL C-450, or approved equal.

All stainless steel sleeves shall conform to the following:

- Shell and Lugs: Stainless steel per ASTM A240, type 304 and type 304L.
- Bolts: 5/8" UNC rolled thread, stainless steel per ASTM A 193, type 304. 4" nominal pipe size has 1/2" bolts. Fasteners coated to prevent galling.
- Nuts: Heavy hex, stainless steel per ASTM A194, type 304.
- Washers: Stainless 304 Steel and plastic lubricating washer.
- Gaskets: Virgin SBR per ASTM D2000 MAA 610, compounded for water and sewer service. Other compounds available on request.
- Flange: Stainless steel per ASTM A240, type 304. Approved tapping sleeves are Romac SST No. 3, Smith Bair 665, Mueller H304, JCM 452 or prior approved equal.

4.7 AIR AND VACUUM RELEASE VALVE ASSEMBLIES

4.7.1 GENERAL

This section covers the work necessary for furnishing and installing the air and vacuum release valve assemblies, complete. Air and vacuum relief valves shall be provided in accordance with sound engineering practices at high points in water mains as required. Automatic air and vacuum relief valves shall not be used in situations where flooding of the manhole or chamber may occur. Chambers, pits or manholes containing valves, blow-offs, meters, air relief valves, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer.

4.7.2 MATERIALS

Main Line connection shall be a wide band single strap service saddle with AWWA thread corporation stop, tap, and neoprene gaskets. Service saddles shall be adequate for use with the size, type, and class of the water pipe and shall be ROMAC No. 101N, Smith Blair 315 or approved equal by GSWSA.

4.7.3 COMBINATION AIR AND VACUUM RELEASE VALVES

The air and release valves shall be designed to operate under working pressures of 150 psi and shall have been tested at a pressure not less than 300 psi, and be 1 inch in size with iron pipe threads on the inlet. Air and vacuum release valves shall have cast iron body and cover. Float guides, bushings, and lever pin shall be stainless steel or bronze.

The air and vacuum release valves shall be ARI combination air release valves, or approved equal by GSWSA.

4.7.4 AIR RELEASE VALVES

Air release valves shall have cast iron body and cover. Float guides, bushings, and lever pin shall be stainless steel or bronze. The air release valves shall be designed to operate at a design pressure of not less than 150 psi. Inlet size shall be 1/2 inch NPT.

The air release valves shall be Val Matic, Crispin or approved equal by GSWSA.

4.7.5 PIPE AND MALLEABLE IRON FITTINGS

The pipe used for the air release valve assemblies shall be Schedule 80 PVC or Schedule 40 stainless steel pipe or approved equal.

4.7.6 WORKMANSHIP

A. Tapping Pipe

On existing waterlines, or waterlines accepted by GSWSA, unless otherwise approved the pipe shall be tapped and service saddle installed by GSWSA Personnel.

B. Testing and Sterilization

Air and vacuum release valve assemblies shall be tested and sterilized in conjunction with the pipeline.

4.8 POTABLE WATER SERVICE CONNECTION

4.8.1 GENERAL

The work covered under this division of the specifications is intended to include the furnishing of all equipment, materials, and labor necessary for or reasonably incidental to the complete installation of the individual house service or building lines including the following items as may be indicated on the plans or specified. Corporation stop, service line, stretch meter box, and double check valve or reduced pressure type back flow preventer. Bid item unit prices for residential service taps shall include tap saddle, tap corporation stop, piping, gaskets, meter box, check valve assembly, and meter setter complete in place. All brass fittings, fixtures and valves coming in contact with potable water shall be made of no lead brass. No-lead brass being defined as a brass product's lead content not exceeding 0.25%, weighted average. All stainless steel fittings shall conform to ASTM A351. Stainless steel nipples shall conform to ASTM A312.

4.8.2 SERVICE CONNECTION SIZE

The location and size of service connection to be installed will be as shown or as directed by the Engineer or the Authority. The water meter will be installed by

the Authority. Services shall consist of the tap, saddle, corporation stop, one (1) inch service line, 1" x 3/4" x 3/4" wye for dual services, and stretch yoke box with dual services.

4.8.3 QUALITY STANDARDS

Quality standards refer to the following standard references with respect to materials, test and physical parameters:

ASTM B88 - Type "K" Copper service line (Only where specifically approved for use.)

AWWA C800 - Threads for all fittings

Commercial Standard Specifications CA-255-63 - Polyethylene Pipe, 200 psi Min. SDR 9 with NFS seal of approval. (See Section 4.8.9)

4.8.4 SUBMITTALS

The Contractor may be required to submit complete shop drawings, cuts, diagrams and charts as necessary, all in accordance with the general conditions and/or special conditions for the project.

4.8.5 METER SETTER

Where meter setters are required the Contractor shall furnish all brass meter setters with connection required to connect to 1 inch service lines on street side of installation and 3/4 inch house connection line on property side of installation. Setters furnished shall raise the meter to point seven inches (7") above run of the service line and shall be equipped with 3/4 brass ground key curb cutoff cock. Connections shall be for 5/8 inch x 3/4 inch meter. Setters furnished shall be similar and equal to that manufactured by Ford Meter Box Company or an equal as may be approved by the Engineer and the Authority.

Meter setters of a different size may be required if designated in the specifications or on the proposal or Project drawings. See Authority Standard Details for turf box and valve on property side of meter.

4.8.6 METER BOXES AND COVERS

Ford 3/4 inch Golden Gate Yoke box No. 241-233-NL with locking lids and angle inlet, straight outlet, as manufactured by Ford Meter Box or approved equal. The

stretch box assembly w/double check valve where required shall be per cities supply for 3/4" and 1" service connections. See standard drawing for applicable installation. Check valve shall be Ford HHC 33-322 or Watts No. 7.

4.8.7 INSTALLATION OF METER BOXES

Meter boxes or vaults shall be installed as shown or as directed by the Engineer or the Authority. Finish grade of completed meter enclosure shall be flush with existing ground or shown otherwise or as directed by the Engineer. Meter boxes or vaults shall be set or constructed plumb with the top set to conform to the slope of the finish grade. Lightly compacted earth backfill shall be placed inside of the meter boxes to depth indicated. Grade adjustment of the meter boxes or vaults shall be by using standard extension sections for the box or vault specified. Backfill around meter vaults as specified for adjoining pipe. Final adjustment to grade of meter box and meter appurtenances is the responsibility of the customer's installing contractor. No meter will be authorized to be set until approval of all appurtenant work and final inspection by the Authority has been received. Meters will be set by Authority personnel.

Meters may be withheld from installation until the entire water system is ready for operation. The remainder of the service connection, excluding the meter and other appurtenances, may be installed at any time during or after construction of the water main. Meters cannot be set until the waterline is first approved by the Authority and received final inspection.

4.8.8 COPPER PIPE (ONLY WHERE SPECIFICALLY APPROVED FOR USE)

Copper pipe used in service entrances shall conform to the requirements for seamless copper service pipe used for underground service connections as specified by ASTM B88, Type "K" for the sizes specified. The copper tubing shall be cut with square ends, reamed, and flared with the proper size flaring tool, cleaned, and made up tightly. Care shall be taken to prevent the tube from kinking or buckling on short radius bends. Kinked or buckled sections of copper tube shall be cut out and the tube spliced with the proper brass fitting at the Contractor's expense.

4.8.9 POLYETHYLENE SERVICE LATERAL PIPING

Where called for on the plans and/or specifications polyethylene or cross linked polyethylene service pipe shall be furnished as approved by the AWWA and the National Sanitary Foundation for 200 psi working pressure. Service pipe shall be

SDR9 (200 psi) polyethylene or cross linked polyethylene, CTS. Pipe shall be marked with the following information: nominal size, manufacturer's name, operating pressure, water service, CTS, NSF, ASTM D 2737 or ASTM F876, material classification and date code. Cross linked polyethylene pipe shall also have a minimum marking of PEXa 3306.

4.8.10 CURB COCKS

Curb cocks furnished shall be a brass ground key curb cock for use with selected service pipe. Curb cocks shall be designed to receive the service pipe connection with straight coupling nut on the street side and an iron pipe thread connection on the opposite side. Curb cocks shall be as manufactured by Mueller, Ford Meter Box Company, or approved equal. See standard drawing for application.

4.8.11 CORPORATION COCKS

Corporation stops. Stops shall be of the same size as the service. Normal house taps shall be 1 inch. Stops shall be CC X CTS (Compression) with an insert if recommended by the manufacturer and shall be Ford, Mueller, Hays or approved equal. See standard drawings for application.

4.9 WATER METERS

4.9.1 COLD WATER METERS - DISPLACEMENT TYPE

The work covered under this division of the specifications is intended to include the furnishing of all equipment, material and labor necessary for or reasonably incidental to the complete installation of the water meters as indicated on the drawings and specified herein.

Water meters shall be installed as shown on the plans. All meters furnished shall comply completely with the latest edition of AWWA C700-71 "AWWA Standards for Cold Water Meters - Displacement Type" 5/8 inch x 3/4 inch Sensus or approved equal shall be used.

4.9.2 COLD WATER METERS - COMPOUND TYPE

The work covered under this division of the specifications is intended to include the furnishing of all equipment, materials and labor necessary for or reasonably incidental to the complete installation of the water meters as indicated on the drawings and specified herein for larger compound type meters.

Water meters shall be installed as shown on the plans. All meters furnished shall comply completely with AWWA C702-70 "AWWA Standard for Cold Water Meters - Compound Type." The Authority shall select the manufacturer and the model meter to be used.

4.10 TAPPING SADDLES

4.10.1 WATER SERVICE LINE TAPPING SADDLES

The Contractor shall furnish and install complete a wide band single strap nylon coated S.S. service saddle or double strap for all taps occurring in pipe mains. Saddles shall be threaded with CC pipe threads. Saddles furnished shall be per the standard drawing for saddles.

Service clamps shall be used on all taps regardless of type main being tapped. Clamp shall have CC outlet and be designed for use of the pipe being tapped. Clamps shall be Romac 101 N, Smith Blair 315, Mueller DEIS or approved equal by GSWSA. All saddles shall meet AWWA standards.

4.10.2 HYDROSTATIC TEST AND LEAKAGE

Test service connections and service connection pipe in conjunction with the main at the test pressure required for the main. Duration of the test shall be in conformance with Chapter 4.

Service connection transfers will be visually inspected for leakage by the Authority under normal system pressure.

4.11 HYDRANT ASSEMBLIES

4.11.1 FIRE HYDRANT SPECIFICATIONS

All fire hydrants shall comply with AWWA Standards C502, the latest revision thereof, and the following design standards.

Fire hydrants shall be of the dry barrel compression type, closing with line pressure, and all operating parts, (including valve seat ring, drain ring upper valve plate, nozzles, etc.) shall be all bronze meeting either of the following: ASTM B61, B62, B98, B150.

Hydrant operating threads shall be contained in an oil or grease reservoir. All threaded and metal to metal bearing surface in bonnet shall be automatically lubricated each time the hydrant is cycled. Maximum operating torque to open or close hydrant shall not exceed 25 ft. lbs. at 50 PSI pressure. Grease and oil shall be USDA food grade.

The main valve shall be of rubber, minimum 4 1/2" diameter. The seat ring shall be bronze and threaded into bronze seat bushing located between lower barrel and shoe, forming an all bronze drain way with a minimum of two drain port openings. Hydrant barrels and shoe shall be cast iron or ductile iron. Bolts securing the lower barrel to the shoe shall be minimum of 3/4" hex head. Distance from bury cast line on lower barrel to center line of nozzles shall be a minimum 18". Lower barrel shall have raised or notched line denoting target ground line. Barrels shall be cast iron or ductile iron and be separated by flat rubber gaskets. Flanges of barrels shall be either snap-ring design so as not to transmit shock waves to underground joints, or integral.

Hydrant hardware shall be stainless steel including nuts, bolts and washers.

Maximum pressure loss allowed shall not exceed AWWA standards.

Hydrant shoe and lower valve plate shall be coated with fusion bonded epoxy coating inside and out, meeting AWWA C-550.

Hydrant shall be traffic model with breakable flanges, and stem coupling shall be breakable design with pinned connectors. Hydrant shall be equipped with one 4 ½" pumper NST threads, and two 2 ½" hose nozzles NST threads. Hydrant shall open left (counter-clockwise) and shall be rated for 200 PSI and shall meet Underwriters Laboratory and Factory Mutual Insurance rating. All suppliers shall provide data certifying to the above criteria when requested.

Hydrant shall be marked with the name of the manufacturer, year of manufacture, and valve opening size. Approved fire hydrant manufacturers are American-Darling Mark 73 by AFC, Mueller Super Centurion, Clow, M & H or approved equal.

All hydrants shall be red in color and installed on the same side of the road as the water main unless otherwise specifically noted.

4.11.2 POST HYDRANT SPECIFICATIONS

Post hydrants or flushing hydrants shall conform to AWWA Standards C502, the latest revision thereof. Post hydrants shall be dry barrel compression type closing with line pressure. Post hydrants shall have a minimum of one 2-1/2" National Standard hose connection. Post hydrants shall be Eclipse, Clow, M & H, Mueller, or approved equal. Installation is to be per standard detail drawings.

Hydrant hardware shall be stainless steel including nuts, bolts and washers.

All hydrants shall be red in color.

4.12 WATER CROSSINGS

4.12.1 All pipe installations above water crossings shall be adequately supported and anchored, protected from damage and freezing, accessible for repair or replacement.

4.12.2 Under water crossings: A minimum of 2 feet of cover shall be provided over the pipe. When crossing water courses that are greater than 15 feet in width, the following shall be provided*: (R.61-58.4.D.(13)(b)(i)-(iii)*

a. The pipe material and joints shall be designed appropriately.

b. Valves shall be located so the section can be isolated for testing or repair, the valves (on both sides of crossing) shall be easily accessible and not subject to flooding.

c. A blow-off shall be provided on the side opposite the supply service sized in accordance with *Section R-61-58.4.(D)(7).* Direct away from streams, over ground.

d. Major rivers and water way crossings shall have the minimum required cover as identified in the Corps of Engineering permit conditions.

CHAPTER 5

SITE WORK AND FENCING

5.1 FENCING

5.1.1 GENERAL

The Contractor shall perform all work necessary for or incidental to the performance and completion of fencing, where fencing is required. This work shall be completed as shown on the drawings and as specified. This work shall include the furnishing of all labor, materials and equipment. The contractor shall be responsible for coordinating the work to assure that the work is completed in an orderly manner.

Although such work may not be specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

5.1.2 CHAIN LINK FENCE MANUFACTURING AND MATERIALS

Chain link fence installed on this project will meet or exceed all applicable standards of the Chain Link Institute. Fencing provided will be of new materials only and all fabric, posts, gates, post tops, tension wire, bars, rails, bands, braces, fittings, fasteners and all other items necessary will be one reputable manufacturer. All items will be hot-dip galvanized steel except fabric which may be aluminum coated. Materials will be fabricated and welded prior to coating. The fencing will consist of the following:

A. Fabric

Fabric will be one piece six (6) feet in width and will consist of No. 9 gauge wire woven in tow (2) diamond mesh with barbed selvages at top and bottom. Fabric will consist of zinc coated steel or aluminum coated steel. Zinc coated will be in accordance with ASTM A 392, Class I " Zinc Coated Steel Chain Link Fence Fabric," and will require 1.2 oz. of coating per square foot (S.F.) of wire surface area. Aluminum coated will be in accordance with ASTM A 491, Class II and will require 0.40 oz. per SF of wire surface area.

B. Posts

1. Line posts will be 2 1/2 inch outside diameter (O.D.) galvanized steel pipe weighing not less than 3.65 lbs. per linear foot (LF); or 2 1/2 inch square tubing or 2 1/4 inch H -Sections weighing not less than 4.1 lbs. per LF.

2. Gate posts will be three (3) inch O.D. galvanized steel pipe weighing not less than 5.79 lbs. per foot for gates up to six (6) feet in width.

3. Corner, pull and end posts or terminal posts will be three (3) inch O.D. galvanized steel pipe or 2 1/2 inch square tube weighing not less than 5.79 lbs. per LF. Corners will be considered as changes in direction of thirty (30) degrees or more. Pull posts will be used at abrupt changes in grade. Posts will be sufficient length to be set in thirty-six (36) inches of concrete as shown on the plans. Steel Pipe will be galvanized in accordance with ASTM A 120 (1.8 oz. zinc per S.F.) Steel, weather-tight post caps will be provided for each post.

4. Bracing rails will consist of 1 5/8 inch O.D. galvanized steel pipe weighing not less than 2.27 lbs. per LF. Bracing will be between terminal posts and adjacent line posts and installed midway between the top rail and the ground level. Pipe will be galvanized in accordance with ASTM A 120 (1.8 oz. zinc per S.F.).

5. Stretcher Bars for attaching fabric to terminal posts will be flat bars of a cross section of 3/16" x 3/4" steel consisting of one piece equal to the height of the fabric. Stretch bar bands will be No. 11 gauge sheet metal spaced at fifteen (15) inches on center and bolted with 3/8 inch diameter bolts. Stretcher bars will be provided at one bar for each gate and end post and two for each corner and pull post. Bars and bands will be galvanized in accordance with ASTM A 120 (1.8 oz. per S.F.).

6. Tension Wire for attaching the fabric to terminal posts will be No. 7 gauge spring rolled steel galvanized with 0.8 oz. of zinc per S.F. of surface and spaced twenty-four (24) inches on center. Fabric bands will be No. 9 gauge wire or straps, galvanized steel or aluminum for attaching fabric to line posts and top rails.

7. Fittings will be of malleable steel, cast iron or pressed steel, rigid and weatherproof and suitable size for strong construction. Included will be a forty-five degree bracket to accommodate three strands of barbed wire.

8. Barbed wire will consist of two (2) strands of No. 12 1/2 gauge wire with 14 gauge 4 point barbs in accordance with ASTM A 121 with Class 3 zinc coating and spaced five (5) inches O.C.

9. Gates. Gate frames will be constructed of galvanized steel pipe not less than 1 7/8 inch in diameter and weighing not less than 2.72 lbs. per LF or square tubing weighing not less than 3.65 lbs per LF. Frames will be bolted, riveted or welded with welds provided with an application of zinc based paint. Fabric will be as previously specified and will be attached with a spacing not exceeding fifteen (15) inches. Gate hinges will be of pressed or forged steel or malleable iron of adequate strength with large bearing surfaces for clamping or bolting in position. Hinges will be off-set to permit 180 degrees gate opening. Hinges will not deform under the action of the gate. Gate latches will be a plunger-bar arranged to engage the center gate stop and for locking with padlocks. Keepers will be provided to engage the gate leaf and hold it open until manually released. A drop rod on the latch with casing set in concrete will be provided. The gates will be capable of being easily opened and closed by one person. A padlock with two keys will be furnished by the Contractor and keyed as specified by the Engineer.

10. All fabric, posts, wires, etc. shall conform to the standard detail approved by GSWSA.

5.1.3 CHAIN LINK FENCE ERECTION

Erection of the fence will be in full accordance with the standards of the Chain Link Institute, ASTM F 567 and manufacturer recommendations and will be by experienced, skilled mechanics.

Final grading of the site will be along straight lines, and set plumb with posts spaced at a maximum distance of ten (10) feet.

Postholes will be drilled in firm, undisturbed or compacted soil. The Contractor is responsible for verifying suitability of soil conditions prior to installation. For posts less than six (6) inches in diameter, holes will be twelve (12) inches in diameter for terminal posts and nine (9) inches flines posts to a depth of forty (40) inches below grade. Posts will be set in a concrete foundation completely filling the hole to a depth of thirty-six inches below grade with four (4) inches of concrete below the bottom of the post. The top of the concrete foundation will be shaped to drain water.

Horizontal brace rails and diagonal truss rods (3/8") brought to proper alignment. Top rails will be installed with expansion couplings providing rigid connections allowing expansion and contraction. Top rails will anchored to main posts with proper fittings. The fence framework will be firmly fit. Fabric will be installed from two (2) inches above grade at the bottom to the top of fabric at the top rail. The fabric will be stretched tight and fastened to end posts with stretcher bars and clamps and to line posts and top rails with wires or bands. The fabric installed on the security side of the fence. Fabric will be free of sags or bulges and secured to posts at fifteen (15) inches O.C. and to top rails at twenty-four (24) inches O.C.

Three strands of barbed wire will be installed on the brackets of the fence and gate, tightened and fastened on each bracket. Brackets will be angled away from the security side of the fence.

Gates will be erected rigidly without sagging, twisting or loose fittings and hung plumb and level. Hardware will be adjusted to provide smooth opening and closing of the gate.

5.2 GRASSING

5.2.1 GENERAL

The Contractor shall perform all work necessary for or incidental to the performance and completion of grassing, when required for specific projects. This work shall be completed as shown on the drawings and as specified. This work shall include the furnishing of all labor, materials, and equipment. The Contractor shall be responsible for coordinating the work to assure that the work is completed in an orderly manner.

Although such work may not be specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for

a sound, secure, and complete installation shall be furnished and installed as part of this work.

5.2.2 SUBMITTALS

The Contractor shall submit data on the suppliers of all materials to be used, germination results, seed content, etc.

5.2.3 SEED SCHEDULE

Grassing shall be in accordance with the latest S.C. Department of Highways and Public Transportation seed schedule.

In all applications, seeded area shall receive an application of mulch at a minimum rate of one (1) bale per 400 SF with 4.5 gallons emulsified asphalt per bale to anchor mulch.

The following procedure shall be utilized in all seeded areas: The topsoil shall be conditioned with limestone incorporated into the full depth of the topsoil by discing, rototilling, or other approved method. The incorporating machine shall pull a drag or other acceptable smoothing device. Following the limestone application, fertilizer shall be applied at the required application rate, evenly spread and incorporated into the top one inch of soil by raking. All debris, stones, etc., over one inch in diameter shall be removed. Finish soil by alternately dragging leveling device and rolling with light-weight (less than 3 1/2 tons) roller until surface is free of high spots and depressions and lightly compacted with positive surface drainage.

Seed shall be sown at the specified rate and mixture within 24 hours following soil conditioning and application of fertilizer. Immediately after seeding, mulch shall be evenly applied at the specified rate. Erosion and displacement of newly laid mulch shall be prevented on all swales and slopes. Displaced mulch shall be applied as necessary to insure grass cover.

Materials used shall meet the following specifications:

5.2.4 LIMESTONE

Ground dolomitic limestone shall be used containing not less than 85 percent total carbonates and 8 percent magnesium. Limestone shall be ground so that 50 percent passes 100 mesh sieve and 90 percent passes 20-mesh sieve. Coarser materials shall be acceptable provided the rate of application is increased over the

specified rates proportionately on the basis of quantities passing 100-mesh sieve. Lime shall conform to the requirements of the South Carolina Department of Agriculture.

5.2.5 FERTILIZER

Commercial fertilizer shall be used containing 5 percent nitrogen, 10 percent available phosphoric acid and 10 percent potash. Fertilizer provided shall conform to all applicable state and federal regulations, conform to the plant nutrients standards of ADAC, be uniform in composition, and be dry and free flowing. Fertilizer shall be delivered to the site in original, unopened, containers bearing manufacturer's guaranteed analysis.

5.2.6 SEED

Seed shall be certified, blue tag, clean, meeting the specified mix requirements. Seed shall be delivered to the site in original, unopened, containers bearing manufacturer's guaranteed analysis. Seed shall be guaranteed 95 percent pure and have a minimum germination rate of 85 percent within one (1) year of application.

5.2.7 MULCH

Mulch shall be threshed straw of oats, wheat, or rye free from seed of nuisance weeds or clean salt hay.

5.2.8 ACCEPTANCE AND PAYMENT

Before acceptance of the grassed areas, the Contractor shall be required to produce a stand of grass sufficient to survive dry periods and winter weather and capable of re-establishment in the spring. Grasses shall be strongly growing of good color, disease free, and of a density sufficient to provide visible evidence of strong resistance to erosion. Stands of grass shall not be satisfactory if the bare spots exceed the following limits: more than 10 percent of any 1,000 square feet area with bare spots larger than six square inches; more than 15 percent of any 1,000 square feet area with bare spots larger than 4 square inches; any bare spots larger than 2 square feet

5.3 CONCRETE WORK

5.3.1 GENERAL

The Contractor shall perform all work necessary for or incidental to the performance and completion of concrete work. This work shall be completed as shown on the drawings and as specified in the contract documents. This work shall include the furnishing of all labor, materials, and equipment. The Contractor shall be responsible for coordinating the work to assure that the work is completed in an orderly manner.

Although such work may not be specifically shown or specified, as a part of water system improvements, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation of a water system shall be furnished and installed as part of this work.

5.3.2 MATERIALS

The Contractor may be required to submit the names of suppliers of all concrete materials. Materials supplied on the project will meet the requirements of ACI 301-72, "Specifications for Structural Concrete for Buildings. "Concrete will be 3,000 or 4,000 psi standard 28 cylinder strength as shown on the plans with a maximum design slump of four (4) inches. Ready Concrete must meet the requirements of ASTM C 94. Specifications for Ready Mix Concrete". Concrete form-work will meet the requirements of ACI 347 "Recommended Practice for Concrete Form work."

Reinforcing steel bars will be Grade 60 for bars No. 4 and larger and Grade 40 for No. 3 bars. Reinforcement bars will meet the requirements of ASTM A 615 for Billet Steel Bars.

5.3.3 TESTING

Concrete testing will conform with ACI 301-72 Chapter H. Two concrete cylinders will be provided per test with two tested at seven days and two additional cylinders at twenty-eight days. One test (four cylinders) will be required per one hundred (100) cubic yards for each type concrete poured. Concrete failing the strength test will be repaired and/or replaced – and re-tested at the Contractor's expense.

Concrete testing will be conducted by a laboratory selected by the Owner or the Authority. The Contractor will be responsible for notifying the Owner, Engineer and Authority and testing laboratory a minimum of twenty-four (24) hours prior to placement of concrete.

Concrete mix test results may be required to be submitted to the Engineer or the Authority prior to initiating concrete work showing compliance with specifications. Engineer's or Authority's approval of concrete mix does not relieve the Contractor of the responsibility for the performance of the concrete.

5.3.4 INSTALLATION

Concrete will not be placed when the temperature is forty (40) degrees Fahrenheit and falling or when freezing weather is predicted within twenty-four hours. The Contractor may place concrete in cold weather if approved and the requirements of ACI 306, "Recommended Practice for Winter Concreting, " are met. However, accelerator antifreezes and high early strength (Type III) concrete may be required to be utilized.

GMC

617 East McBee Avenue
Suite 200
Greenville, SC 29601
864.527.0460

www.gmcnetwork.com