WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

PROJECT MANUAL

FOR

WATER TREATMENT PLANT
FLOC/SED BASIN NO. 2

EDA Investment No. 04-79-07777

COG PROJECT No. 1606
WKD No. 20210110.00.CH

SOUTH CAROLINA
W.K. DICKSON & COMPANY, INC. No. C00177
CERTIFICATE OF AUTHORIZATION

CITY OF GEORGETOWN

SOUTH CAROLINA

DATE OF ISSUE: MARCH 22, 2023

REV	DATE	DESCRIPTION	BY	CHK	APR
0	03/22/23	BID SET – NOT FOR CONSTRUCTION			

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 23049
GEORGE A. BOYD, JR.

Mar 6 2023 11:50 AM

CITY OF GEORGETOWN
WATER UTILITIES DEPARTMENT
2377 ANTHUAN MAYBANK DRIVE
GEORGETOWN SC 29440
(843) 545-4500

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 23258
03-07-23
WILLIAM H. YOUNG

COVER PAGE

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

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(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 01 00
ENUMERATION OF THE DOCUMENTS

The drawings, specifications, and addenda, which form a part of this contract as set forth in Paragraph 1 of the General Conditions, Contract and Contract Documents are enumerated in Section 00 00 50 - Table of Contents.

The order of precedence when conflicts in the documents occur is as follows:

1. Permits from other Agencies as may be required by law
2. Change Orders and/or supplemental agreements according to the latest date
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The figured dimensions shown on the Drawings and in the Specifications may not, in every case agree with the scale dimension. Figured dimensions take precedence over scaled dimensions and finer scaled drawings take precedence of coarser scaled drawings, i.e., one inch equals twenty feet drawings takes precedence over one inch equals fifty feet drawings.

(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 01 50
REFERENCES

The following reference shall be used hereinafter:

Owner: City of Georgetown, SC PO Box 939 Georgetown, SC 29442	The City of Georgetown hereinafter will be referred to as the "Owner" and/or the "City".
City Administrator: Mrs. Sandra Yudice, Ph.D. PO Box 939 Georgetown, SC 29442	Mrs. Sandra Yudice hereinafter will be referred to as the "City Administrator".
Risk Manager: To Be Determined (TBD) PO Box 939 Georgetown, SC 29442	TBD hereinafter will be referred to as the "Risk Manager".
Purchasing Agent: Mrs. Daniella Howard 1134 North Fraser Street Georgetown, SC 29440	Mrs. Daniella Howard hereinafter will be referred to as the "Purchasing Agent".
Water Utilities Director: TBD Water Utilities Manager 2377 Anthuan Maybank Dr. Georgetown, SC 29440	TBD hereinafter will be referred to as the "Water Utilities Director".
Project Manager Mr. Orlando Arteaga, P.E. City Engineer 2377 Anthuan Maybank Drive Georgetown, SC 29440	Mr. Arteaga hereinafter will be referred to as the "Project Manager".
Engineer Mr. Bill Young, P.E. W.K. Dickson & Co., Inc. 4105 Faber Place Drive, Ste. 410 North Charleston, SC 29405	W.K. Dickson & Co., Inc. will be referred to as the "Engineer"

(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

00 02 00
ADVERTISEMENT FOR BIDS

The City of Georgetown requests sealed bids from qualified contractors for the following project:

WTP Floc/Sed Basin No. 2 - Project #1606 – Request for Bid (RFB)

The U.S. DEPARTMENT OF COMMERCE Economic Development Administration is providing partial funding for this project (EDA Investment No. 04-79-07777). Therefore, bidders must comply with all applicable State and Federal requirements identified in the contract documents. Recipients are hereby notified that they are encouraged, to the greatest extent practicable to purchase American-made equipment and products with funding provided under this award.

This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program. The Contractor and Subcontractors must agree to comply with EDA Contracting Provisions for Construction Projects in addition to all applicable federal, state, and local requirements. All contractors and subcontractors must be registered in the federal System for Award Management (SAM).

A non-mandatory Pre-Bid Conference will be held on **April 4, 2023,** at **10:00 am** (EST) at the Georgetown Water Treatment Plant, 2355 Anthuan Maybank Drive, Georgetown, SC 29440, and will be followed by a site visit.

Bids will be opened and read aloud at **2:00 pm (EST), April 26, 2023**.

Bidder must make positive efforts to use women-owned or minority-owned businesses.

Bid documents including, but not limited to forms, specifications and milestone events, may be downloaded free of charge from the City website: www.georgetownsc.gov. Select "Bids" from the bottom of the home page. You may also send an email request to purchasing@georgetownsc.gov for a direct link.

Owner: City of Georgetown.

Any prospective bidder, offeror, contractor or subcontractor who is aggrieved in connection with the solicitation of this contract may protest to Engineer (or) Owner in accordance with Section 11-35-4210 of the SC Code of Laws, within 15 days of the date of issuance of the Notice of Intent to Award.

No bid will be considered unless the bidder is legally qualified under the provisions of the South Carolina Contractor's Licensing Law (South Carolina Code of Laws as amended on April 1, 1999, Chapter 11, Sections 40-11-10 through 40-11-428).

Contractors shall have a classification of:

GENERAL CONTRACTOR-WATER & SEWER PLANTS (WP).

No bidder may withdraw the bid within 90 days after the actual date of the opening and thereof.

Bid documents will be modified only by written addenda. It is the responsibility of the Bidder to obtain information regarding projects directly from the City's website, www.georgetownsc.gov, under "Bids". Bids received after the due date and specified time will not be considered for any reason and will remain unopened. The City will not accept bids by fax or electronic mail.

When the Procurement Division is closed due to force majeure, bid openings will be postponed to the same time on the next official business day.

(END OF SECTION)

00 10 0
INFORMATION FOR BIDDERS

1. PROJECT SUMMARY

The **WTP Floc/Sed Basin No. 2 - Project #1606** consists of building a new, duplicate flocculation and sedimentation basin adjacent to the existing basin, as generally described in Section 01 11 00 and as more fully described in the complete Bid Documents.

This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program.

2. RECEIPT AND OPENING OF BIDS

All procurement procedures are subject to the Owner's procurement policies as outlined in Section 2-187 of the City's municipal code.

The Owner's Purchasing Ordinance can be found in its entirety on the City's website.

It is the sole responsibility of the bidder to have their Bids delivered to the Owner before the closing hour and date. The Owner assumes no responsibility **for technological failure in submitting Bids electronically.** It is the sole responsibility of the bidder to consider that their Bid was submitted on time, and that their PDF file/files are not corrupt.

Submittals may be rejected if deemed non-responsive. To be considered, interested parties **must** submit the following no later than the aforementioned deadline:

The Owner **WILL NOT** accept Bids by:

Hard copy

Fax

Email

To be considered responsive, interested parties **must** comply with the following:

1. Submit bid electronically through the Owner's website, www.georgetownsc.gov.
   Click here to submit electronically.
   Submittal package must include **all** of the following items. If more than one PDF file is uploaded, each PDF file should be clearly labeled as such:

   1. Complete Bid Form – Exhibit A
   2. Complete Bid Table – Exhibit B

2. Bid must be received electronically through the Owner's website, www.georgetownsc.gov, no later than the aforementioned deadline. Bids will be publicly opened and read aloud via the Owner's public Facebook page, https://www.facebook.com/Cityofgtown/. **It is the sole responsibility of the bidder to have their bid delivered to the Owner before the closing hour and date. The Owner assumes no responsibility for technological failure in submitting Bids electronically. It is the sole responsibility of the bidder to consider that their Bid was submitted on time, and that their PDF file/files are not corrupt.** Late Bids will not be accepted nor considered. The official clock shall be that of the Owner's Purchasing Agent, or designee. The Owner reserves the right to accept or reject any or all Bids and to waive any informalities and technicalities in the Bid process. No additional fees, costs, or any other reimbursable expenses will be allowed.
3. This solicitation does not commit the Owner to award a contract. The Owner reserves the right to waive any technicalities or informalities and to accept or reject any and/or all submissions as deemed by its sole judgment to be in its best interest. The Owner also reserves the right to terminate the selection process without notice, to waive any irregularities in any submittal, and to request additional information from any of the bidders submitting a Bid.
4. Any bidder may withdraw their Bid only by written request, at any time prior to the scheduled opening of responses. Partial or incomplete Bids may be rejected.

All costs incurred in preparing the Bid, or costs incurred in any other manner by the bidder in responding to this RFB, will be wholly the responsibility of the bidder. All materials and documents submitted by the bidder in response to this RFB become the property of the Owner and will not be returned.

3. PREPARATION OF BID

Each bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in with ink or typewritten.

Bids that are incomplete, unbalanced, conditional or obscure, or which contain additions not called for, erasures, alterations, or irregularities of any kind, or which do not comply with the Information for Bidders, may be rejected at the option of the Owner.

The correct total amount bid for the completed work is defined as the correct sum total of the amounts bid for the individual items in the proposal. The correct amount bid for each unit price item is defined as the correct product of the quantity listed for the item by the unit price bid.

4. SUBCONTRACTS

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract must be acceptable to the Owner.

5. QUALIFICATION OF BIDDER AND ITS SUBCONTRACTORS

The Owner may make such investigations as is deemed necessary to determine the ability of the bidder and proposed subcontractors 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 contract and to complete the work contemplated therein. Conditional bids will not be acceptable.

6. BID SECURITY

Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of five percent (5%) of the bid. Checks will be returned to all except the three (3) lowest bidders within three (3) days after the opening of bids, and the remaining checks will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within ninety (90) days after the date of the opening of the bids, upon demand of the bidder at any time thereafter so long as bidder has not been notified of the acceptance of its bid.

Bid security shall be a legitimate bid bond provided by a surety company authorized to do business in South Carolina, or the equivalent in, certified check, cashiers' check, or money order." A digital copy of the Bid Security must be submitted along with the electronic bid. The hard copy bid bond or check must be received by the purchasing agent within three (3) working days of the solicitation deadline. Mail or hand deliver only to:

City of Georgetown
Attn. Purchasing Agent
1134 N. Fraser Street
Georgetown, SC 29440

7. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful bidder, upon failure or refusal to execute and deliver the contract and bonds required within ten (10) days after they have received notice of the acceptance of their bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with the bid.

8. TIME OF COMPLETION AND LIQUIDATED DAMAGES

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within the number of consecutive calendar days thereafter as indicated on the Bid Form. Bidder must agree also to pay as liquidated damages the sum indicated on the Bid Form for each

consecutive calendar day thereafter as hereinafter provided in General Conditions.

9. CONDITIONS OF WORK

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract.

Insofar as possible, the Contractor in carrying out the work must employ such methods and means as will not cause any interruption of, or interference with, the work of any other contractor.

10. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Each request for such interpretation should be in writing and addressed to the Project Manager. To be given consideration, the request must be received at least five (5) days prior to the date fixed for the opening of bids.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be posted in the Project listing that is located at the City of Georgetown website http://www.georgetownsc.gov no later than three (3) days prior to the date fixed for the opening of bids. It shall be the bidder's responsibility to check for addenda before issuing its bid. Failure of any bidder to receive any addendum shall not relieve the bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the contract documents.

11. BID, PAYMENT AND PERFORMANCE BONDS

When a construction contract is awarded in excess of One Hundred Thousand Dollars ($100,000) a payment and performance bond shall be delivered by the successful bidder to the City and shall become binding on the parties upon execution of the contract.

Simultaneously with bidder's delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as secured for the faithful performance of this contract and for the payment of all persons performing labor on the project under this contract, as specified in General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company. An agent must be provided with a South Carolina license authorized to sign and execute the bond(s). Countersignature by an agent residing in South Carolina will not be required, but execution by an agent holding a South Carolina non-resident license is required. The Bid Bond shall be an amount equal to or at least five percent (5%) of the amount of the bid. The Performance Bond shall be in the amount of one-hundred and ten percent (110%) of the bid and the Payment Bond shall be in the amount of one-hundred percent (100%) of the bid.

Bid Security in the amount of 5% - Bid security shall be a legitimate bid bond provided by a surety company authorized to do business in South Carolina, or the equivalent in, certified check, cashiers' check, or money order." A digital copy of the Bid Security must be submitted along with the electronic bid. The hard copy bid bond or check must be received by the purchasing agent within three (3) working days of the solicitation deadline. Mail or hand deliver only to:
City of Georgetown
Attn. Purchasing Agent
1134 N. Fraser Street
Georgetown, SC 29440

12. POWER OF ATTORNEY

Attorneys-in-fact who sign bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

13. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

A. Inspection and testing of materials
B. Insurance requirements
C. Stated allowances
D. Permits and Rights-of-way
E. Hazardous Gas Safety (Section 01 06 00)

14. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

15. METHOD OF AWARD - LOWEST QUALIFIED BIDDER

If at the time this contract is to be awarded, the lowest base bid or total bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the contract, the contract will be awarded on the base bid or total bid amount. If such bid exceeds such amount, the Owner may reject all bids or may award the contract on the base bid or total bid amount.

The Owner will decide which the lowest qualified bidder is, and in determining such bidder, the following elements will be considered for each bidder:

- Maintains a permanent place of business and registered with the SC Secretary of State.
- Licensed as a general contractor by the South Carolina Contractor's Licensing Board.

- Has adequate plant equipment and personnel to perform the Work properly and expeditiously.
- Has a suitable financial status to meet obligations incident to the work.
- Has appropriate technical experience with a minimum of five (5) years of practice.

16. RIGHT TO INCREASE OR DECREASE THE AMOUNT OF WORK

The work comprises approximately the quantities shown in the bid form which will be used as a basis for comparison of Bids and not for final estimate. The Owner does not, by expression or by implication, agree that the actual amount of work shall correspond with the estimated quantities. The Owner reserves the right to increase or decrease the amount of work under the Contract of the work contemplated, at the unit prices quoted in the Bid.

17. OBLIGATION OF BIDDER

At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and been thoroughly familiar with the plans and contract documents, including all addenda. If a site visit is required, contact the Project Manager to schedule a date and time. The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation with respect to its bid.

It is the sole responsibility of the bidder to have their quotes delivered to the City before the closing hour and date. The City assumes no responsibility for technological failure in submitting quotes electronically. It is the sole responsibility of the bidder to consider that their bid was submitted on time, and that their PDF file/files are not corrupt."

SECTION 00 11 00
CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE REQUIREMENTS

1. As required under Paragraph 29 of the General Conditions, the Contractor shall not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his Subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.

2. Unless otherwise specified in this Contract, the Contractor shall, at its sole expense, maintain in effect at all times, during the performance of work, insurance coverage with limits not less than those set forth below with insurers and under forms of policies satisfactory to Owner.

3. The Contractor shall deliver Certificates of Insurance to the Engineer no later than ten (10) days after award of the Contract but in any event, prior to execution of the Contract by the Owner and prior to commencing work on the site as evidence that policies providing such coverage and limits of insurance are in full force and effect.

    A. Certificates shall provide not less than thirty (30) days advance notice will be given in writing to the Owner prior to cancellation, termination, or material alteration of said policies of insurance.

    B. Certificates shall identify on their faces the project name "**WTP FLOC/SED BASIN NO. 2**" and the "**PROJECT NUMBER 1606**".

4. Additional Insured: The Commercial General Liability, Auto Liability, and Excess Liability (Umbrella) insurance policies shall be endorsed to include the Owner as an additional insured.

5. The Owner is not maintaining any insurance on behalf of the Contractor covering against loss or damage to the work or to any other property of the Contractor unless otherwise specifically stated herein and as may be described by appendix hereto. In the event the Contractor maintains insurance against physical loss or damage to the Contractor's construction equipment and tools, such insurance shall include an insurer's waiver of rights of subrogation in favor of the Owner.

6. The Contractor shall indemnify the Owner and the Engineer, as stated in Part 47 of The General Conditions.

7. Insurance Requirements:
   Contractor shall provide coverage for not less than the following amounts, or greater where required by Laws and Regulations:

   a. Workers' Compensation and Employer's Liability

Workers' Compensation	Statutory
Employer's Liability	
Each Accident	$ 500,000.00
Each Employee	$ 500,000.00
Policy Limit	$ 500,000.00

   b. Commercial General Liability

General Aggregate	$ 2,000,000.00
Products - Completed Operations Aggregate	$ 2,000,000.00
Personal and Advertising Injury	$ 1,000,000.00
Bodily Injury and Property Damage—Each Occurrence	$ 1,000,000.00

   c. Automobile Liability

Combined Single Limit (Bodily Injury and Property Damage)	$ 1,000,000.00

   d. Excess or Umbrella Liability

Per Occurrence	$ 2,000,000.00
General Aggregate	$ 2,000,000.00

   e. Builder's Risk Insurance

Estimated cost of the project	$4,235,000.00

(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 31 10
BID FORM

WTP FLOC/SED BASIN NO. 2

Date: _____
Project No.: 1606

PROPOSAL OF _____, doing business as a corporation / a partnership / an individual (Strike out inapplicable terms), with its principal office in the City of _____, County of _____, State of _____, (hereinafter called "Bidder").

TO: City of Georgetown, SC

Gentlemen:

The Bidder, in compliance with your invitation for bids for the **WTP Floc/Sed Basin No. 2,** having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within **360 consecutive calendar days** thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of **$1,000 for each consecutive calendar day** thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

The plans, specifications, and addenda are complementary of each other. What is called for by one shall be as binding as if called for by all. If a conflict between any of the above is discovered by the contractor, the problem shall be referred to the Engineer as soon as possible for resolution by the Engineer. Should a conflict occur which is not resolved before bid time and/or is necessary to comply with mandatory requirements (i.e., codes, ordinances, etc.), it shall be the contractor's responsibility to price and bid the more expensive method.

Bidder acknowledges receipt of the following addendum:

No: _____Dated:_____

No: _____Dated:_____

No: _____Dated:_____

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

BASE BID: Bidder agrees to perform the work as described in the specifications and shown on the plans to furnish all products, materials and equipment and performing all labor necessary to complete the WTP Floc/Sed Basin No. 2 for the following unit or lump sum (LS) prices:

No.	Description	Qty.	Unit	Unit Price ($)	Cost ($)
1	Mobilization and General Conditions	1	LS		
2	Sitework (Excavation and Grading)	1	LS		
3	Site Piping and Valves	1	LS		
4	Erosion Control and Grassing	1	LS		
5	Sidewalks and Paving	1	LS		
6	Foundation Piles (104 Piles at 38 ft long)	1	LS		
7	Cast-in-Place Concrete Structure	1	LS		
8	Stairs, Metal Platforms, and Handrails	1	LS		
9	Painting and Coatings	1	LS		
10	Flocculation Basin Sluice Gates	1	LS		
11	Flocculation Basin Mixers	1	LS		
12	Sedimentation Basin Plate Settler System	1	LS		
13	Sedimentation Basin Sludge Collector System	1	LS		
14	Sludge Metering Station	1	LS		
15	Chemical Junction Boxes and Piping	1	LS		
16	Electrical	1	LS		
17	Equipment Allowance: Controls and SCADA System Modifications	1	LS	$ 133,715.87	$133,715.87
18	Cash Allowance: Soils, Concrete and Pile Testing and Special Inspections	1	LS	$ 20,000.00	$ 20,000.00
	TOTAL BASE BID AMOUNT INCLUDING ALLOWANCES				

Amounts shall be shown in both words and figures. In case of discrepancy, the amount in words shall govern.

Total Base Bid Amount Including Allowances Lump Sum Amount of:

_____ _____Dollars

($_____)

ADD/DEDUCT WORK IF ORDERED BY ENGINEER:

No.	Description	Qty.	Unit	Add/Deduct Unit Price ($)	Add/Deduct Cost ($)
19	Add Pile Length (over 38 ft long)	Add 100	LF		
20	Deduct Pile Length (under 38 ft long)	Deduct 100	LF	( )	( )
21	Add Foundation Piles (each 38 ft long)	Add 5	EA		
22	Omit Foundation Piles (each 38 ft long)	Deduct 5	EA	( )	( )
	TOTAL ADD/DEDUCT WORK IF ORDERED BY ENGINEER				

Amounts shall be shown in both words and figures. In case of discrepancy, the amount in words shall govern.

Total Add/Deduct Work If Ordered By Engineer Amount of:

_____Dollars

($_____)

TOTAL BID:

Amounts shall be shown in both words and figures. In case of discrepancy, the amount in words shall govern.

Total Bid includes Total Base Bid Amount Including Allowances plus Total Add/Deduct Work If Ordered By Engineer Amount of:

_____

Dollars

(Words)

($_____)

The lump sum price indicated above shall include all labor, materials, equipment, overhead, profit, insurance, taxes, business license, construction permit fees, etc., to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part of.

The Bidder declares that he/she understands that the quantities shown in the Proposal are subject to adjustment by either increase or decrease and that should the quantities of any of the items of the work be increased, the undersigned proposed to do the additional work at the unit prices stated herein, and should the quantities be decreased, he also understands that payment will be made on actual quantities at the unit price bid, and will make no claim for anticipated profits for any decrease in the quantities and that actual quantities will be determined upon completion of the work, at which time adjustment will be made to the contract amount by direct increase or decrease.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Paragraph 30 of the General Conditions. The bid security attached in the sum of

_____ Dollars

($_____) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

By submission of this bid, each bidder certifies, and in the case of a joint bid, each party thereto certifies as to its 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.

[SEAL – (If bid is by a corporation)]

Respectfully submitted:

BY: _____

_____
(Print Name)

_____
(Title)

_____
(Business Address)

_____
(Email)

_____
(Telephone)

SECTION 00 35 00
BID BOND

KNOW ALL MEN BY THESE PRESENT:

That we, the undersigned _____, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Georgetown, South Carolina, as Owner, in the penal sum of (5% of total bid) _____ Dollars

($ _____), for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors 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 hereby and by reference made a part hereof, to enter into a contract in writing for the **WTP FLOC/SED BASIN NO. 2** project.

NOW, THEREFORE,

(A) If said Bid shall be rejected, or

(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 faithful performance of said contract, and for the payment of all persons performing labor 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 an 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 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.

_____
Principal

(Corporate Seal)

By :_____(L.S)

_____
Surety

(Corporate Seal)

By :_____(L.S)

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)

SECTION 00 50 00
CONTRACT

STATE OF SOUTH CAROLINA

COUNTY OF GEORGETOWN

THIS AGREEMENT, entered into this _____ day of _____, 20_____ and effective immediately by and between _____ , doing business as a (individual/partnership/corporation), with its principal office in the City of _____, _____ County, _____State,(hereinafter called the "Contractor") and the City of Georgetown, a duly organized and validly existing politic body of the State of South Carolina (hereinafter called "City"),

WITNESSETH THAT WHEREAS, The City desires to engage the services of a professional contractor for the purpose of, **WTP FLOC/SED BASIN NO. 2** hereinafter referred to as "Project"; and,

WHEREAS, The City has solicited bids for same by that certain Request for Bids for Construction Services, hereinafter referred to as "RFB", a copy of which is attached hereto for all purposes as **EXHIBIT "1"**; and,

WHEREAS, The Contractor has represented to City that it has the qualifications, experience, expertise, training, and personnel to timely perform the Project for City; and,

WHEREAS, The Contractor has expressed its desire to do so by their bid opened _____, 20 , hereinafter referred to as "Bid", a copy of which is attached hereto for all purposes as **EXHIBIT "2"**;and,

WHEREAS, the parties desire to enter in an agreement for the Contractor to perform the Project for City per all the terms and conditions more particularly set out herein below;

NOW, THEREFORE, for and in consideration of the foregoing, and of other good and valuable consideration, the adequacy of which is hereby acknowledged, the parties hereto agree as follows:

(1) **SCOPE OF SERVICES:**

a. Contractor hereby agrees to perform a project for the WTP **FLOC/SED BASIN NO. 2** as outlined in the Project Manual, incorporated into this Agreement as **ATTACHMENT "A"** and hereinafter referred to as "Work";

b. Contractor further agrees to commence and complete any and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his/hers (it's or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendents, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal and the General Conditions, Supplemental General Conditions, and Special Provisions of the Contract, the plans, including all maps, plats, blueprints, and other drawings and printed or written explanatory matters thereof, the specifications and contract documents therefore as prepared by the Engineer, and as enumerated in Paragraph 1 of the General Conditions, all of which are made a part hereof and collectively evidence and constitute the Contract.

c. City may, from time to time require changes in the Work of the Contractor to be performed hereunder. Such changes, which are mutually agreed upon by and between City and the Contractor, shall be incorporated by written amendment to this Agreement.

(2) **COMPENSATION:**

a. City agrees to pay Contractor a sum not to exceed _____ Dollars

($_____.___) in accordance with the Schedule of Values, incorporated into this Agreement as **ATTACHMENT "B"** and hereinafter referred to as "Compensation";

b. In the event funds are not appropriated or become non-appropriated for an included fiscal year by City, it is agreed by the parties that this Agreement will become null and void and the City's obligations cannot extend beyond the date of non-appropriation.

(3) **PERIOD OF SERVICES:**

a. the Work to be performed hereunder by the Contractor shall begin upon the date outlined to the City's Notice to Proceed letter to the Contractor, incorporated into this Agreement as **ATTACHMENT "C"** and hereinafter referred to as "NTP."

b. The Work shall be completed in accordance with the Schedule, incorporated into this Agreement as **ATTACHMENT "D"** and hereinafter referred to as "Schedule".

c. Modifications to the Schedule may be required. Such modifications, which are mutually agreed upon by and between City and the Contractor shall be incorporated by written amendment to this Agreement.

(4) **FORCE MAJEURE:**

a. Force majeure includes acts of God, acts of other branches of government in either their sovereign or contractual capacities, or any similar cause beyond the reasonable control of the parties.

b. Any delays in or failure of performance by either party that are caused by a Force Majeure shall not constitute breach of this Agreement.

c. In the event that any event of force majeure, as herein defined, occurs, both parties shall be entitled to a reasonable extension of time for performance of its WORK.

(5) **NOTICES:**

a. Any notices, bills, invoices, or reports required by this Agreement shall be sufficient if sent by the parties in the United States mail or electronic mail to the addresses of the Project Manager (See Section 00015).

(6) **RECORDS AND INSPECTIONS:**

a. Contractor shall maintain full and accurate records with respect to all matters covered under this Agreement for a period of one year after the completion of the project.

b. City shall have free access at all proper times to such records, and the right to examine and audit the same and to make transcripts there from, and to inspect all program data, documents, proceedings, and activities.

(7) **COMPLETENESS OF AGREEMENT:**

a. This Agreement and any additional or supplementary document or documents incorporated herein by specific reference contain all the terms and conditions agreed upon by the parties hereto, and no other agreements, oral or otherwise, regarding the subject matter of this Agreement or any part thereof shall have any validity or bind any of the parties hereto
b. This Agreement is entered into with full understanding and awareness of such requirement.
c. City shall be allowed to rely upon the representations of Contractor as set out in the Proposal.
d. With the exception of the foregoing, this Agreement constitutes the entire agreement between the parties hereto and may not be modified or amended except in writing signed by both parties hereto.

(8) **CONFLICTS:**

a. In the case of any conflict between the terms and conditions of this Agreement and the terms of any other agreement between the parties hereto, the terms of this Agreement shall control.
b. If there is a conflict between the City's Requests for Bids and this Agreement, then this Agreement shall control.
c. If there is a conflict between the City's Request for Bids and the Contractor's Bid, the City's Request for Bids shall control.
d. Both parties agree that all conflicts arising under this Agreement that cannot be settled between the parties shall be resolved in the Georgetown County Court of Common Pleas (Non-Jury).

(9) **SEVERABILITY:**

a. If any part or provision of this Agreement is held invalid or unenforceable under applicable law, such invalidity or unenforceability shall not in any way affect the validity or enforceability of the remaining parts and provisions of this Agreement.

(10) **NONWAIVER:**

a. The waiver by City or Contractor of a breach of this Agreement shall not operate as a waiver of any subsequent breach, and no delay in acting with regard to any breach of this Agreement shall be construed to be a waiver of the breach.

b. In no event shall the making of any payment by City to the Contractor constitute or be construed as a waiver by City of any breach of covenant, or any default which may exist on the part of the Contractor.

c. The making of any such payment by City while any such breach or default shall exist in no way impairs or prejudices any right or remedy available to City in respect to such breach or default.

(11) **GOVERNING LAW:**

a. This Agreement and the rights, obligations and remedies of the parties hereto, shall in all respects be governed by and construed in accordance with the laws of the State of South Carolina.

(12) **RESPONSIBILITY:**

a. Each party shall be responsible for its own acts as provided under the law of South Carolina and will be responsible for all damages, costs, fees and expenses which arise out of the performance of this Agreement which are due to that party's own negligence, tortious acts and other unlawful conduct and the negligence, tortious action and other unlawful conduct of its respective agents, officers and employees.

(13) **FREEDOM OF INFORMATION ACT (FOIA)**

a. The parties acknowledge that all documents are subject to release under the South Carolina Freedom of Information Act (FOIA) and will be released to the public unless exempt from disclosure under the FOIA.

b. If the Contractor contends a document is exempt from disclosure under the FOIA, it shall mark any such documents plainly, and seek protection from disclosure by filing an

appropriate action in Circuit Court and shall bear the cost of the action and any monetary or attorney's fees awarded to the person or entity making the FOIA request.

c. If the Contractor objects to release and litigation is commenced against the City under the FOIA, the City agrees to promptly notify the Contractor, who shall move in intervene as a party. The Contractor agrees to hold the City harmless from and indemnify for all costs (including plaintiff's attorney's fees if awarded by the Court) incurred by the City in defending the lawsuit and the funds necessary to satisfy any judgment and all costs on appeal, if any.

(14) **THIRD-PARTY OBLIGATIONS:**

a. Neither party shall be obligated or liable hereunder to any party other than the second party to this Agreement.

(15) **RESTRICTIONS ON LOBBYING:**

a. The Contractor shall comply with all requirements of Section 1352, Title 31 of the U.S. Code, which prohibits all recipients of federal funds from using appropriated monies for lobbying activities.

(16) **SUCCESSORS AND ASSIGNS:**

a. The rights and obligations herein shall inure to and be binding upon the successors and assigns of the parties hereto.

IN WITNESS WHEREOF, City and the Contractor have executed this agreement as of the date first written above.

CITY OF GEORGETOWN, SOUTH CAROLINA
(OWNER)

_____
(SIGNATURE)

By: _____

(SEAL) Title: _____

_____
(CONTRACTOR)

_____
(SIGNATURE)

By: _____

(CORPORATE SEAL) Title: _____

Attest:

_____
It's Secretary

_____
Witness

(END OF SECTION)

SECTION 00 60 00.1
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS THAT

_____

(NAME OF CONTRACTOR)

_____

(ADDRESS OF CONTRACTOR)

A Corporation Partnership, hereinafter called Principal, and

_____

(NAME OF SURETY)

_____

(ADDRESS OF SURETY)

Hereinafter called Surety, are held and firmly bound unto

THE CITY OF GEORGETOWN, SOUTH CAROLINA
(NAME OF OWNER)

PO BOX 939, GEORGETOWN, SC 29442
(ADDRESS OF OWNER)

hereinafter called Owner, in the penal sum of (110% of total bid)

_____ Dollars

($ _____), in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these present.

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 part hereof for **WTP FLOC/SED BASIN NO. 2.**

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 if he shall satisfy all claims and demands incurred under such contract and 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, extensions of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way 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 three (3) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20____.

Signed, sealed and delivered in the presence of:

_____
(PRINCIPAL - CONTRACTOR)

_____

_____
(SIGNATURE)

_____
As to Principal

By: _____

Title: _____

_____
(SURETY)

_____

_____
(SIGNATURE)

_____
As to Surety

By: _____
ATTORNEY-IN-FACT
(Power of Attorney to be attached)

By: _____
(AGENT)

_____
(AGENT COMPANY NAME)

_____

_____
(AGENT COMPANY ADDRESS)

_____

_____
(AGENT ADDRESS)

NOTES:

1. Date of Bond must not be prior to date of Contract.

2. If Contractor is a Partnership, all partners should execute Bond.

3. 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)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 60 10.1
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(NAME OF CONTRACTOR)

_____
(ADDRESS OF CONTRACTOR)

A Corporation Partnership, hereinafter called Principal, and

_____
(NAME OF SURETY)

_____
(ADDRESS OF SURETY)

Hereinafter called Surety, are held and firmly bound unto

THE CITY OF GEORGETOWN, SOUTH CAROLINA
(NAME OF OWNER)

PO BOX 939, GEORGETOWN, SC 29442
(ADDRESS OF OWNER)

hereinafter called Owner, in the penal sum of (100% of total bid)
_____ Dollars

($ _____), in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these present.

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 part hereof for **WTP FLOC/SED BASIN NO. 2.**

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 of 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, extensions of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way 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 three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20____.

Signed, sealed and delivered in the presence of:

_____
(PRINCIPAL - CONTRACTOR)

_____

_____
(SIGNATURE)

_____
As to Principal

By: _____

Title: _____

_____
(SURETY)

_____

_____
(SIGNATURE)

_____
As to Surety

By: _____
ATTORNEY-IN-FACT
(Power of Attorney to be attached)

By: _____
(AGENT)

_____
(AGENT COMPANY NAME)

_____

_____
(AGENT COMPANY ADDRESS)

_____

_____
(AGENT ADDRESS)

NOTES:

1. Date of Bond must not be prior to date of Contract.

2. If Contractor is a Partnership, all partners should execute Bond.

3. 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)

SECTION 00 60 10.2

NOTICE OF INTENT TO AWARD

OWNER: City of Georgetown
2377 Anthuan Maybank Drive
Georgetown, SC 29440

PROJECT NO.: 1606

PROJECT DESCRIPTION: WTP Floc/Sed Basin No. 2

TO ALL BIDDERS:

This is to notify all bidders that it is the intent of the Owner to award a contract as follows:

NAME OF BIDDER: _____

DATE BIDS WERE RECEIVED: _____

AMOUNT OF BASE BID: $_____

The Owner has determined that the above-named Bidder is responsible and has submitted the lowest responsive bid. The Owner may enter into a contract with this Bidder subject to the contract review and approval by the EDA and City Council.

_____	_____
(Print or Type Name)	(Title)
_____	_____
(Signature)	(Date Posted)

(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 60 20.4
NOTICE OF AWARD

TO:

PROJECT: WTP Floc/Sed Basin No. 2

PROJECT NO.**:** 1606

DATE:

The City of Georgetown (Owner) has considered your proposal in response to the Request for Bid (RFB) dated _____.

You are hereby notified that Owner has approved your bid in the amount of:

$_____.

You are required to provide the following documents: W-9 form, Employment Verification Affidavit, City's business license, Payment and Performance bonds, and Certificate of Insurance naming the City of Georgetown as additionally insured, within ten (10) business days from the date of this notice to you. A Purchase Order and contract agreement will then be prepared once the requested documents are on hand.

Please sign and return this form in acknowledgment of this Notice of Award to the Owner.

CITY OF GEORGETOWN, SOUTH CAROLINA

By: _____

Title: _____

Acceptance of Notice

Receipt of the above Notice of Award is hereby acknowledged this _____day of _____ , 20_____.

_____
(Signature)

By: _____

Title: _____

(END OF SECTION)

SECTION 00 60 40
EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENT

A. Contractor is required to comply with all applicable State and Federal employment eligibility verification requirements including but not limited to the following:

1. By signing its bid or proposal, Contractor certifies that it will comply with the applicable requirements of Title 41, Chapter 8 of the South Carolina Code of Laws and agrees to provide to the City of Georgetown upon request any documentation required to establish either: (a) that Title 41, Chapter 8 is inapplicable both to Contractor and its subcontractors or sub-subcontractors are in compliance with Title 41, Chapter 8. Pursuant to Section 41-8-70, "In addition to other penalties provided by law, a person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and upon conviction, must be fined within the discreti9on of the court or imprisoned for not more than five years, or both. "Contractor agrees to include in any contracts with its subcontractor's language requiring its subcontractors to (a) comply with the applicable requirement of Title 41, Chapter 8, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 41, Chapter 8.

B. Contractor is required to complete and submit the attached affidavit along with the executed contract documents.

C. E-Verify.

1. In addition to completing and maintaining the federal employment eligibility verification form (Form I-9), Contractor must, within three (3) business days after employing a new employee, verify the employee's work authorization through the E-Verify federal work authorization program administered by the U.S. Department of Homeland Security. Employers may no longer confirm a new employee's employment authorization with a driver's license or state identification card.

2. Contractor shall enroll in E-Verify at www.dhs.gov/e-verify.

CONTRACTOR AFFIDAVIT

SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT (Amended)

In accordance with the requirements of the South Carolina Illegal Immigration Reform Act, Contractor hereby certifies that it is currently in compliance with the requirements of Title 40, Chapter 8 of the S.C. Code Annotated and will remain in compliance with such requirements throughout the term of its contract with the Owner.

The Contractor hereby acknowledges that in order to comply with the requirements of S.C. Code Annotated Section 41-8-20:

(A) All private employers in South Carolina shall be imputed a South Carolina employment license, which permits a private employer to employ a person in this State. A private employer may not employ a person unless the private employer's South Carolina employment license and any other applicable licenses as defined in Section 41-8-10 are in effect and are not suspended or revoked. A private employer's employment license shall remain in effect provided the private employer complies with the provisions of this chapter.

(B) All private employers who are required by federal law to complete and maintain federal employment eligibility verification forms or documents must register and participate in the E-Verify federal work authorization program, or its successor, to verify the work authorization of every new employee within three business days after employing a new employee. A private employer who does not comply with the requirements of this subsection violates the private employer's licenses.

(C) The South Carolina Department of Employment and Workforce shall provide private employers with technical advice and electronic access to the E-Verify federal work authorization program's website for the sole purpose of registering and participating in the program.

(D) Private employers shall employ provisionally a new employee until the new employee's work authorization has been verified pursuant to this section. A private employer shall submit a new employee's name and information for verification even if the new employee's employment is terminated less than three business days after becoming employed. If a new employee's work authorization is not verified by the federal work authorization program, a private employer must not employ, continue to employ, or reemploy the new employee.

(E) To assist private employers in understanding the requirements of this chapter, the director shall send written notice of the requirements of this section to all South Carolina employers and shall publish the information contained in the notice on its website. Nothing in this section shall create a legal requirement that any private employer receive actual notice of the requirements of this chapter through a written notice from the director, nor create any legal defense for failure to receive notice.

(F) If a private employer is a contractor, the private employer shall maintain the contact phone numbers of all subcontractors and sub-subcontractors performing services for the private employer. The private employer shall provide the contact phone numbers or a contact phone number, as applicable, to the director pursuant to an audit or investigation within seventy-two hours of the director's request.

The Contractor agrees to provide to the Owner upon request any documentation required to establish the applicability of the South Carolina Illegal Immigration Reform Act (Amended) to the contractor, subcontractor or sub-subcontractor. The Contractor further agrees that it will upon request provide the Owner with any documentation required to establish that the Contractor and any subcontractors or sub-subcontractors are in compliance with the requirements of Title 41, Chapter 8 of the S.C. Code Annotated.

Date:_____

_____
(Signature)

By: _____

Title: _____

(END OF SECTION)

WTP FLOC/SED BASIN NO. 2
CITY OF GEORGETOWN

SECTION 00 60 60
NOTICE TO PROCEED

TO:

OWNER: City of Georgetown, South Carolina

PROJECT: WTP Floc/Sed Basin No. 2

PROJECT NUMBER: 1606

DATE:

This is your Notice to Proceed with the Work, on the above-mentioned Project, in accordance with

The Agreement dated _____, 20_____. You are authorized to commence

Work on _____ 20_____, and you are required to complete the Work

within **Three-Hundred and Sixty Days (360)** consecutive calendar days thereafter.

The date of final completion for all Work is therefore: _____ 20_____.

Kindly return this Notice to Proceed to the Owner in acknowledgement.

CITY OF GEORGETOWN, SOUTH CAROLINA

_____
(Signature)

By: _____

Title: _____

Acceptance of Notice

Receipt of the above Notice to Proceed is hereby acknowledged this the _____day of _____ , 20_____.

_____
(Signature)
By:_____

Title:_____

(END OF SECTION)

SECTION 00 61 00
APPLICATION FOR PAYMENT

Contractor may submit other Pay Request form for Engineer's approval in lieu of the following:

Owner: City of Georgetown

Contractor:

Contract No.
Pay Estimate No.
Period of Estimate: From _____ to _____

CONTRACT CHANGE ORDER SUMMARY

No.	Approval Date	Additions	Deductions
Totals:			
Net Change:			

ESTIMATE

1. Original Contract	$
2. Change Orders	$
3. Revised Contract (1+2) ...	$
4. Work Completed*	$
5. Stored Materials*	$
6. Subtotal (4+5)	$
7. Retainage	$
8. Previous Payments	$
9. Amount Due (6-7-8)	$

** Detailed breakdown attached*

CONTRACT TIME

Original (days): _____ On Schedule: Yes____ No ____

Revised: _____ Starting Date: _____

Remaining: _____ Projected Completion: _____

Contractor's Certification:

The undersigned certifies that to the best of their knowledge, information, and belief the work covered by this payment estimate has been completed in accordance with the contract documents, that all amounts due subcontractors and suppliers have been paid by the Contractor for work for which previous payment estimates were issued and payments received from the Owner, and that the current payment shown herein is now due.

(Signature): _____

By: _____

Date: _____

Engineer's Certification:

The undersigned certifies that to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents. Based on periodic but less than full-time field representation, to the best of our information the quantities, items and schedule of values, work completed, and material and equipment delivered are accurate as indicated on this request for payment. Some defects or problems with construction items may not be determined until final testing and operation of the system are performed. The Engineer cannot be held liable for approval for partial payments for the installation of these items from which the evidence of defects or problems were not determined until after the request for payment was approved.

(Signature): _____

By: _____

Date: _____

Approved by Owner:

(Signature): _____

By: _____

Date: _____

PAY ESTIMATE NO. ___________________ DATE _____________________

Page ___ of ____

PROJECT: ____ PROJECT NUMBER: ______________

		CURRENT CONTRACT				TOTAL THIS PERIOD		PREVIOUS TOTAL		TOTAL TO DATE		
Item No	Description	Quantity	Units	Unit Cost	Total Cost	Quantity	Total Cost	Quantity	Total Cost	Quantity	Total Cost	%
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
										0.00	$0.00	#DIV/0!
	TOTALS				$0.00		$0.00		$0.00		$0.00	#DIV/0!

SECTION 00 62 00
CONTRACTOR'S AFFIDAVIT

The State of _____ Date: _____

The County of _____ The City of _____

_____ of _____
(Officer's Name) (Officer's Title) (Contractor's Name)

being duly sworn, deposed and says that _____ has furnished
(Contractor's Name)
Labor and materials entering into the **WTP Floc/Sed Basin No. 2** dated _____ with the City of Georgetown, South Carolina.

_____ states further that this officer has full knowledge of all
(Contractor's Name)
obligations for such labor and materials which have entered into and become part of that certain project known and designated above, and that this officer further deposes and says that all debts and other obligations for such labor and materials have been fully and completely paid for in good and lawful money of the United States of America and that there are no suits for damages against them proceeding, prospective and/or that there are no suits for damages against them proceeding, prospective, or otherwise, in consequence of their operations on the above said project.

The said _____ will hold the Owner, the City of Georgetown
(Contractor's Name)
South Carolina, blameless of any and all mechanic's liens that may be hereafter entered or filed for record, so as to constitute a charge against said premises for work or labor done or materials furnished by them.

IN WITNESS HEREOF, this officer has heretofore put his hand and seal:

_____
(Officer's Name)

I, _____, Notary Public in and for the above named County and State do hereby certify that _____ personally know to me to be the
(Officer's Name)
affiant in the foregoing Affidavit, personally appeared before me this day and, having been duly sworn, deposed and says the facts set forth in the above Affidavit are true and correct.

WITNESS my hand and seal this _____ day of _____ 20_____.

_____

Notary Public for the State of _____

My Commission Expires: _____

SECTION 00 63 00
CONTRACT CHANGE ORDER

DATE: _____ PROJECT: _____
CHANGE ORDER #: _____ PROJECT #: _____

Description of and Reason for Change: _____

_____

_____

_____

Itemization of Proposed Change and Basis for Payment

Original Contract Price . . . . . $_____

Previous Change Orders . . . . . $_____

This Change, (An Addition) (A Deduction) of . . . . . .$_____

Proposed Revised Contract Price . . . . . $_____

Additional funds shall be provided in the following manner: _____

_____

Extension of Contract Time Required: _____ days.

Revised Contract Completion Date: _____

Accepted by the Contractor:

By: _____ Date: _____

Recommended by the Engineer:

By: _____ Date: _____

Approved by the Owner:

By: _____ Date: _____

SECTION 00 70 00
GENERAL CONDITIONS

1. CONTRACT AND CONTRACT DOCUMENTS. The plans, specifications and addenda, hereinafter enumerated in Paragraph 1 of Supplemental General Conditions, shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents titles, heading, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the contract documents and in no way affect, limit or cast light on the interpretations of the provisions to which they refer.

Contents

2. DEFINITIONS. The following terms as used in this contract are respectively defined as follows:

(a) Contractor. A person, firm or corporation with whom the contract is made by the Owner.

(b) Subcontractor. A person, firm or corporation supplying labor and materials, or only labor, for work at the site of the project for and under separate contract or agreement with the Contractor.

(c) Work on or at the Project. Work to be performed at the location of the project, including the transportation of materials and supplies to or from the location of the project by employees of the Contractor and any Subcontractor.

3. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS. The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the Contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry on the work in accordance with the additional detail drawings and instructions. The Contractor and the Engineer will prepare jointly:

(a) A schedule fixing the dates at which special detail drawings will be required; such drawings, if any, to be furnished by the Engineer in accordance with said schedule; and

(b) A schedule fixing the respective dates for the submission of shop drawings, the beginning of manufacture, testing and installation of materials, supplies, and equipment, and the completion of the various parts of the work; each such schedule to be subject to change from time to time in accordance with the progress of the work.

4. SHOP DRAWINGS AND SAMPLES. Submit to the Engineer for approval, in accordance with the requirement of Section 01340.

4.1 Samples. Contractor shall also submit to the Engineer for approval, all samples required by Section 01340. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

4.2 Deviations. At the time of each submission, Contractor shall in writing call the Engineer's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Document.

4.3 Engineer's Review. Engineer will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. Contractor shall direct specific attention in writing or on

resubmitted Shop Drawings to revisions other than the corrections called for by Engineer on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and Contract Documents.

4.4 Contractor's Records. Where a Shop Drawing or sample submission is required by the Specifications, no related work shall be commenced until the submission has been approved by Engineer. A copy of each approved shop drawing and each approved sample shall be kept in good order by Contractor at the site and shall be available to Engineer.

4.5 Contractor's Responsibility. Engineer's approval of Shop Drawings or sample shall not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called the Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

5. MATERIALS, SERVICES, AND FACILITIES shall be furnished by the Contractor.

(a) 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, gas lights, power, transportation, superintendence, taxes, insurance, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete and deliver the work within the specified time.

(b) Any work necessary to be performed after regular working hours, on Sundays, or legal holidays, shall be performed without additional expense to the Owner.

6. CONTRACTOR'S TITLE TO MATERIALS. No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

7. INSPECTION AND TESTING OF MATERIALS. Unless otherwise specifically provided for in the specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the Owner. The cost of such inspection and testing shall be paid by the Contractor.

7.1 Certification by Contractor. Where the detailed specifications call for certified copies of mill or shop tests to establish conformance of certain materials with the specifications, it shall be the responsibility of the Contractor to assure delivery of such certifications to the Owner. No materials or finished articles shall be incorporated in the work until such materials and finished articles have passed the required tests. The Contractor shall promptly segregate and remove rejected material and finished articles from the site of the work.

7.2 Guaranty. The testing and approval of materials by the laboratory, or laboratories, shall not relieve the Contractor of any of his obligations to fulfill his contract and guarantee of workmanship and materials as called for in paragraph entitled "General Warranty for One Year After Completion of Contract" herein. The Contractor may, at his option and at his own expense, cause such other tests to be conducted as he may deem necessary to assure suitability, strength, and durability of any material or finished article.

8. "OR EQUAL" CLAUSE. The phrase "or equal" shall be construed to mean that material or equipment will be acceptable only when, in the judgment of the Engineer, they are composed of parts of equal quality, or equal workmanship and finish, designed and constructed to perform or accomplish the desired result as efficiently as the indicated brand, pattern, grade, class, make or model. Written approval will be obtained from the Engineer prior to installation.

9. PATENTS. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents. If the Contractor uses any design, device or material covered by letter, patent, or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood that, with exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringements by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

10. SURVEYS, LAWS AND REGULATIONS. The Contractor shall comply with the following:

10.1 Construction staking shall be in accordance standard construction staking practice or with the requirements of Section 01050 entitled "Field Engineering".

10.2 Laws and Regulations. The Contractor shall keep himself fully informed of all laws, ordinances, and regulations of State, City and County in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Owner. He shall, at all times, himself observe and comply with all such existing and future laws, ordinances and regulations (to the extent that such requirements do not conflict with Federal laws or regulations) and shall protect and indemnify the Owner and its agents against any claims or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

11. CONTRACTOR'S OBLIGATIONS. The Contractor shall, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery,

equipment, facilities, and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with provisions of this contract and said specifications, and in accordance with the plans and drawings covered by this contract and any and all supplemental plans and drawings and in accordance with the directions of the Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitation of the contract and specifications, and shall do, carry on and complete the entire work to the satisfaction of the Engineer and the Owner.

12. WEATHER CONDITIONS. In the event of temporary suspension of work or during inclement weather, or whenever the Engineer shall direct, the Contractor will, and will cause his subcontractors to, protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect its work, such materials shall be removed and replaced at the expense of the Contractor.

13. PROTECTION OF WORK AND PROPERTY, EMERGENCY. The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract or by the Owner or by his duly authorized representatives. In case of emergency which threatens loss or injury of property and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Engineer, in a diligent manner. He shall notify the Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Engineer for approval. Where the Contractor has not taken action but has notified the Engineer of an emergency threatening injury to persons or damage to the work of any adjoining property, he shall act as instructed or authorized by the Engineer. The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in paragraph entitled "Changes in Work" of these specifications.

14. INTERPRETATIONS. If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of these proposed contract documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt and actual delivery. Any interpretation of such documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The Owner will not be responsible for any other explanation or interpretation of such documents which anyone presumes to make on behalf of the Owner before expiration of the ultimate time set for the receipt of bids.

15. REPORTS RECORDS AND DATA. 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 under this contract.

16. SUPERINTENDENCE BY CONTRACTOR. The Contractor shall employ only competent and skilled men on the work. The Contractor shall have competent Superintendent or Foreman present at all times when the work is in progress, who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who can be

continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll. The Contractor shall, upon demand from the Engineer, immediately remove any superintendent, foreman or workman whom the Engineer may consider incompetent or undesirable.

17. CHANGES IN WORK. No changes in the work covered by the approved contract documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of, the following methods:

(a) Unit bid prices previously approved.

(b) An agreed lump sum.

(c) The actual cost of:

1. Labor, including foremen.
2. Materials entering permanently into the work.
3. The ownership or rental cost of construction plant and equipment during the time of use on the extra work.
4. Power and consumable supplies for the operation of power equipment.
5. Insurance.
6. Social security and old age and unemployment contributions.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed 10 percent of the estimated cost of the work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit and any other general expenses.

18. EXTRAS. Without invalidating the contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner, or the Engineer acting officially for the Owner, and the price is stated in such order. Extra work shall be performed only upon the execution of authorized change orders as set forth in the preceding paragraph.

19. TIME FOR COMPLETION AND LIQUIDATED DAMAGES. It is hereby understood and mutually agreed by and between the Contractor and the Owner that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are essential conditions of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the Notice to Proceed.

19.1 Regular Prosecution of Work. The Contractor agrees that said work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for completion of the work described herein is a reasonable time for completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

19.2 Liquidated Damages. If the Contractor shall neglect, fail, or refuse to complete the work within the time herein specified, or any proper extensions

thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticality and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

19.3 Extensions of Time for Completion. It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contractor an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority or allocation order duly issued by the Government.

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor including, but not restricted to, acts 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, hurricanes, tornadoes; and

(c) To any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article.

Provided, further that the Contractor shall, within seven (7) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner in writing of the causes of delay, who shall ascertain the facts and extent of delay and notify the Contractor within a reasonable time of its decision in the matter, and grant such extension of time as the Owner shall deem suitable and just.

Normal weather conditions for the project area are taken into consideration in the time for completion of the contract; therefore, no extension of time will be extended for normal weather conditions, with the exception of hurricanes and tornadoes.

20. CORRECTION OF WORK. All work, all materials, whether incorporated in the work or not, all processes of manufacturer, and all methods of construction, shall be at all times and places subject to the inspection of the Engineer, who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture, and methods of construction of the purposes for which they are used. Should they fail to meet his approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at his own expense. Rejected material shall immediately be removed from the site. If in the opinion of the Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not

performed in accordance with the contract documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as, in the judgment of the Engineer, shall be equitable.

21. SUBSURFACE CONDITIONS FOUND DIFFERENT. Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Engineer of such conditions before they are disturbed. The Engineer will thereupon promptly investigate the conditions, and if he finds that they materially differ from those shown on the plans or indicated in the specifications, he will at once make such changes in the plans and/or specifications as he may find necessary; any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in paragraph 17 of these specifications.

    (a) Where no specific subsurface conditions are indicated or specified, no increase in cost will be considered in regards to subsurface conditions encountered.

22. CLAIMS FOR EXTRA COSTS. No claim for extra work or cost shall be allowed unless the same was done in pursuance of a written order of the Engineer, as aforesaid, and the claim presented with the first estimate after the changes or extra work is done. When work is performed under the terms of subparagraph 17(c) of these specifications, the Contractor shall furnish satisfactory bills payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

23. RIGHT OF OWNER TO TERMINATE CONTRACT. In the event that any of the provisions of this contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the surety of its intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, the contract shall, upon the expiration of said 10 days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract; provided, however, that if the surety does not commence performance thereof within 10 days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute same to completion by the contract or by force account for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned thereby, and in such event the Owner may take possession of and utilize in completion the work such materials, appliances and plant as may be on the site of the work and necessary therefore. If the Contractor should die, be declared an incompetent, be declared bankrupt or insolvent, make an assignment for the benefit of creditors during the term of his contract, the Owner may terminate the contract in the manner and under the procedure set forth above with the exception that no notices to the Contractor shall be required, but in lieu thereof the Owner must make a reasonable effort to notify the estate of the Contractor, his guardian, assignee, or legal representative of the intention to terminate and fact of termination, if there is any such guardian, assignee, or legal representative at the time the Owner desires to terminate.

24. CONSTRUCTION SCHEDULE AND PAYMENT ESTIMATES. Immediately after execution and delivery of the contract and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of

commencement and completion of each of the various subdivisions of work required under the contract documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule.

24.1 Contractor's Payment Estimate. The Contractor shall also furnish:

(a) A detailed payment estimate, giving a complete breakdown of the contract price; and

(b) Periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for addition to or deductions from the contract price.

24.2 Equipment Delivery Schedule. The Contractor shall also prepare a schedule of anticipated shipping dates for materials and equipment. It is intended that equipment and materials be so scheduled as to arrive at the job site just prior to time for installation to prevent excessive materials on hand for inventory and the necessity for extensive storage facilities at the job site.

25. PAYMENTS TO CONTRACTOR shall be made according to the following:

(a) Payments to the Contractor will be made within thirty (30) days upon receipt of a duly certified approved estimate of the work performed during the preceding calendar month under this contract, but to insure the proper performance of this contract, the Owner will retain a portion of each estimate until final completion and acceptance of all work covered by this contract in accordance with the following:

1) Retention of up to 10% of payment claimed until construction is complete.

(b) In preparing the payment request, the material delivered on the site and preparatory work done may be taken into consideration.

(c) All material and work covered by partial payments shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and 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 the terms of the contract.

25.1 Owner's Right to Withhold Certain Amounts and Make Application Thereof. The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the contractor, either pay unpaid bills, of which the Owner has written notice, direct, 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 this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner to the Contractor, and the Owner shall not be liable to the Contractor for any such payment made in good faith.

26. ACCEPTANCE OF WORK AND FINAL PAYMENT. Before final acceptance of the work and payment to the Contractor of the percentage retained by the Owner, the following requirements shall be complied with:

(a) Final Inspection. Upon notice from the Contractor that his work is completed, the Engineer will make a final inspection of the work and shall notify the Contractor of all instances where his work fails to comply with the contract drawings and specifications, as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the work comply with the contract drawings and specifications, and to the satisfaction of the Engineer.

(b) Operating Test. After the alterations for compliance with the contract drawings and specifications have been made, and before acceptance of the whole or any part of the work, it shall be subjected to test to determine that it is in accordance with the contract drawings and specifications. The Contractor shall maintain all work in first class condition for a thirty (30) day operating period after the work has been completed as a whole, the final inspection has been made, and the Engineer has notified the Contractor in writing that the work has been finished to his satisfaction. The retained percentage as provided herein will not become due or payable to the Contractor until after the thirty (30) day operating period has expired.

(c) Cleaning Up. Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, crosswalks, pavements, sidewalks, fences and other public and private property disturbed or damaged should be restored to their former condition. Final acceptance will be withheld until such work is finished.

(d) Liens. Final acceptance of the work will not be granted and the retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of the work under this contract have been settled, and that no legal claims can be filed against the Owner for such labor or material.

(e) Final Payment. Upon completion of all cleaning up, alterations and repairs required by the final inspection or operating test, the satisfactory completion of the operating test, and upon submitting proper and satisfactory evidence to the Owner that all claims have been settled, the Contractor shall then prepare his final payment estimate. After review and approval of the final payment estimate by the Engineer and the Owner, the payment shall then become due.

27. ACCEPTANCE OF FINAL PAYMENT AS RELEASE. The acceptance by the Contractor of final payment shall be and shall operate as a release to the owner of

all claims and all liability to 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 this work. No payment, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or his sureties from any obligations under this contract or the performance and payment bond.

28. PAYMENTS BY CONTRACTOR. The Contractor shall pay:

(a) For all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;

(b) For all materials, tools, and other expendable equipment to the extent of ninety (90) percent of the cost thereof not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used; and

(c) To each of his subcontractors not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

29. INSURANCE. The Contractor shall procure and shall maintain during the life of this contract, whether such operation be by himself or by a subcontractor or anyone directly or indirectly employed by either of them, such insurance as required by statute and/or ordinance to adequately protect the Owner from any claims or damages, including bodily injury or death, which may arise from them during operations under this contract.

29.1 Limits of Liability. Insurance shall be obtained for not less than the limits of liability as specified in Section 00110-Insurance Requirements.

29.2 Certificates of Insurance. The Contractor shall furnish the Owner, if requested, certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of the policies. Such certificates shall contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered except after 30 days written notice has been received by the Owner".

30. PAYMENT AND PERFORMANCE BONDS. The Contractor shall furnish a 110 percent performance bond and a 100 percent payment bond as security for the faithful performance of this contract, as security for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract. The performance bond and payment bond shall be in separate instruments. Before the final acceptance, each bond must be approved by the Owner.

31. ASSIGNMENTS. The Contractor shall not assign the whole or any part of this contract or any sums of money due or to become due hereunder without the written consent of the Owner. In case the Contractor assigns all or any part of any sums of money due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that is agreed that the right of the assignee in and to any sums of money due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services

rendered or materials supplied for the performance of the work called for in this contract.

32. MUTUAL RESPONSIBILITY OF CONTRACTORS. If through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

33. SEPARATE CONTRACTS. The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractor, shall keep informed of the progress and the detail work of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors. Failure of a contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

34. SUBCONTRACTING shall comply with the following:

(a) The Contractor may utilize the services of specialty contractors on those parts of the work that under normal contracting practices are performed by specialty subcontractors.

(b) The Contractor shall not award any work to any subcontractor without the prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement shall contain such information as the Owner may require.

(c) The Contractor shall be as 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 employed by him.

(d) 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 General Conditions and other 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 Contract under any provisions of the contract documents.

(e) Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

35. ENGINEER'S AUTHORITY. The Engineer shall determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or

payment for work under this contract affected in any manner or to any extent by such question.

35.1 Interpretation of Drawings and Specifications. The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work that may arise between the Contractor under this contract and other contractors performing work for the Owner shall be adjusted and determined by the Engineer.

36. ALLOWANCES: Controls and SCADA System Modifications; Soils and Concrete Testing.

37. USE OF PREMISES AND REMOVAL OF DEBRIS. The Contractor expressly undertakes at his own expense:

(a) To take every precaution against injuries to persons or damage to property.

(b) To store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors.

(c) To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.

(d) To clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance.

(e) Before final payment to remove all surplus material, falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition.

(f) To effect all cutting, fitting or patching of his work required to make the same conform to the plans and specifications, and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other contractor.

38. QUANTITIES OF ESTIMATE. The estimated quantities of work to be done and materials to be furnished under this contract, shown in any of the documents, including the proposal, are given for use in comparing bids, and the right is specially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract, and such increase or diminution shall in no way vitiate this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

39. RIGHT-OF-WAY AND SUSPENSION OF WORK. The Owner shall furnish all land and rights-of-way necessary for the carrying out of this contract and the completion of the work herein contemplated, and will use due diligence in acquiring said land and rights-of-way as speedily as possible. But it is possible that all lands and rights-of-way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin his work upon such land and rights-of-way as the Owner may have previously acquired, and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining lands and rights-of-way.

Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation or by reason of its ability to procure any lands or rights-of-way for said work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay or to withdraw from the contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.

40. GENERAL WARRANTY FOR ONE YEAR AFTER COMPLETION OF CONTRACT. For a period of at least one year after the completion of the contract, the Contractor warrants the fitness and soundness of all work done and materials and equipment put in place under the contract, and neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting there from, which shall appear within a period of one year from the date of final acceptance of the work, unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness. This warranty period shall be extended as necessary to include additional warranty periods required by permitting agencies.

41. NOTICE AND SERVICE THEREOF. Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted by registered mail to said Contractor or his authorized representative on the work or is deposited in the regular United States Mail in a sealed, postage prepaid envelope and the receipt thereof is acknowledged by the Contractor.

    41.1 Owner's Notice. All papers required to be delivered to the Owner shall be delivered as indicated in Section 00 80 00 entitled Supplemental General Conditions.

42. REQUIRED PROVISIONS DEEMED INSERTED. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein, and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not correctly inserted, then upon the application of either party the contract shall forthwith by physically amended to make such insertion or correction.

43. PROTECTION OF LIVES AND HEALTH. In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the contract. The Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage that may result from their failure or their improper construction, maintenance or operation.

44. WAGES AND OVERTIME COMPENSATION. The Contractor and each of his subcontractors shall comply with all applicable State and local laws or ordinances with respect to the hours worked by laborers and mechanics engaged in work on the project and with respect to compensation for overtime.

45. PROHIBITED INTERESTS. No official of the Owner, who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer, or inspector of and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project shall become directly or indirectly interested personally in this contract or in any part hereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

46. CONFLICTING CONDITIONS. Any provisions in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in these General Conditions shall be void to the extent of such conflict or inconsistency.

47. INDEMNIFICATION

47.1 The CONTRACTOR will indemnify and hold harmless the OWNER, 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 there from; and is caused in whole or in part by any negligent or willful act of 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.

47.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by an employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly 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 limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

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

(END OF SECTION)

SECTION 00 80 00
SUPPLEMENTARY CONDITIONS

1. WORKING HOURS

The Contractor is allowed to work during regular working hours from 7:00 AM to 6:00 PM unless warranted due to emergency conditions. Weekend work must be approved in advance by the Owner.

2. BUSINESS LICENSE AND PERMITS

The selected contractor shall be required to obtain a per-job city business license. Contact Revenues Manager, at 843-545-4041, to obtain a City business license.

3. PROJECT SCHEDULE OF EVENTS

The following is the schedule of events listed in the order of occurrence, showing the major milestones from issuance of the RFB to the contract completion:

PROJECT MILESTONE EVENTS	**DATE**	**LOCAL TIME**
Construction Bid Document Release	Wednesday, March 22, 2023	
Non-Mandatory Pre-Bid Meeting	Tuesday, April 4, 2023	10:00 AM
Deadline for questions - emailed to: purchasing@georgetownsc.gov	Tuesday, April 18, 2023	2:00 PM
Deadline for addenda to be posted to the City's website, under "Bids"	Thursday, April 20, 2023	2:00 PM
Bid Opening Date	Wednesday, April 26, 2023	2:00 PM
City Council and EDA Approval (Tentative)	May 18, 2023	
Construction Notice of Award (Tentative)	May 22, 2023	
Construction Notice to Proceed (Tentative)	May 8, 2023	
Construction Start (Tentative)	June 12, 2023	
Construction Finish (360 calendar days after Construction Start)	June 6, 2024	
Project Closeout (60 calendar days after Construction Finish)	August 5, 2024	

3. SPECIFIC EDA AWARD CONDITIONS

This is a federally funded project and as such Contractors are bound to the Code of Federal Regulations (CFR) – Part 200. EDA Awards became effective on November 12, 2020. Additional revisions to 2 CFR Part 200 are anticipated in the future. This Specific Award Condition (SAC) is provided to confirm that fact and advise the Recipient(s) that the version of 2 CFR Part 200 that took effect on November 12, 2020 currently applies to this award and supersedes conflicting provisions of 2 CFR Part 200 appearing in the SF-450 and/or Standard Terms and Conditions and this Exhibit (if any) attached to this Award. Future revisions to 2 CFR Part 200 may further supersede the version that took effect on November 12, 2020.

EEO Goals:
Goals for minority participation for each trade: 33%
Goals for female participation for each trade: 6.9%
Contractors shall refer to PART 60-4 - CONSTRUCTION CONTRACTORS - AFFIRMATIVE ACTION REQUIREMENTS for further information

If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply and the SC Department of Archives and History and EDA shall be contacted immediately. 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."

Contractors shall pay construction laborers and mechanics current Davis Bacon wage rates.

The Contractor shall install EDA Project Sign at a location designated by the Owner.

The Contractor shall take digital photographs of the site sign and provide digital photographs of the investment showing progress of construction, the completed facility, before and after views, and other milestones such as check presentations, ground breakings and ribbon cutting/grand openings, if appropriate. Include EDA Sign in photographs when practicable. Please email digital photographs to the City Project Manager and Grant Administrator.

4. REQUIRED USE OF AMERICAN IRON, STEEL, MANUFACTURED PRODUCTS, AND CONSTRUCTION MATERIALS FOR INFRASTRUCTURE PROJECTS

The Build America, Buy America (BABA) provisions of the Infrastructure and Investment Jobs Act, Pub. L. 117-58, require Recipients of an award of Federal

financial assistance for infrastructure to utilize American iron, steel, manufactured products, and construction materials for the Project. The Buy American preference of BABA requires that:
(1) all iron and steel used in the Project be produced in the United States – this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
(2) all manufactured products used in the Project be produced in the United States – this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
(3) all construction materials be manufactured in the United States – this means that all manufacturing processes for the construction material occurred in the United States.
This preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to the Project. It does not apply to tools, equipment, supplies, or furnishings that are not an integral part of the structure or permanently affixed to the Project.
When necessary, Recipients may apply in writing for a waiver from these requirements. EDA may, in its discretion, waive the application of the domestic content procurement preference in any case in which:
(1) applying the domestic content procurement preference would be inconsistent with the public interest;
(2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
(3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall Project by more than 25 percent.

Waiver requests are subject to public comment periods of no less than 15 days and must be reviewed by the Made in America Office. There may be instances where an award qualifies, in whole or in part, for an existing waiver described at whitehouse.gov/omb/management/made-in-america.

For the purposes of this Specific Award Condition only:
“Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber; or drywall.

“Domestic content procurement preference’’ means all iron and steel used in the Project are produced in the United States; the manufactured products used in the Project are produced in the United States; or the construction materials used in the Project are produced in the United States.

“Infrastructure” includes, at a minimum, the structures, facilities, and equipment for, in the United States, roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property. Infrastructure includes facilities that generate, transport, and distribute energy.
“Project” means the construction, alteration, maintenance, or repair of infrastructure in the United States.

(END OF SECTION)

"General Decision Number: SC20220001 02/25/2022

Superseded General Decision Number: SC20210001

State: South Carolina

Construction Types: Heavy (Heavy and Sewer and Water Line)

Counties: Abbeville, Allendale, Bamberg, Barnwell, Beaufort, Cherokee, Chester, Chesterfield, Clarendon, Colleton, Dillon, Georgetown, Greenwood, Hampton, Jasper, Lancaster, Lee, Marion, Marlboro, McCormick, Newberry, Oconee, Orangeburg, Union and Williamsburg Counties in South Carolina.

DOES NOT INCLUDE SAVANNAH RIVER SITE IN ALLENDALE AND BARNWELL COUNTIES

HEAVY CONSTRUCTION PROJECTS (includes Sewer & Water Line projects)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 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 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least

30, 2022:	$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022

* SUSC1990-005 02/08/1990

	Rates	Fringes
Boilermaker (tank work)	$ 12.96 **	3.315
Bricklayer	$ 7.25 **	
Carpenter	$ 7.42 **	
Cement mason/concrete finisher	$ 7.25 **	
Ironworker	$ 10.98 **	
Laborers:		
Chain saw	$ 7.25 **	
General	$ 7.25 **	
Pipelayer	$ 7.25 **	
Pipefitter	$ 9.09 **	
Power equipment operators:		
Backhoe	$ 7.25 **	
Bulldozer	$ 7.25 **	
Crane	$ 7.98 **	

Dragline.....$ 7.25 **
Front End Loader.....$ 7.25 **
Mechanic.....$ 7.25 **
Motor grader.....$ 7.25 **
Pan Scraper.....$ 7.25 **

Line Construction: line
technician.....$ 10.08 **

MANHOLE BUILDER.....$ 7.25 **

TRUCK DRIVER.....$ 7.25 **

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

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 https://www.dol.gov/agencies/whd/government-contracts.

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 National Office because National Office has 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.

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END OF GENERAL DECISIO"

FORM **CD-512**
(REV 12-04)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING
LOWER TIER COVERED TRANSACTIONS

Applicants should review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying."

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure Form to Report Lobbying,'' in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME
	WTP Floc-Sed Basin No. 2
PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
SIGNATURE	DATE

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246 AND 41 CFR PART 60-4)

The following Notice shall be included in, and shall be a part of all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000.

The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

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 for each trade
	33 %	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. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non federally involved construction.
The Contractor's compliance with the Executive Order and the regulations in 41 CFR 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. 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 minorities 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.

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 of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is:

State of South Carolina

County of Georgetown

City of Georgetown

OMB Number: 0610-0096
Expiration Date: 01/31/2025

U. S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

EDA CONTRACTING PROVISIONS
FOR CONSTRUCTION PROJECTS

These EDA Contracting Provisions for Construction Projects (EDA Contracting Provisions) are intended for use by recipients receiving federal assistance from the U. S. Department of Commerce - Economic Development Administration (EDA). They contain provisions specific to EDA and other federal provisions not normally found in non-federal contract documents. The requirements contained herein must be incorporated into all construction contracts and subcontracts funded wholly or in part with federal assistance from EDA.

TABLE OF CONTENTS

1. DEFINITIONS

Agreement – The written instrument that is evidence of the agreement between the Owner and the Contractor overseeing the Work.

Architect/Engineer - The person or other entity engaged by the Recipient to perform architectural, engineering, design, and other services related to the work as provided for in the contract.

Contract – The entire and integrated written agreement between the Owner and the Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

Contract Documents – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents.

Contractor – The individual or entity with whom the Owner has entered into the Agreement.

Drawings or Plans – That part of the Contract Documents prepared or approved by the Architect/Engineer that graphically shows the scope, extent, and character of the Work to be performed by the Contractor.

EDA - The United States of America acting through the Economic Development Administration of the U.S. Department of Commerce or any other person designated to act on its behalf. EDA has agreed to provide financial assistance to the Owner, which includes assistance in financing the Work to be performed under this Contract. Notwithstanding EDA's role, nothing in this Contract shall be construed to create any contractual relationship between the Contractor and EDA.

Owner – The individual or entity with whom the Contractor has entered into the Agreement and for whom the Work is to be performed.

Project – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

Recipient – A non-Federal entity receiving a Federal financial assistance award directly from EDA to carry out an activity under an EDA program, including any EDA-approved successor to the entity.

Specifications – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

Subcontractor – An individual or entity having direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

Work – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

2. APPLICABILITY

The Project to which the construction work covered by this Contract pertains is being assisted by the United States of America through federal assistance provided by the U.S. Department of Commerce - Economic Development Administration (EDA). Neither EDA, nor any of its departments, entities, or employees is a party to this Contract. The following EDA Contracting Provisions are included in this Contract and all subcontracts or related instruments pursuant to the provisions applicable to such federal assistance from EDA.

3. FEDERALLY REQUIRED CONTRACT PROVISIONS

(a) All contracts in excess of the simplified acquisition threshold - currently fixed at $150,000 (*see* 41 U.S.C. §§ 134 and 1908) must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate.

(b) All contracts in excess of $10,000 must address termination for cause and for convenience by the Recipient including the manner by which it will be effected and the basis for settlement.

(c) All construction contracts awarded in excess of $10,000 by recipients of federal assistance and their contractors or subcontractors shall contain a provision requiring compliance with Executive Order 11246 of September 24, 1965, *Equal Employment Opportunity*, as amended by Executive Order 11375 of October 13, 1967, and Department of Labor implementing regulations at 41 C.F.R. part 60.

(d) All prime construction contracts in excess of $2,000 awarded by Recipients must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148) as supplemented by Department of Labor regulations at 29 C.F.R. part 5. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations at 29 C.F.R. part 3.

(e) All contracts awarded by the Recipient in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704 (the Contract Work Hours and Safety Standards Act) as supplemented by Department of Labor regulations at 29 C.F.R. part 5.

(f) All contracts must include EDA requirements and regulations that involve a requirement on the contractor or sub-contractor to report information to EDA, the Recipient or any other federal agency.

(g) All contracts must include EDA requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.

(h) All contracts must include EDA requirements and regulations pertaining to copyrights and rights in data.

(i) All contracts and subgrants in excess of $150,000 must contain a provision that requires compliance with all applicable standards, orders, or requirements issued under the Clean Air Act (42 U.S.C. § 7401 *et seq.*) and the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. § 1251 *et seq.*), and Executive Order 11738, *Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans*.

(j) Contracts must contain mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C.§ 6201).

(k) Contracts must contain a provision ensuring that contracts are not to be made to parties on the government wide Excluded Parties List System in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. part 180.

(l) Contracts must contain a provision ensure compliance with the Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352) under which contractors that apply or bid for an award of $100,000 or more must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

(m) If the Recipient is a state agency or agency of a political subdivision of a state, any contract awarded must contain a provision ensuring compliance with section 6002 of the Solid Waste Disposal Act (42 U.S.C. § 6962), as amended by the Resource Conservation and Recovery Act related to the procurement of recovered materials.

4. REQUIRED PROVISIONS DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion of correction.

5. INSPECTION BY EDA REPRESENTATIVES

The authorized representatives and agents of EDA shall be permitted to inspect all work, materials, payrolls, personnel records, invoices of materials, and other relevant data and records.

6. EXAMINATION AND RETENTION OF CONTRACTOR'S RECORDS

(a) The Owner, EDA, or the Comptroller General of the United States, or any of their duly authorized representatives shall, generally until three years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders that do not exceed $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Owner, EDA, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

7. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule. The Contractor also shall furnish the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only to determine the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

8. CONTRACTOR'S TITLE TO MATERIAL

No materials, supplies, or equipment for the work shall be purchased by the Contractor or by any subcontractor that is subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants and guarantees that he/she has good title to all work, materials, and equipment used by him/her in the Work, free and clear of all liens, claims, or encumbrances.

9. INSPECTION AND TESTING OF MATERIALS

All materials and equipment used in the completion of the Work shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. Materials of construction, particularly those upon which the strength and durability of any structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for intended uses.

10. "OR EQUAL" CLAUSE

Whenever a material, article, or piece of equipment is identified in the Contract Documents by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard. Any material, article, or equipment of other manufacturers and vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Architect/Engineer, of equal substance and function. However, such substitution material, article, or equipment shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

11. PATENT FEES AND ROYALTIES

(a) Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device that is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Architect/Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Owner in the Contract Documents.

(b) To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner and the Architect/Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

12. CLAIMS FOR EXTRA COSTS

No claims for extra work or cost shall be allowed unless the same was done in pursuance of a written order from the Architect/Engineer approved by the Owner.

13. CONTRACTORS AND SUBCONTRACTORS INSURANCE

(a) The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance reasonably required by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until the insurance required of the subcontractor has been so obtained and approved.

(b) Types of insurance normally required are:

(1) Workers' Compensation
(2) Contractor's Public Liability and Property Damage
(3) Contractor's Vehicle Liability
(4) Subcontractors' Public Liability, Property Damage and Vehicle Liability
(5) Builder's Risk (Fire and Extended Coverage)

(c) **Scope of Insurance and Special Hazards:** The insurance obtained, which is described above, shall provide adequate protection for the Contractor and his/her subcontractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any of the special hazards that may be encountered in the performance of this Contract.

(d) **Proof of Carriage of Insurance:** The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates, and dates of expiration of applicable insurance policies.

14. CONTRACT SECURITY BONDS

(a) If the amount of this Contract exceeds $150,000, the Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and also a payment bond in an amount equal to one hundred percent (100%) of the Contract price or in a penal sum not less than that prescribed by State, Territorial, or local law, as security for the payment of all persons performing labor on the Work under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by EDA. If the amount of this Contract does not exceed $150,000, the Owner shall specify the amount of the payment and performance bonds.

(b) All bonds shall be in the form prescribed by the Contract Documents except as otherwise provided in applicable laws or regulations, and shall be executed by such sureties as are named in the current list of *Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies* as published in Treasury Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's

authority to act. Surety companies executing the bonds must also be authorized to transact business in the state where the Work is located.

15. **LABOR STANDARDS - DAVIS-BACON AND RELATED ACTS**
(as required by section 602 of PWEDA)

(a) **Minimum Wages**

(1) All laborers and mechanics employed or working upon the site of the Work in the construction or development of the Project 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 at 29 C.F.R. part 3, the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at the 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 that 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 29 C.F.R. § 5.5(a)(1)(iv); 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 29 C.F.R. § 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 determined under 29 C.F.R. § 5.5(a)(1)(ii) 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.

(2) (i) Any class of laborers or mechanics to be employed under the Contract, but not listed in the wage determination, shall be classified in conformance with the wage determination. EDA shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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

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

(C) The proposed wage rate, including any bona fide fringe benefits, bears a

reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and EDA or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by EDA or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and EDA or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), EDA or its designee shall refer the questions, including the views of all interested parties and the recommendation of EDA or its designee, to the Administrator for determination.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(2)(ii) or (iii) 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.

(3) 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.

(4) 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.

(b) **Withholding**

EDA or its designee shall upon its own action or upon written request of 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 in the construction or development of the Project, all or part of the wages required by the Contract, EDA or its designee 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. EDA or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(c) **Payrolls and basic records**

(1) 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 in the construction or development of the Project. 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 section 1(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 C.F.R. § 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, the plan or program is financially responsible, and the plan or program has been communicated in writing to the laborers or mechanics affected, and provide records that 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.

(2) (i) For each week in which Contract work is performed, the Contractor shall submit a copy of all payrolls to the Owner for transmission to EDA or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 C.F.R. part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose. It may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402; or downloaded from the U.S. Department of Labor's website at https://www.dol.gov/whd/forms/wh347.pdf. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors

(ii) 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:

(A) That the payroll for the payroll period contains the information required to be maintained under 29 C.F.R. § 5.5(a)(3)(i) and that such information is correct and complete;

(B) 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 29 C.F.R. part 3; and

(C) 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.

(iii) 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 15(c)(2)(ii) of this section.

(iv) 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 3729 of Title 31 of the U.S. Code.

(3) The Contractor or subcontractor shall make the records required under paragraph 15(c)(1) of this section available for inspection, copying, or transcription by authorized representatives of EDA or its designee 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, EDA or its designee may, after written notice to the Contractor 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 C.F.R. § 5.12.

(d) **Apprentices and Trainees**.

(1) **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, Bureau of Apprenticeship and Training (Bureau), or with a State Apprenticeship Agency recognized by the Bureau, 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 Bureau of Apprenticeship and Training 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 Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, 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.

(2) **Trainees**. Except as provided in 29 C.F.R. § 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 that 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's 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.

(3) **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, *Equal Employment Opportunity*, as amended, and 29 C.F.R. part 30.

(e) **Compliance with Copeland Anti-Kickback Act Requirements**. The Contractor shall comply with the Copeland Anti-Kickback Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations (29 C.F.R. part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that the Contractor and any subcontractors shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which they are otherwise entitled. The Owner shall report all suspected or reported violations to EDA.

(f) **Subcontracts**. The Contractor and any subcontractors will insert in any subcontracts the clauses contained in 29 C.F.R. §§ 5.5(a)(1) through (10) and such other clauses as EDA or its designee may require, 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 C.F.R. § 5.5.

(g) **Contract termination; debarment**. The breach of the contract clauses in 29 C.F.R. § 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 C.F.R. § 5.12.

(h) **Compliance with Davis-Bacon and Related Act Requirements**. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 C.F.R. parts 1, 3, and 5 are herein incorporated by reference in this contract.

(i) **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 C.F.R. parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and EDA or its designee, the U.S. Department of Labor, or the employees or their representatives.

(j) **Certification of Eligibility**.

(1)By entering into this Contract, the Contractor certifies that neither it nor any person or firm that 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 C.F.R. § 5.12(a)(1).

(2) 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 C.F.R. § 5.12(a)(1).

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

16. LABOR STANDARDS - CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(a) **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 that person 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.

(b) **Violation; liability for unpaid wages, liquidated damages**. In the event of any violation of the clause set forth in paragraph (a) 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) 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) of this section.

(c) **Withholding for unpaid wages and liquidated damages**. EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies 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) of this section.

(d) **Subcontracts**. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (a) through (c) 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) through (c) of this section.

17. EQUAL EMPLOYMENT OPPORTUNITY

(a) The Recipient hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 C.F.R. chapter 60, which is paid for in whole or in part with funds obtained from EDA, the following equal opportunity clause:

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by EDA and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of

this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph 17(a)(1) and the provisions of paragraphs 17(a)(1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as EDA or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by EDA or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

(9) The Recipient further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally-assisted construction work. Provided, however, that if the Recipient so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality, or subdivision of such government that does not participate in work on or under the Contract.

(10)The Recipient agrees that it will assist and cooperate actively with EDA and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish EDA and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist EDA in the discharge of the EDA's primary responsibility for securing compliance.

(11) The Recipient further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by EDA or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the Recipient agrees that if it fails or refuses to comply with these undertakings, EDA may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this EDA financial assistance; refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case

to the Department of Justice for appropriate legal proceedings.

(b) Exemptions to Above Equal Opportunity Clause (41 C.F.R. chapter 60):

(1) Contracts and subcontracts not exceeding $10,000 (other than Government bills of lading, and other than contracts and subcontracts with depositories of Federal funds in any amount and with financial institutions which are issuing and paying agents for U.S. savings bonds and savings notes) are exempt. The amount of the Contract, rather than the amount of the federal financial assistance, shall govern in determining the applicability of this exemption.

(2) Except in the case of subcontractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in subcontracts below the second tier.

(3) Contracts and subcontracts not exceeding $10,000 for standard commercial supplies or raw materials are exempt.

18. **CONTRACTING WITH SMALL, MINORITY AND WOMEN'S BUSINESSES**

(a) If the Contractor intends to let any subcontracts for a portion of the work, the Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services.

(b) Affirmative steps shall consist of:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(4) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises;

(5) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies;

(6) Requiring each party to a subcontract to take the affirmative steps of this section; and

(7) The Contractor is encouraged to procure goods and services from labor surplus area firms.

19. **HEALTH, SAFETY, AND ACCIDENT PREVENTION**

(a) In performing this contract, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to their health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons;

(3) Prevent damage to property, materials, supplies, and equipment; and

(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

(1) Comply with regulations and standards issued by the Secretary of Labor at 29 C.F.R. part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 3701 – 3708); and

(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this Contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 C.F.R. part 1904.

(d) The Owner shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the Work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as EDA, or the Secretary of Labor shall direct as a means of enforcing such provisions.

20. CONFLICT OF INTEREST AND OTHER PROHIBITED INTERESTS

(a) No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part hereof.

(b) No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

(c) The Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the Contract Documents has a corporate or financial affiliation with the supplier or manufacturer.

(d) The Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, may be involved. Such a conflict may arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in the Contractor. The Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from the Contractor or subcontractors.

(e) If the Owner finds after a notice and hearing that the Contractor, or any of the Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of the Owner or EDA in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, the Owner may, by written notice to the Contractor, terminate this Contract. The Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which the Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

(f) In the event this Contract is terminated as provided in paragraph (e) of this section, the Owner may pursue the same remedies against the Contractor as it could pursue in the event of a breach of this Contract by the Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, the Owner may pursue exemplary damages in an amount (as determined by the Owner) which shall not be less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such officer or employee.

21. RESTRICTIONS ON LOBBYING

(a) This Contract, or subcontract is subject to 31 U.S.C. § 1352, regarding lobbying restrictions. The section is explained in the common rule, 15 C.F.R. part 28 (55 FR 6736-6748, February 26, 1990). Each bidder under this Contract or subcontract is generally prohibited from using federal funds for lobbying the Executive or Legislative Branches of the Federal Government in connection with this EDA Award.

(b) **Contract Clause Threshold**: This Contract Clause regarding lobbying must be included in each bid for a contract or subcontract exceeding $100,000 of federal funds at any tier under the EDA Award.

(c) **Certification and Disclosure**: Each bidder of a contract or subcontract exceeding $100,000 of federal funds at any tier under the federal Award must file Form CD-512, *Certification Regarding Lobbying – Lower Tier Covered Transactions*, and, if applicable, Standard Form-LLL, *Disclosure of Lobbying Activities*, regarding the use of any nonfederal funds for lobbying. Certifications shall be retained by the Contractor or subcontractor at the next higher tier. All disclosure forms, however, shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(d) **Continuing Disclosure Requirement**: Each Contractor or subcontractor that is subject to the Certification and Disclosure provision of this Contract Clause is required to file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person. Disclosure forms shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(e) **Indian Tribes, Tribal Organizations, or Other Indian Organizations**: Indian tribes, tribal organizations, or any other Indian organizations, including Alaskan Native organizations, are excluded from the above lobbying restrictions and reporting requirements, but only with respect to expenditures that are by such tribes or organizations for lobbying activities permitted by other federal law. An Indian tribe or organization that is seeking an exclusion from Certification and Disclosure requirements must provide EDA with the citation of the provision or provisions of federal law upon which it relies to conduct lobbying activities that would otherwise be subject to the prohibitions in and to the Certification and Disclosure requirements of 31 U.S.C. § 1352, preferably through an attorney's opinion. Note, also, that a non-Indian subrecipient, contractor, or subcontractor under an award to an Indian tribe, for example, is subject to the restrictions and reporting requirements.

22. HISTORICAL AND ARCHAEOLOGICAL DATA PRESERVATION

The Contractor agrees to facilitate the preservation and enhancement of structures and objects of historical, architectural or archaeological significance and when such items are found and/or unearthed during the course of project construction. Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the State Historic

Preservation Officer (SHPO) for recovery of the items. *See* the National Historic Preservation Act of 1966 (54 U.S.C. § 300101 *et seq.*, formerly at 16 U.S.C. § 470 *et seq.*) and Executive Order No. 11593 of May 31, 1971.

23. **CLEAN AIR AND WATER**

Applicable to Contracts in Excess of $150,000

(a) **Definition**. "Facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by the Contractor or any subcontractor, used in the performance of the Contract or any subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the United States Environmental Protection Agency (EPA) determines that independent facilities are collocated in one geographical area.

(b) In compliance with regulations issued by the EPA, 2 C.F.R. part 1532, pursuant to the Clean Air Act, as amended (42 U.S.C. § 7401 *et seq.*); the Federal Water Pollution Control Act, as amended (33 U.S.C. § 1251 *et seq.*); and Executive Order 11738, the Contractor agrees to:

(1) Not utilize any facility in the performance of this contract or any subcontract which is listed on the Excluded Parties List System, part of the System for Award Management (SAM), pursuant to 2 C.F.R. part 1532 for the duration of time that the facility remains on the list;

(2) Promptly notify the Owner if a facility the Contractor intends to use in the performance of this contract is on the Excluded Parties List System or the Contractor knows that it has been recommended to be placed on the List;

(3) Comply with all requirements of the Clean Air Act and the Federal Water Pollution Control Act, including the requirements of section 114 of the Clean Air Act and section 308 of the Federal Water Pollution Control Act, and all applicable clean air and clean water standards; and

(4) Include or cause to be included the provisions of this clause in every subcontract and take such action as EDA may direct as a means of enforcing such provisions.

24. **USE OF LEAD-BASED PAINTS ON RESIDENTIAL STRUCTURES**

(a) If the work under this Contract involves construction or rehabilitation of residential structures over $5,000, the Contractor shall comply with the Lead-based Paint Poisoning Prevention Act (42 U.S.C. § 4831). The Contractor shall assure that paint or other surface coatings used in a residential property does not contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5 percent by weight or 5,000 parts per million (ppm) by weight. For purposes of this section, "residential property" means a dwelling unit, common areas, building exterior surfaces, and any surrounding land, including outbuildings, fences and play equipment affixed to the land, belonging to an owner and available for use by residents, but not

including land used for agricultural, commercial, industrial or other non-residential purposes, and not including paint on the pavement of parking lots, garages, or roadways.

(b) As a condition to receiving assistance under PWEDA, recipients shall assure that the restriction against the use of lead-based paint is included in all contracts and subcontracts involving the use of federal funds.

25. ENERGY EFFICIENCY

The Contractor shall comply with all standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201) for the State in which the Work under the Contract is performed.

26. ENVIRONMENTAL REQUIREMENTS

When constructing a Project involving trenching and/or other related earth excavations, the Contractor shall comply with the following environmental constraints:

(1) **Wetlands**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert wetlands.

(2) **Floodplains**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency (FEMA) Floodplain Maps, or other appropriate maps, i.e., alluvial soils on Natural Resource Conservation Service (NRCS) Soil Survey Maps.

(3) **Endangered Species**. The Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of the Contractor, the Contractor will immediately report this evidence to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the U.S. Fish and Wildlife Service.

27. DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSIONS

As required by Executive Orders 12549 and 12689, *Debarment and Suspension*, 2 C.F.R. Part 180 and implemented by the Department of Commerce at 2 C.F.R. part 1326, for prospective participants in lower tier covered transactions (except subcontracts for goods or services under the $25,000 small purchase threshold unless the subrecipient will have a critical influence on or substantive control over the award), the Contractor agrees that:

(1) By entering into this Contract, the Contractor and subcontractors certify, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared

ineligible, or voluntarily excluded from participation in this Contract by any federal department or agency.

(2) Where the Contractor or subcontractors are unable to certify to any of the statements in this certification, the Contractor or subcontractors shall attach an explanation to this bid.

See also 2 C.F.R. part 180 and 2 C.F.R. § 200.342.

28. **EDA PROJECT SIGN**

The Contractor shall supply, erect, and maintain in good condition a Project sign according to the specifications provided by EDA. To the extent practical, the sign should be a free standing sign. Project signs shall not be located on public highway rights-of-way. Location and height of signs will be coordinated with the local agency responsible for highway or street safety in the Project area, if any possibility exists for obstructing vehicular traffic line of sight. Whenever the EDA site sign specifications conflict with State law or local ordinances, the EDA Regional Director will permit such conflicting specifications to be modified so as to comply with State law or local ordinance.

29. **BUY AMERICA**

To the greatest extent practicable, contractors are encouraged to purchase American-made equipment and products with funding provided under EDA financial assistance awards.

OMB Number: 0610-0096
Expiration Date: 01/31/2025

EDA PROJECT SIGN

The Contractor shall supply, erect, and maintain in good condition a project sign according to the specifications set forth below:

EDA SITE SIGN SPECIFICATIONS

Size: 4' x 8' x ¾"

Materials: Exterior grade/MDO plywood (APA rating A-B)

Supports: 4" x 4" x 12' posts with 2" x 4" cross branching

Erection: Posts shall be set a minimum of three feet deep in concrete footings that are at least 12" in diameter.

Paint: Outdoor enamel

Colors: Jet Black, Blue (PMS300), and Gold (PMS7406). Specifically, on white background the following will be placed:

The U. S. Department of Commerce seal in blue, black, and gold;

"EDA" in blue;

"U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT

ADMINISTRATION" in black;

"In partnership with" in blue;

(Actual name of the) "EDA Grant Recipient" in black;

Lettering: Specific fonts are named below; positioning will be as shown on the attached illustration.

"U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION" use Bank Gothic Medium - BANK GOTHIC MED

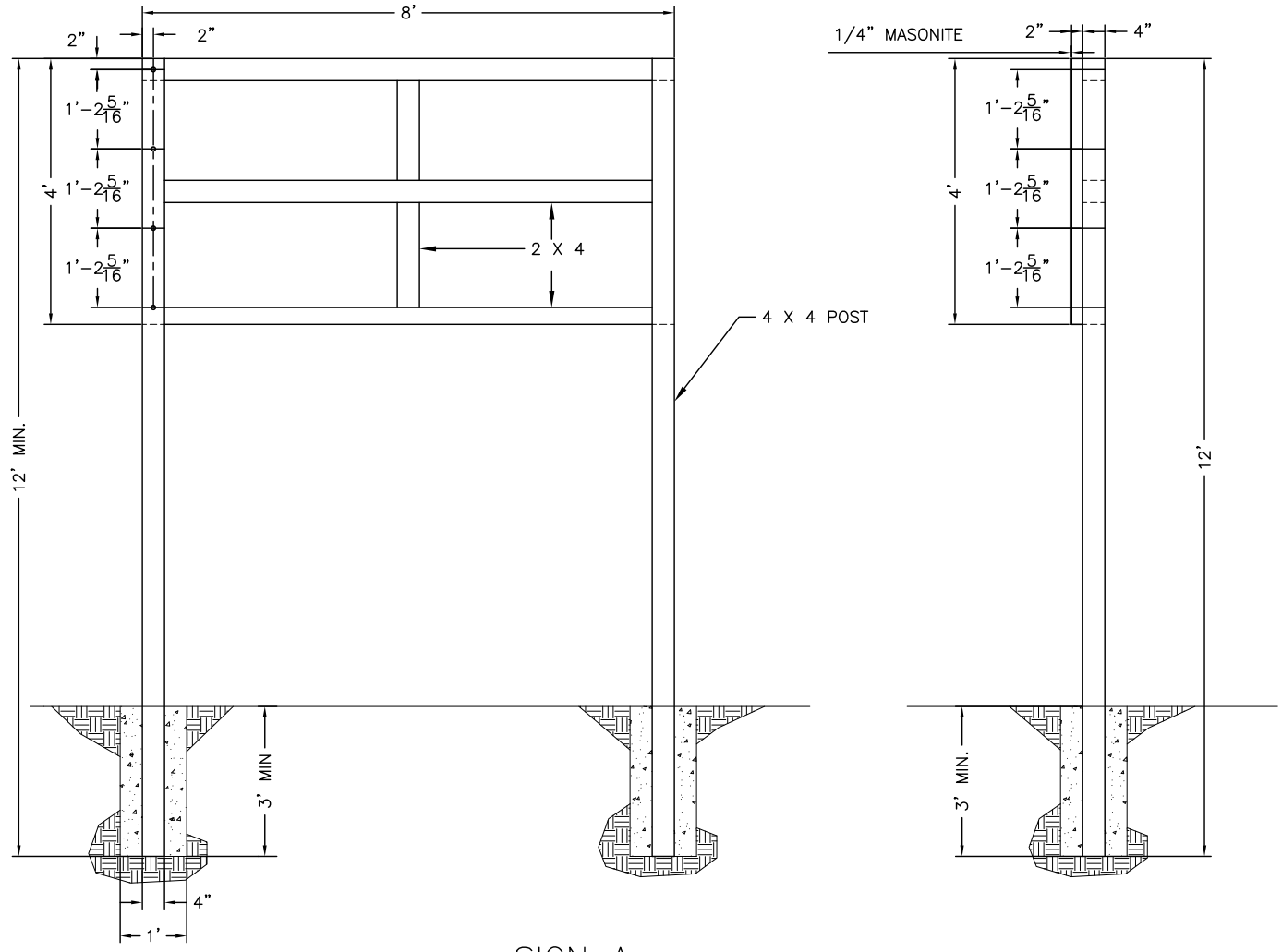
"In partnership with" use Univers™ 55 Oblique - *Univers 55*

(Name of) "EDA Grant Recipient" use Univers™ Extra Black 85 **Univers 85**

Project signs will not be erected on public highway rights-of-way. If any possibility exists for obstruction to traffic line of sight, the location and height of the sign will be coordinated with the agency responsible for highway or street safety in the area.

The EDA Regional Director may permit modifications to these specifications if they conflict with state law or local ordinances.

OMB Number: 0610-0096
Expiration Date: 01/31/2025

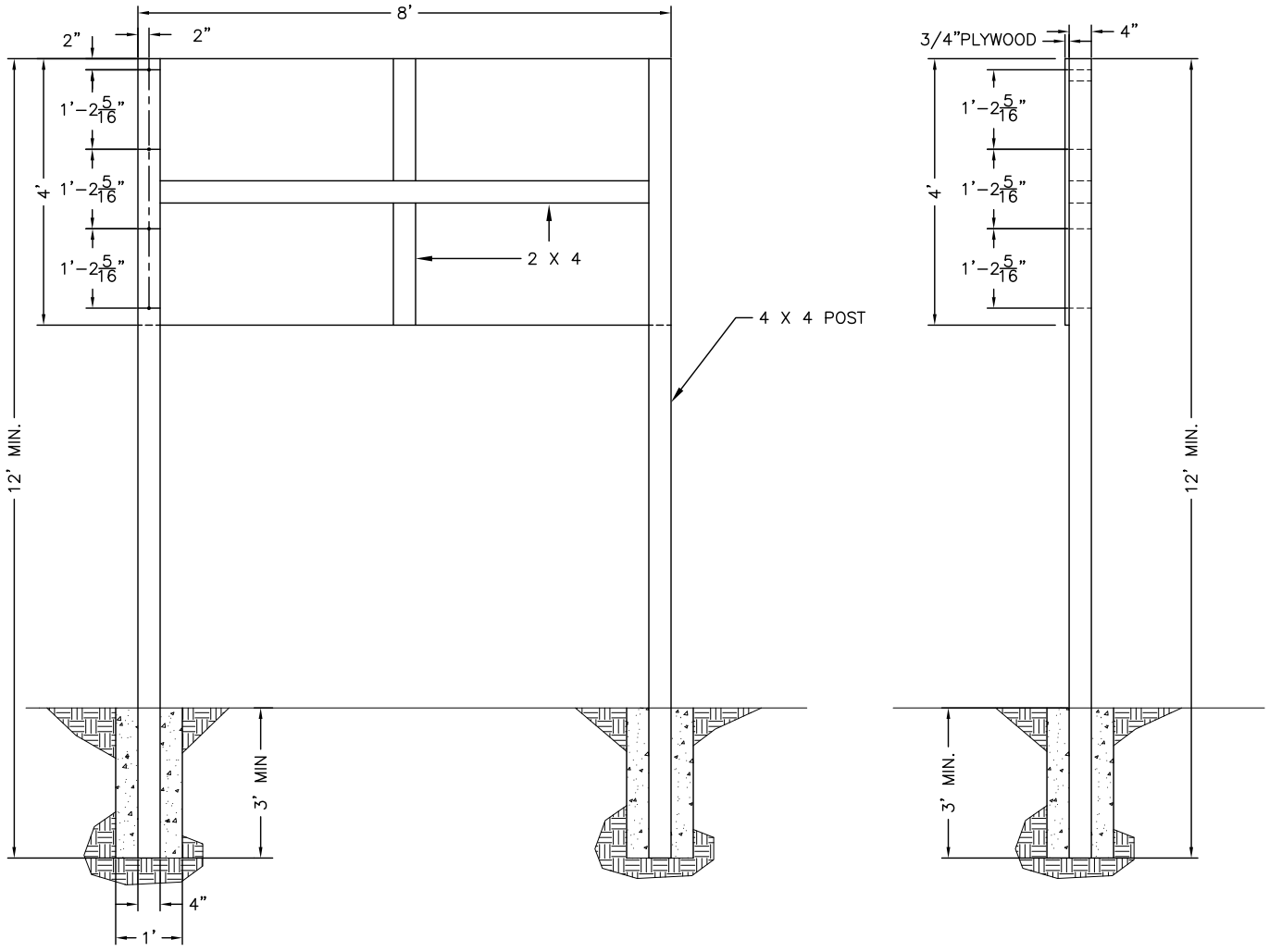


SIGN A
MASONITE SIGN

SCALE: 3/8" = 1'

PROJECT - SIGN A
ECONOMIC DEVELOPMENT ADMINISTRATION

OMB Number: 0610-0096
Expiration Date: 01/31/2025



SIGN B
PLYWOOD SIGN
SCALE: 3/8" = 1'

PROJECT - SIGN B
ECONOMIC DEVELOPMENT ADMINISTRATION

EDA

U.S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION

In partnership with

<EDA Grant Recipient Name>

EDA

Black
Blue= PMS300
Gold= PMS7406

2.25”
13.5”
1.75”
1.75”
10”
48”

2.0”
1.5”
4.0”
3.0”
3.0”
3.75”
3.0”
4.25”
3.75”
4.0”

U.S. Department of Commerce Economic Development Administration

In partnership with

Recipient Name

Joseph R. Biden, Jr., President of the United States

SECTION 00 90 00

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(END OF SECTION)

SECTION 01 04 60
CONTROL OF WORK AND MATERIALS

PART 1 GENERAL (NOT APPLICABLE)

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.

B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.

C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

3.02 EASEMENTS AND ENCROACHMENTS:

A. As indicated on the drawings, the work is located on property owned by the Owner.

B. Contractor shall schedule work so that it will cause minimum inconvenience and nuisance to abutting property owners, over the shortest possible time.

3.03 OPEN EXCAVATIONS:

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.

B. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.

3.04 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

A. All existing buildings, utilities, pipes, poles, wires fences, curbings, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.

B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them to a condition similar or equal to that existing before removal was done, to the satisfaction of the engineer.

D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.

E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.

F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.06 MAINTENANCE OF FLOW:

A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.

C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01710, CLEANING UP.

3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor and shall not be made use of elsewhere in the work.

B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder,

shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.

C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Engineer, occurring previous to the final payment.

3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.09 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

END OF SECTION

SECTION 01 05 00
FIELD ENGINEERING

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:

1. Provide all staking required to construct the facility from coordinates established by the Engineer.

2. Establish the proper line and levels for installation of utilities.

3. Establish the proper grades and elevations for earthwork.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Additional requirements for field engineering also may be described in other Sections of these Specifications. These include but are not limited to the following:

C. Work by others:

1. Not less than one (1) benchmark elevation will be provided.

1.2 QUALITY ASSURANCE

A. Provide a competent survey party and surveying instruments for staking the work.

B. Exercise proper precautions to verify the figures shown on the Drawings prior to laying out any part of the Work.

1. The Contractor will be held responsible for any errors therein that otherwise might have been avoided.

2. Promptly inform the Engineer of any error or discrepancies discovered in the Drawings or Specifications in order that proper corrections may be made.

1.3 PROCEDURES:

A. Locate and protect control points before starting work on the site.

B. Preserve permanent reference points during progress of the Work.

C. Do not change or relocate reference points or items of the Work without specific approval from the Engineer.

D. Promptly advise the Engineer when a reference point is lost or destroyed or requires relocation because of other changes in the Work.

1.4 CONSTRUCTION LAYOUT:

A. Perform calculations, and the set of marks and stakes necessary to ensure that the work conforms to the required lines, grades, and dimensions.

B. Relate such layout to the coordinate grid system, elevation datum, and related survey control monuments and bench marks identified on the drawings or elsewhere in the contract documents.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 06 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

The following requirements of Regulatory Agencies having an interest in this project are hereby made a part of this Contract.

1.1 The construction of the project, including the letting of the contracts in connection therewith, shall conform to the applicable requirements of State, territorial and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.

1.2 South Carolina Sales Tax: All applicable South Carolina sales tax shall be to the account of the Contractors.

1.3 Use of chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

1.4 Safety and Health Regulations: The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54)

1.5 The Contractor shall comply with Part V of the South Carolina Manual on Uniform Traffic Control Devices for Streets and Highways.

1.6 Inspection by Agencies: The representatives of the South Carolina Department of Health and Environmental Control, USDA Rural Development, Environmental Protection Agency, Department of Natural Resources and the Corps of Engineers shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.

1.7 Withholding for non-residents shall comply with the following:

A. Attention of non-residents Contractors is invited to Code Sections 12-8-540 and 12-8-550 as amended effective July 1, 1994, Section 49, Appropriations Bill, Part II.

B. If a non-resident Contractor is the successful bidder on this project, he/she shall be required to provide the Owner with an Affidavit (Form I-312, Nonresident Taxpayer Registration Affidavit Income Tax Withholding) affirming registration with the South Carolina Department of Revenue or the South Carolina Secretary of State's office. (Refer to attached form)

C. Forms to register for all taxes administered by the South Carolina Department of Revenue may be obtained by calling the License and Registration Section at (803) 737-4872 or writing to South Carolina Department of Revenue, Registration Unit, Columbia, South Carolina 29214-0140.

D. In the absence of an Affidavit being provided, withholding in the amount of two (2) percent of the contract price will be made by the Owner.

1.8 If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply and the SC Department of Archives and History, the EDA and the Catawba Indian Nation shall be contacted immediately. 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.

END OF SECTION

SECTION 01 06 10

PERMITS AND RIGHTS-OF-WAY

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included: This section established requirements pertaining to the securing and paying for licenses, building permits, right-of-way, etc. necessary for the construction of the project.

B. Work Not Include: Owner will obtain and provide to the Contractor, as required, copies of the following:

1. South Carolina Department of Health and Environmental Control - Permit to Construct Water/Wastewater Facilities

C. Office of Ocean and Coastal Resource Management Certification

D. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Additional requirements for field engineering also may be described in other Sections of these Specifications. These include but are not limited to the following:

a) None

1.2 SUBMITTALS

A. Submit to the Engineer satisfactory evidence that all necessary licenses, building permits, etc., have been secured prior to commencing the work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 BUSINESS LICENSE

3.1.1 Determine licenses necessary to perform the work at project location.

3.1.2 Obtain all necessary licenses at no permits required, whether of temporary or permanent nature.

3.2 BUILDING PERMITS

3.2.1 Secure and pay for all building permits required, whether temporary or permanent nature.

3.3 RIGHT-OF-WAY, EASEMENTS

(Not Used)

END OF SECTION

SECTION 01 09 00
REFERENCED STANDARDS

PART 1 GENERAL

1.1 DESCRIPTION

A. Throughout the Project Documents, reference is made to specifications and standards issued by nationally recognized professional and/or trade organizations:

1. These referenced standards are generally identified by abbreviating the name of the organization following with the specification/standard number.

2. Unless specifically indicated otherwise, all references to standards refer to the latest edition available at the time of the bidding.

1.2 ABBREVIATIONS

A. Wherever the following abbreviations are used in these Project Documents, they are to be construed the same as the respective expressions represented:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ALS	American Lumber Standards
ANSI	American National Standards Institute, Inc
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWPA	American Wood Preservers Association
AWS	American Welding Society
FSS	Federal Specifications and Standards
GSA	General Services Administration
IBC	International Building Code
NACE	National Association of Corrosion Engineers
NFPA	National Fire Protection Association
NSF	Formerly: National Sanitary Foundation
OSHA	Occupational Safety and Health Administration
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 11 00

PROJECT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals at the City of Georgetown Water Treatment Plant (WTP) as specified herein and shown on the Drawings complete in place and ready to operate including but not limited to:

1. Demolition and disposal of existing site piping, concrete structures and pavement as shown on the Drawings.
2. Construction of a new flocculation and sedimentation concrete basin on a pile foundation (Floc-Sed Basin No. 2) consisting of four flocculation cells with mixers and a sedimentation basin with inclined plate settlers and hoseless sludge removal system.
3. Construction of a new Sludge Meter Station above grade on a concrete pad including piping, flow meter, valves and appurtenances.
4. Construction of new site piping and junction boxes to convey treatment chemicals and settled water samples between the existing Administration/Chemical Building and Floc-Sed Basins No. 1 and 2.
5. Furnishing and installing four variable speed drives inside the existing Electrical Room in the Administration Building for the 2 HP mixers in Floc-Sed Basin No. 2.
6. Site work, including grading, paving and utilities, as shown on the Drawings.
7. Integration of monitoring and control inputs and all system alarms via new local control panel (LCP-S) and modified SCADA System.
8. Furnishing and installing all associated conduit and wiring related to electrical modifications and required for new equipment.
9. If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply and the SC Department of Archives and History, the EDA and the Catawba Indian Nation shall be contacted immediately. 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.

1.2 EXISTING FACILITY OPERATIONS

A. The Contractor shall coordinate the work with the Owner so that the construction will not restrain or hinder operation of the existing facilities. If, at any time, any facilities are out of service, the Contractor must obtain approval from the Owner as to the date, time and length of time systems, or facilities to be out of service.

B. Connections to existing facilities or alteration of existing facilities will be made at times when the use of the facility can be conveniently interrupted for the period needed to make the connection or alteration.

C. After having coordinated the work with the Owner, the Contractor shall prepare a submittal in accordance with Section 01 34 00 to include the time, time limits and method of each connection or alteration and have the approval of the Engineer before any work is undertaken.

D. Owner notification shall be at least five days prior to taking existing plant components out of service and approved schedules shall be confirmed 48-hours prior to initiating work.

E. Access to and work at the City of Georgetown WTP shall be limited to between the hours of 7:00 A.M. and 5:30 P.M., Monday through Friday, except that no work shall be performed on City-observed holidays. Exceptions to this limitation may be granted for work efforts related to required tie-ins and equipment installation work authorized by the City for evening and weekend hours.

F. City-observed holidays are defined as New Year's Day, Martin Luther King Day, Presidents' Day, Good Friday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Day after Thanksgiving, Christmas Eve, Christmas Day and Day after Christmas.

1.2 SEQUENCING

A. The Contractor shall be solely responsible for all construction sequencing with the constraints specified herein. Completion of specific preliminary sequencing task where specified shall be required prior to any significant site demolition.

B. The following construction sequencing constraints emphasize critical tasks of Work in the Contract and do not comprise a complete list of all work to be completed.

C. The Contractor shall submit Gantt/bar schedules in conformance with Section 01 34 00 of these Specifications showing all activities required for completion of work described in this Section. Performance of the work requires short-term interruption of WTP processes and the sequence of activities shown by the Overall Project Schedule shall be performed as follows:

1. The Sludge Meter Station shall be constructed and placed into operation prior to completion of Floc-Sed Basin No. 2 and demolition of the existing sludge meter station.
2. The chemical feed and settled water sample piping and junction boxes shall be constructed and ready to be placed into operation prior to completing settled water piping modifications and connections.
3. Modifications and connections to the existing raw water and settled water piping shall be coordinated with the OWNER and performed when the WTP can be interrupted in accordance with Article 1.2 in this Section.

END OF SECTION

SECTION 01 20 00
CONTRACTOR/SUBCONTRACTOR QUALIFICATIONS

PART 1 GENERAL

The following information and completed forms may be requested by the Owner of the three lowest bidders. The request will be made within five (5) davs following the bid opening. Requested data to be received by the Owner within five (5) days of the request. Failure to provide the data in this section, upon request, will subject bidder to disqualification.

1.1 DESCRIPTION

A. Information submitted will be used by the Owner to determine the competency and ability of the Contractor/Subcontractor to perform the scheduled work in a manner deemed satisfactory to the Owner. The Owner's decision shall be final.

B. Any Subcontractor used by the General Contractor whose portion of this project exceeds 10% of the total bid shall be required to provide the same information as the General Contractor.

C. The Contractor/Subcontractor shall include with this section a detailed financial statement indicating the Contractor's/Subcontractor's financial resources. The information on that statement shall be certified by a Certified Public Accountant and shall be submitted on the Associated General Contractors of America from "Standard Questionnaires and Financial Statement for Bidders."

D. The Contractor/Subcontractor shall certify by attaching his signature to this Section as provided that all information contained herein is complete and all statements and answers are accurate and true. Providing misinformation, incomplete information, inaccurate information, or failure to certify the information, will subject bidder to disqualification.

1.2 QUALIFICATIONS

A. Complete the following (attach additional sheets as required):

1. Name:_____

2. Address:_____

3. City, State, Zip:_____

4. Principal:_____

B. Number of years your firm has been in business: _____

C. List and describe a minimum of five (5) previous projects of similar size and nature completed in the last five (5) years. Three (3) of the five (5) projects must be water treatment or wastewater treatment plant projects where your firm was the Prime Contractor with a minimum construction contract amount of $1 Million (each project). (Attach additional sheets, if necessary):

1. _____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

_____

_____

5. _____

_____

_____

D. List Owner, contact and telephone number for each of the five (5) projects referenced above. (Attach additional sheets, if necessary):

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

_____

_____

5. _____

_____

_____

E. For the projects listed in Item C, list the original bid price, final construction costs, specified completion time, actual completion time and explanations for differences in costs and times as required. (Attach additional sheets, if necessary):

1. Original contract price: _____

   Final construction price: _____

   Specified completion time: _____

   Actual completion time: _____

   Explanation: _____

   _____

   _____

   _____

2. Original contract price: _____

   Final construction price: _____

   Specified completion time: _____

   Actual completion time: _____

   Explanation: _____

   _____

   _____

   _____

3. Original contract price: _____

Final construction price: _____

Specified completion time: _____

Actual completion time: _____

Explanation: _____

_____

_____

_____

4. Original contract price: _____

   Final construction price: _____

   Specified completion time: _____

   Actual completion time: _____

   Explanation: _____

   _____

   _____

   _____

5. Original contract price: _____

   Final construction price: _____

   Specified completion time: _____

   Actual completion time: _____

   Explanation: _____

   _____

   _____

   _____

F. List the names, addresses and work of any portion of this project which will be subcontracted (more than 10% of the bid price). (Attach additional sheets, if necessary):

1. _____

   _____

   _____

2. _____

   _____

   _____

3. _____

   _____

   _____

4. _____

   _____

   _____

5. _____

   _____

   _____

G. List equipment owned that is available for this project:

_____

_____

_____

_____

_____

H. List equipment to be purchased, leased or rented to perform this work:

_____

_____

_____

_____

_____

I. List superintendent(s), foreman or others in charge who will be assigned to this project. Provide resumes and qualifications (insert sheets as required):

_____

_____

_____

_____

_____

J. List and describe current projects, current statues of job and estimate schedule of completion. (Attach additional sheets, if necessary):

1. _____

   _____

   _____

2. _____

   _____

   _____

3. _____

   _____

   _____

4. _____

_____

_____

5. _____

_____

_____

K. List all projects involving litigation, arbitration and/or mediation in past five (5) years (Attach additional sheets, if necessary):

1. Project Name: _____

   Owner: _____

   Engineer: _____

   Date: _____

   Explanation: _____

   _____

   _____

   _____

   Result: _____

   _____

   _____

   _____

2. Project Name: _____

   Owner: _____

   Engineer: _____

   Date: _____

   Explanation: _____

_____

_____

_____

Result: _____

_____

_____

_____

3. Project Name: _____

   Owner: _____

   Engineer: _____

   Date: _____

   Explanation: _____

   _____

   _____

   _____

   Result: _____

   _____

   _____

   _____

4. Project Name: _____

   Owner: _____

   Engineer: _____

   Date: _____

   Explanation: _____

_____

_____

_____

Result: _____

_____

_____

_____

5. Project Name: _____

   Owner: _____

   Engineer: _____

   Date: _____

   Explanation: _____

   _____

   _____

   _____

   Result: _____

   _____

   _____

   _____

L. Attach rate schedule for equipment, labor, overhead and profit.

M. Additional information:

_____

_____

_____

_____

_____

I hereby certify that as a duly authorized representative of _____ (bidder), the information provided is to the best of my knowledge accurate and that failure to provide accurate information will result in disqualification of my bid

_____
Signature

_____
Name (Print)

(Seal)

_____
Title

_____
Date

Notary Public of _____ (State)

My commission expires: _____

END OF SECTION

SECTION 01 21 00
PRECONSTRUCTION CONFERENCE

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: To help clarify construction contract administration procedures, the Engineer will conduct a Preconstruction Conference prior to start of the Work. Provide attendance by the designated personnel.

B. Related work: Documents affecting the work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. For those persons designated by the Contractor, his Subcontractors, and suppliers to attend the Preconstruction Conference, provide required authority to commit the entities they represent to solutions agreed upon in the Conference.

1.3 SUBMITTALS

A. To the maximum extent practicable, advise the Engineer at least 24 hours in advance of the Conference as to items to be added to the agenda.

B. The Engineer will compile minutes of the Conference and will furnish one copy of the minutes to the Contractor and required copies to the Owner. The Contractor may make and distribute such other copies as he/she wishes.

1.4 PRECONSTRUCTION CONFERENCE

A. The Conference is required and will be scheduled to be held within 30 working days after the Owner has determined the low bidder and may be held prior to issuance of the Notice to Proceed when required by regulatory agencies having jurisdiction. In any event, the Conference will be held prior to actual start of the work.

B. Attendance:

1. Provide attendance by authorized representatives of the Contractor and major subcontractors. The Engineer will advise other interested parties, including the Owner, and request their attendance.

C. Minimum agenda: Data will be distributed and discussed on:

1. Organizational arrangement of Contractor’s forces and personnel and those of subcontractors, materials suppliers, and the Engineer.

2. Channels and procedures for communication.

3. Construction schedule, including sequence of critical work.

4. Contract Documents, including distribution of required copies of Drawings and revisions.

5. Processing of Shop Drawings and other data submitted to the Engineer for review.

6. Processing of field decisions and Change Orders.

7. Rules and regulations governing performance of Work.

8. Procedures for security, quality control, housekeeping, and related matters.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 22 00

PROJECT MEETINGS

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: To enable orderly review during progress of the Project, and to provide for systematic discussion of problems, the Owner will conduct project meetings throughout the construction period.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of the project meetings content.

1.2 QUALITY ASSURANCE

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the meetings.

1.3 SUBMITTALS

A. Agenda items: To the maximum extent practicable, advise the Owner at least 48 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:

1. The Owner will compile Minutes of each project meeting and will furnish three copies to the Contractor and required copies to Engineer.

2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 MEETING SCHEDULE

A. Project meetings will be held monthly.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

A. The meeting will be held at the City of Georgetown – Water Utilities and Engineering Department.

2377 Anthuan Maybank Drive
Georgetown, SC 29440

3.3 PROJECT MEETINGS

A. Attendance:

1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout the progress of the Work.
2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum agenda:

1. Review, revise as necessary, and approve Minutes of previous meetings.
2. Review Safety Plan and any incidents since last meeting.
3. Review progress of the Work since last meeting, including status of submittals for approval.
4. Identify problems that impede planned progress.
5. Develop corrective measures and procedures to regain planned schedule.
6. Complete other current business.

3.4 Revision to Minutes:

A. Unless published Minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.

B. Persons challenging published Minutes shall reproduce and distribute copies of the challenged to all Minutes.

C. Challenge to Minutes shall be settled as priority portion of “old business” at the next regularly scheduled meeting.

END OF SECTION

SECTION 01 27 00
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SCOPE

A. The Bid lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid.

B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid, and which are not specified in this Section to be measured or to be included in one of the items listed in the Bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices bid for the various Bid items. The Contractor shall prepare the Bid accordingly.

C. Work includes furnishing all plant, labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings.

1.2 DESCRIPTIONS

A. Measurement of an item of work will be by the unit indicated in the Bid.

B. Final payment quantities shall be determined from the record drawings.

C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.

D. Unless otherwise stated in individual sections of the Specifications or in the Bid, no separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part.

E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all plant, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Drawings.

1.3 EROSION AND SEDIMENTATION CONTROL

A. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls, except as noted below. All other temporary and/or permanent erosion and sedimentation control costs shall be included in the unit or lump sum price bid for the item to which it pertains.

1.4 EXCAVATION AND BACKFILL OF STRUCTURES

A. No separate or additional payment shall be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with these Specifications, regulatory requirements, permits, laws or regulations which govern this Project.

B. No separate payment shall be made for excavation for structures. All costs shall be included in the unit price bid for the item to which it pertains.

C. Sheeting, Bracing and Shoring: No separate payment will be made for providing sheet piling, sheeting, bracing and timbering.

1.5 SITE UTILITIES

Solid sleeves and fittings necessary for connections to existing site utilities, even if not shown on the Drawings, are considered incidental to the Project and will not be paid for separately. Additionally, no payment will be made for fittings provided due to the Contractor's sequence of construction, layout problems, tie-ins, or repairs.

1.6 FOUNDATION PILES

The Base Bid for this work shall include 104 piles installed to 38 feet (ft) long and 120,000 pounds (60 tons) allowable capacity, 270,000 pounds (135 tons) ultimate capacity, as directed by the Specifications. Results of the penetration resistance of the test piles may modify the length requirement if ordered by the Engineer; however, regardless of the final length, the piles shall be installed to the specified bearing capacity. Payment shall be based upon the number of piles properly installed and the actual piling length required as measured from the pipe tip to the final cutoff of each pile and as directed by the Engineer. If ordered by the Engineer, payment will be adjusted for lengths over or under the base number and length in accordance with the unit contract amounts contained in the Bid. The payment shall be the full compensation for furnishing all materials and labor necessary to properly install the piles under this contract and shall include furnishing and handling of all piling materials and delivery of same to the pile driving equipment, use of pile driving and related equipment, cutting off to grade, disposing of any cutoffs, and any other work or materials necessary to complete.

1.7 CASH ALLOWANCES

A. General

1. The Contractor shall include in the Bid Total all cash allowances stated in the Contract Documents. These cash allowances shall cover the net cost of the services provided by a firm selected by the Owner and if ordered by the Engineer. The Contractor's handling costs, labor, overhead, profit and other expenses contemplated for the original allowance shall be included in the items to which they pertain and not in cash allowances.

2. No payment will be made for nonproductive time on the part of testing personnel due to the Contractor's failure to properly coordinate testing activities with the work schedule or the Contractor's problems with maintaining equipment in good working condition.

3. No payment shall be provided for services which fail to verify required results.

B. Should the net cost be more or less than the specified amount of the cash allowance, the Contract will be adjusted accordingly by change order. The amount of change order will not recognize any changes in handling costs at the site, labor, overhead, profit and other expenses caused by the adjustment to the cash allowance.

C. Documentation

1. Submit copies of the invoices with each periodic payment request from the firm providing the services.

2. Submit results of services provided which verify required results.

D. Schedule of Cash Allowances

1. Soils and Concrete Testing: Allow the amount provided in the Bid for the services of an Owner selected geotechnical engineering firm and testing laboratory to verify soils conditions including trench excavation and backfill, and similar issues and for the testing of concrete cylinders for poured in place concrete.

END OF SECTION

SECTION 01 28 00

EQUIPMENT ALLOWANCES

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish services and install the equipment identified in the Equipment Allowances subject to all provisions of these Specifications.

B. In the event of failure of manufacture to perform, whether Goods, Special Services or schedule for such, the Contractor's sole remedy shall be against the manufacturer under the terms and conditions of its procurement agreement with the manufacturer. The Owner and Engineer do not warrant the performance of the manufacturer.

1.2 COSTS

A. The Contractor shall include, in the Bid Total, the Equipment Allowances specified in the Bid for the purchase of services and equipment pre-selected by the Owner. These allowances shall cover the cost of the equipment and services, as specified in this Section or other Specification Sections, and Freight on Board (FOB) Job Site.

B. The Contractor's applicable taxes, unloading, storage, handling, labor, installation, and overhead costs, plus profit and other expenses contemplated for the allowances shall be included in Item 1 of the Bid and not in the allowances.

C. If the terms and conditions of purchase of equipment and services differ from those given in these Contract Documents, then the Contractor shall include the cost of the differences in Item 1 of the Bid.

1.3 ADJUSTMENT OF COSTS

A. Should the final invoice amount for special services or equipment be more or less than the specified amount of the allowance, the Contract will be adjusted by a change order. Such adjustment shall be limited to the cost directly attributable to changes authorized by the Engineer and Owner for a change in scope, schedule or terms and conditions.

B. The amount of change order will not recognize any changes in unloading, storage, handling, labor, installation, and overhead costs, nor profit and other expenses caused by the adjustment of the final invoice amount. The change order will recognize changes in applicable taxes.

1.4 DOCUMENTATION

Submit copies of new invoices from the vendors with each periodic payment request.

1.5 SCHEDULE OF EQUIPMENT ALLOWANCES

Control Panel and SCADA Modifications

Allow the amount specified in the Bid for services provided by McKim & Creed as specified in Sections 40 91 00 and 40 95 15 of these Specifications with detailed scope of work provided by Appendix 3.

END OF SECTION

SECTION 01 31 00
CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Engineer in appraising the reasonableness of the proposed schedule and in evaluating progress of Work, prepare and maintain the schedules and reports described in this Section.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Requirements for progress schedule: General Conditions.

3. Construction period: Form of Agreement

C. Definitions: “Day”, as used throughout the Contract unless otherwise stated, means calendar day.

1.2 QUALITY ASSURANCE

A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, and in preparing and issuing periodic reports as required below.

B. Perform data preparation, analysis, charting, and updating in accordance with standards approved by the Engineer.

C. Reliance upon the approved schedule:

1. The construction schedule as approved by the Engineer will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.

2. Should any activity not be completed within 15 days after the stated scheduled date, the Owner shall have the right to require the Contract to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.

3. Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.

4. Costs incurred by the Owner and by the Engineer in connection with expediting construction activity shall be reimbursed by the Contractor.

5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite and activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01 34 00.

B. Preliminary analysis: Within 10 calendar days after the Contractor has received the Notice to Proceed, submit one reproducible copy and four prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.

C. Construction schedule: Within 10 calendar days after the Contractor has received the Engineer's approval to revisions of a preliminary construction schedule, submit one reproducible copy and four prints of a construction schedule prepared in accordance with Part 3 of this Section.

D. Periodic reports: On the first working day of each month following the submittal described in Paragraph 1.3.C above, submit four prints of the construction schedule updated as described in Part 3 of this Section.

PART 2 PRODUCTS

2.1 CONSTRUCTION ANALYSIS

A. Graphically show by bar chart the order and interdependence of all activities necessary to complete the work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram.

1. Provide two line bar chart; one for planned activity and one for actual completion.

B. Include, but do not necessarily limit indicated activities to:

1. Project mobilization.
2. Submittal and approval of shop drawings and samples.
3. Procurement of equipment and critical materials.
4. Fabrication of special material and equipment, and its installation and testing.
5. Final cleanup.
6. Final inspecting and testing.
7. All activities by the Engineer that affect progress, required dates for completion, or both, for all and each part of the Work.

PART 3 EXECUTION

3.1 PRELIMINARY ANALYSIS

A. Contents:

1. Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of construction schedule.
2. Show the Contractor's general approach to remainder of the Work.
3. Show cost of all activities scheduled for performance before submittal and approval of the construction schedule.

3.2 CONSTRUCTION SCHEDULE

A. Provide a construction schedule incorporating all revisions from review of the preliminary analysis.

3.3 PERIODIC REPORTS

A. Provide monthly updates of the approved construction schedule.

1. Indicate “actual” progress for each activity on the bar chart.

2. Provide written narrative summary of revisions causing delay in the program, and an explanation of correct actions taken or proposed.

3.4 REVISIONS

A. Make periodic revisions to the schedule to incorporate delays, early completion, etc.

B. Make only those revisions to approved construction schedule as are approved in advance by the Engineer.

END OF SECTION

SECTION 01 34 00
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Make submittals required by the Contract Documents and revise and resubmit as necessary to establish compliance with the specified requirements.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.

2. Individual requirements for submittals also may be described in pertinent sections of these specifications.

C. Work not included:

1. Un-required submittals will not be reviewed by the Engineer.

2. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Engineer.

1.2 QUALITY ASSURANCE

A. Coordination of submittals:

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item and the submittal for it conform in all respects with the specified requirements.

3. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.

4. Review and coordinate each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

B. Completeness of submittal:

1. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes.

2. Determine and verify all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

C. "Or equal":

1. Where the phrase "or equal" occurs in the Contract Documents, do not assume that the materials, equipment or methods will be considered as equal unless the item has been specifically approved for this Work by the Engineer.

2. The decision of the Engineer shall be final.

D. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise in writing.

1.3 SUBMITTALS

A. Within 10 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Schedule for submittals including specification section, type or submittal and submittal date.

2. Construction schedule.

3. Schedule of partial payment request.

B. Make submittals of shop drawings, samples, substitution requests and other items in accordance with the provisions of this Section.

PART 2 PRODUCTS

2.1 SHOP DRAWINGS

A. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

B. Large prints (11" x 17" or larger):

1. Submit shop drawings in the form of white copies.

2. Blueprints will not be acceptable.

C. Manufacturer's literature:

1. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

2. Cross out or strikethrough all data not pertinent to the submittal.

D. Number of copies:

1. Product data: submit the number of copies which are required to be returned, plus three copies which will be retained by the Engineer.

2. Shop drawings: submit the number of copies which are required to be returned, plus four copies which will be retained by the Engineer.

E. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.

2.2 VARIATIONS

A. With each submittal, provide specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

B. Provide an explanation of why the item(s) submitted are considered to be equal to the item(s) specified.

C. Failure to submit a written notice will result in rejection of the submittal.

2.3 SAMPLES

A. Provide sample or samples identical to the precise article proposed to be provided. Identify as described under “Identification of submittals” below.

1. Unless otherwise specified, submit samples in the quantity, which is required to be returned, plus one which will be retained by the Engineer.

2. By prearrangement in specific cases, a single sample may be submitted for review and, when approved, when installed in the work at a location agreed upon by the Engineer.

2.4 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available to the specified products, submit accurate color and pattern charts to the Engineer for selection.

PART 3 EXECUTION

3.1 CONTRACTOR’S REVIEW OF SUBMITTALS

A. Before submitting a shop drawing or any related material, Contractor shall:

1. Determine and verify all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.

2. Determine and verify the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the work.

3. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor.

4. Approve each such submission before submitting it.

5. Stamp and sign each such submission before submitting it.

B. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.

C. Shop drawings or material not specified, or which have not been approved by the Contractor shall be returned without comment.

D. Contractor is to utilize the following stamp on all shop drawing submittals:

This shop drawing has been reviewed by (Contractor) and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. (Contractor) also warrants that this shop drawing complies with contract documents and comprises no variations thereto.

By:

Date:

E. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of the General Conditions and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of the General Conditions.

3.2 IDENTIFICATION OF SUBMITTALS

A. Consecutively number all submittals

1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.

2. On re-submittals, cite the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

D. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.

3.3 GROUPING OF SUBMTTALS

A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

1. Partial submittals may be rejected as not complying with the provisions of the Contract.

2. The Contractor may be held liable for delays so occasioned.

3.4 TIMING OF SUBMITTALS

A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

B. In scheduling, allow at least twenty (20) days for review by the Engineer following his receipt of the submittal.

3.5 RESUBMITTAL SCHEDULE

A. For submittals marked “Revise and Re-Submit”, “Submit Specified Item”, or “Rejected”, re-submittal shall be within ten (10) days of the review data shown on the Engineer’s shop drawing review stamp.

3.6 ENGINEER’S REVIEW

A. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

B. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer.

C. Engineer’s review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given to the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

D. Engineer’s review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

E. The review and approval of a separate item as such will not indicate approval of the assembly in which the items functions.

F. Revisions:

1. Make revisions required by the Engineer.

2. If the Contractor considers any required revision to be a change, he/she shall so notify the Engineer as provided for in the General Conditions.

3. Make only those revisions directed or approved by the Engineer.

G. Submittals which have been reviewed and returned to the Contractor marked “Revise and Re-submit” or “Rejected” and which are re-submitted and not in an approvable state, will not be reviewed a third time unless payment for the third and any subsequent review is by the Contractor. The engineering costs for review shall be equal to the Engineer’s charges to the Owner under the terms of the Engineering Agreement with the owner.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Provide workforce and equipment as are required for proper completion of the Work including, but not necessarily limited to:

1. All work described in the Project Manual and Plans

2. Additional work mutually agreed upon by the Owner and the Contractor

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Additional requirements for quality requirements also may be described in other Sections of these Specifications. These include but are not limited to the following:

C. Work by others:

1. An inspection and testing agency, approved by the Owner, shall be retained by the Contractor to perform tests required by SCDOT as specified on plans and SCDOT Standard Specifications.

2. The performance or lack of performance of such tests and inspections shall not be construed as granting relief from the requirements of these specifications or the other contract documents.

1.2 QUALITY ASSURANCE

A. The Contractor shall have a written Quality Control Program and Inspection Procedures document that shall provide details of how compliance with the requirements of these specifications and the shop and placement drawings shall be achieved.

B. The Contractor shall use an adequate number of skilled personnel, who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specification requirements and the methods needed for the proper performance of the work of this Specification.

C. The Contractor shall utilize equipment adequate in type, number, size and capacity to accomplish the work of this Specification in a safe and timely manner.

D. The Owner reserves the right to make inspections at any time at the source of supply of materials, at the place of preparation of materials, and during execution of all work.

1.3 SUBMITTALS

A. When required, an excavation Safety Plan shall be submitted for review and approval by the Engineer no less than 5 days before the scheduled date for start of excavation operations. The plan shall indicate the systems, methods, and techniques to be used to ensure that excavation sidewalls will be properly guarded to protect personnel, and existing facilities and structures in the vicinity of the work.

B. When required, a Water Control Plan shall be submitted for review and approval no less than 5 days before the scheduled date for the start of earthwork operations. The plan shall indicate the methods and techniques to be used for control of water (both surface runoff and ground water) during Work.

1.4 EXISTING SITE CONDITIONS

A. Before starting work the Contractor shall thoroughly examine the site to ascertain conditions under which the work must be performed.

B. The Contractor is responsible for familiarizing himself with the existing site conditions and be prepared to adequately care for and safeguard himself, his workers, and the Owner from damage.

C. Existing Geotechnical Conditions if available, a copy of the report is included in the contract documents. The information contained in the report shall not be construed as a guarantee of the depth, extent, or character of materials actually present.

D. Existing Utilities

1. There now may exist in the construction area potable and non-potable water distribution systems, wastewater and stormwater collection systems, natural gas and electrical power distribution systems, telecommunication systems and other utilities.

2. These utilities are both underground and overhead and their location, as shown on the plans, is approximate and is for information purposes only. In addition other utilities not shown on the plans may exist.

3. The South Carolina Underground Utility Damage Prevention Act (S.C. Ann Code, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground utilities, prior to excavation and demolition. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PRE-CONSTRUCTION EXAMINATION

A. General

B. Before starting work the Contractor shall thoroughly examine the site to ascertain conditions under which the work must be performed.

C. Existing Facilities to Remain

D. Take measures to protect existing facilities within the work area that are not designated for removal from being damaged by the work.

E. Survey Monuments

1. Locate and protect from damage any survey monuments within the work area. Properly relocate or witness any monument that must be disturbed by the work. After completion of the work, restore monument witnesses.

F. Immediately notify Engineer of any discrepancies between the plans and the actual site conditions, or of any obstruction that will prevent or adversely affect the contractor's ability to complete the Work.

3.2 EXISTING OR COMPLETED UTILITIES

A. Unless shown to be removed protect active utility lines shown on the drawings or otherwise made known to the Contractor.

B. Use care in moving machinery and equipment over existing or newly installed pipes and utilities during construction so as not to cause damage to completed work.

C. Do not use power-driven equipment to excavate closer than 2 feet from any existing utility or structure. For work immediately adjacent to, or for excavation exposing an existing utility or other structure, use manual or light equipment excavation methods until the obstruction is cleared.

D. Support uncovered pipes and other existing work affected by the excavation until they are properly supported by backfill.

E. Take the necessary precautions to maintain services provided by all active utility lines in the construction area. If service is interrupted as a result of the Work, immediately restore service by repairing the damaged utility.

F. If during construction active utility lines not shown on the drawings or otherwise made known to the Contractor are encountered or if active utility lines will interfere with the work, immediately notify the Engineer.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Provide temporary facilities needed for the work including, but not necessarily limited to:

1. Temporary utilities such as heat, water and electricity.
2. Field office for the Contractor's personnel.
3. Sanitary facilities.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.
2. Permanent installation and hookup of the various utility lines are described in other Sections.

1.2 PRODUCT HANDLING

A. Maintain temporary facilities in proper and safe condition throughout progress of the work.

PART 2 PRODUCTS

2.1 UTILITIES

A. Water:

1. Provide necessary temporary piping and water supply and, upon completion of the work, remove such temporary facilities.
2. The Owner shall provide water used in construction. The Contractor shall obtain a construction meter from the Owner.

B. Electricity:

1. Provide necessary temporary wiring and, upon completion of the work remove such temporary facility.
2. Provide and pay for electricity used in construction.

C. Heating: Provide and maintain heat necessary for proper conduction of operations needed in the work.

2.2 FACILITIES

A. Sanitary facilities:

1. Provide temporary sanitary facilities in the quantity required for use by all personnel.
2. Maintain in a sanitary condition at all times.

B. Strictly enforce their use.

2.3 PROJECT SIGNS

A. If required provide and maintain a project information sign with following information
    1. Project Name
    2. Project Cost
    3. Anticipated Completion date
    4. Contractor
    5. Engineer
    6. Owner
    7. Members of City Council
B. EMPLOYMENT SIGN
C. SAFETY SIGN

PART 3 EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.
B. Remove such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Engineer.

END OF SECTION

SECTION 01 57 13
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SCOPE

A. Submittals and Permits

1. Within 15 days after the date of the Notice to Proceed, the Contractor shall submit description, Drawings and schedule for proposed temporary and permanent erosion and sedimentation controls to the Engineer. The description and Drawings shall be consistent with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, as published by the Erosion and Sediment Control Division of the South Carolina Land Resources Conservation Commission. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. The Contractor shall obtain a copy of the South Carolina Department of Health and Environmental Control (DHEC) Office of Ocean and Coastal Resource Management (OCRM) Land Disturbance Permit from the Engineer. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. A copy of the local soil erosion and sedimentation control ordinances is available from the Engineer.

2. Description and working drawings shall indicate controls which will ensure that storm water and drainage from the disturbed jobsite areas, which will be denuded, stripped or modified of its naturally existing or artificially established stabilization or protection against erosion, shall pass through some type of filter system before being discharged. These areas shall be kept sufficiently moist to control dust.

3. Submit a written plan for both temporary and permanent grassing. The plan shall include selection of species, dates and rates of application for seeding, fertilizer and mulching.

4. The schedule of values for lump sum Projects shall include separate costs for this work as well as maintenance costs.

B. Basic Principles

1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.

2. Minimize the disturbed area and the duration of exposure to erosion elements.

3. Stabilize disturbed areas immediately.

4. Safely convey run off from the site to an outlet such that erosion will not be increased off site.

5. Retain sediment on site that was generated on site.

6. Minimize encroachment upon watercourses.

C. Implementation

1. The erosion and sedimentation control measures shown on the Drawings are minimal requirements. The Contractor's methods of operation may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures. The Contractor's failure to stabilize disturbed areas immediately following intermediate or final grading may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures.

2. The Contractor shall notify the Engineer of any changes and/or additions to the erosion and sedimentation control plan necessary to accommodate the Contractor's methods of operation. No additional payment shall be made for erosion and sedimentation control measures made necessary by the Contractor's methods of operation.

3. The Contractor shall be solely responsible for control of erosion within the Project site and prevention of sedimentation of any adjacent waterways.

4. The Contractor shall install controls which will ensure that stormwater and drainage from the disturbed area of the Project site shall pass through some type of filter system before being discharged. The filter system must meet the requirements of the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas.

D. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.

2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.

3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

E. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

1.2 QUALITY ASSURANCE

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated herein and these Specifications.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

PART 2 PRODUCTS

2.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL MATERIALS

A. Silt Fence

1. Silt fence shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be either steel or pressure treated fir, southern pine or hemlock and shall be spaced not more than six feet on center. Silt fence shall be provided with netting to provide reinforcing when necessary. Silt fence shall have an Equivalent Opening Size (EOS) of 40 to 100. Silt fence fabric shall have a maximum permeability of 40 gallons per minute per square foot.

2. Silt fence fabric shall be equal to Mirafi 100X, Amoco 1380 or Exxon GTF 100 Series.

B. Hay bales shall be clean, seed free cereal hay type.

C. Netting shall be 1/2-inch, galvanized steel, chicken wire mesh.

D. Filter stone shall be coarse aggregate conforming to South Carolina Department of Highways and Public Transportation, Aggregate Number CR 14.

E. Concrete block shall be hollow, non-load bearing type.

F. Plywood shall be 3/4-inch-thick exterior type.

2.2 CONCRETE

A. Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. Ready mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

B. Provide a concrete mix design for job mixed concrete for the Engineer's approval.

PART 3 EXECUTION

3.1 GENERAL

A. Standards: Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, local enforcing agency guidelines and these Specifications.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the creeks. The preferred method is to provide an undisturbed natural buffer, extending a minimum of 25 feet from the top of the bank, to filter the run off. Should this buffer prove infeasible due to construction activities being too close to the creek, or if the amount of sediment overwhelms the

buffer, the Contractor shall place silt fences to filter the runoff and, if necessary, place permanent rip rap to stabilize the creek banks. When excavation activities disturb the previously stated preventative measures, or if they are not maintained, or whenever the construction activities cross the creeks, check dams shall be installed downstream and within 200 feet of the affected area.

B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawings, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials. Detention ponds, if constructed, shall be maintained in a condition ensuring that unfiltered water will not leave the pond.

C. Where permanent grassing is not appropriate, and where the Contractor's temporary erosion and sedimentation control practices are inadequate, the Engineer may direct the Contractor to provide temporary vegetative cover with fast growing seedings. Such temporary vegetative cover shall be provided by the Contractor in compliance with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, specifically in the selection of species, planting dates and application rates for seedings, fertilizer and mulching with the exception that kudzu shall not be permitted.

D. All erosion and sedimentation control devices, including check dams, shall be inspected by the Contractor at least weekly and after each rainfall occurrence and cleaned out and repaired by the Contractor as necessary.

E. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

3.3 PERMANENT EROSION CONTROL

A. Permanent erosion control shall include:

1. Restoring the work site to its original contours, unless shown otherwise on the Drawings or directed by the Engineer.

2. Permanent vegetative cover shall be performed in accordance with Article 3.4 of this Section.

3. Permanent stabilization of steep slopes and creeks shall be performed in accordance with Article 3.5 of this Section.

B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the Project. In no event shall implementation be postponed when no further construction activities will impact that portion or segment of the Project. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.

3.4 GRASSING

A. General

1. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein for seeding, fertilizing, mulching, etc.

2. When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized, and mulched in an effort to restore to a protected condition. Critical areas shall be sodded as approved or directed by the Engineer.

3. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.

4. Permanent grassing shall be of a perennial species.

B. Replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season. Outside of residential or landscaped areas, grass the entire area disturbed by the work on completion of work in any area. In all areas, promptly establish successful stands of grass.

C. Grassing activities shall comply with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, specifically for the selection of species, with the exception that kudzu shall not be permitted, planting dates and application rates for seeding, fertilizer and mulching. Where permanent vegetative cover (grassing) cannot be immediately established (due to season or other circumstances) the Contractor shall provide temporary vegetative cover. The Contractor must return to the site (at the appropriate season) to install permanent vegetation in areas that have received temporary vegetative cover.

END OF SECTION

SECTION 01 64 00
PRODUCT HANDLING

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.

2. Additional procedures also may be prescribed in other Sections of these specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURE'S RECOMMENDATIONS

A. Except as otherwise approved by the Engineer, determine and comply with manufacture's recommendations on product handling, storage and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.

2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacture, grade, quality and other pertinent information.

1.5 PROTECTION OF MATERIAL AND WORK

A. General:

1. Carefully and properly protect all materials of every description, both before and after being used in the Work in accordance with manufacturer's recommendations.

2. Provide any enclosing or special protection from weather deemed necessary by the Engineer at no additional cost to the Owner.

B. Partial payments under the Contract will not relieve the Contractor from responsibility.

1. When materials and work at the site that have been partially paid for are not adequately protected by the Contractor, such materials will be protected by the Owner at the expense of the Contractor and no further partial payment thereon will be made.

2. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 STORAGE

A. Store all items of equipment, component parts, etc., in accordance with the manufacturer's recommendations or as may otherwise be necessary to prevent damage or deterioration of any sort.

B. Electrical and control equipment:

1. Store in a dry area protected from dust and humidity.

2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

1.7 REPAIRS AND REPLACEMENTS

A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time or completion.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included shall be providing compliance with the requirements of the General Conditions of these Specifications for administrative procedures in closing out the project work.

B. Related work:

1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Other requirements for technical services are stated in other sections of these Specifications.

3. Section 00 62 00 – Contractors Affidavit.

4. Section 01 72 00 – Project Record Documents

1.2 SUBSTANTIAL COMPLETION

A. The Contractor shall notify the Engineer that, in his/her opinion, the project is substantially complete. A written statement listing items complete shall be submitted.

B. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.

C. If, in the Engineer's opinion, the project is not substantially complete, a written notice to the Contractor shall follow outlining reasons and deficiencies in work that comprised the Engineer's decision. The Engineer's decision shall be final.

1.3 FINAL OBSERVATION

A. The Engineer will make a final observation for the Contractor after all items noted in the substantial completion observation have been corrected. The Contractor shall notify the Engineer in writing when a final observation is needed. Incomplete and/or defective work shall be given to the Contractor by written notice.

1.4 RE-OBSERVATION

A. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer.

B. Cost for such observations will be due to and payable by the Contractor at a rate equal to charges to the Owner for similar work.

C. Re-observations will continue until the work is acceptable to the Engineer.

1.5 COMPLETION BY CONTRACTOR

A. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.

B. Closeout submittals shall contain at least the following:

1. Project record documents.

2. Equipment operation and maintenance manuals and copies of start-up reports.

3. Warranties and bonds.
4. Spare parts and manuals.
5. Evidence of payment and release to liens per General Conditions.
6. Contractors Affidavit.

1.6 FINAL PAYMENT

A. Final payment to the Contractor will be made upon completion of previous items and others required by these specifications. A final statement shall be forwarded to the Engineer. The statement shall address:

1. Previous change orders.
2. Unit Prices.
3. Deductions for uncorrected work.
4. Deductions for liquidated damages.
5. Deductions for re-testing work.
6. Deductions for re-observation.
7. Deductions for shop drawing review.
8. Adjusted contract sum.
9. Previous payments.
10. Amount Due.

B. When required, the Engineer will prepare a contract change order for adjustments not previously made.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 71 00
CLEANING UP

PART 1 GENERAL

1.1 DESCRIPTION

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer, provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

1.2 RELATED WORK

A. Section 00 70 00 GENERAL CONDITIONS

B. Section 01 04 60 CONTROL OF WORK AND MATERIALS

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 DAILY CLEANUP:

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.05 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

SECTION 01 72 00
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included:

1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.

2. Upon completion of the Work, deliver the recorded changes to the Engineer.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Additional requirements for field engineering also may be described in other Sections of these Specifications. These include but are not limited to the following:

1.2 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.

B. Accuracy of records shall be such that future search for items shown on the Project Record Documents may rely reasonably on the information provided under this Section of the Work

1.3 SUBMITTALS

A. The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.

B. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.

C. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.

1.4 PRODUCT HANDLING

A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer to the Engineer.

B. In the event of loss of recorded data, use all means necessary to again secure the data to the Engineer's approval

1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials.

2. In such case, provide replacements to the standards originally required by the Contract Documents

PART 2 PRODUCTS

2.1 JOB SET DOCUMENTS

A. Promptly following receipt of the Owner's Notice to Proceed, secure from the Engineer, at no charge to the Contractor, one complete set of all Documents comprising the Contract

PART 3 EXCECUTION

3.1 MAINTENANCE JOB SET DOCUMENTS

A. Immediately upon receipt of the job set described in above paragraph titled "JOB SET DOCUMENTS", identify each of the Documents with the title, "RECORD DOCUMENTS- JOB SET".

B. Preservation:

1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.

2. Do not use the job set for any purpose except entry of new data and for review by the Engineer.

3. Maintain the job set at the site of Work as that site is designated by the Engineer.

C. Field work and making entries on Job Set Drawings:

1. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.

2. Show by station number location of all fittings, manholes, valves, wyes locations, etc.

3. Reference all fittings and valves at least to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.

4. Field measure and reference all fittings and valves to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.

5. Show location of electrical conduit, pull boxes, etc.

6. Gravity sewers and storm sewers

a) Provide survey grade state plane Geographic Information System (G.I.S.) electronic data horizontal coordinates for each structure location.

b) Provide ground elevation, top elevation, and invert elevations for each structure.

c) Comply with Section 01050.1

D. Submittals:

1. Submit “marked-up” set of drawings to the Engineer.

2. Make any necessary additions as required by the Engineer.

END OF SECTION

SECTION 02 07 30
REMOVAL OF EXISTING STRUCTURES AND PIPING

PART 1 GENERAL

1.1 SCOPE

A. The work covered under this section includes furnishing all labor, equipment and material required to remove, handle, store and dispose of all materials from existing structures and piping as shown on the Drawings, or required for the completion of the work, including all necessary excavation and backfilling.

B. The Contractor shall demolish existing structures and remove existing piping and valves which are not to remain in service in the finished work, whether or not shown on the Drawings and/or specified herein. Materials from demolished structures shall be disposed of in an approved manner. Removed piping and valves shall be stored as directed or disposed of in an approved manner.

C. The work specified herein and shown on the Drawings is intended to give a general idea of the scope of this work, but must not be construed as covering it entirely. The Contractor shall visit the site and judge the amount of work required and the problems the Contractor might encounter in the performance of the work.

D. All structures and piping removal work shall be scheduled and performed in accordance with Section 01 11 00 of these Specifications.

1.2 STRUCTURES AND PIPING REMOVAL

The Contractor shall be responsible for demolition, removal and disposal of structures, piping, valves and accessories as shown on the Drawings, including the following:

1. Existing Raw Water Meter Vault concrete structure, piping, valves and appurtenances.

2. Existing Sludge Valve Pit concrete structure, piping, valves and appurtenances.

PART 2 PRODUCTS

2.1 MATERIALS

All backfill used shall comply in all respects with the applicable material requirements of these Specifications.

PART 3 EXECUTION

3.1 REMOVAL

A. The Contractor shall exercise full care and shall use such methods and equipment during removal as will maintain the usefulness of the various materials removed. The sequence and order of removal and the method of storing and disposal of removed materials shall be at all times subject to the direction and approval of the Engineer.

B. Any damage done during removal and any patching, plugging or repairs necessitated because of removal of structures, piping and valves shall be repaired as directed by the Engineer at no change in Contract Price.

C. Abandoned Piping: Existing piping to be abandoned shall be cut and plugged or capped at each end. Where existing piping interferes with new piping or construction, it shall be removed beyond the limits required for the proper completion of the work and the open ends plugged or capped.

3.2 DISPOSAL

A. The Contractor shall assume ownership of and dispose of all removed structures, piping, valves and materials which the Owner or Engineer deems worthless on-site. The cost of transporting the removed materials shall be included in the lump sum prices bid and no separate payment will be made.

END OF SECTION

SECTION 02 20 00
INFORMATION AVAILABLE TO BIDDERS

PART 1 GENERAL

1.1 INFORMATION USED DURING DESIGN

A. The Engineer has relied upon documents related to geotechnical conditions and permit requirements in the preparation of plans and specifications. The following information is provided in the Appendix.

1. Joel E. Wood & Associates geotechnical investigation report, May 12, 2021, JWA File No.: 210505; and
2. South Carolina Department of Health and Environmental Control (SCDHEC) and Ocean & Coastal Resource Management (OCRM) Permits.

B. The Engineer has relied upon documents related to existing systems and process equipment in the preparation of plans and specifications. The following information will be available by the Owner for review by interested bidders.

1. Jordan, Jones & Goulding record drawings, August 2001, Job No. 2193.006; and
2. Henningson, Durham & Richardson construction drawings, 1972, EDA Project No. 04-1-00735, Contract No. I.

C. It is understood that reports, manufacturer's submittal information and record drawings are offered as an aid in bidding only and are not part of the Construction Documents.

D. The Contractor may rely upon the general accuracy to the information made available. It is understood that no claim shall be made against the Owner or Engineer with respect to:

1. The completeness of any report and any reference to means, methods, techniques and procedures of construction to be employed by the Contractor and related safety precautions;
2. Accuracy of dimensions and installation details; and
3. Contractor interpretation of information made available by the Owner.

PART 2 (NOT USED)

PART 3 EXECUTION

3.1 DIFFERING CONDITIONS

A. If the Contractor believes that any equipment feature, physical arrangement or subsurface condition is revealed to be materially different than shown by the Owner-supplied information and of such a nature as to require a change in the Contract Documents, the Contractor shall promptly and, before performing any Work notify the Engineer in writing of such condition.

END OF SECTION

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FOR

CONCRETE, METALS, AND EQUIPMENT SPECIFICATIONS

City of Georgetown

WTP Floc/Sed Basin No. 2

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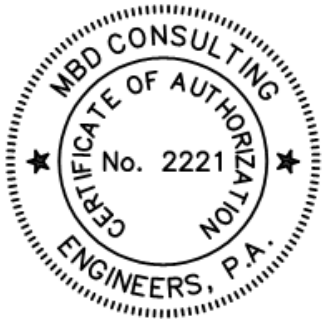

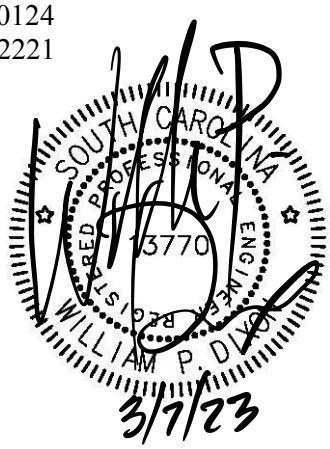

SECTION 03 11 00
STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of structural concrete formwork as specified herein or shown on Contract Drawings.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 DESIGN

A. Formwork shall be designed in accordance with methodology of ACI 347 for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Class A and Class B Finish: Forms for Class A and Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

B. Forms for Class C Finish: Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

C. Forms for Class D Finish: Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

D. Form Ties: Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

E. Form Releasing Agents: Form releasing agents shall be commercial formulations that will not bond with, stain, or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Formwork: Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 and conforming to construction tolerance given in ACI 117 "Tolerance for Concrete Construction and Materials, unless noted otherwise. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a non staining bond breaker.

3.2 CHAMFERING

A. Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

A. Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

A. Forms shall be removed, preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of

concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 90 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

END OF SECTION

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SECTION 03 15 00
EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of expansion joints, contraction joints, and waterstops as specified herein or shown on Contract Drawings.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 CONTRACTION JOINT STRIPS

A. Contraction joint strips shall be 1/8-inch-thick tempered hardboard conforming to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 PREFORMED EXPANSION JOINT FILLER

A. Expansion joint filler shall be preformed material conforming to ASTM D 1751or ASTM D 1752. Unless otherwise indicated, filler material shall be 3/8 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.3 SEALANT

A. Joint sealant shall conform to the following:
   1. Preformed Polychloroprene Elastomeric Type ASTM D 2628.
   2. Lubricant for Preformed Compression Seals ASTM D 2835.

3. Hot-Poured Type
   ASTM D 6690 tested in accordance with ASTM D 1191.
4. Field-Molded Type
   ASTM C 920, Type M for horizontal joints or Grade NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

2.4 WATERSTOPS

A. Intersection and change of direction waterstops shall be shop fabricated.

B. Non-Metallic Materials: Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572. Thermoplastic elastomeric rubber waterstops shall conform to ASTM D 471.

C. Non-Metallic Hydrophilic: Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D 412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F shall be 3 to 1 minimum.

D. Preformed Plastic Adhesive: Preformed plastic adhesive waterstops shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, and shall contain no solvents, asbestos, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength.
   1. Chemical Composition
      The chemical composition of the sealing compound shall meet the requirements shown below:

PERCENT BY WEIGHT

COMPONENT	MIN.	MAX.	TEST
Bitumen (Hydrocarbon plastic)	50	70	ASTM D 4
Inert Mineral Filler	30	50	AASHTO T 111
Volatile Matter	2		ASTM D 6

   2. Adhesion Under Hydrostatic Pressure
      The sealing compound shall not leak at the joints for a period of 24 hours under a vertical 6-foot head pressure. In a separate test, the sealing compound shall not leak under a horizontal pressure of 10 psi which is reached by slowly applying increments of 2 psi every minute.

3. Sag of Flow Resistance: Sagging shall not be detected when tested as follows: Fill a wooden form 1 inch wide and 6 inches long flush with sealing compound and place in an oven at 135 degrees F in a vertical position for 5 days.
4. Chemical Resistance: The sealing compound when immersed separately in a 5% solution of caustic potash, a 5% solution of hydrochloric acid, 5% solution of sulfuric acid and a saturated hydrogen sulfide solution for 30 days at ambient room temperature shall show no visible deterioration.

PART 3 EXECUTION

3.1 JOINTS

A. Joints shall be installed at locations indicated and as authorized.

B. Contraction Joints: Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8 inch wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.
   1. Joint Strips: Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC or HIPS strips shall be discarded, and the insert left in place. True alignment of the strips shall be maintained during insertion.
   2. Sawed Joints: Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

C. Expansion Joints: Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed, and oiled wood strip temporarily secured to the top to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

D. Joint Sealant: Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign

material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

1. Joints with Preformed Compression Seals
   Compression seals shall be installed with equipment capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal or concrete and with no more than 5 percent stretching of the seal. The sides of the joint and, if necessary, the sides of the compression seal shall be covered with a coating of lubricant. Butt joints shall be coated with liberal applications of lubricant.
2. Joints with Field-Molded Sealant
   Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C 919 shall be followed. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.2 WATERSTOPS, INSTALLATION AND SPLICES

A. Waterstops shall be installed at the locations shown to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified trained personnel using approved equipment and procedures.

B. Non-Metallic: Fittings shall be shop made using a machine specifically designed to mechanically weld the waterstop. A miter guide, proper fixturing (profile dependant), and portable power saw shall be used to miter cut the ends to be joined to ensure good alignment and contact between joined surfaces. The splicing of straight lengths shall be done by squaring the ends to be joined. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc.) shall be maintained across the splice.
   1. Rubber Waterstop: Splices shall be vulcanized or shall be made using cold bond adhesive as recommended by the manufacturer. Splices for TPE-R shall be as specified for PVC.
   2. Polyvinyl Chloride Waterstop: Splices shall be made by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. The correct temperature shall be used to sufficiently melt without charring the plastic. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.
   3. Quality Assurance: Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include but are not limited to the following: 1) Tensile strength less than 80 percent of parent section. 2) Free lap joints. 3) Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch. 4) Misalignment which reduces waterstop cross section more than 15 percent. 5) Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness. 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet. 7) Visible porosity in the weld area, including pin holes. 8)

Charred or burnt material. 9) Bubbles or inadequate bonding. 10) Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

C. Non-Metallic Hydrophilic Waterstop Installation: Ends to be joined shall be miter cut with sharp knife or shears. The ends shall be adhered with cyanacryiate (super glue) adhesive. When joining hydrophilic type waterstop to PVC waterstop, the hydrophilic waterstop shall be positioned as shown on the drawings. A liberal amount of a single component hydrophilic sealant shall be applied to the junction to complete the transition.

D. Preformed Plastic Adhesive Installation: The installation of preformed plastic adhesive waterstops shall be a prime, peel, place and pour procedure. Joint surfaces shall be clean and dry before priming and just prior to placing the sealing strips. The end of each strip shall be spliced to the next strip with a 1-inch overlap; the overlap shall be pressed firmly to release trapped air. During damp or cold conditions, the joint surface shall be flashed with a safe, direct flame to warm and dry the surface adequately; the sealing strips shall be dipped in warm water to soften the material to achieve maximum bond to the concrete surface.

3.3 CONSTRUCTION JOINTS

A. Construction joints are specified in Section 03 30 00 except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

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SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of concrete reinforcement as specified herein or shown on Contract Drawings.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 WELDING

A. Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Engineer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY, HANDLING, AND STORAGE

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 DOWELS

A. Dowels shall conform to ASTM A 675/A 675M, Grade 80. Steel pipe conforming to ASTM A 53, Type E or S, Grade B, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.2 FABRICATED BAR MATS

A. Fabricated bar mats shall conform to ASTM A 184/A 184M.

2.3 REINFORCING STEEL

A. Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M or ASTM A 706/A 706M (for welding), grades and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. In highly corrosive environments or when directed

by the Engineer, reinforcing steel shall conform to ASTM A 767/A 767M or ASTM A 775/A 775M as appropriate.

2.4 WELDED WIRE FABRIC

A. Welded wire fabric shall conform to ASTM A 1064. When directed by the Engineer for special applications, welded wire fabric shall conform to ASTM A 884/A 884M.

2.5 WIRE TIES

A. Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.6 SUPPORTS

A. Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

2.7 SYNTHETIC FIBER REINFORCEMENT

A. Synthetic fiber shall be polypropylene with a denier less than 100 and a nominal fiber length of 2 inches.

PART 3 EXECUTION

3.1 REINFORCEMENT

A. Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

B. Placement: Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

C. Splicing: Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

3.2 WELDED-WIRE FABRIC PLACEMENT

A. Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.3 DOWEL INSTALLATION

A. Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

3.4 SYNTHETIC FIBER REINFORCED CONCRETE

A. Fiber reinforcement shall be added to the concrete mix in accordance with the applicable sections of ASTM C 1116 and the recommendations of the manufacturer, and in an amount of 0.1 percent by volume.

3.5 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

A. Special inspections and testing for seismic-resisting systems and components shall be done in accordance with the specifications.

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SECTION 03 30 00
CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of cast-in-place concrete as specified herein or shown on Contract Drawings.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 QUALIFICATIONS

A. Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field-Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

Concrete Transportation Construction Inspector or Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.4 FIELD TEST PANELS

A. Field test panels shall be constructed prior to beginning of work using the materials and procedures proposed for use on the job, to demonstrate the results to be attained. The quality and appearance of each panel shall be subject to the approval of the Engineer, and, if not judged satisfactory, additional panels shall be constructed until approval is attained. Formed or finished surfaces in the completed structure shall match the quality and appearance of the approved field example.

B. Sample Wall Panels: One sample panel at least 4 feet by 5 feet and 6 inches thick shall be constructed to demonstrate Class A formed finish and a similar one for Class B formed finish. Panels shall be located on site. Each panel shall include a full length and full width joint line and

shall have at least two voids each at least 12 inches by 12 inches by 3 inches deep either impressed in the concrete as placed or chipped in the hardened concrete. After the concrete is 7 days old, the voids shall be patched to demonstrate the effectiveness and the appearance of the Contractor's repair procedures.

C. Slab Panels: A slab panel at least 4 feet by 5 feet and 4 inches thick shall be constructed to demonstrate exposed aggregate slab finish and a similar panel for extra high class slab finish. Panels shall be located on site. Each panel shall have a full length joint line.

1.5 SPECIAL REQUIREMENTS

A. A pre-installation meeting with the Engineer will be required at least 10 days prior to start of construction on the water containment structures. The Contractor shall be responsible for calling the meeting; the Project Superintendent and active installation personnel shall be present.

1.6 GENERAL REQUIREMENTS

A. Tolerances: Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

B. Strength Requirements and w/c Ratio

1. Strength Requirements: When the designer considers it appropriate, 90-day compressive or flexural strength may be specified in lieu of 28-day, but not both.

Specified compressive strength (f'c) shall be as follows:

COMPRESSIVE STRENGTH	STRUCTURE OR PORTION OF STRUCTURE
4500 psi at 28 days	Water Containment Structures Building Floor Slabs, beams, columns
3000 psi at 28 days	Building Foundations

Concrete slabs on-grade shall have a 28-day flexural strength of 475 psi. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39/C 39M. Flexural strength shall be determined in accordance with ASTM C 78.

a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12-inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500

psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42/C 42M. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Engineer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Owner.

c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Engineer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Engineer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Engineer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Owner.

d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 50 psi. A "test" is defined as the average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

2. Water-Cement Ratio: Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.45	All Water Containment Structures All Exposed Concrete

These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground

granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations of ACI 211.1 for the term P which is used to denote the weight of pozzolan.

C. Air Entrainment: Except as otherwise specified all normal weight concrete shall be air entrained to contain between 3 and 6 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 3.5 and 7 percent. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

Air entrainment not required for building foundations or interior floor slabs.

D. Slump: Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143/C 143M.

	Slump	
Structural Element	Minimum	Maximum
Walls, columns and beams	2 in.	4 in.
Foundation walls, substructure walls, footings, slabs	2 in.	5 in.
Any structural concrete approved for placement by pumping:		
At pump	2 in.	6 in.
At discharge of line	1 in.	4 in.

When use of a plasticizing admixture conforming to ASTM C 1017/C 1017M or when a Type F or G high range water reducing admixture conforming to ASTM C 494/C 494M is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

E. Concrete Temperature: The temperature of the concrete as delivered shall not exceed 90 degrees F. When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

F. Size of Coarse Aggregate: The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

G. Special Properties and Products: Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special

properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

H. Technical Service for Specialized Concrete: The services of a factory trained technical representative shall be obtained to oversee proportioning, batching, mixing, placing, consolidating, and finishing of specialized structural concrete, such as shrinkage reducing concrete. The technical representative shall be on the job full time until the Engineer is satisfied that field controls indicate concrete of specified quality is furnished and that the Contractor's crews are capable of continued satisfactory work. The technical representative shall be available for consultation with, and advice to, Owner forces.

1.7 MIXTURE PROPORTIONS

A. Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

B. Proportioning Studies for Normal Weight Concrete: Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by weight of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39/C 39M. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and

28-day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

C. Proportioning Studies for Flexural Strength Concrete: Trial design batches, mixture proportioning studies, and testing requirements shall conform to the requirements specified in paragraph Proportioning Studies for Normal Weight Concrete, except that proportions shall be based on flexural strength as determined by test specimens (beams) fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 78. Procedures given in ACI 211.1 shall be modified as necessary to accommodate flexural strength.

D. Average Compressive Strength Required for Mixtures: The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'cr) exceeding the specified compressive strength (f'c) by the amount indicated below. This required average compressive strength, f'cr, will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'cr during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'cr, the mixture shall be adjusted, as approved, to bring the daily average back up to f'cr. During production, the required f'cr shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1. Computations from Test Records

   Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'cr used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

   f'cr = f'c + 1.34S where units are in psi

   f'cr = f'c + 2.33S - 500 where units are in psi

   Where S = standard deviation

   Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

2. Computations without Previous Test Records: When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'cr shall be determined as follows:

   If the specified compressive strength f'c is less than 3,000 psi,

   f'cr = f'c + 1000 psi

   If the specified compressive strength f'c is 3,000 to 5,000 psi,

   f'cr = f'c + 1,200 psi

   If the specified compressive strength f'c is over 5,000 psi,

   f'cr = f'c + 1,400 psi

E. Average Flexural Strength Required for Mixtures: The mixture proportions selected during mixture design studies for flexural strength mixtures and the mixture used during concrete production shall be designed and adjusted during concrete production as approved, except that the overdesign for average flexural strength shall simply be 15 percent greater than the specified flexural strength at all times.

1.8 OWNER ASSURANCE INSPECTION AND TESTING

A. Day-to day inspection and testing shall be the responsibility of the Engineer. Owner inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

B. Materials: The Owner will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

C. Fresh Concrete: Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

D. Hardened Concrete: Tests on hardened concrete will be performed by the Owner when such tests are considered necessary.

E. Inspection: Concrete operations may be tested and inspected by the Owner as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered, nor will it obligate the Owner for final acceptance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

A. Cementitious Materials shall be portland cement, portland-pozzolan cement, portland blast-furnace slag cement, or portland cement in combination with pozzolan or ground granulated blast furnace slag or silica fume and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

B. Portland Cement: ASTM C 150, Type I low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II low alkali or Type V. White portland cement shall meet the above requirements except that it may be Type I, Type II or Type III low alkali. White Type III shall be used only in specific areas of the structure, when approved in writing.

For concrete mixed with Portland Cement and an appropriate amount of fly ash or ground granulated blast furnace slag (as stated below), the total alkalis in the Portland Cement (calculated as the percentage of NA2O plus 0.658 times the percentage of K2O) shall not exceed 0.85% unless aggregates to be used meet the requirements for non-reactivity with alkalis stated below.

For concrete mixed with only Portland Cement, the total alkalis in the cement (calculated as the percentage of K2O) shall not exceed 0.40% unless aggregates to be used meet the requirements for non-reactivity with alkalis stated below.

Use one brand of cement throughout the project, unless otherwise acceptable to Engineer.

C. High-Early-Strength Portland Cement: ASTM C 150, Type III with tricalcium aluminate limited to 8 percent, low alkali. Type III cement shall be used only in isolated instances and only when approved in writing.

D. Blended Cements: ASTM C 595, Type IP or IP (MS).

E. Pozzolan (Fly Ash): ASTM C 618, Class C or F with the optional requirements for multiple factor, drying shrinkage, and uniformity from Table 3 of ASTM C 618. Requirement for maximum alkalies from Table 1 of ASTM C 618 shall apply. If pozzolan is used, it shall never be less than 15 percent nor more than 25 percent by weight of the total cementitious material. Fly ash shall conform to EPA requirements in accordance with Section 01670.

Where fly ash is included in the concrete mix to waive the 0.4% alkali requirement of the Portland Cement, the fly ash shall be set between 15% and 25% of the total weight of the combined Portland Cement and fly ash. The percentage of fly ash shall be set so that the mean

mortar bar expansion of the cement-fly ash mix shall be 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The Portland Cement and aggregates used in the mix for this test shall be the Portland Cement and aggregates submitted for use on the job

Only 70% of the fly ash by weight may be counted as cement in computing W/C ratio. Fly ash shall not be used with expansive cement.

F. Ground Granulated Blast-Furnace (GGBF) Slag: ASTM C 989, Grade 100 or 120.

Where ground granulated blast furnace slag is included in the concrete mix to waive the 0.4% alkali requirement of the Portland Cement, the ground granulated blast furnace slag constituent shall be between 35% and 50% of the total weight of the combined Portland Cement and slag. For concrete placed when the ambient temperature is 50 degrees F or less, the maximum slag content shall be limited to 40%. The percentage of ground granulated blast furnace slag shall be set so that the mean mortar bar expansion of the cement-slag mix shall be 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The Portland Cement and aggregates used in the mix for this test shall be the Portland Cement and aggregates submitted for use on the job. 100% of slag cement may be counted as cement in computing the W/C ratio.

G. Silica Fume: Silica fume shall conform to ASTM C 1240. Available alkalies shall conform to the optimal limit given in Table 2 of ASTM C 1240. Silica fume may be furnished as a dry, densified material or as a slurry. In accordance with paragraph Technical Service for Specialized Concrete, the Contractor shall provide at no cost to the Owner the services of a manufacturer's technical representative experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume.

2.2 AGGREGATES

A. Aggregates shall conform to the following.

B. Fine Aggregate: Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

C. Coarse Aggregate: Coarse aggregate shall conform to ASTM C 33, Class 5S. When aggregates which are non-reactive with alkalis are desired in order to waive the alkali content requirement of cement as stated above, the following test shall be performed:
   1. A petrographic analysis in accordance with ASTM C 295 shall be performed to identify the constituents of the fine and coarse aggregates. Aggregates containing more than the following quantities of constituents shall be considered potentially reactive:
      a. Optically strained, microfractured, or microcrystalline quartz exceeding 5.0%.
      b. Chert or chalcedony exceeding 3.0%.
      c. Tridymite or cristobalite exceeding 1.0%.
      d. Opal exceeding 0.5%.
      e. Natural volcanic glass in volcanic rocks exceeding 3.0%.
   2. Aggregate shall be evaluated by ASTM C 1260. Aggregate sources that exhibit mean mortar bar expansions at 16 days greater than 0.08% shall be considered potentially reactive. Tests shall be made with cement proposed for use on the job.

Aggregates having a lithology which is essentially similar to that of sources in the same region that have been found to be reactive in service shall be considered potentially reactive, and the alkali content requirement of cement stated above shall apply regardless of the results of the tests above.

The Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

2.3 CHEMICAL ADMIXTURES

A. Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

B. Air-Entraining Admixture: ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

C. Accelerating Admixture: ASTM C 494/C 494M, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

D. Water-Reducing or Retarding Admixture: ASTM C 494/C 494M, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

E. High-Range Water Reducer: ASTM C 494/C 494M, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

F. Surface Retarder: COE CRD-C 94.

G. Expanding Admixture: Aluminum powder type expanding admixture conforming to ASTM C 937.

H. Shrinkage Reducing Admixture: ASTM C 494, Type S, 1.5 Gal/Yd^3 dosage. Use in all concrete for containment structures.

I. Other Chemical Admixtures: Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017/C 1017M, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

A. Impervious-Sheet: Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

B. Membrane-Forming Compound: Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye and shall have the reflective requirements in ASTM C 309 waived.

C. Burlap and Cotton Mat: Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

A. Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

A. Nonshrink grout shall conform to ASTM C 1107 and shall be a commercial formulation suitable for the proposed application.

2.7 NONSLIP SURFACING MATERIAL

A. Nonslip surfacing material shall consist of 55 percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland cement paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the No. 30 sieve to particles passing the No. 8 sieve.

2.8 LATEX BONDING AGENT

A. Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.9 EPOXY RESIN

A. Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

2.10 EMBEDDED ITEMS

A. Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Hangers for suspended ceilings shall be as specified in Section 09510. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.11 FLOOR HARDENER

A. Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluorides can be used individually or in combination. Proprietary hardeners may be used if approved in writing by the Engineer.

2.12 PERIMETER INSULATION

A. Perimeter insulation shall be polystyrene conforming to ASTM C 578, Type II; polyurethane conforming to ASTM C 591, Type II; or cellular glass conforming to ASTM C 552, Type I or IV. Insulation shall conform to EPA requirements in accordance with Section 01670.

2.13 VAPOR BARRIER

A. Vapor barrier shall conform to ASTM E1745, Class C or better, not less than 10 mils thickness. Include Manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.14 JOINT MATERIALS

A. Joint Fillers, Sealers, and Waterstops: Expansion joint fillers shall be preformed materials conforming to ASTM D 1751. Materials for waterstops shall be in accordance with Section 03 15 00. Materials for and sealing of joints shall conform to the requirements of these specifications.

B. Contraction Joints in Slabs: Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

2.15 DRY SHAKE FLOOR TOPPING MATERIAL

A. Dry shake floor topping material shall be a premixed ready-to-use dry shake. It shall be proportioned, mixed, and packaged at the factory, and delivered to the jobsite in sealed, moisture resistant bags, ready to apply, finish and cure. The manufacturer of the dry shake material shall have at least 10 years experience in the manufacture of such material. Any material from a manufacturer who makes any disclaimer of the materials performance shall not be used.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

A. Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

B. Foundations
   1. Concrete on Earth Foundations: Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.
   2. Preparation of Rock: Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached, or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Engineer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.
   3. Excavated Surfaces in Lieu of Forms: Concrete for footings and walls may be placed directly against the soil provided the earth or rock has been carefully trimmed, is uniform and stable, and meets the compaction requirements of Section 02315. The concrete shall be placed without becoming contaminated by loose material, and the outline of the concrete shall be within the specified tolerances.

C. Previously Placed Concrete: Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Engineer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean surfaces of well bonded coarse aggregate are exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse aggregate shall not be undercut. The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing

fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift. For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand passing the No. 8 sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

1. Air-Water Cutting: Air-water cutting of a fresh concrete surface shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 100 psi plus or minus, 10 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Engineer, a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure waterjet or sandblasting shall be used as the last operation before placing the next lift.
2. High-Pressure Water Jet: A stream of water under a pressure of not less than 3,000 psi shall be used for cutting and cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the waterjet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.
3. Wet Sandblasting: Wet sandblasting shall be used after the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. After wet sandblasting, the surface of the concrete shall then be washed thoroughly to remove all loose materials.
4. Waste Disposal: The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.
5. Preparation of Previously Placed Concrete: Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.
6. Perimeter Insulation: Perimeter insulation shall be installed at locations indicated. Adhesive shall be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

D. Vapor Barrier: Vapor barrier shall be provided beneath the interior on-grade concrete floor slabs. The greatest widths and lengths practicable shall be used to eliminate joints wherever possible. Joints shall be lapped a minimum of 12 inches. Torn, punctured, or damaged vapor barrier material shall be removed, and new vapor barrier shall be provided prior to placing concrete. For minor repairs, patches may be made using laps of at least 12 inches. Lapped joints shall be sealed, and edges patched with pressure-sensitive adhesive or tape not less than 2 inches wide and compatible with the membrane. Vapor barrier shall be placed directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, the surface shall be choked with a light layer of sand, as approved, before placing the vapor barrier. A 2-inch layer of compacted, clean concrete sand (fine aggregate) shall be placed on top of the vapor barrier

before placing concrete. Concrete placement shall be controlled so as to prevent damage to the vapor barrier, or any covering sand.

E. Embedded Items: Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 1 feet of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

3.2 CONCRETE PRODUCTION

A. Batching, Mixing, and Transporting Concrete: Concrete shall either be batched and mixed onsite or shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94/C 94M, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. Site-mixed concrete shall conform to the following subparagraphs. Concrete shall be batched and mixed onsite, or close to onsite, and shall conform to the following subparagraphs.

1. General: The batching plant shall be located off site close to the project. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.
2. Batching Equipment: The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious material are used, they may be batched cumulatively, provided that the portland cement is batched first, except that silica fume shall always be batched separately. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified

mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers. Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3. Scales: The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of an Owner inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.
4. Batching Tolerances:
   a. Tolerances with Weighing Equipment:

MATERIAL	PERCENT OF REQUIRED WEIGHT
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

   b. Tolerances with Volumetric Equipment: For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

MATERIAL	PERCENT OF REQUIRED MATERIAL
Water	plus or minus 1 percent
Chemical admixtures	0 to plus 6 percent

5. Moisture Control: The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.
6. Concrete Mixers: Mixers shall be stationary mixers or truck mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

7. Stationary Mixers: Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94/C 94M applicable to central-mixed concrete.
8. Truck Mixers: Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94/C 94M. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it is possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed. Or, if approved in lieu of this, the number of revolutions shall be marked on the batch tickets. Water shall not be added at the placing site unless specifically approved; and in no case shall it exceed the specified w/c. Any such water shall be injected at the base of the mixer, not at the discharge end.

3.3 CONCRETE PRODUCTION, SMALL PROJECTS

A. Batch-type equipment shall be used for producing concrete. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94/C 94M, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. Site-mixed concrete shall be produced in accordance with ACI 301, and plant shall conform to NRMCA CPMB 100. In lieu of batch-type equipment, concrete may be produced by volumetric batching and continuous mixing, which shall conform to ASTM C 685.

3.4 TRANSPORTING CONCRETE TO PROJECT SITE

A. Concrete shall be transported to the placing site in truck mixers, or by approved pumping equipment.

3.5 CONVEYING CONCRETE ON SITE

A. Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

B. Buckets: The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except those buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

C. Transfer Hoppers: Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

D. Trucks: Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94/C 94M. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

E. Chutes: When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Engineer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

F. Belt Conveyors: Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

G. Concrete Pumps: Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.6 PLACING CONCRETE

A. Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

B. Depositing Concrete: Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

C. Consolidation: Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segration, or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

D. Cold Weather Requirements: Special protection measures, approved by the Engineer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps.

Salt, chemicals, or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494/C 494M, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

E. Hot Weather Requirements: When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

F. Prevention of Plastic Shrinkage Cracking: During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition, the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

G. Placing Concrete Underwater: Concrete shall be deposited in water by a tremie or concrete pump. The methods and equipment used shall be subject to approval. Concrete buckets shall not be used for underwater placement of concrete except to deliver concrete to the tremie. The tremie shall be watertight and sufficiently large to permit a free flow of concrete. The concrete shall be deposited so that it enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete. The discharge end of the pump line or tremie shaft shall be kept continuously submerged in the concrete. The underwater seal at start of placing shall not produce undue turbulence in the water. The tremie shaft shall be kept full of concrete to a point well above the water surface. Placement shall proceed without interruption until the concrete has been brought to the required height. The tremie shall not be moved horizontally during a placing operation, and a sufficient number of tremies shall be provided so that the maximum horizontal flow of concrete will be limited to 15

feet. Concrete shall not be deposited in running water or in water with a temperature below 35 degrees F.

H. Placing Concrete in Congested Areas: Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion. Reinforcing bars may be temporarily crowded to one side during concrete placement provided they are returned to exact required location before concrete placement and consolidation are completed.

I. Placing Flowable Concrete: If a plasticizing admixture conforming to ASTM C 1017/C 1017M is used or if an ASTM C494/C494 M, Type F or G high range water reducing admixture is permitted to increase the slump, the concrete shall meet all requirements of paragraph GENERAL REQUIREMENTS in PART 1. Extreme care shall be used in conveying and placing the concrete to avoid segregation. Consolidation and finishing shall meet all requirements of paragraphs Placing Concrete, Finishing Formed Surfaces, and Finishing Unformed Surfaces. No relaxation of requirements to accommodate flowable concrete will be permitted.

3.7 JOINTS

A. Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. In general, such joints shall be located near the middle of the spans of supported slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs, unless otherwise approved. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 2 inches clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 30-pound asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 07900.

B. Construction Joints: For concrete other than slabs on grade, construction joints shall be located so that the unit of operation does not exceed 30 feet. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 72 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Engineer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 1 inch square-edge lumber, beveled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

C. Contraction Joints in Slabs on Grade: Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the concrete slab by use of rigid inserts impressed in the concrete during placing operations, use of snap-out plastic joint forming inserts, or sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

D. Expansion Joints: Installation of expansion joints and sealing of these joints shall conform to the requirements of these specifications

E. Waterstops: Waterstops shall be installed in conformance with the locations and details shown on the drawings using materials and procedures specified in Section 03 15 00.

F. Dowels and Tie Bars: Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. Structural type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.8 FINISHING FORMED SURFACES

A. Forms, form materials, and form construction are specified in Section 03100. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

B. Class B Finish: All finished formed surfaces on the project will require a Class B finish. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and, except as otherwise indicated or as specified in Section 03100, holes left by removal of form ties shall be reamed and filled. Defects more than 1/2 inch in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep. The Contractor shall prepare a sample panel for approval (as specified in PART 1) before commencing repair, showing that the surface texture and color match will be attained.

C. Architectural and Special Finishes: Architectural concrete finishes are specified in Section 03 33 00. Special finishes shall conform to the requirements specified herein.

1. Smooth Finish: After other concrete construction is complete in each overall separate contiguous area of the structure, smooth finish shall be applied to all exposed concrete surfaces. A mortar mix consisting of one-part portland cement and two parts well-graded sand passing a No. 30 sieve, with water added to give the consistency of thick paint, shall be used. Where the finished surface will not receive other applied surface, white cement shall be used to replace part of the job cement to produce an approved color, which shall be uniform throughout the surfaces of the structure. After the surface has been thoroughly wetted and allowed to approach surface dryness, the mortar shall be vigorously applied to the area by clean burlap pads or by cork or wood-floating, to completely fill all surface voids. Excess grout shall be scraped off with a trowel. As soon as it can be accomplished without pulling the mortar from the voids, the area shall be rubbed with burlap pads having on their surface the same sand-cement mix specified above but without any mixing water, until all of the visible grout film is removed. The burlap pads used for this operation shall be stretched tightly around a board to prevent dishing the mortar in the voids. The finish of any

area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the surface. The surface shall be continuously moist cured for 48 hours commencing immediately after finishing operations in each area. The temperature of the air adjacent to the surface shall be not less than 50 degrees F for 24 hours prior to, and 48 hours after, the application. In hot, dry weather the smooth finish shall be applied in shaded areas or at night and shall never be applied when there is significant hot, dry wind.

3.9 REPAIRS

A. Damp-Pack Mortar Repair: Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed, and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1-part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

B. Repair of Major Defects: Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

1. Surface Application of Mortar Repair: Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Engineer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a

mortar gun is used, the gun shall be a small, compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

2. Repair of Deep and Large Defects: Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

C. Resinous and Latex Material Repair: In lieu of the portland cement bonding coats specified above, an epoxy resin or a latex bonding agent may be used.

3.10 FINISHING UNFORMED SURFACES

A. The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

B. General: The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 50 degrees F. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints

shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10-foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

C. Rough Slab Finish: As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough slab finish prepared as follows. All non-accesible surfaces will receive a rough slab finish. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

D. Troweled Finish: The floors of all water containment structures will receive a trowelled finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 2 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

3.11 FLOOR HARDENER

A. All exposed areas receiving a troweled finish will receive a floor hardener. Floor hardener shall be applied after the concrete has been cured and then air dried for 28 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, one pound of the silocofluoride shall be dissolved in one gallon of water. For subsequent applications, the solution shall be two pounds of silicofluoride to each gallon of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying

silicofluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

3.12 EXTERIOR SLAB AND RELATED ITEMS

A. Pavements: Pavements shall be constructed where shown on the drawings. After forms are set and underlying material prepared as specified, the concrete shall be placed uniformly throughout the area and thoroughly vibrated. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. The entire surface shall be tamped with the strike off, or consolidated with a vibrating screed, and this operation continued until the required compaction and reduction of internal and surface voids are accomplished. Care shall be taken to prevent bringing excess paste to the surface. Immediately following the final consolidation of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. After finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled cutting straightedges. Straightedges shall be 12 feet in length and shall be operated from the sides of the pavement and from bridges. A straightedge operated from the side of the pavement shall be equipped with a handle 3 feet longer than one-half the width of the pavement. The surface shall then be tested for trueness with a 12-foot straightedge held in successive positions parallel and at right angles to the center line of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages of not more than one-half the length of the straightedge. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is true. Before the surface sheen has disappeared and well before the concrete becomes nonplastic, the surface of the pavement shall be given a nonslip sandy surface texture by belting with approved "belt" and procedures or use of a burlap drag. A strip of clean, wet burlap from 3 to 5 feet wide and 2 feet longer than the pavement width shall be carefully pulled across the surface. Edges and joints shall be rounded with an edger having a radius of 1/8 inch. Curing shall be as specified.

B. Sidewalks: Concrete shall be 4 inches minimum thickness. Contraction joints shall be provided at 5 feet spaces unless otherwise indicated. Contraction joints shall be cut 1 inch deep with a jointing tool after the surface has been finished. Transverse expansion joints 1/2 inch thick shall be provided at changes in direction and where sidewalk abuts curbs, steps, rigid pavement, or other similar structures. Sidewalks shall be given a lightly broomed finish. A transverse slope of 1/4 inch per foot shall be provided, unless otherwise indicated. Variations in cross section shall be limited to 1/4 inch in 5 feet.

C. Curbs and Gutters: Concrete shall be formed, placed, and finished by hand using a properly shaped "mule" or constructed using a slipform machine specially designed for this work. Contraction joints shall be cut 3 inches deep with a jointing tool after the surface has been

finished. Expansion joints (1/2 inch wide) shall be provided at 100 feet maximum spacing unless otherwise indicated. Exposed surfaces shall be finished using a stiff bristled brush.

D. Pits and Trenches: Pits and trenches shall be constructed as indicated on the drawings. Bottoms and walls shall be placed monolithically or waterstops and keys, shall be provided as approved.

3.13 CURING AND PROTECTION

A. General: Concrete shall be cured by an approved method for the period of time given below:

Concrete with Type III cement	3 days
All other concrete	7 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded. Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

B. Moist Curing: Concrete to be moist cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

C. Membrane Forming Curing Compounds: Membrane forming curing compounds shall be used only on surfaces not in contact with water. Concrete in the following areas may be cured with a pigmented curing compound in lieu of moist curing or may be cured with a nonpigmented curing compound containing a fugitive dye in lieu of moist curing. Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be

bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

D. Impervious Sheeting: All of the concrete surfaces may be cured using impervious sheets. However, except for plastic coated burlap, impervious sheeting alone shall not be used for curing. Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 18 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

E. Ponding or Immersion: Concrete shall be continually immersed throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

F. Cold Weather Curing and Protection: When the daily ambient low temperature is less than 32 degrees F the temperature of the concrete shall be maintained above 40 degrees F for the first seven days after placing. During the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by suitable temperature measuring devices furnished by the Contractor, as required, and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

3.14 SETTING BASE PLATES AND BEARING PLATES

A. After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed. Nonshrink grout shall be used for equipment bases.

B. Damp-Pack Bedding Mortar: Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

C. Nonshrink Grout: Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

1. Mixing and Placing of Nonshrink Grout: Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.
2. Treatment of Exposed Surfaces: For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parge coat of mortar consisting of 1-part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

3.15 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

A. The Contractor shall perform the inspection and tests described below and based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Engineer, the concreting operation is out of control, concrete placement shall cease, and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Owner from samples obtained at the manufacturer, at transfer points, or at the project site. The Owner will inspect the laboratory, equipment, and test procedures prior to start

of concreting operations and at least once per month thereafter for conformance with ASTM C 1077. Testing shall be paid by the Contractor from an Allowance included in the Contractor's Bid. The testing firm shall be selected by the Contractor, subject to approval of the Owner.

B. Grading and Corrective Action

1. Fine Aggregate: At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Engineer, concreting shall be stopped, and immediate steps taken to correct the grading.
2. Coarse Aggregate: At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Engineer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Engineer. Concreting shall be stopped, and immediate steps shall be taken to correct the grading.

C. Quality of Aggregates: Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

D. Scales, Batching and Recording: The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

E. Batch-Plant Control: The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

F. Concrete Mixture

1. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Owner inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Owner and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Engineer, and the air content at the mixer controlled as directed.
2. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.
3. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during

each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Owner inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Owner and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Engineer, and the slump at the mixer controlled as directed.

4. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.
5. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.
6. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Engineer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Engineer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per the same paragraph shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C

39M for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Engineer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

G. Inspection Before Placing: Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Engineer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

H. Placing: The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Engineer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

I. Vibrators: The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service, and repaired or replaced.

J. Curing Inspection
   1. Moist Curing Inspections. At least once each shift, and not less than twice per day on work and non-workdays, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
   2. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
   3. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.
   4. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

5. Sheet Curing Inspection. At least once each shift and once per day on non-workdays, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
6. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

K. Cold-Weather Protection: At least once each shift and once per day on non-workdays, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

L. Mixer Uniformity
1. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M.
2. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
3. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

M. Reports: All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Engineer has the right to examine all contractor quality control records.

N. Leakage Test: All cast-in-place water bearing structures shall be tested for leakage as follows: Prior to backfilling, the structure shall be filled to the maximum water elevation and remain filled for 48 hours. No visible leaks shall be apparent. Repair imperfections and leaks to make structure watertight. Each chamber of compartmentalized structures shall be tested individually to ensure interior walls, gates, pipe connections, etc. are watertight. Leakage shall be no more than 0.1% of the water volume in 24 hours in accordance with ACI 350.1/350.1R.

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SECTION 03 41 00
PLANT-PRECAST CONCRETE PRODUCTS

PART 1 GENERAL

1.1 SUMMARY

A. This section provides information regarding the plant precast concrete products for this project.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 if these Specifications.

1.3 GENERAL REQUIREMENTS

A. Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete units similar to that indicated in the project specifications or drawings for at least 3 years.

1.4 DESIGN

A. Standard Precast Concrete Unit Design: Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ACI 350, and PCI MNL-120. Design must also consider stresses induced during handling, shipping, and installation in order to avoid product cracking or other handling damage. Design loads for precast concrete units shall be indicated on the shop drawings.

Precast panels and connections shall be designed and detailed to transfer shear loads as indicated on the drawings.

B. Non-Standard Precast Concrete Unit Design: Design calculations and drawings of non-standard precast units shall be prepared and signed by a licensed South Carolina professional engineer and submitted for customer approval prior to fabrication. Calculations shall include the analysis of units for lifting stresses and the sizing of lifting devices.

C. Franchise Precast Concrete Units: Products manufactured under franchise arrangements shall conform to all the requirements specified by the franchiser. Items not included in the franchise specification but included in this specification shall conform to the requirements in this specification.

D. Joints and Sealants: Joints and sealants between adjacent units shall be of the type and configuration indicated on shop drawings meeting specified design and performance requirements.

E. Concrete Mix Design

1. Concrete Proportions: Selection of proportions for concrete shall be based on the methodology presented in ACI 211.1 for normal weight concrete, ACI 211.2 for lightweight concrete and ACI 211.3 for no-slump concrete. The concrete proportions shall be developed using the same type and brand of cement, the same type and brand of pozzolan, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Accelerators containing calcium chloride shall not be used in precast concrete containing reinforcing steel or other embedded metal items.

   Upon request, the precast concrete producer shall submit a mix design for each strength and type of concrete that will be used. Submitted mix designs shall include the quantity, type, brand, and applicable data sheets for all mix design constituents as well as documentation indicating conformance with applicable reference specifications.

   The use of self-consolidating concrete is permitted provided that mix design proportions and constituents meet the requirements of this specification.

2. Durability and performance Requirements
   a. Concrete Compressive Strength: Precast concrete units shall have a 28-day compressive strength (f'c) of 5,000 psi.
   b. Water-Cement Ratio: Concrete that will be exposed to freezing and thawing shall contain entrained air and shall have water-cement ratios of 0.45 or less. Concrete which will not be exposed to freezing, but which is required to be watertight, shall have a water-cement ratio of 0.48 or less if the concrete is exposed to fresh water, or 0.45 or less if exposed to brackish water or sea water. For corrosion protection, reinforced concrete exposed to deicer salts, brackish water or seawater shall have a water-cement ratio of 0.40 or less.
   c. Air Content: The air content of concrete that will be exposed to freezing conditions shall be within the limits given below.

Nominal Maximum Aggregate Size (in)	Air Content %	
	Severe Exposure	Moderate Exposure
3/8	6.0 to 9.0	4.5 to 7.5
½	5.5 to 8.5	4.0 to 7.0
¾	4.5 to 7.5	3.5 to 6.5
1	4.5 to 7.5	3.0 to 6.0
1-1/2	4.5 to 7.0	3.0 to 6.0
* For specified compressive strengths greater then 5000 psi, air content may be reduced 1%		

1.5 QUALITY ASSURANCE

A. Precast concrete producer shall demonstrate adherence to the standards set forth in the NPCA Quality Control Manual for Precast Concrete Plants. The precast concrete producer shall meet requirements written in subparagraph 1.5.B.

B. NPCA Plant Certification: The precast concrete producer shall be certified by the NPCA Plant Certification Program prior to and during production of the products for this project.

1.6 LOCATION/DESIGN

A. See drawings for location, design loads, and types of precast, prestressed concrete units required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The precast concrete manufacturer must meet the requirements established in section 1.5 Quality Assurance.

2.2 MATERIALS

A. Except as otherwise specified, material shall conform to the following section.

B. Cement: ASTM C 150 (Type I, II, III or V); ASTM C 595 (for Blended Cements)

C. Silica Fume: ASTM C 1240

D. Fly Ash and Pozzolans: ASTM C 618

E. Ground Granulated Blast-Furnace Slag: ASTM C 989

F. Water: ASTM C1602. The use of reclaimed/recycled process water shall be permitted.

G. Aggregates
1. Aggregate Selection: Aggregates shall conform to ASTM C 33. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalies in the cement. Upon request, the precast concrete producer shall provide documentation indicating the aggregates are not susceptible to alkali-aggregate reaction.
2. Aggregates for Lightweight Concrete: ASTM C 330

H. Admixtures
1. Air-Entraining: ASTM C 260
2. Accelerating, Retarding, Water Reducing Moderate to High: ASTM C 494
3. Pigments: ASTM C 979
4. Corrosion Inhibitors: ASTM C 1582

I. Reinforcement
1. Reinforcing Bars
   a. Deformed Billet-Steel: ASTM A 615
2. Reinforcing Wire
   a. Plain Wire: ASTM A 82

1. Deformed Wire: ASTM A 496

J. Welded Wire Reinforcement
   1. Plain Wire: ASTM A 185
   2. Deformed Wire: ASTM A 497

K. Inserts and Embedded Metal: All items embedded in concrete shall be of the type required for the intended use and meet the following standards.
   1. Structural Steel Plates, Angles, etc.: ASTM A 36
   2. Hot-Dipped Galvanized: ASTM A 152

L. Proprietary Items: In accordance with manufacturers published literature

M. Joint Sealants and Joint Gaskets
   1. Rubber Gaskets for Circular Concrete Sewer Pipe and Culvert Pipe: ASTM C 443
   2. External Sealing Bands for Noncircular Sewer, Storm Drain and Culvert Pipe: ASTM C 877
   3. Preformed Flexible Joint Sealants for Concrete Pipe, Manholes, and Manufactured Box Sections: ASTM C 990
   4. Elastomeric Joint Sealants: ASTM C 920

N. Pipe Entry Connectors: ASTM C 923; ASTM C 1478

O. Grout
   1. Nonshrink Grout: ASTM C 1107
   2. Cementitious Grout: Shall be of suitable mix design for the intended use, consisting of Portland cement, sand, and water. Provide air entrainment for grout exposed to corrosive conditions or severe weather.

P. Calcium chloride, chloride ions or other salts shall not be used.

2.3 MANUFACTURER

A. Manufacturer shall conform to the NPCA Quality Control Manual for Precast Concrete Plants unless specified otherwise.

B. Forms: Forms for manufacturing precast concrete units shall be of the type and design consistent with industry standards and practices. They should be capable of consistently providing uniform products and dimensions. Forms shall be constructed so that the forces and vibrations to which the forms will be subjected cause no damage to the precast concrete unit.

Forms shall be cleaned of concrete build-up after each use.

Form release agents shall be applied according to the manufacturer's recommendations and shall not be allowed to build up on the form casting surfaces.

C. Reinforcement: Applicable ASTM International and/or ACI 318 standards for placement and splicing.

Cages of reinforcement shall be fabricated either by tying the bars, wires, or welded wire reinforcement into rigid assemblies or by welding, where permissible, in accordance with AWS D1.4. Reinforcing shall be positioned as specified by the design and so that the concrete cover conforms to requirements. The tolerance on concrete cover shall be one-third of that specified but not more than 1/2 in. Concrete cover shall not be less than 1/2 in., unless otherwise specified. Positive means shall be taken to assure that the reinforcement does not move significantly during the casting operations.

D. Embedded Items: Embedded items shall be positioned at locations specified in the design documents. Welding shall be performed in accordance with AWS D1.1 when necessary. Inserts, plates, weldments, lifting devices and other items to be embedded in precast concrete units shall be held rigidly in place so that they do not move significantly during casting operations.

E. Concrete
   1. Concrete Mixing: Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.
   2. Concrete Placing: Conventional concrete shall be deposited into forms as near to its final location as practical. Self-consolidating concrete shall be placed in a manner in which it flows and consolidates without segregation or air entrapment. The free fall of the concrete shall be kept to a minimum. Concrete shall be consolidated in such a manner that segregation of the concrete is minimized and honeycombed areas are kept to a minimum. Consolidation efforts are often not required when using self-consolidating concrete. Vibrators used to consolidate concrete shall have frequencies and amplitudes sufficient to produce well-consolidated concrete.
      a. Cold Weather Concreting: Recommendations for cold weather concreting are given in detail ACI 306 R. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used. In cold weather the temperature of concrete at the time of placing shall not be below 45° F. Concrete that freezes before its compressive strength reaches 500 psi shall be discarded.
      b. Hot Weather Concreting: Recommendations for hot weather concreting are given in ACI 305 R. During hot weather, proper attention shall be given to constituents, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The temperature of concrete at the time of placing shall not exceed 90° F.
   3. Concrete Curing: Commence curing operations immediately following the initial set of the concrete and completion of surface finishing.
      a. Curing by Moisture Retention: Moisture shall be prevented from evaporating from exposed surfaces until adequate strength for stripping the precast concrete unit from the forms is reached by one of the following methods:

         - Cover with polyethylene sheets a minimum of 6 mils thick (ASTM C 171)
         - Cover with burlap or other absorptive material and keep continually moist
         - Use of a membrane-curing compound applied at a rate not to exceed 200 sq. ft. per gallon, or per manufacturers' recommendations (ASTM C 309)

Surfaces that will be exposed to weather during service shall be cured as above until a minimum compressive strength of 2.50 psi has been reached. Forms shall be considered effective in preventing evaporation from the contact surfaces. If air temperature is below 50°F the curing period shall be extended.

b. Curing with Heat and Moisture: Concrete shall not be subjected to steam or hot air until after the concrete has attained its initial set. Steam, if used, shall be applied within a suitable enclosure, which permits free circulation of the steam in accordance with ACI 517.2R. If hot air is used for curing, precautions shall be taken to prevent moisture loss from the concrete. The temperature of the concrete shall not be permitted to exceed 150° F. These requirements do not apply to products cured with steam under pressure in an autoclave.

4. Surface Finish: Unformed surfaces of wet-cast precast concrete products shall be finished as specified. If no finishing procedure is specified, such surfaces shall be finished using a strike-off to level the concrete with the top of the form.
   a. Formed Non-Architectural Surfaces: Surfaces shall be cast against approved forms in accordance with standard industry practices in cleaning forms, designing concrete mixes, placing, and curing concrete. Normal color variations, form joint marks, small surface holes caused by air bubbles, and minor chips and spalls will be accepted. Major imperfections, excessive honeycombing or other major defects shall not be permitted.
   b. Unformed Surfaces: Surfaces shall be finished with a vibrating screed, or by hand with a float. Normal color variations, minor indentations, minor chips, and spalls will be accepted. Major imperfections, excessive honeycombing or other major defects shall not be permitted.
   c. Special Finishes: Troweled, broom or other finishes shall be according to the requirements of project documents and performed per industry standards or supplier specifications. Precast concrete producers shall submit sample finishes for approval when required by the project documents. The sample finishes shall be approved prior to the start of production.
   d. Architectural Finishes: Architectural finishes shall be according to the requirements of project documents and performed per industry standards or supplier specifications.
      Precast concrete producers shall submit sample finishes for approval when required by the project documents. Full-size mockups are recommended for the approval of architectural finishes, because color variations and surface imperfections are not always apparent on small scale samples. The sample finishes shall be approved prior to the start of production.
5. Stripping Precast Concrete Units from Forms: Precast concrete units shall not be removed from the forms until the concrete reaches the compressive strength for stripping required by the design. If no such requirement exists, products may be removed from the forms after the final set of concrete provided that stripping damage is minimal. Stripping strengths shall be routinely measured to ensure product has attained sufficient strength for safe handling.
6. Patching and Repair: No repair is required to formed surfaces that are relatively free of air voids and honeycombed areas unless the surfaces are required by the design to be finished.
   a. Repairing Minor Defects: Defects that will not impair the functional use or expected life of a precast concrete unit may be repaired by any method that does not impair the product.
   b. Repairing Honeycombed Areas: When honeycombed areas are to be repaired, all loose material shall be removed, and the areas cut back into essentially horizontal or vertical

planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Proprietary repair materials shall be used in accordance with the manufacturer's instructions. If a proprietary repair material is not used, the area shall be saturated with water. Immediately prior to repair, the area should be damp, but free of excess water. A cement-sand grout or an approved bonding agent shall be applied to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.

c. Repairing Major Defects: Defects in precast concrete products which impair the functional use, or the expected life of products shall be evaluated by qualified personnel to determine if repairs are feasible and, if so, to establish the repair procedure.

7. Shipping Precast Concrete Units: Precast concrete units shall not be shipped until they are at least 14 days old, unless it can be shown that the concrete strength has reached at least 75% of the specified 28-day strength, or that damage will not result, impairing the performance of the product.

PART 3 EXECUTION

3.1 INSTALLATION

A. Site Access: The general contractor shall be responsible for providing adequate access to the site to facilitate hauling, storage, and proper handling of the precast concrete units.

B. Installation: Precast concrete units shall be installed to the lines and grades shown in the contract documents or otherwise specified.

Precast concrete units shall be lifted by suitable lifting devices at points provided by the precast concrete producer.

Precast concrete units shall be installed in accordance with applicable industry standards. Upon request, the precast concrete producer shall provide installation instructions.

Field modifications to the product shall relieve the precast producer of liability regardless if such modifications result in the failure of the precast concrete unit.

C. Watertightness: Where watertightness is a necessary performance characteristic of the precast concrete unit's end use, watertight joints, pipe-entry connectors, and inserts should be used to ensure the integrity of the entire system.

3.2 FIELD QUALITY CONTROL

A. Final inspection and acceptance of erected precast, prestressed concrete shall be made by the Engineer.

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SECTION 03 50 00
PRECAST, PRESTRESSED CONCRETE PILES

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of precast, prestressed concrete piles as specified herein or shown on Contract Drawings.

B. This work shall consist of furnishing and driving foundation piles of the type and dimensions designated in the contract documents, including the foundation exploration engineering studies and analysis, including cutting off or building up foundation piles when required. This specification also covers providing test piles and performing loading tests. Piling shall conform to and be installed in accordance with these specifications including the foundation report; at the location; and to the elevation, penetration, and the required ultimate pile capacity shown in the contract documents or as directed by the Engineer.

C. The work shall include vibration monitoring of adjacent structures during pile driving operations.

D. Except when test piles are required, the Contractor shall furnish the piles in accordance with the dimensions shown in the contract documents. When test piles are required, the production pile lengths shown in the contract documents are for estimating purposes only and the actual lengths to be furnished for production piles shall be determined by the Engineer after the test piles have been driven and tested. The lengths given in the order list provided by the Engineer shall include only the lengths anticipated for use in the completed structure. The Contractor shall increase the lengths shown or ordered to provide for fresh heading and for such additional length as may be necessary to suit the method of operation, without added compensation.

1.2 SUBMITTALS

A. Submit sealed design calculations, shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

C. Pile test reports and pile driving records.

D. Certified pile survey.

E. Preconstruction photographs and record of condition of adjacent structures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 PRESTRESSED CONCRETE PILES

A. Production of piles shall be in accordance with Prestressed Concrete Institute PCI MNL-116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products."

B. Forms: Forms for prestressed concrete piles shall conform to the general requirements for concrete form work as provided in the Prestressed Concrete Institute, PCI MNL-116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products."

C. Casting: Perform continuous concrete casting within 3 days after pretensioning steel; however, do not deposit concrete in forms until placement of reinforcement and anchorages has been inspected and approved by pile manufacturer's quality control representative. Each pile shall have dense concrete, straight smooth surfaces, and reinforcement retained in its proper position during fabrication. Unless self-consolidating concrete is used, the concrete shall be compacted by vibrating with a vibrator head smaller than the minimum distance between pretensioning steel. Ensure pile end surfaces are perpendicular to the longitudinal axis of the pile.

D. Finish: Finish of piles shall be in accordance with PCI MNL-116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products." Standard finish shall be that the formed sides are reasonably smooth from casting against approved forms. Standard finish of the top shall be a float finish with edges tooled.

E. Curing and Protection: Curing of piles shall be in accordance with PCI MNL-116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products." Cure piles using moist curing or accelerated steam curing. No pile shall be driven until it is sufficiently cured so as to resist handling and driving stresses without damage. In no case shall piles be driven before 7 days' curing time and concrete compressive strength reaches at least 0.8 f'c.

In cold weather, an extended curing period may be required as specified in the contract documents. Concrete shall be protected from freezing until the compressive strength reaches at least 0.8 f'c.

F. Prestressing: Prestressing of piles shall be in accordance with PCI MNL-116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products."

G. Storage and Handling: Handling, storing, and transporting prestressed concrete piles shall be done in such a manner as to avoid excessive bending stresses, cracking, spalling, or other injurious result.

PART 3 EXECUTION

3.1 PILE DRIVING EQUIPMENT

A. All pile driving equipment, including the pile driving hammer, hammer cushion, helmet, pile cushion, and other appurtenances to be furnished by the Contractor shall be approved in advance by the Engineer before any driving can take place. Pursuant to obtaining this approval, the Contractor shall submit a description of pile driving equipment to the Engineer at least two weeks before pile driving is to begin. The description must contain sufficient detail so that the proposed driving system can be evaluated by the Engineer in a wave equation analysis.

If the ultimate pile capacity is to be determined by static load test, dynamic test, rapid load test or wave equation analysis, the Engineer shall use the equipment submittal to determine by wave equation analysis that the piles are drivable.

If the ultimate pile capacity is to be determined by dynamic formula, a wave equation analysis is not required. The blow count required by the dynamic formula shall not exceed 12 blows per inch (25 mm).

The following hammer efficiencies shall be used in a wave equation analysis of vertical piles unless better information is available

Hammer Type	Efficiency (in Percent)
Single acting air/steam	67
Double acting air/steam	50
Diesel	80
Hydraulic or diesel with built-in energy measurement	95

Hammer efficiencies shall be adjusted for batter driving.

In addition to the other requirements of these specifications, the criterion that the Engineer will use to evaluate the driving equipment shall consist of both the required number of hammer blows per inch (25mm) at the required ultimate pile capacity and the pile driving stresses over the entire driving process. The required number of hammer blows indicated by the wave equation analysis at the required ultimate pile capacity shall be between 2 and 10 blows per inch (25mm) for the driving equipment to be deemed acceptable.

In addition, for the driving equipment to be deemed acceptable, the pile stresses, which are determined by the wave equation analysis for the entire driving operation shall not exceed the values below:

For concrete piles, tensile stresses shall not exceed 3 multiplied by the square root of the concrete compressive strength, f'c, in pounds per square inch plus the effective prestress value, i.e., [3(f'c)^0.5 + prestress] where f'c is given in psi, [7.9(f'c)^0.5 + prestress] where f'c is given in kPa and compressive stresses shall not exceed 85 percent of the compressive strength minus the effective prestress value, i.e., (0.85 f'c - prestress). Design compressive loads shall not exceed maximum allowable stress in Table 1810.3.2.6 of the Building Code.

During pile driving operations, the Contractor shall use the approved system. Any change in the driving system will only be considered after the Contractor has submitted revised pile driving equipment data to the Engineer. The Contractor will be notified of the acceptance or rejection of the driving system changes within 2 working days of the Engineer's receipt of the requested change. The time required for submission, review, and approval of a revised driving system shall not constitute the basis for a contract time extension to the Contractor.

Approval of pile driving equipment shall not relieve the Contractor of responsibility to drive piles, free of damage, to the required ultimate pile capacity and, if specified, the minimum penetration, shown in the contract documents.

B. Hammers

1. General: Piles shall be driven with an air, a diesel, or a hydraulic hammer conforming to these specifications. Pile driving hammers shall be of the size needed to develop the energy required to drive the piles at a blow count that does not exceed 12 blows per inch (25 mm) at the required ultimate pile capacity.
2. Air Hammers: If a dynamic formula is used to establish the required blow count, the weight of the striking parts of air hammers used shall not be less than one-third the weight of pile and drive cap, and in no case shall the striking part have a weight less than 1.4 tons (1.25 tons). If a wave equation analysis is used to establish the required blow count and driving stresses, this limitation on ram weight does not apply. The plant and equipment furnished for air hammers shall have sufficient capacity to maintain, under working conditions, the pressure at the hammer specified by the Manufacturer. The hose connecting the compressor with the hammer shall be at least the minimum size recommended by the Manufacturer. Hammer performance shall be evaluated at the end of driving by measuring blows per minute and comparing with the Manufacturer’s recommendations.
3. Diesel Hammers: Some open-end (single acting) diesel hammers are equipped with a device to measure impact velocity at all times during pile driving operations. If this device is not available, the stroke shall be obtained by measuring the speed of operation either manually or with a device that makes the measurement automatically. Closed end (double acting) diesel hammers shall be equipped with a bounce chamber pressure gauge in good working order, mounted near ground level so as to be easily read by the Engineer. The Contractor shall provide a correlation chart of bounce chamber pressure and potential energy.
4. Hydraulic Hammers: Hydraulic hammers shall be equipped with a system for measurement of ram energy. The system shall be in good working order and the results shall be easily and immediately available to the engineer.
5. Additional Equipment or Methods: In case the required penetration is not obtained by the use of a hammer complying with the minimum requirements above, the Contractor may be required to provide a hammer of greater energy or, when permitted, resort to supplemental methods such as jetting or predrilling.

C. Driving Appurtenances

1. Hammer Cushion: All impact pile driving equipment except drop hammers shall be equipped with a suitable thickness of hammer cushion material to prevent damage to the hammer or pile. Some hammers are designed such that a hammer cushion is not required. These hammers are excluded from this requirement. Hammer cushions, where applicable, shall be made of durable manufactured materials that will retain uniform properties during driving.

Wood, wire rope, or asbestos hammer cushions shall not be used. A striker plate shall be placed on the hammer cushion to ensure uniform compression of the cushion material. The hammer cushion shall be replaced by the Contractor before driving is permitted to continue whenever there is a reduction of hammer cushion thickness exceeding 25 percent of the original thickness or, for air hammers, when the reduction in thickness exceeds the Manufacturer's recommendations.

2. Pile Cushion: A pile cushion shall protect the heads of concrete piles. The cushion thickness placed on the pile head prior to driving shall be selected by wave equation analysis so that the limiting driving stresses are not exceeded. If the required driving blow count is determined by a dynamic formula the cushion shall have a thickness of at least 4 inches (100mm). A new pile cushion shall be provided if, during driving, the cushion begins to smoke or excessive compression occurs. The pile cushion dimensions shall be such as to distribute the blow of the hammer uniformly over the entire cross-section of the pile. Pile cushions shall be protected from the weather and kept dry prior to use. Pile cushion shall not be soaked in any liquid unless approved by the Engineer. The use of manufactured pile cushion materials in lieu of a wood pile cushion shall be evaluated on a case-by-case basis. A used pile cushion in good condition shall be used for restrike tests.
3. Leads: Pile driving leads that align the pile and the hammer in proper positions throughout the driving operation shall be used. Leads shall be constructed in a manner that affords freedom of movement of the hammer while maintaining alignment of the hammer and the pile to ensure concentric impact for each blow. The leads shall be so designed as to permit proper alignment of battered piles when applicable. Leads may be either fixed or swinging type. Swinging leads, when used, shall be fitted with a pile gate at the bottom of the leads. The leads shall be adequately embedded in the ground, or the pile constrained in a structural frame such as a template to maintain alignment.
4. Followers: Followers shall be used only when approved in writing by the Engineer or when specified in the contract documents. For concrete piles, a pile cushion shall be used at the pile top and suitability of the follower shall be checked by wave equation analysis to verify the blow count, driving stresses and the ultimate pile capacity. For steel or timber piles, if a wave equation analysis is not performed the follower shall have an impedance between 50% and 200% of the pile impedance. The follower and pile shall be maintained in proper alignment during driving. The follower shall be of such material and dimensions to permit the piles to be driven to the blow count determined to be necessary.
5. Jetting: Jetting shall be permitted only if specified in the contract documents or approved in writing by the Engineer. The Contractor shall determine the number of jets, and the volume and pressure of water at the jet nozzles necessary to freely erode the material adjacent to the pile. The Contractor shall control and dispose of all jet water in a manner satisfactory to the Engineer, or as specified in the contract documents. If jetting is specified or approved by the Engineer and is performed according to the specifications or as approved by the Engineer, the Contractor will not be responsible for any damage to the site caused by jetting operations. If jetting is used for the Contractor's convenience, the Contractor shall be responsible for all damages to the site caused by jetting operations. Unless otherwise indicated by the Engineer or the contract documents, jet pipes shall be removed prior to or when the pile tip is 5 feet (1500 mm) above the minimum or final tip elevation and the pile shall then be driven without jetting to the final tip elevation or to the required ultimate pile capacity with an impact hammer. If the required ultimate pile capacity is not reached at the final tip elevation, the pile may be allowed to setup and then the required ultimate pile capacity will be determined by restriking the pile.

3.2 PREPARATION FOR DRIVING

A. Site Work
   1. Excavation: If practical, piles shall not be driven until after the excavation is complete. Any material forced up between the piles shall be removed to the correct elevation before concrete for the foundation is placed.
   2. Predrilling to Facilitate Driving: When required by the contract documents and/or to reduce vibrations, the Contractor shall predrill holes of a size specified, at pile locations, and to the depths shown in the contract documents, as recommended by the Geotechnical Engineer, or approved in writing by the Engineer. Any void space remaining around the pile after completion of driving shall be filled with sand or other approved material. The use of spuds shall not be permitted in lieu of predrilling, unless specified in the contract documents or approved in writing by the Engineer. Material resulting from drilling holes shall be disposed of as approved by the Engineer.
   3. Predrilled Holes in Compacted Fill: If required by the contract documents, piles to be driven through compacted fill of a depth greater than 5 feet (1500 mm) shall be driven in holes predrilled to natural ground. After driving the pile, the space around the pile shall be filled to the ground surface with sand or other approved material. Material resulting from predrilling the holes shall be disposed of as approved by the Engineer.

B. Preparation of Piling
   1. Pile Heads: Precast concrete pile heads shall be flat, smooth, and perpendicular to the longitudinal axis of the pile to prevent eccentric impacts. Prestressing strands shall be cut off below the surface of the end of the pile. The pile head shall be chamfered on all sides.

C. Protect structures, underground utilities, and other construction from damage caused by pile driving.

3.3 DRIVING

A. Unless approved by the Engineer, piles shall be driven to the required ultimate pile capacity (practical refusal), or the required ultimate pile capacity and minimum tip elevation, if specified, or the specified tip elevation.

   The ultimate pile capacity is usually confirmed by achieving the specified blow count which is the number of hammer blows required to cause one foot (300 mm) or one inch (25 mm) of penetration. The blow count shall always be measured, either during initial driving or by re-driving with a warm hammer after a wait period, as determined by the Engineer.

   For diesel hammers the stroke shall be recorded. Either energy or impact velocity shall be recorded for hydraulic hammers.

   If water jets are used in connection with the driving, the ultimate pile capacity shall be determined from the results of driving after the jets have been withdrawn.

The procedure used in driving the piles shall not subject them to excessive and undue abuse producing crushing and spalling of the concrete, injurious splitting, splintering, and brooming of the wood, or excessive deformation of the steel.

B. Heaved Piles: If pile heave is observed, level readings referenced to a fixed datum shall be taken by the Engineer on all piles immediately after installation and periodically thereafter as adjacent piles are driven to determine the pile heave range.

If during the driving process for adjacent piles, piles shall be re-driven:

- If they have more than ½ inch (13 mm) and end bearing is dominant
- If they have more than 1-½ inches (38 mm) and shaft friction is dominant.

If pile heave is detected for pipe or shell piles which have been filled with concrete, the piles shall be redriven to original position after the concrete has obtained sufficient strength and a proper hammer-pile cushion system, satisfactory to the Engineer, is used. The Contractor shall be paid for all work performed in conjunction with redriving piles due to pile heave, provided the initial driving was done in accordance with the specified installation sequence.

C. Obstructions: If piles encounter unforeseeable, isolated obstructions, the Contractor shall be paid for the cost of obstruction removal and for all remedial design or construction measures caused by the obstruction.

D. Installation Sequence: The order of installing piles in pile groups shall be either starting from the center of the group and proceeding outwards in both directions or starting at the outside row and proceeding progressively across the group.

E. Limiting Driving Stresses: Unless specified otherwise in the contract documents or by the Engineer the stresses induced during driving shall not exceed the limits set forth in section 4.1.

F. Driving of Test Piles: When required in the contract documents, test piles shall be furnished to the lengths specified and driven at the locations and to the elevations, ultimate pile capacities or blow counts directed by the Engineer before other piles are ordered. All piles shall be driven with approved impact hammers unless specifically stated otherwise in the contract documents. The same type and size hammer shall be used on the production piles.

The approval of driving equipment shall conform to the requirements of these Specifications. Unless otherwise approved by the Engineer, the Contractor shall excavate the ground at each test pile to the elevation of the bottom of the footing before the pile is driven. Test piles shall be driven at locations selected by the Engineer or as shown in the contract documents to explore possible subsurface variations.

G. Accuracy of Driving: Piles shall be driven with a variation of not more than ¼ inch per foot (1:50) from the vertical or not more than 1/2 inch per foot (1:25) from the batter shown in the contract documents.

After driving, the pile head shall be within 6 inches (150 mm) of plan locations for all piles capped below final grade.

No pile shall be nearer than 18 inches from any edge of the cap. Any increase in pile cap dimensions or reinforcing caused by out-of-position piles shall be at the Contractor's expense.

3.4 DETERMINATION OF ULTIMATE PILE CAPACITY

A. General: The ultimate capacity of the piles, and driving criteria, will be determined by the Engineer using Dynamic Testing: Dynamic testing shall be conducted in accordance with ASTM D4945.

The Contractor shall prepare for the required instrument attachment as directed by the Engineer.

The Contractor shall drive the pile as directed by the Engineer. If directed by the Engineer, the Contractor shall reduce the driving energy transmitted to the pile by using additional cushion or reducing the energy output of the hammer in order to maintain acceptable stresses in the piles. If non-axial driving is indicated by dynamic measurements, the Contractor shall immediately realign the driving system.

If the required ultimate pile capacity is not achieved at the end of driving, the Contractor shall restrike the dynamic test pile following a waiting period specified in the contract documents or as directed by the Engineer. The dynamic testing instruments are then reattached, the pile is redriven and the dynamic test is repeated. The hammer shall be warmed up before restrike begins. The maximum penetration required during restrike shall be 3 inches (75 mm) or the maximum total number of hammer blows required will be 20, whichever occurs first.

B. Wave Equation Analysis: When specified in the contract documents the Engineer, using a wave equation analysis, shall determine the driving criterion necessary to reach the required ultimate pile capacity. Soil and pile properties to be used in this analysis shall be as shown in the contract documents or as determined by the Engineer. The Contractor shall supply the Engineer the necessary information on his proposed driving equipment to perform the wave equation analysis.

3.5 SPLICING OF PILES

A. Where splices are unavoidable for steel or concrete piles, their number, locations, and details shall be subject to approval of the Engineer.

B. Concrete Piles: Full-length piles shall be used where practical. If splicing is permitted, concrete pile splice details shall conform to the contract documents, or as approved by the Engineer. Mechanical splices including drive- fit splices may also be used.

3.6 DEFECTIVE PILES

A. Manipulation of piles to force them into proper position, considered by the Engineer to be excessive, will not be permitted.

A pile damaged by reason of internal defects or by improper driving shall be corrected by one of the following methods approved by the Engineer for the pile in question:

- The pile is withdrawn if practicable and replaced by a new and, if necessary, longer pile.
- One or more replacement piles are driven adjacent to the defective pile.

A pile driven below the specified butt elevation shall be corrected by one of the following methods approved by the Engineer for the pile in question.

- The pile is spliced or built up as otherwise provided herein
- A sufficient portion of the footing is extended down to properly embed the pile.

A pile driven out of its proper location, fixed by the contract documents or by the Engineer, shall be corrected by one of the following methods approved by the Engineer for the pile in question:

- One or more replacement piles are driven next to the out of position piles.
- The footing is extended laterally to incorporate the out of location pile

Additional reinforcement is added.

Cost for remediating defective piles should rest with the party at fault.

3.7 PILE CUTOFF

A. General: All piles shall be cut off to a true plane at the elevations required and anchored to the structure as shown in the contract documents.

All cut-off lengths of piling shall remain the property of the Contractor and shall be properly disposed of.

END OF SECTION

SECTION 05 50 00
MISCELLANEOUS METALS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of miscellaneous metal as specified herein or shown on Contract Drawings.

1.2 SUBMITTALS

A. Submit shop drawings samples, and engineering data (sealed) in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 GENERAL REQUIREMENTS

A. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

A. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

A. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in

accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

A. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.7 ALUMINUM FINISHES

A. Unless otherwise specified, aluminum items shall have standard mill finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish. Aluminum surfaces to be in contact with plaster or concrete during construction shall be protected with a field coat conforming to CID A-A-344.

1.8 SHOP PAINTING

A. Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Access Doors: Access doors shall be the size and location as shown on the plans. All doors and frames shall be stainless steel or appropriately fabricated aluminum.

Covers shall be reinforced to support a minimum live load of 300 psf with a maximum deflection of 1/150th of the span. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing. Operation of the cover shall not be affected by temperature.

The cover shall be aluminum or stainless steel with diamond pattern. The frame shall be aluminum or stainless steel with full anchor flange around the perimeter. The hinges shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with

Type 316 stainless steel bolts and locknuts. Provide a 1-1/2" drain coupling located in the right front corner of the channel frame.

Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the hatch and the latch release shall be protected by a flush, gasketed, removable screw plug.

Hardware shall be as follows: Heavy forged brass hinges, each having a minimum 3/8" (9.5mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame. The cover shall be equipped with a hold open arm which automatically locks the cover in the open position. The cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electrocoated acrylic finish. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover. Compression spring tubes shall be an anti-corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be Type 316 stainless steel. Springs shall have an electrocoated acrylic finish for corrosion resistance.

B. Panels: Panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 16-gauge stainless steel with welded joints and finished with anchorage for securing into construction.

2.2 FLOOR GRATINGS AND FRAMES

A. Aluminum grating shall be designed in accordance with NAAMM MBG 531 to meet the indicated load requirements. Aluminum grating shall be minimum 1 1/2-inch I-bar depth spaced not more than 1 3/16 inches on center with maximum 4-inch cross bar spacing. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Grating panels shall be sized to limit panel weight to 80 lbs. Frames shall be of welded steel construction finished to match the grating.

2.3 FLOOR PLATES

A. Floor plates shall be 1/4-inch minimum thickness, pattern as indicated.

2.4 HANDRAILS

A. Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 50 pounds per foot applied horizontally to top of the rail, whichever is more severe.

B. Aluminum Handrails: Handrails shall consist of 1-1/2-inch nominal Schedule 40 minimum pipe ASTM B 429. Railings and pipe collars shall be mill finish. All fasteners shall be Series 300 stainless steel.

1. Jointing shall be by one of the following methods:
   a. Flush type rail fittings welded and ground smooth with splice locks secured with 3/8-inch recessed head setscrews.
   b. Mitered and welded joints, made by fitting post to top rail and intermediate rail to post and corners, shall be groove welded and ground smooth. Splices, where allowed by the Engineer, shall be butted, and reinforced by a tight fitting dowel or sleeve not less than 6 inches in length. Dowel or sleeve shall be connected to one side of the splice by tack welding or by using epoxy cement.
   c. Railings shall be assembled using slip-on aluminum-magnesium alloy fittings for joints. Fittings shall be fastened to pipe or tube with 1/4 inch or 3/8-inch stainless steel recessed head setscrews. Assembled railings shall be provided with fittings only at vertical supports or at rail terminations attached to walls. Expansion joints shall be at the midpoint of panels. A setscrew shall be provided in only one side of the slip-on sleeve. Alloy fittings shall conform to ASTM B 26/B 26M.
2. Removable sections, toe-boards and brackets shall be provided where required, using flange castings as appropriate.

2.5 LADDERS

A. Ladders shall be stainless steel or aluminum, fixed rail type in accordance with ANSI A14.3.

2.6 SAFETY CHAINS

A. Safety chains shall be welded stainless steel, proof coil chain tested in accordance with ASTM A 467/A 467M, Class CS. Safety chains shall meet current OSHA regulations. Safety chains shall be straight link style, 3/16-inch diameter, minimum 12 links per foot and with bolt type snap hooks on each end. Eye bolts for attachment of chains shall be galvanized 3/8-inch bolt with 3/4-inch eye, anchored as indicated. Two chains shall be furnished for each guarded opening.

2.7 SAFETY NOSING

A. Safety nosings shall be of cast aluminum with cross-hatched, abrasive surface. Nosing shall be 3 inches wide and terminating at not more than 6 inches from the ends of treads, except nosing for metal pan cement-filled treads shall extend the full length of the tread. Safety nosings shall be provided with anchors not less than 3/4 inch long. Integrally cast mushroom anchors are not acceptable.

2.8 METAL STAIRS

A. Treads: Grating as specified. Provide integral corrugated non-slip nosing.

B. Risers: Grating treads shall be solid plate welded to trailing edge of tread or landing and shall be a minimum 3/16” thick and 4” thick.

C. Landings: Grating as specified. Provide integral corrugated non-slip nosing at edge acting as stair tread /nosing.

D. Design live load for landing platform and supporting structure.
   1. 100 PSF, uniform load.
   2. 300 lbs. concentrated load on 4" square area.
   3. All components to be adequate for the uniform load or the concentrated load, whichever requires the stronger component.
   4. Maximum deflection: 1/300 of span under a superimposed live load of 100 PSF.

E. Design, fabricate, and install in compliance with NAAMM and applicable codes.
   1. NAAMM AMP 510
      a. Exterior at site structures and equipment: Industrial Class
      b. Interior or exterior at buildings: Service Class

F. Handrails and Guardrails: Refer to Paragraph 2.4 of this section.

G. Material shall be aluminum.

2.9 ACCESS HATCHES

A. Access hatches shall be single leaf type and of the specific clear openings as shown on the Drawings, and shall be equal to Series W1S Access Door as manufactured by Halliday Products, or Type TPS as manufactured by U.S. Foundry.

B. Mounting bolts and expansion shields shall be AISI Type 316 stainless steel. Access hatch material shall be 6063-T6, 0.25-inch aluminum alloy diamond plate with a uniform live load rating of 300 psf.

C. Access hatch shall incorporate a 0.25-inch aluminum channel frame with continuous anchor flange and a 1.5-inch drainage coupling.

D. Access hatch shall close flush with the frame and rest on a built-in neoprene gasket.

E. Access hatch shall open to 90 degrees and automatically lock with a Type 316 stainless steel hold open arm with aluminum release handle. Door shall open in direction of above grade piping or valve operators. Handle, hinges, and all fastening hardware shall be Type 316 stainless steel. Unit shall lock with pad lock lugs. Unit shall carry a minimum 10-year guarantee against defects in materials and workmanship.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 ATTACHMENT OF HANDRAILS

A. Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

B. Installation of Aluminum Handrails

Installation shall be by means of flanges anchored to concrete or masonry by expansion shields or base plates or flanges bolted to stringers or structural steel framework. Bolts used to anchor aluminum alloy flanges shall be stainless steel of a size appropriate to the standard product of the manufacturer. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals or portland cement concrete, the contact surface shall be given a heavy coating of bituminous paint or asphalt varnish.

3.3 MOUNTING OF SAFETY CHAINS

A. Safety chains shall be mounted 3 feet 6 inches and 2 feet above the floor.

3.4 INSTALLATION OF SAFETY NOSINGS

A. Nosing shall be completely embedded in concrete before the initial set of the concrete occurs and shall finish flush with the top of the concrete surface.

END OF SECTION

SECTION 26 00 13
ELECTRICAL POWER AND SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division 1 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.2 DEFINITIONS

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Indicated: Shown on the Drawings.

E. Noted: Indicated or specified elsewhere.

1.3 MATERIAL NOT FURNISHED

A. Unless otherwise noted, the following are furnished and installed under other Divisions:

1. Motors
2. Vendor-supplied motor starters
3. Electric heating and air conditioning equipment
4. Building energy management systems
5. Electrical heat tracing
6. Pilot and control devices for the above equipment

B. All power wiring including associated terminations is provided under this Division. Control and signal wiring shown on the electrical drawings, including associated terminations is also provided under this Division. Control wiring for mechanical equipment not shown on the electrical drawings is provided under the applicable mechanical Division. Where digital communications cables (fiber optic cables, RS-485 cables, etc.) are specified under the applicable instrumentation Division, cable

pulling and installation in raceways shall be provided under this Division with any required splices and all terminations provided under the instrumentation Division.

1.4 LOCAL CONDITIONS

A. Power will be supplied from the existing Owner's distribution system. Provide feeders and connections to existing equipment as indicated on the Drawings. No power interruptions to existing equipment are permitted unless schedule for same has been approved by the Owner and coordinated with the power company. Make necessary arrangements with the power company for temporary service requirements and any removal/reinstallation of utility metering equipment.

B. Instrumentation and controls will be tied into the Owner's existing system. Refer to the Drawings and Specifications for interface requirements.

1.5 QUALITY ASSURANCE

A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies.

C. Industry Standards: Standards organizations and their abbreviations, as used herein, are as follows. Applicable date for industry standards is that in effect on the date of advertisement of the Project.

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. Federal Specifications (FS)
4. Institute of Electrical and Electronics Engineers (IEEE)
5. Insulated Cable Engineers Association (ICEA)
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories, Inc. (UL)

1.6 SUBMITTALS

A. Make all submittals in accordance with the requirements of Division 1. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned, and stamped approval is not required prior to installation.

C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.7 RECORD DRAWINGS

A. Furnish record drawings in accordance with the requirements of Division 1. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) or as digital media and shall include:

1. Title page with Project name; installing contractor's name, address and telephone number; date of installation and warranty period.

2. Index sheet.

3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.

4. Coordination Study (if applicable) and written certification that devices have been set in accordance with the study.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any tests required in the individual equipment sections.

1.8 ARC FLASH STUDY

A. Description: Conduct and submit an arc flash study to facilitate compliance with NFPA 70E, Handbook for Electrical Safety in the Workplace. Arc Flash Study shall be performed using software specifically for the purpose and all calculations shall comply with IEEE 1584. The Contractor may prepare the study using talent employed directly by the Contractor, by the electrical distribution equipment supplier, or by an independent preparer specializing in power system studies.

B. Documentation: Provide an Arc Flash analysis summary including as a minimum the following information:

1. Equipment name
2. Equipment voltage
3. Available fault current (3 phase bolted)
4. Arcing fault current
5. Protective device operating time
6. Arc flash boundary (in.)
7. Working distance (in.)
8. Incident Energy (cal/cm^2)
9. Protective clothing category

Provide arc flash warning nameplates for each individual equipment item. Nameplates shall include the wording "WARNING – Arc Flash Hazard. Protective Equipment Required". Nameplate shall also include the analysis data as listed above, settings (where applicable) of the equipment main protective device and a description of protective clothing required.

C. Scope: Study shall include MCC-B1.

D. Study Data and Submittal Requirements: Fault current and equipment data are as specified above under "Coordination Study", Arc Flash Study shall be included with or submitted concurrently with the coordination study.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

PART 2 PRODUCTS

2.1 MATERIALS

Provide only new products of the manufacturer's latest design.

2.2 SUBSTITUTIONS

Where the words "or approved equal" follow the listed acceptable manufacturers, equal of other manufacturers are acceptable and request for substitution may be made submittal stage.

PART 3 EXECUTION

3.1 INSTALLATION

A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Engineer's consideration.

C. Do not stub up conduits prior to receipt of approved shop drawings showing conduit entry locations.

D. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.2 CERTIFICATION AND TESTS

A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION

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SECTION 26 05 00
ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SCOPE

This Section includes basic materials and methods common to all Sections of Division 26.

1.2 SUBMITTALS

Submit product data.

PART 2 PRODUCTS

2.1 BOXES

A. Cast Boxes: NEMA 250; NEMA Type 4, galvanized cast iron or cast aluminum box and cover, neoprene gasket, stainless steel cover screws, UL listed as raintight. Provide flat-flanged type for surface mounting.

B. Corrosion Resistant Boxes: UL 508, type 304 stainless steel, NEMA Type 4X. For boxes larger than 12-inches in any dimension provide hinge on one side and stainless steel clamp latches (equal to Hoffman A-L23SS) on the other side(s). Hoffman Bulletin A-4 or approved equal.

2.2 WIRING DEVICES

A. Switches: FS W-S-896, 20 amp, 120-277 volt, gray handle.

B. Receptacles: NEMA WD-1; 5-15R; nylon face; gray. Exceptions: Provide specific use receptacles where indicated. Provide 5-20R receptacles for branch circuits serving one device.

C. Receptacle, Ground Fault Circuit Interrupter: Duplex, specification grade, tripping at 5-milliamps; 125-volt, configuration 5-20R.

D. Indoor Device Plates: Type 302 stainless steel, 0.030-inch thick minimum, satin finish.

E. Indoor Corrosion Resistant (NEMA 4X) Cover Plates: Type 302 stainless steel, specification grade, gasketed, with silicone rubber mat, equal to Pass & Seymour 4515 or 4151FS for toggle switches. Cast aluminum, gasketed, Pass & Seymour CA Series or approved equal for receptacles. For heat tape, instruments, or other devices which are continuously plugged in, provide die cast aluminum, suitable for wet locations while-in-use, Hubbell WP26 or approved equal.

F. Outdoor Weatherproof (NEMA 3R and NEMA 4X) Cover Plates: Stainless steel, specification grade, gasketed, Sierra WP Series or approved equal for toggle switches. Die cast aluminum,

suitable for wet locations while in use. Hubbell WP26 or approved equal for all outdoor receptacles.

2.3 DISCONNECT SWITCHES

A. Disconnect Switches: UL-98 and NEMA KS-1; heavy duty, quick make, quick break type; horsepower and i2t rated. Provide lever type operating handle directly connected to the switch mechanism; rocker types are not acceptable. Include padlocking provisions and nameplate clearly indicating "ON" and "OFF" positions. Equip all switches with a ground lug and, where neutral conductors are scheduled, provide insulated neutral lugs. Where indicated on the Drawings provide DPDT auxiliary contacts rated 10 amps at 120 VAC minimum.

B. Fusible Switches: Equip with rejection clips for fuse types noted.

C. Enclosure: Stainless steel meeting NEMA 3R, 4X and 12 requirements for all process areas and outdoors. Sheet metal; NEMA 1 for indoor dry locations only.

D. Acceptable Manufacturers: ABB/General Electric, Eaton, Siemens, Square D or approved equal.

2.4 CONTROL STATIONS

A. Pushbuttons, Selectors and Pilot Lights: 30mm, 600 volt, heavy duty, factory sealed. Provide LED lamps in pilot lights.

B. Enclosure: Stainless steel meeting NEMA 4X and NEC Class I, Division 2, Group C and D requirements.

C. Acceptable Manufacturers: Allen-Bradley Bulletin 800H or approved equal.

2.5 INDIVIDUAL SURGE SUPPRESSORS

A. Surge Suppressor: Listed in accordance with UL 1449, 4th Edition and UL 1283. Device shall provide surge current diversion paths for 120 VAC circuit application; L-N, L-G, and N-G. Device shall be fused with a surge rated fuse and incorporate a thermal cutout device. An audible alarm shall indicate protection failure. Minimum surge current capability shall be 50 kA.

B. Enclosure: NEMA 4X stainless steel.

C. Acceptable Manufacturers: Advanced Protection Technologies TE/XP Series or ABB/GE Tranquell (suppressor) and Hoffman (enclosure) or approved equal.

2.6 FUSES

A. Fuses: Current limiting, non-renewable type, rated 200,000 AIC, with rejection feature; Class J or as required by load for ratings 600 amp and below and Class L for ratings 601 amp and above.

B. Acceptable Manufacturers: Bussmann, Chase-Shawmut, Littelfuse or approved equal.

2.7 ELECTRICAL IDENTIFICATION

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Wire and Cable Markers: Plastic, split sleeve or tubing type, Brady Type XC, Thomas & Betts Type EZCODE or approved equal.

PART 3 EXECUTION

3.1 BOXES

A. Provide boxes as shown on the Drawings and as required for splices, taps, wire pulling, and equipment connections. Support boxes independently of conduit. Provide knockout closures for unused openings.

B. Box locations shown on the Drawings are approximate unless dimensioned.

C. Unless otherwise noted, use only stainless steel boxes. Cast boxes may be used for wiring devices.

D. Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum bending radius for the conductors.

E. Use PVC coated boxes wherever PVC coated conduit is indicated. Exceptions: stainless steel is permitted for boxes larger than 4 inches square.

3.2 WIRING DEVICES

A. Secure devices to outlet boxes without depending on device plates to pull them tight. Install a bonding jumper between all devices and outlet boxes. Install receptacles with ground pole down.

B. For cord and plug connected equipment, coordinate receptacle configuration with equipment supplied.

3.3 DISCONNECT SWITCHES

A. Provide switches with voltage, ampere, and number of poles as indicated on the Drawings.

B. Switches are non-fused type, unless Drawings note otherwise, or the switch is used as a disconnect for an item of equipment with a maximum fuse size designated on the nameplate. In such cases, provide fusible type with appropriate fuse. If fusible switches protect conductors with an ampacity less than the rating of the switch, provide a nameplate on the inside front cover of the switch designating the maximum allowable fusing.

C. Install switches so they are rigidly supported and readily accessible. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

D. For disconnect switches serving motors with space heaters, provide lamecoid nameplate engraved “WARNING – Motor space heater energized with switch open”.

3.4 CONTROL STATIONS

Install control stations so they are rigidly supported and located so as not to impair access to equipment for maintenance.

3.5 INDIVIDUAL SURGE SUPPRESSORS

Install suppressors so they are rigidly supported and accessible.

3.6 FUSES

Equip all fusible devices with fuses. Replace all blown fuses up to final acceptance of the Project. At the completion of the Project, turn over to the Owner spare fuses for each type and size installed; six each for ratings 60 amps and below, and three each for ratings above 60 amps.

3.7 ELECTRICAL IDENTIFICATION

A. Provide nameplates for all enclosed circuit breakers and other items of electrical distribution equipment. Engrave with the equipment identification as indicated and the voltage, current and interrupting rating. Attach nameplates two-part epoxy glue.

B. Provide wire markers on each conductor in control panels, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

END OF SECTION

SECTION 26 05 10
WIRE AND CABLE

PART 1 GENERAL

1.1 SCOPE

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.2 SUBMITTALS

A. Submit product data.

B. Submit test results as listed in Part 3.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Power Conductors: Aetna, American, Cablec, Continental, Okonite, Pirelli, Southwire or Triangle.

B. Signal Circuit Conductors: Belden, Continental, Dekoron or Penn.

C. Connectors: Burndy, Thomas & Betts, Ideal or OZ.

D. VFD Cable: Olflex – VFD.

E. Fiber Optic Cable: Corning – P/N 012K8P-31130-29.

F. Fiber optic Connectors: Corning – 95-101-41-SP.

G. Pulling Compounds: Water soluble, Polywater J.

H. Wire and Cable Markers: Plastic, split sleeve or tubing type, Brady Type XC or T & B Type SM.

I. Substitutions: Products listed or approved equals.

2.2 BUILDING WIRE

A. Thermoplastic Insulated Building Wire: NEMA WC-5.

B. Feeder and Branch Circuits: Single conductor; 98 percent conductivity copper; 75/90 degrees C; 600 volt PVC insulated with nylon jacket; Type THWN/THHN for sizes #1 AWG and smaller. Sizes larger than #1 AWG are XLP insulation type XHHW. Minimum size #12 AWG.

C. Control Circuits: Same as specified above for feeder and branch circuits, except minimum size #14 AWG.

2.3 VFD CABLE

VFD Cables: Stranded copped conductors, 100% shielding with foil tape and copper tape, oil and chemical resistant outer jacket, specifically designed for use with variable frequency drives. Cables are 4 conductor plus 2 – No. 14 signal conductors in sizes No. 12 AWG to No. 4 AWG and 4 conductor in sizes No. 2 AWG and larger.

2.4 REMOTE CONTROL AND SIGNAL CABLE

A. Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 600 volt polyethylene insulation; twisted pair or three conductor construction; 100 percent coverage aluminum polyester shield; #18 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

B. Category 6 Ethernet Cables: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together and covered with a PVC jacket; UL listed.

C. Fiber Optic Cables: Multimode, 62.5/125 OM1, outdoor, tight buffered fiber optic cable meeting functional requirements of ICEA-S-87-640, TIA-568 and TIA-598; rated -40 degrees C to +85 degrees C; polyethylene outer cable jacket. Provide 6 pairs minimum. Equip all strands with SC connectors (or other connector type coordinated with the Owner's existing fiber switch equipment) in termination cabinets, patch panels and associated enclosures.

PART 3 EXECUTION

3.1 GENERAL WIRING METHODS

A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.

B. Use 10 AWG conductor for 20 amp, 120 volt branch circuit home runs longer than 75 feet, and for 20 amp, 277 volt branch circuit home runs longer than 200 feet.

C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use wire markers at all terminals and connections. Color code power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

E. For conductors larger than #6 AWG color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.

F. Neatly train and lace wiring inside boxes, equipment, control panels and panelboards. Support to prevent conductor movement under fault conditions.

G. Provide separate pull and junction boxes to keep analog signal wiring separate from control and power wiring.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Unless otherwise indicated, install all conductors in conduit.

B. Pull all conductors into a raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricant for all pulls. Do not exceed the manufacturer's pulling tension.

C. Install wires in raceway after raceway system is physically complete and all mechanical work likely to injure conductors has been completed. Do not disassemble portions of the raceway system to facilitate installation of wires.

3.3 WIRING CONNECTIONS AND TERMINATIONS

A. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.

B. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.

C. Use mechanical connectors for splices, taps, fixture, and motor connections. Exception: Square thread helical spring plastic cap (wire nut) type connectors are acceptable for solid conductor splices and taps. Provide adapters as required for terminations of multiple conductors.

D. Use insulated throat, spade type crimp on connectors for strap screw device terminals. Exception: Receptacle back wiring provisions may be used for terminating solid conductors.

E. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.4 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Torque conductor connections and terminations to manufacturer's recommended values.

C. Continuity Tests: Ring all conductors for continuity and replace any open conductors.

D. Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 2 megohms to ground.

END OF SECTION

SECTION 26 05 26
GROUNDING

PART 1 GENERAL

1.1 SCOPE

A. Power system grounding.

B. Communication system grounding.

C. Electrical equipment and raceway grounding and bonding.

1.2 SYSTEM DESCRIPTION

A. The system consists of a ground grid for building/structure grounding; ground clusters for supplemental electrodes; and connections thereto of structures, equipment and electrical systems.

B. This section is intended to supplement the requirements of the NEC, particularly Article 250, and to differentiate among options allowed by the NEC. This Section is not intended to reiterate explicit requirements of the NEC.

C. Within this section the following definitions apply:

1. Ground Grid: A horizontal loop, electrically and mechanically continuous; routed approximately three feet outside the structure or floor slab perimeter. Where any building dimension exceeds 100 feet provide cross ties spaced not farther than 50 feet apart connected to the perimeter loop and to each other at all points of intersection to form a grid.

2. Ground Cluster: An assembly of three or more driven ground rods; spaced not closer than eight feet apart; each rod connected to the others in a closed delta configuration; and providing a resistance to ground of not more than 10 ohms.

3. Connect or Bond: For underground or otherwise inaccessible locations - a permanent connection made by exothermic welding, brazing, or similar process. For exposed and accessible locations - a connection made with clamps, bolts or similar fittings approved for the purpose.

1.3 SUBMITTALS

A. Submit product data.

B. Indicate scaled or dimensioned layout of ground grid and routing of grounding electrode conductors.

PART 2 PRODUCTS

2.1 Materials

A. Bare Conductors: ASTM B-8; stranded; hard drawn copper. Size unless otherwise noted is #4/0 AWG.

B. Ground Rods: UL 425H; 5/8-inch x 8 feet; high strength steel core with metallically bonded copper jacket.

C. Exothermic Weld Connection System: System shall meet the applicable requirements of ANSI IEEE Standard 80 "IEEE Guide for Safety in AC Substation Grounding" and IEEE Standard 837 IEEE "Standard for Qualifying Permanent Connections Used in Substation Grounding". Independent test data showing conformance to IEEE Std. 80 and IEEE Std. 837 shall be readily available. The system shall be approved by an OSHA Nationally Recognized Test Laboratory such as Underwriters Laboratories to ANSI UL 467 "Grounding and Bonding Equipment". Connections shall be suitable for exposure to the elements of direct burial in earth or concrete without degradation over the lifetime of the grounding system. Molds shall be made of graphite material capable of withstanding high temperatures that are capable of providing an average life of not less than fifty separate exothermic welds. Starting material (where used) shall consist of aluminum and copper and iron oxides. It shall not contain phosphorous, magnesium or any caustic, toxic or explosive substances. Low voltage battery starting (where used), shall use an electric ignition system that does not use starting material. Weld metal used for grounding connections shall contain copper oxide, aluminum and not less than 3% tin as the wetting agent. Weld metal used for cathodic connections shall not contain tin, but shall contain vanadium. Erico Products (Cadweld) or approved equal.

D. Mechanical Connectors: UL 486B listed; split-bolt, saddle, or cone screw type; tin-plated, high strength copper alloy with spacer to separate dissimilar materials; suitable for all combinations of connections of copper, aluminum, ACSR, AAAC, 5005, and steel.

E. Compression Connectors: Irreversible compression type using wrought copper extrusion material. Tools and dies specific for use with same connectors. Burndy Hyground or approved equal.

F. Ground Test Well: 12-inch diameter concrete well with 3000PSI concrete cap or 10-inch diameter Schedule 40 PVC well with four slots and 3/16-inch-thick steel cover with corrosion-resistant coating. Harger 360P42 or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Except as noted, use insulated ground conductors only where installed in a raceway. Use bare conductors for the ground grid, ground rod connections, and bonding of buildings, structures etc. Where a bare conductor is installed in a raceway use only non-metallic raceways; do not install bare conductors in metallic raceways.

B. Bury the grid three feet deep in the earth. Provide connections to earth with driven ground rods as indicated.

C. Drive ground rods so the top is 3 to 6-inches below finished grade. If rock is encountered then rods may be driven at an angle or grounding plates, as approved by the Engineer, may be used.

D. Construct ground clusters as follows: Start with three driven ground rods and measure the resistance to ground of each rod. If the parallel combination exceeds 10 ohms then add sections and drive the rods deeper, or drive additional rods until the specified value is obtained. Connect each rod to every other rod in the cluster. Exception: not more than three additional rods or sections (six total) are required for any one cluster.

E. Where bare conductors emerge from concrete encasement, provide a 4-inch (minimum) length of Schedule 40 PVC conduit set in the concrete to protect the conductor.

3.2 SERVICE ENTRANCE EQUIPMENT

A. Bond service entrance equipment ground bus to the ground grid with a No. 4/0 conductor.

B. Prior to energizing the system, remove the neutral link and meggar the system neutral. Repair any grounds then replace the neutral link.

3.3 BUILDINGS/STRUCTURES/EQUIPMENT

Bond transfer switch ground bar and enclosure to the ground grid.

3.4 SEPARATELY DERIVED SYSTEMS

Ground generator and transformer secondary neutral point to the ground grid.

3.5 UNDERGROUND DISTRIBUTION SYSTEMS

Route a bare conductor through each duct bank. Connect to the ground grid and equipment ground bus as applicable.

3.6 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Notify the Owner's representative at least one week in advance that the ground grid is ready for inspection. Obtain written notice to proceed before filling trenches, pouring slabs, or otherwise covering the work.

C. Compile and submit a list of ground resistance measurements for each ground rod in ground clusters. Measure and submit resistance to ground of service equipment ground bus.

D. Make resistance to ground measurements in normal, dry weather conditions not less than 24 hours after rainfall. Make measurements using the fall of potential method per IEEE Standard No. 142.

END OF SECTION

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SECTION 26 05 29
SUPPORTING DEVICES

PART 1 GENERAL

1.1 SCOPE

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 SUBMITTALS

Submit product data.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Prefabricated structural systems shall be B-Line Systems, Kindorf, Powerstrut, Unistrut or approved equal.

B. Fabricated aluminum per standard details.

2.2 MATERIAL

A. Interior, dry and non-corrosive locations

1. Support Channel: Galvanized or painted steel.

2. Hardware: Zinc plated.

3. Threaded Rods: 3/8-inch diameter, galvanized.

B. Interior, wet or corrosive locations:

1. Support Channel: Stainless steel, aluminum or fiberglass as indicated.

2. Hardware: 316 stainless steel, PVC coated steel or fiberglass as indicated.

3. Threaded Rods: 3/8-inch diameter, stainless steel.

C. Exterior locations

1. Support Channel: Stainless steel, aluminum or fiberglass as indicated.

2. Hardware: Stainless steel, PVC coated steel or fiberglass as indicated.

3. Threaded Rods: 3/8-inch diameter, stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using appropriate devices.

B. Unless noted otherwise, use toggle bolts or hollow wall fasteners in hollow masonry, plaster, precast hollow-core planks, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or adhesive anchors on cast-in-place concrete walls and slabs; self-drilling inserts in precast hollow-core planks; and sheet metal screws in sheet metal studs.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not attach to precast double-tee flanges or the bottom of the stem. Use pre-installed holes in side of stem.

E. Do not attach to bottom side of cast-in-place concrete beam or to cast-in-place concrete columns.

F. Do not use powder-actuated anchors, perforated straps or wire.

G. Make all supports from the structure, not the work of other trades. Do not drill or cantilever from structural steel members. Install supports so as not to weaken the structure.

H. Install free-standing electrical equipment on concrete pads. Anchor to concrete pad in accordance with manufacturer's instructions using a minimum of one anchor per corner of each unit/section.

I. Install surface-mounted cabinets and panelboards on channel or plywood backboard with minimum of four anchors.

J. Cutting, drilling, nicking, or damaging reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any existing concrete for anchorage, Contractor shall locate existing reinforcing steel and/or pre-stressed tendons using concrete imaging equipment, such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and existing reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors would not allow 3-inch spacing to reinforcing steel/pre-stressed tendons.

K. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

END OF SECTION

SECTION 26 05 33
CONDUIT

PART 1 GENERAL

1.1 SCOPE

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Liquidtight flexible metal conduit and fittings.

D. Non-metallic conduit and fittings.

E. Underground duct banks.

F. Manholes.

1.2 SUBMITTALS

Submit product data.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Conduit: Allied, Republic, Triangle or Wheatland.

B. PVC Coated Conduit and Fittings: Ocal, Permacote or Robroy.

C. PVC Conduit: Cantex, Carlon or JM Eagle.

D. Fittings: Appleton, Crouse-Hinds, Oz or Thomas & Betts.

E. Nonmetallic Flexible Conduit and Fittings: Carlon Carflex.

F. Precast Manholes: Oldcastle Precast, Shaw or DeKalb Concrete Products.

G. Manhole Frames and Covers: Neenah Foundry.

H. Substitutions: Products listed or approved equals.

2.2 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: UL 6; ANSI C80.1; hot dip galvanized; minimum size 3/4-inch.

B. Rigid Aluminum Conduit: UL 6; ANSI C80.5; minimum size 3/4-inch.

C. PVC Coated Conduit: NEMA RN-1 or UL-6 rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.

D. Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit. Where PVC coated conduits are indicated all couplings, fittings, conduit bodies, pipe straps, U bolts, beam clamps, flex connections and other accessories shall be stainless steel or shall have factory applied PVC coating. Use PVC coated hubs for connection of coated conduits - locknuts are not acceptable.

2.3 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. IMC: UL 1242; hot dip galvanized; minimum size 3/4-inch.

B. Fittings and Conduit Bodies: Use fittings and conduit bodies specified above for rigid steel conduit.

2.4 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: UL listed liquidtight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch. Exception: Where connected to devices with manufacturer supplied 1/2 or 3/8-inch hubs, match conduit size to hub size.

B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring. Where PVC coated conduits are indicated, provide PVC coated fittings for flex connections.

2.5 RIGID NONMETALLIC CONDUIT AND FITTINGS

A. Conduit: NEMA TC-2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC-3.

2.6 LIQUIDTIGHT FLEXIBLE NON-METALLIC CONDUIT AND FITTINGS

A. Conduit: UL listed, liquidtight consisting of a hard PVC spiral with flexible PVC covering. Minimum size is 3/4-inch.

B. Fittings: UL listed, molded from high-strength, glass-filled thermoplastic.

2.7 PRECAST MANHOLES

A. Dimensions: As indicated.

B. Concrete: 4,500 psi, suitable for H-20 loading.

C. Frames and Covers: 24-inches by 36-inches minimum; hinged; heavy duty; traffic-rated.

D. Cable Racks: Heavy duty nonmetallic stanchions and arms. Underground Devices CR36-B stanchions with RA8, RA14 or RA20 arms or approved equal.

E. Wireway for Analog Signal Wiring: As shown on the Drawings. Provide wireways in manholes only where analog signal wiring is installed. See the Ductbank Schedule in the Drawings.

PART 3 EXECUTION

3.1 CONDUIT SCHEDULE

A. Except as noted, use only rigid steel or IMC conduits.

B. Use liquidtight flexible steel conduit for connections to motors, transformers and other vibrating equipment. Maximum length is 3 feet unless approved by the Engineer.

C. Use PVC coated conduits where conduits are in direct contact with earth. Provide 24 inches minimum cover.

D. Rigid nonmetallic conduit may be used for underground concrete encased duct banks and in or below slab on grade. Exception: Use rigid steel or IMC conduit for analog signal circuits; 4 to 20 mA and AC or DC signals less than 25 volts.

E. Where PVC conduit is indicated, make a transition to rigid steel below grade or slab and continue above with rigid steel conduit. Exception: PVC may enter switchboards, motor control centers or other floor standing electrical equipment enclosures. Provide bell ends or socket end bell at enclosure entry.

F. Where aluminum conduit is indicated, conduit may not be installed in direct contact with concrete or masonry surfaces.

3.2 CONDUIT ARRANGEMENT AND SUPPORT

A. Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 25 percent additional conduits. Use concentric bends for parallel runs.

B. Avoid sources of heat when possible. Where unavoidable, maintain 3-inch clearance when crossing hot pipes and 12-inch clearance between parallel hot pipes, flues, heating appliances and other heat sources.

C. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one-hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

D. Support conduit at a maximum of seven feet on center and within three feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.

E. Do not support conduits from electrical distribution equipment or control panels.

3.3 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipecutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.

B. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LBD" or similar fittings to permit a straight pull from either direction. In no case shall a fitting be used which results in bending radius too small for the cable.

C. The maximum length between pull points is 400 feet. This length shall be reduced by one foot for each degree of bend.

D. Use hydraulic conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.

E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

G. Provide a 200-pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.

H. Install expansion joints equal to Crouse Hinds type XJ where conduit crosses building expansion joints and for straight runs in excess of 100 feet. For seismic joints use expansion joints equal to Crouse Hinds type XD.

I. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.

J. Provide watertight seals, equal to OZ type WSK, FSK, or CSM, where conduit penetrates exterior walls and where conduit passes between spaces normally at different temperatures. Seal duct bank and underground conduit entry with silicone sealant.

K. Obtain approved shop Drawings showing conduit entry space before stubbing conduits in floor standing electrical gear. Stub duct bank and underground conduits up a minimum of 2-inches above equipment pads and provide bushing.

L. In locations where the conduit cannot be turned, provide three piece threaded rigid couplings.

M. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.

N. Route conduits in slabs above grade above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1-inch and minimum cover is 2-inches. Route so conduits in slabs above grade do not cross. For slab on grade route conduits in a trench below slab at sufficient depth to permit vertical exit from slab. Home runs shall not be routed in slabs except where indicated.

O. Protect conduit threads from rust and damage during construction.

P. PVC Conduit Bends: Do not use methods which will deform or change the physical characteristics of the conduit. Use PVC-coated rigid steel factory elbows for bends in runs longer than 100 feet, and in runs which have more than two bends, regardless of length. Exception: Where concrete encased in slab or ductbank, GRS elbows may be used in lieu of PVC coated.

Q. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

R. PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch. Fill space between PVC coating and reducing fittings with silicone sealant.

S. Conductor Protection: Provide bushings on metallic and bell ends on PVC conduits unless conduit terminates in a hub or similar fitting.

3.4 UNDERGROUND DUCT BANK INSTALLATION

A. Install top of duct bank minimum 18-inches below finished grade with plastic warning tape 12-inches below finished grade.

B. Install conduit with minimum grade of 4-inches per 100 feet where manholes are utilized; otherwise level or follow finished grade. Slope or vary entire depth of duct bank so as to prevent moisture from draining into electrical equipment enclosures or interior spaces of buildings.

C. Terminate conduit in end bell at manhole entries.

D. Stagger conduit joints in concrete encasement 6-inches minimum.

E. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than four feet on centers to provide conduit spacing as indicated. Securely anchor conduit to prevent movement during concrete placement.

F. Construct duct banks with 3,000 psi concrete. Provide reinforcing as indicated.

3.5 EXCAVATION

A. Perform excavation in accordance with applicable OSHA requirements, including suitable bracing and shoring where required.

B. Excavation includes all excavation of trenches and pits, no matter what the substance encountered, and disposal of excess material.

C. Perform trench excavation by open cut. The top portion of the trench may be excavated with vertical or sloping sides to any width within the construction easement which will not cause unnecessary damage to adjoining structures, roadways, pavements, utilities, trees, or private property.

D. Backfill the first 18-inches with select material consisting of finely selected earth, stone dust, or sand. Place in 6-inch layers and compact with proper hand tools. Remaining backfill, if necessary, may be with general excavated material so long as the material consists of not more than 1/3 broken rock with no single rock weighing over 50 pounds.

3.6 BEDDING OF MANHOLES

Excavate manholes a minimum of 12-inches below the base elevation then bring the bed to the proper elevation with compacted stone or gravel, 3/4-inch and less in size. Thoroughly compact the bed by tamping or slicing with a flatbed shovel.

END OF SECTION

SECTION 26 24 19
LOW VOLTAGE MOTOR CONTROL CENTERS

PART 1 GENERAL

1.1 SCOPE

Low Voltage Motor Control Centers and AC variable frequency drives.

1.2 QUALITY ASSURANCE

A. Provide motor control centers manufactured and tested in accordance with NEMA ICS-2 and UL 845.

B. Provide a UL label where applicable, on each unit and each vertical section.

C. NEMA Classification: Class IS, Type B.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 01 34 00 of these Specifications, per NEMA classification as noted above, and including additional information as noted in the following Paragraphs.

B. Elementary Diagrams: Provide a separate elementary diagram for each starter unit following the format shown on the Drawings and showing numbered terminal points and interconnections to the first level of remote devices.

C. Reference Data: Submit front elevations and plan views showing section alignment, transition sections, etc. Include product data for individual control components including but not limited to circuit breakers, fuses, contactors, controllers, timers, relays, and pilot devices.

D. Submit installation instructions.

E. Submit field test results.

1.4 RECORD DRAWINGS

A. Shop drawings; as listed in Article 1.3 corrected to reflect the equipment as-built.

B. Operation and maintenance data including recommended maintenance procedures and intervals, spare parts listing, and instruction books for the equipment and components.

1.5 DELIVERY, STORAGE AND HANDLING

A. Arrange shipping splits as required for installation. Individually wrap each section and mount on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure and finish.

1.6 SPARE PARTS

A. Contacts: One set for each NEMA size furnished.

B. Coils: One for each NEMA size furnished.

C. Control Circuit Fuses: Three for each rating furnished. Provide one fuse puller.

D. Pilot Light Lamps: 10 percent of the number of lights furnished, two lights minimum.

E. Touch-Up Paint: One can.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Motor control centers shall be ABB ReliaGear with structure and bussing configured to directly bus-splice to the left side of existing MCC-B. MCC-B is existing General Electric 8000 Line MCC (Catalog #0681X0651F03). Drives shall be ABB or approved equal.

2.2 RATINGS

A. Service: 480 Volt, 3 Phase, 60 Hz.

B. Short Circuit: Unless otherwise indicated device interrupting rating and bus bracing is 30,000 amperes RMS symmetrical. Provide fully rated devices; series ratings are not acceptable.

C. Ampacity: 300 amps minimum for vertical bus, as indicated for horizontal bus. Rating to be in accordance with UL standards for temperature rise.

2.3 CONSTRUCTION

A. Equipment consists of the required number of vertical sections to accommodate all devices indicated and specified herein, each nominally 90-inches high and 20-inches deep. Sections are bolted together to form a rigid free standing, front accessible, dead front assembly. Maximum dimensions of MCC-B1 are 90”H x 40”W x 20”D.

B. Provide each section with isolated horizontal wireways at the top and bottom and isolated vertical wireways with hinged door and cable tie supports. Unused spaces are to have bussing for future units and blank door covers.

C. Enclosures are NEMA 1A gasketed painted in the manufacturer's standard grey over a rust inhibitor treatment.

2.4 VFD UNITS

A. Type: Variable frequency consisting of an input full wave rectifier and output inverter capable of producing a constant volts per hertz output suitable for operating a standard squirrel cage induction motor. Drives are pulse width modulated (PWM) 2-circuit board design with power components on one board and control components on another board. Drives shall be 6-pulse type equipped with load side dV/dt filters.

B. Ratings and Service Conditions

1. Speed Range: 6 to 60 Hertz with a constant torque load. Variable torque drives are permitted only where specifically noted.

2. Efficiency: 95 percent minimum at 100 percent speed.

3. Service Factor: 1.0 continuous; 1.5 for one minute.

4. Speed Regulation: 3 percent.

5. Operating Temperature: 0 to 50 degrees C.

6. Altitude: Up to 500 feet above sea level.

7. Relative Humidity: 0 to 98 percent.

8. Voltage Variation: +5 percent to -10 percent.

C. Equip drive with adjustments for minimum speed, maximum speed, acceleration-deceleration rate and current limit.

D. Protective Features

1. Input circuit breaker or fused disconnect switch to disconnect drive and control circuits. The variable speed drive package (VFD, circuit breaker, bypass and output contactors, controls and any other equipment associated with the drive or internal to the drive enclosure) shall have a withstand rating of 30,000 amps minimum. This withstand rating shall be stamped on a UL 508C nameplate attached to the VFD enclosure. Provide external operator handle that can be padlocked in the open position.

2. Output contactor to disconnect the motor when the drive is off. Interlock contactor with drive to prevent starting unless the drive is at zero volts and hertz. Provide restart delay to allow equipment to coast to rest before restarting. Output contactor may be rated in accordance with NEMA or IEC standards.

3. Solid state protective circuits with diagnostic capabilities for over/under voltage, loss of voltage, inverse time and instantaneous overcurrent, phase loss, phase unbalance, and thermal overload. Activation of all protective functions shall be accomplished without damage to the

drive and without need to replace any components. Over/under voltage and loss of voltage are to reset automatically when voltage returns to normal; all other conditions are to be manually reset.

4. Provide protective circuitry, if not inherent in the drive design, to shut down without damage to the drive if an out of synch condition occurs, i.e., running drive connected to a stopped motor, plug reversal or motor stall.

E. Provide the following door-mounted operator control devices:

1. Digital HMI to access all drive controls, monitoring functions, and configuration menus.

2. Local-Off-Remote selector switch for remote start/stop.

3. Manual Start-Stop selector and speed adjustment knob if not part of digital HMI.

4. Local-Remote selector for remote speed control.

5. Speed indicating meter: Included in drive diagnostic module.

6. Elapsed time meter: Included in drive diagnostic module.

7. Power on indicating light.

8. Other pilot devices as indicated in equipment Specification and as shown on the Drawings.

F. Provide an Ethernet/IP communication card and configure it to provide full drive monitoring functions over this network. This shall include, but not be limited to monitoring the following: local, auto, output frequency, output speed, motor current, motor torque, motor power, motor voltage, DC-link voltage, drive temperature, operating elapsed time, power in kW and kW-hrs, motor temperature as calculated by the thermal model, and status of all digital inputs and relay outputs. Speed set and speed verification shall also be controlled and monitored over this network. In addition, provide the following for remote control interface:

1. Remote speed command, isolated 4-20 mA DC.

2. Remote run/stop command, maintained dry contact, close to run.

3. Isolated 4-20 mA output signal for remote speed indication.

4. 120 volt, 10 amp dry contact for remote run indication; closed when running.

5. 120 volt, 10 amp dry contact for remote alarm indication; closed on occurrence of any fault condition.

6. Two 120 volt powered contacts, one closed when motor operates and one open when motor operates, for future accessories (motor space heater, pump seal water solenoid, etc.) Provide 150 VA spare capacity in drive control power transformer for accessories not listed in this Section.

7. Remote safety switch interlock. Configure interlock to shut down drive and control circuits when remote contact opens.

8. 120 volt, 10 amp dry contacts for NOT IN REMOTE indication: one N.O., one N.C.

9. Other signals and contacts as indicated in equipment Specification and as shown on the Drawings.

G. All controls shall operate at 120VAC or 12VDC. Provide a control power transformer for 120VAC controls and 12VDC power supply for low-voltage controls.

H. dV/dt Filters: The dV/dt low pass filter shall be designed to reduce motor failures caused by IGBT-based drives connected by long leads of up to 1,000 feet. The filter shall significantly reduce the common mode current available that can damage motor bearings and produce unwanted signals in control and other analog signals.

2.5 BUS

A. Material: Copper, tin or silver plated at all joints.

B. Isolation: Locate main bus at the top or center, completely compartmentalized with sliding or removable barriers for access to joints. Provide phase isolation for vertical bus by polyester barriers enclosing each phase bar or providing adequate creepage to restrict fault propagation. Plug all holes not used to stab in units.

C. Configure right end of main bus to allow splicing directly to existing General Electric 8000 Line MCC without the need for any transition section, top hat, etc. Provide splice plates and hardware to facilitate bus connection to existing MCC in the field.

D. Provide ground bus rated 600 amps minimum extending the full length of the lineup.

2.6 CONTROL DEVICES

A. Indicating Lights and Selectors: Heavy duty, oiltight, industrial grade with octagonal ring. Pilot lights are transformer type; LED; push-to-test. Equal to Allen-Bradley, Bulletin 800T.

B. Control Relays: Heavy duty, 600 volt, industrial grade, 10 amp contact rating. Equal to Allen-Bradley, Bulletin 700, Type P.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motor control centers on embedded sills within 4-inch-high concrete pad. Top of pad shall match existing pad beneath existing MCC-B. Place in location shown on Drawings in accordance with manufacturer's written instructions. Anchor to concrete pad in accordance with applicable Structural Sections of these Specifications. Drilling into reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any concrete for anchorage, Contractor shall locate reinforcing steel and/or pre-stressed tendons using concrete imaging equipment such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide

minimum spacing of 3 inches between anchors and reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors will not allow 3-inch spacing to reinforcing steel/pre-stressed tendons. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

B. Tighten accessible bus connections and mechanical fasteners after placing motor control center.

C. Touch up paint scratches and vacuum to remove construction debris and dirt. Install all doors, wireway covers etc., and plug any unused device holes.

D. Verify motor phasing/rotation and alignment prior to operation.

E. Ensure adequate space for air circulation around drive ventilation openings.

F. Provide services to configure and program the drive's operational and protection set points and software.

3.2 INSPECTION AND TESTING

A. Meggar each bus, phase-to-phase and phase-to-ground.

B. All factory tests and inspections shall be conducted, as specified, and approved by the Engineer prior to delivery of the equipment to site.

C. Following installation perform installation check per manufacturer requirements.

D. Following installation perform functional tests per manufacturer's requirements. Demonstrate performance by operating for a continuous period while varying the application load. Record drive input voltage and current as well as at the motor. Submit readings in test report.

END OF SECTION

SECTION 31 20 00
EARTHWORK

PART 1 GENERAL

1.1 SCOPE

A. This Section includes earthwork and related operations, including, but not limited to, clearing and grubbing the construction site, dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills, backfilling around structures and pipe, backfilling all trenches and pits, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork.

B. The Contractor shall provide all services, labor, materials and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing complete work as shown on the Drawings or specified in these Contract Documents.

C. Related Sections:

D. 1. Section 31 23 19 Dewatering
2. Section 31 23 33 Trench Excavation and Backfill
3. Section 31 25 00 Erosion and Sedimentation Control

1.2 SUBMITTALS

A. Dewatering Plan: Describe dewatering methods to be used.

B. Compaction tests in accordance with ASTM D 698.

C. Field density tests for each two foot lift, one test for each 8,000 square feet of fill.

1.3 QUALITY ASSURANCE

A. Soil testing will be performed by an independent testing laboratory as specified in Section 01 40 00 of these Specifications with the cost of testing paid as a Bid Form Allowance.

B. Contractor's duties related to testing include coordination with laboratory and delivery of samples.

1.3 GENERAL EARTHWORK

A. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the Contractor until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.

B. The Contractor shall control grading in a manner to prevent surface water from entering excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains or temporary

drains.

C. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition or condition thereof. Contractor shall transport excess material to a disposal site pay all costs related to spreading, grading and erosion control.

D. Tests for compaction and density shall be conducted by an independent testing laboratory selected by the Owner. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.

E. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Engineer.

F. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site to identify special construction problems which might arise as a result of groundwater, watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands.

PART 2 PRODUCTS

2.1 MATERIALS

A. Earthwork Materials

1. Fill Material, General

a. Approval Required: All fill material shall be subject to the approval of the Engineer.

b. Notification: For approval of imported fill material, notify the Engineer at least one week in advance of intention to import material, designate the proposed borrow area and permit the Engineer to evaluate test reports to confirm the quality of the material.

2. Topsoil: Original surface soil of the area capable of supporting native plant growth shall be free of weeds, large stones, roots, debris, or other unsuitable material which may inhibit plant growth.

3. Subsoil: Clean natural soil with plasticity index of 15 or less that is free of clay or lumps larger than 3-inches in any dimension, organic matter, debris, frozen material or any deleterious material that may cause settlement. Suitable material excavated from the site may be used as subsoil fill under optimum moisture conditions.

4. Granular Fill: Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SW, SP, SP-SM or SP-SC.

5. Sand Cushions and Sand Fill: Sand cushions and sand fill shall consist of a sand-gravel fill of such gradation that 100 percent will pass a 3/8-inch sieve and not more than 10 percent by weight is lost by washing.

6. Coarse Aggregate: Coarse aggregate shall conform to the South Carolina Department of Transportation Standard Specifications for Highway Construction 305 and shall have the following gradation:

Sieve Size	%Passing
2-inch	-
1-1/2 inch	100
1-inch	95 – 100
1/2-inch	25 – 60
No. 4	0 – 10
No. 8	0 – 5

7. Fine Aggregate: All fine aggregate shall conform to the South Carolina Department of Transportation Standard Specifications for Highway Construction 305 and shall have the following gradation:

Sieve Size	Percent Passing
No. 4	100
No. 16	25 - 75
No. 100	0 - 25

8. Pea Gravel: Pea gravel shall be clean, naturally rounded aggregate, 1/8 to 3/4-inch in diameter per ASTM C 33.

B. Sheeting and Shoring: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and excavations for structures in open cut and to prevent all movement that could endanger workers, structures, or utilities outside of the trench or pit.

1. General

a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a Professional Engineer registered in the State of South Carolina.

b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.

c. Neither the presence nor observation by the Engineer or Owner shall excuse the Contractor in any way from the responsibility to provide required sheeting and

shoring necessary for the protection of life and property during construction.

d. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety.

e. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

f. Steel drag shields or trench boxes may also be used subject to written approval of the Engineer.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.

3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall always be protected against lateral movement. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling within three feet of an existing building, structure or pipeline shall remain in place, unless otherwise directed by the Engineer.

4. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the structures and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

C. Other Materials: All other materials not specifically described but required for proper completion of the work of this Section shall be as selected by the Contractor subject to the approval of the Engineer.

D. Stockpile Area: An area onsite shall be used to stockpile soil material for backfilling around structures and to stockpile needed topsoil. The Owner will designate an onsite area at the Pre-Construction Meeting.

PART 3 EXECUTION

3.1 GENERAL

A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.

B. Topsoil

1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under

buildings, pavements, and from all areas which are to be cut to lower grades or filled.

2. With the Engineer's approval, topsoil to be used for finish grading may be stored on the site. Other topsoil may be used for filling in non-critical areas with approval of the Engineer.

C. Bracing and Sheeting

1. Furnish, put in place, and maintain all sheeting, bracing and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property or workers.

2. Properly support all excavations in locations indicated on the Drawings and where necessary to conform to all pertinent rules and regulations and these Specifications, even though such locations are not indicated on the Drawings.

3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.

4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.

D. Obstructions

1. Remove and dispose of all trees, stumps, roots, boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the work.

2. Exercise care in excavating around catch basins, inlets and manholes so as not to disturb or damage these structures.

3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.

4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.

E. Utilities to be Abandoned

1. When pipes, conduits, sewers or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged or sealed with brick and non-shrink grout.

2. Abandoned structures such as manholes or chambers shall be entirely removed unless otherwise specified or indicated on the Drawings.

3. All materials from abandoned utilities which can be readily salvaged shall be removed from the excavation and stored on the site at a location as directed by the Owner.

4. All salvageable materials will remain the property of the Owner unless otherwise indicated by the Owner.

F. Cutting Paved Surfaces and Similar Improvements

1. Remove existing pavement as necessary for installing pipe utilities and appurtenances or as otherwise shown on the Drawings.

2. Before removing any pavement, mark the pavement neatly, paralleling pipelines and existing street lines. Space the marks the width of the trench.

3. Break asphalt pavement along the marks using jack hammers or other suitable tools. Break concrete pavement along the marks by use of jack hammers or by scoring with a rotary saw and breaking below the score using jack hammers or other suitable tools.

4. Do not pull pavement with machines until completely broken and separated from pavement to remain.

5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.

6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.

7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.2 GENERAL SITE EXCAVATION

A. Method

1. All excavations for pipe appurtenances and structures shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting and supporting the sides of the excavation, for pumping and draining groundwater and wastewater which may be encountered, and for the removal from the excavation of all materials excavated.

2. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.

B. Grades

1. Excavate to grades indicated on the Drawings.

2. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material

1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.

2. Dispose of excavated material off site at locations secured by the Contractor and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street or alley. No debris shall be deposited on any private property except by written consent of the property owner. In no case shall any material be left on the Owner's property, shoved onto abutting private properties, or be buried in embankments or trenches on the Owner's property.

3.3 EXCAVATING FOR STRUCTURES

A. Earth Excavation

1. Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than two feet outside wall lines, to allow for formwork and inspection, and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.

2. No separate payment will be made for earth excavation. The cost of such work and all costs incidental thereto, shall be included in the price bid for the item to which the work pertains.

B. Rock Excavation

1. Definition of Rock: Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or comparable to Caterpillar 977 front-end loader and occupying an original volume of at least one cubic yard). The Engineer shall be the sole determinant as to the limits to which the material is classified as rock.

2. Excavation: Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as otherwise directed by the Engineer. The Contractor shall be responsible for obtaining any blasting permits required.

C. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.

1. Unsuitable Foundation Material

a. Any material, in the opinion of the Engineer which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer.

b. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.

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2. Pipe Trenches Beneath Structures

   a. Where piping or conduit passes beneath footings or slabs resting on grade, trenches shall be excavated to provide a minimum of 6-inches clearance from all surfaces of the pipe or conduit. The trench shall be backfilled to the base of the structure with concrete.

   b. No separate payment will be made for concrete backfill of trenches beneath structures. The cost of this work and all costs incidental to it shall be included in the price bid for the item to which the work pertains.

3. Unauthorized Excavation

   a. Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete as directed by the Engineer.

   b. Additional costs of corrective work, made necessary by unauthorized excavation, shall be borne by the Contractor.

3.4 GENERAL SITE FILL

A. Controlled Fill

1. Fill for roadways, parking areas, walks, structures, and building slabs on grade shall be controlled fill.

2. After the existing ground or excavated area has been proof-rolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.

3. The fill shall be placed in even layers not exceeding 10-inches in depth and shall be thoroughly compacted as herein specified.

4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.

5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.

6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

B. Proof-rolling

1. All areas where roadways, parking areas, sidewalks, structures, and buildings are to be

constructed on cut areas, compacted fill, and other areas, where indicated on the Drawings, shall be proof-rolled to detect soft spots prior to the placement of fill material and after placement of fill, which shall be construction of foundations.

2. Proof-rolling shall consist of moving a 20-30 ton loaded dump truck, or another pneumatic tire roller over the subgrade before the subgrade is shaped. Proof-rolling shall be witnessed by the Engineer.

3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels which shall be of such size and ply that tire pressures can be maintained between 80 and 100 pounds per square inch for 25,000-pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to 90 psi. The roller wheels shall be located abreast in a rigid steel frame. Each wheel shall be loaded with an individual weight box so that each wheel will bear an equal load when traversing uneven ground. The weight boxes shall be suitable for ballast loading such that the load per wheel shall be 25,000 pounds. The spacing of the wheels shall insure that the distance between the nearest edges of adjacent tires shall be not greater than one-half of the tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be operated no faster than 10 miles per hour.

4. Subgrade shall be proof-rolled with six passes of the truck or roller. Depressions that develop during the proof-rolling operation shall be filled with suitable material and those filled areas shall be proof-rolled with six passes of the roller. If, after having been filled and proof-rolled, the subgrade still contains depressions, the area shall be undercut to the full depth of the soft material or five feet whichever is less, backfilled, recompacted, and rolled to achieve a subgrade acceptable to the Engineer.

5. After the proof-rolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at every point.

6. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proof-rolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed as described under Article 3.3. The area shall then be scarified to a depth of at least 6-inches.

2. Fill materials shall be placed in continuous approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having a net compacted thickness of not over 6-inches.

3. Fill materials shall be placed at optimum moisture content within practicable limits (not less than one percent below optimum). Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.

D. Compaction

1. Fill materials shall be compacted to dry densities as determined by the Standard Proctor Compaction Test performed in accordance with ASTM D 1557.

2. Fill materials supporting roadways, parking areas, sidewalks, structures, and buildings, and backfill around structures, buildings, and walls shall be compacted to 98 percent of the maximum dry density. The top 12-inches of fill material supporting roadways, parking areas, sidewalks, structures, and buildings shall be compacted to 98 percent of the maximum dry density. Fill placed for general site grading shall be compacted to 95 percent of the maximum dry density.

3. Compaction of embankments shall be by sheepsfoot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

4. Compaction of backfill around structures shall be accomplished by heavy power tamping equipment.

5. If tests indicate that density of fill is less than that specified, the area shall be either recompacted or undercut, filled, and compacted until specified density is achieved.

E. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

F. Excess Material: Any excess earth excavation and unsuitable materials may be placed on the site as approved by the Engineer. Surfaces and slopes of fill shall be left smooth and free to drain.

G. Moisture

1. All fill shall be compacted with the moisture content as established by the 98 percent intercept on the moisture density curves or the moisture content at the shrinkage limit, whichever is less.

2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.

3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.5 GENERAL SITE BACKFILL

A. Backfill carefully to restore the ground surface to its original condition. Dispose of surplus material.

B. Compact backfill underlying roadways, parking areas, sidewalks, structures, and buildings to 98 percent of the maximum dry density.

C. Backfill for Pipe

1. Initial: Place initial backfill material carefully around the pipe above bedding in uniform 6-inch layers to a depth of at least 18-inches above the pipe bell. Compact each layer thoroughly with suitable hand tools. Do not disturb or damage the pipe. Backfill on both sides of the pipe simultaneously to prevent side pressures. Initial backfill material is earth material excavated from the trench which is clean and free of rock, organics, and other unsuitable material. If materials excavated from the trench are not suitable for use as initial backfill material, obtain suitable materials elsewhere.

2. Final: After initial backfill material has been placed and compacted, backfill with general excavated material. Place backfill material in uniform layers and thoroughly compact with heavy power tamping tools of the "Wacker" type.

3. Settlement: If trenches settle, re-fill and grade the surface to conform to the adjacent surfaces.

D. Backfilling Around Structures

1. General

a. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.

b. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.

c. Backfilling against walls is to take place after all the concrete in the affected members has attained the specified strengths.

2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

3.6 GRADING

A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of + 0.10 foot.

B. Compact backfill underlying roadways, parking areas, sidewalks, structures and buildings to 95 percent of the maximum dry density. The top 12-inches of backfill shall be compacted to 98 percent of the maximum dry density.

C. Treatment After Completion of Grading

1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Engineer.

2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.7 SURFACE WATER CONTROL

A. Regulations and Permits: Obtain all necessary soil erosion control permits in accordance with all pertinent rules, laws, and regulations of all applicable federal, state, county and municipal regulatory agencies.

B. Unfavorable Weather

1. Do not place, spread or roll any fill material during unfavorable weather conditions.

2. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

C. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

D. Pumping and Drainage

1. Provide, always maintain and use during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the work.

2. Dewater by means which will ensure dry excavations, preserve final lines and grades, do not disturb or displace adjacent soil.

3. Do not overload or obstruct existing drainage facilities.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.1 SCOPE

A. This section shall apply to all excavation, except trench excavation.

B. Construct all permanent work in areas free from water. Design, construct and maintain all wells, pumps, vacuum systems, sumps, dikes, levees, cofferdams and diversion and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove temporary works after they have served their purpose.

C. The Contractor shall be responsible for the stability of all temporary and permanent slopes, grades, foundations, materials and structures during the course of the Contract. Repair and replace all slopes, grades, foundations, materials and structures damaged by water, both surface and subsurface, to the lines, grades and conditions existing prior to the damage, at no additional cost to the Owner.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 CARE OF WATER

A. Except where the excavated materials are designated as materials for permanent work, material from required excavation may be used for dikes, levees, cofferdams and other temporary backfill.

B. Furnish, install, maintain and operate necessary pumping and other equipment for dewatering the various parts of the work and for maintaining the foundation and other parts free from water as required for constructing each part of the work.

C. Install all drainage ditches, sumps and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables and to drain impervious surfaces at final excavation elevation.

D. Dewater by means which will ensure dry excavations, preserve final lines and grades, do not disturb or displace adjacent soil.

E. All pumping, and drainage shall be done with no damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic or the work of other contractors, and in accordance with all pertinent laws, ordinances

and regulations.

F. Do not overload or obstruct existing drainage facilities.

G. After they have served their purpose, remove all temporary protective work at a satisfactory time and in a satisfactory manner. All diversion channels and other temporary excavations in areas where the compacted fill or other structures will be constructed shall be cleaned out, backfilled and processed under the same Specifications as those governing the compacted fill. Fill or grout all temporary dewatering wells unless otherwise directed by the Engineer.

H. When the temporary works will not adversely affect any item of permanent work or the planned usage of the Project, the Contractor may be permitted to leave such temporary works in place. In such instances, breeching of dikes, levees and cofferdams may be required.

3.2 DEWATERING

A. By the use of well points, pumps, tile drains or other approved methods, the Contractor shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.

B. Excavations shall be continuously dewatered to maintain a ground water level no higher than three to four feet below the lowest point in the excavation. Dewatering systems shall be designed to allow for localized variations in the depth of excavations required to reach a suitable foundation. Dewatering shall be accomplished well enough in advance of excavation to ensure that groundwater is already lowered prior to completing the final excavation to finish subgrade.

C. All destabilized subgrade conditions caused by inadequate or untimely dewatering operations shall be undercut and backfilled with suitable backfill material at no additional cost to the Owner.

D. Piezometric observation wells are required to monitor the ground water level to insure proper dewatering prior to excavation below the static water table. The number of wells required will vary depending on the size and depth of structures.

END OF SECTION

SECTION 31 23 33
TRENCH EXCAVATION AND BACKFILL

PART 1 GENERAL

1.1 SCOPE

A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the site utilities, including all pipelines, electrical conduits and duct banks shown on the Drawings and as specified.

B. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the utility and appurtenances in conformance with the lines and grades shown on the Drawings and as specified.

C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.

D. The trench is divided into five specific areas:

1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.

2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the utility.

3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.

4. Initial Backfill: The area above the haunching material and below a plane 18-inches above the top of the barrel of the pipe or the top of duct bank.

5. Final Backfill: The area above a plane 18-inches above the top of the utility.

E. The choice of method, means, techniques and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of manmade improvements to be protected, available easement or right-of-way and prevailing practice in the area.

1.2 QUALITY ASSURANCE

A. Density: All references to “maximum dry density” shall mean the maximum dry density defined by the “Maximum Density-Optimum Moisture Test”, ASTM D 698. Determination of

the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, "Density of Soil In Place by the Sand Cone Method", ASTM D 2937, "Density of Soil In Place by the Drive-Cylinder Method" or ASTM D 6938, "In-Place Density/Water content of Soil/Soil Aggregate by Nuclear Methods Shallow Depth".

B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory. All imported fill materials shall meet the requirements of on-site fill materials.

1.3 SAFETY

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

PART 2 PRODUCTS

2.1 TRENCH FOUNDATION MATERIALS

Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the South Carolina DHPT Specification 406.08 with the exception that slag or crushed slag shall not be used. Stone size shall be between No. 57 and No. CR 14, inclusive.

2.2 BEDDING AND HAUNCHING MATERIALS

A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.

B. Crushed stone utilized for bedding and haunching shall meet the requirements of the South Carolina DHPT Specification 406.08 with the exception that slag or crushed slag shall not be used. Stone size shall be No. 57.

C. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section at no additional cost to the Owner.

2.3 INITIAL BACKFILL

A. Initial backfill material shall be crushed stone or earth materials as specified for bedding and haunching materials.

B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

2.4 FINAL BACKFILL

Final backfill material shall be general excavated earth materials, shall not contain rock larger than 2-inches at its greatest diameter, cinders, stumps, limbs, man-made wastes and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

2.5 SELECT BACKFILL

Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

2.6 CONCRETE

Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

PART 3 EXECUTION

3.1 TRENCH EXCAVATION

A. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.

B. Trenches shall be excavated to the lines and grades shown on the Drawings with the centerlines of the trenches on the centerlines of the utilities and to the dimensions which provide the proper support and protection of the utility and other structures and accessories.

C. Trench Width for Pipelines

1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench

width shall be that which allows the proper consolidation of the haunching and initial backfill material.

2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.

3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 9-inches clearance between the rock and any part of the pipe barrel or manhole.

4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher Class or Type of bedding and haunching as shown on the Drawings for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the Engineer or Owner.

D. Trench Width for Electrical Duct Banks

1. The sides of all trenches for electrical duct banks shall be vertical to a minimum of one foot above the top of the duct bank. The maximum trench width shall be equal to the duct bank width as shown on the Drawings.

2. Wherever the prescribed maximum trench width is exceeded, the Contractor shall backfill around the duct bank with select backfill material at no additional cost to the Owner. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the Engineer or Owner.

3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide the duct bank to the dimensions shown on the Drawings. The maximum allowable width of rock excavation for payment shall be based upon a trench width equal to the width of duct bank shown on the Drawings.

E. Depth

1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the utilities and bedding to the dimensions shown on the Drawings.

2. Pressure Mains

a. Depth of Trenches: Excavate trenches to provide depths as shown on the Drawings. The depth of cover shall not exceed that as shown on the Drawings by more than two feet, without approval of the Engineer.

b. Excavate trenches to provide a minimum cover of four feet. Within the right-of-way of highways, streets or roadways, also excavate to place the top of the pipe a minimum of three feet below the nearest pavement edge or drainage ditch.

c. Excavate trenches to provide minimum cover of 18-inches for service lines.

d. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.

3. Electrical Duct Banks

a. Excavate trenches to provide a minimum cover of 18-inches.

b. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.

F. Excavated Materials

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.

2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.2 SHEETING, BRACING AND SHORING

A. Sheeting, bracing and shoring shall be performed in the following instances:

1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.

2. In caving ground.

3. In wet, saturated, flowing or otherwise unstable materials. The sides of all trenches and excavations shall be adequately sheeted, braced and shored.

4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.

5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.

C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.

D. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities.

E. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe or utility.

F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the utility and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed or is within three feet of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet below the surface.

G. Sheet piling within three feet of an existing structure or utility shall remain in place, unless otherwise directed by the Engineer.

3.3 DEWATERING EXCAVATIONS

A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.

B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.

C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the utility crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.

E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used

as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.

F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.4 TRENCH FOUNDATION AND STABILIZATION

A. The bottom of the trench shall provide a foundation to support the utility and its specified bedding. The trench bottom shall be graded to support the utility and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the utility, the trench will be determined to be unsuitable, and the Engineer shall then authorize payment for trench stabilization.

C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the Engineer, an unstable foundation for the pipe, the Contractor shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone as directed by the Engineer.

D. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.

E. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

3.5 BEDDIND AND HAUNCHING

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling

with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.

C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.

E. Gravity Sewers and Accessories: Lay PVC pipe with minimum Class "B" bedding. Lay all other pipe with Class "C" bedding, unless shown or specified otherwise.

1. Class "A" (Bedding Factor - 2.8): Excavate the bottom of the trench flat at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. Lay pipe to line and grade on concrete block. Place concrete to the full width of the trench and to a height of one-fourth of the outside diameter of the pipe above the invert.

2. Class "B" (Bedding Factor - 1.9): Excavate the bottom of the trench flat at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.

3. Class "C" (Bedding Factor - 1.5): Excavate the bottom of the trench flat at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-fourth the outside diameter of the pipe above the bottom of the pipe barrel.

4. Type 5: Excavate the bottom of the trench flat at a minimum depth as shown on the Drawings, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade before installing pipe. After the pipe has been brought to the proper grade, haunching material shall be carefully placed by hand and compacted to the top of the pipe.

F. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.

G. Pressure Mains

1. Ductile Iron Pipe

a. Unless otherwise shown on the Drawings or specified, utilize earth materials for

bedding and haunching. Type 2, 3, 4 and 5 bedding shall be as detailed on the Drawings.

b. Unless specified or shown otherwise, bedding shall meet the requirements for Type 2 Pipe Bedding. Unless specified or shown otherwise for restrained joint pipe and fittings, bedding shall meet the requirements for Type 3 Pipe Bedding.

c. Type 4 or Type 5 Pipe Bedding called for on the Drawings, specified or ordered by the Engineer, shall meet requirements for Type 4 or Type 5 Pipe Bedding, utilizing crushed stone bedding and haunching material.

2. Polyvinyl Chloride Pipe

a. Unless shown otherwise on the Drawings, utilize earth materials for bedding and haunching.

b. Unless shown otherwise on the Drawings, bedding and haunching shall meet the requirements for Type 2 Pipe Bedding, as detailed on the Drawings.

H. Excessive Width and Depth

1. Gravity Sewers: If the trench is excavated to excess width, provide the bedding class with the next higher bedding factor. Crushed stone haunching and initial backfill may be used in lieu of Class "A" bedding, where Class "A" bedding is necessitated by excessive trench width.

2. Pressure Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Drawings.

3. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.

J. Compaction: Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise.

3.6 INITIAL BACKFILL

A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.

B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 18-inches above the pipe barrel or duct bank. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.

C. Backfill on both sides of the pipe simultaneously to prevent side pressures.

D. Compact each layer thoroughly with suitable hand tools or tamping equipment.

E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless shown or specified otherwise.

F. For PVC gravity sewer, crushed stone shall be used for initial backfill up to 6-inches above the pipe barrel.

G. For electrical duct banks, place the first 12-inches of initial backfill materials as specified in this Section. Place in 6-inch layers, compact with suitable hand tools or tamping equipment.

H. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

3.7 CONCRETE ENCASEMENT FOR PIPELINES

Where concrete encasement is shown on the Drawings for pipelines, excavate the trench to provide a minimum of 6-inches clearance from the bell of the pipe. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 6-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

3.8 CONCRETE ENCASEMENT FOR ELECTRICAL DUCT BANKS

A. Install top of duct bank minimum 18-inches below finished grade with plastic warning tape 12-inches below finished grade.

B. Terminate conduit in end bell at manhole entries.

C. Stagger conduit joints in concrete encasement 6-inches minimum.

D. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than four feet on center to provide conduit spacing as indicated. Securely anchor conduit to prevent movement during concrete placement.

E. Where duct bank passes beneath footings or slabs, excavate to provide a minimum of 6-inches clearance between the conduits and the structure. Backfill to the base of the structure with concrete.

3.9 FINAL BACKFILL

A. Backfill carefully to restore the ground surface to its original condition.

B. The top 6-inches shall be topsoil obtained as specified in “Trench Excavation” of this Section.

C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of, at no additional cost to the Owner, in a manner approved by the Engineer. Surplus soil may be neatly distributed and spread over the site, if approved by the Engineer. If such spreading is

allowed, the site shall be left in a clean and sightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.

D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

E. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:

1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack".

2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.

3. In 24-inch layers, if using a hydra-hammer.

F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.

G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

3.10 ADDITIONAL MATERIAL

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material.

3.11 BACKFILL UNDER ROADS

Compact backfill underlying pavement and sidewalks, and backfill under dirt and gravel roads to a minimum 95 percent of the maximum dry density. The top 12-inches shall be compacted to a minimum of 98 percent of the maximum dry density.

3.12 BACKFILL ALONG RESTRAINED JOINT PIPE

Backfill along restrained joint pipe shall be compacted to a minimum 90 percent of the maximum dry density.

3.13 DETECTION TAPE

Where required, detection tape shall be buried 4 to 10-inches beneath the ground surface directly over the top of the utility. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finished grade surface.

3.14 TESTING AND INSPECTION

A. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with Article 1.02 of this Section.

2. Field density tests for each two feet of lift, one test for each 2,000 feet of pipe installed or more frequently if ordered by the Engineer.

3. Inspecting and testing stripped site, subgrades and proposed fill materials.

B. The Contractor's duties relative to testing include:

1. Notifying laboratory of conditions requiring testing.

2. Coordinating with laboratory for field testing.

3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.

4. Providing excavation as necessary for laboratory personnel to conduct tests.

C. Inspection

1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the Engineer.

2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.

D. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SCOPE

A. Submittals and Permits

1. Within 15 days after the date of the Notice to Proceed, the Contractor shall submit description, Drawings and schedule for proposed temporary and permanent erosion and sedimentation controls to the Engineer. The description and Drawings shall be consistent with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, as published by the Erosion and Sediment Control Division of the South Carolina Land Resources Conservation Commission. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. The Contractor shall obtain a copy of the South Carolina Department of Health and Environmental Control (DHEC) and Office of Ocean and Coastal Resource Management (OCRM) permits from the Engineer. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. A copy of the local soil erosion and sedimentation control ordinances is available from the Engineer.

2. Description and working drawings shall indicate controls which will ensure that storm water and drainage from the disturbed jobsite areas, which will be denuded, stripped or modified of its naturally existing or artificially established stabilization or protection against erosion, shall pass through some type of filter system before being discharged. These areas shall be kept sufficiently moist to control dust.

3. Submit a written plan for both temporary and permanent grassing. The plan shall include selection of species, dates and rates of application for seeding, fertilizer and mulching.

4. The schedule of values for lump sum Projects shall include separate costs for this work as well as maintenance costs.

B. Basic Principles

1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.

2. Minimize the disturbed area and the duration of exposure to erosion elements.

3. Stabilize disturbed areas immediately.

4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.

5. Retain sediment on site that was generated on site.

6. Minimize encroachment upon watercourses.

C. Implementation

1. The erosion and sedimentation control measures shown on the Drawings are minimal requirements. The Contractor's methods of operation may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures. The Contractor's failure to stabilize disturbed areas immediately following intermediate or final grading may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the Contractor's responsibility to determine and install said measures.

2. The Contractor shall notify the Engineer of any changes and/or additions to the erosion and sedimentation control plan necessary to accommodate the Contractor's methods of operation. No additional payment shall be made for erosion and sedimentation control measures made necessary by the Contractor's methods of operation.

3. The Contractor shall be solely responsible for control of erosion within the Project site and prevention of sedimentation of any adjacent waterways.

4. The Contractor shall install controls which will ensure that stormwater and drainage from the disturbed area of the Project site shall pass through some type of filter system before being discharged. The filter system must meet the requirements of the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas.

D. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.

2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.

3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

E. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

1.2 QUALITY ASSURANCE

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated herein and these Specifications.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

PART 2 PRODUCTS

2.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL MATERIALS

A. Silt Fence

1. Silt fence shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be either steel or pressure treated fir, southern pine or hemlock and shall be spaced not more than six feet on center. Silt fence shall be provided with netting to provide reinforcement when necessary. Silt fence shall have an Equivalent Opening Size (EOS) of 40 to 100. Silt fence fabric shall have a maximum permeability of 40 gallons per minute per square foot.

2. Silt fence fabric shall be equal to Mirafi 100X, Amoco 1380 or Exxon GTF-100 Series.

B. Hay bales shall be clean, seed-free cereal hay type.

C. Netting shall be 1/2-inch, galvanized steel, chicken wire mesh.

D. Filter stone shall be coarse aggregate conforming to South Carolina Department of Highways and Public Transportation, Aggregate Number CR-14.

E. Concrete block shall be hollow, non-load-bearing type.

F. Plywood shall be 3/4-inch thick exterior type.

2.2 RIP RAP

Rip Rap shall be field stone or hard quarry stone conforming to SCDOT Specification 804.02, Class A Riprap, with midrange size 6 inches, and maximum size 9 inches equally distributed. Geotextile filter fabric shall be non-woven, needle punched, non-biodegradable, filter fabric conforming to SCDOT Specification 804.11 for Type A, Class 1 fabric.

2.3 EROSION CONTROL CONCRETE

A. Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

B. Provide a concrete mix design for job mixed concrete for the Engineer's approval.

PART 3 EXECUTION

3.1 GENERAL

Standards: Provide all materials and promptly take all actions necessary to achieve effective erosion

and sedimentation control in accordance with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, local enforcing agency guidelines and these Specifications.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the creeks. The preferred method is to provide an undisturbed natural buffer, extending a minimal 25 feet from the top of the bank, to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the creek, or if the amount of sediment overwhelms the buffer, the Contractor shall place silt fences to filter the run-off and, if necessary, place permanent rip rap to stabilize the creek banks. When excavation activities disturb the previously stated preventative measures, or if they are not maintained, or whenever the construction activities cross the creeks, check dams shall be installed downstream and within 200 feet of the affected area.

B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawings, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials. Detention ponds, if constructed, shall be maintained in a condition ensuring that unfiltered water will not leave the pond.

C. Where permanent grassing is not appropriate, and where the Contractor's temporary erosion and sedimentation control practices are inadequate, the Engineer may direct the Contractor to provide temporary vegetative cover with fast growing seedings. Such temporary vegetative cover shall be provided by the Contractor in compliance with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, specifically in the selection of species, planting dates and application rates for seedings, fertilizer and mulching with the exception that kudzu shall not be permitted.

D. All erosion and sedimentation control devices, including check dams, shall be inspected by the Contractor at least weekly and after each rainfall occurrence and cleaned out and repaired by the Contractor as necessary.

E. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

3.3 PERMANMENT EROSION CONTROL

A. Permanent erosion control shall include:

1. Restoring the work site to its original contours, unless shown otherwise on the Drawings or directed by the Engineer.

2. Permanent vegetative cover shall be performed in accordance with Article 3.04 of this Section.

3. Permanent stabilization of steep slopes and creeks shall be performed in accordance with Article 3.05 of this Section.

B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the Project. In no event shall implementation be postponed when no further construction activities will impact that portion or segment of the Project. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.

3.4 GRASSING

A. General

1. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein for seeding, fertilizing, mulching, etc.

2. When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized and mulched in an effort to restore to a protected condition. Critical areas shall be sodded as approved or directed by the Engineer.

3. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.

4. Permanent grassing shall be of a perennial species.

B. Replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season. Outside of residential or landscaped areas, grass the entire area disturbed by the work on completion of work in any area. In all areas, promptly establish successful stands of grass.

C. Grassing activities shall comply with the Best Management Practices of the Erosion and Sediment Control Practices for Developing Areas, specifically for the selection of species, with the exception that kudzu shall not be permitted, planting dates and application rates for seeding, fertilizer and mulching. Where permanent vegetative cover (grassing) cannot be immediately established (due to season or other circumstances) the Contractor shall provide temporary vegetative cover. The Contractor must return to the site (at the appropriate season) to install permanent vegetation in areas that have received temporary vegetative cover.

3.5 RIP RAP

A. Rip rap shall be placed where shown on the Drawings and at all points where banks of drainage ditches are disturbed by excavation and where natural vegetation is removed from banks of the drainage ditches. Carefully compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a drainage ditch as well as crossing a drainage ditch.

B. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, rip rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground and the side next to the fill or cut shall have that same slope. After the rip rap is placed, the toe ditch shall be backfilled, and the excess dirt spread neatly.

C. Placement of Filter Fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be placed loosely to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet during construction. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the Owner.

D. Placement of Rip Rap: The rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural slope of the stream bank and stream bottom.

1. Stone Rip Rap: Stone rip rap shall be dumped into place to form a uniform surface and to the thickness specified on the Drawings. The thickness tolerance for the course shall be -6-inches and +12-inches. If the Drawings or the Bid do not specify a thickness, the course shall be placed to a thickness of not less than 18-inches.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aggregate base course on a prepared subgrade.

B. Related Sections:
1. Section 31 20 00 - Earthwork
2. Section 32 14 23 - Asphalt Concrete Paving

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-pound) rammer and a 457-mm (18-inch) drop.

B. ASTM International:
1. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
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).

C. SCDOT Standard Specifications:
1. Standard Specifications for Highway Construction, 2007, published by the South Carolina Department of Transportation.

1.3 SUBMITTALS

A. Section 01 34 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit to testing laboratory 10-pound sample of each type of aggregate in airtight containers.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate Base Course: Graded aggregate base course (GABC) conforming to Section 305 of SCDOT Standard Specifications.

B. Fine Aggregate: Fine Aggregate with gradations conforming to Division 300 of SCDOT Standard Specifications.

PART 3 EXECUTION

3.1 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting as specified in Section 31 20 00.

B. Any areas observed to “pump”, deflect excessively, or display instability of any kind should be removed and replaced with properly compacted dry suitable material. Do not place fill on soft, muddy, or frozen surfaces.

3.2 AGGREGATE PLACEMENT

A. Place aggregate in minimum 4-inch and maximum 10-inch layers and roller compact to specified density. When total thickness is 10 inches or less, place in one layer. When total thickness is greater than 10 inches, place in two equal layers.

B. Have each layer of material compacted and approved prior to placing succeeding layers.

C. Level and contour surfaces to elevations and gradients indicated on Drawings.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Use mechanical tamping equipment in areas inaccessible to roller compaction equipment.

3.3 TOLERANCES

A. Section 01 40 00 - Quality Requirements.

B. Maximum Variation from Thickness: 1/2 inch.

C. Maximum Variation from Elevation: 1/2 inch.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements.

B. Laboratory Material Tests: Conform to Modified Proctor ASTM D1557 or AASHTO T180.

C. In-place Compaction Tests: Conform to:
   1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. Compaction:
   1. 100 percent of maximum when measured in-place by standard methods.
   2. 98 percent of maximum when measured in-place by nuclear methods.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Compaction Tests: One test per 6-inch layer for every 500 square yards of aggregate base course or more frequently as directed by the Engineer.

END OF SECTION

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SECTION 32 14 23
ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphaltic Concrete Paving: Surface, binder, and base courses.
   2. Prime Coat and Tack Coat.
   3. Surface Sealer.
   4. Quality Control and Testing.

B. Related Sections:
   1. Section 31 23 33 – Trench Excavation and Backfill: Backfill under roads.
   2. Section 32 11 23 - Aggregate Base Courses: Compacted base for paving.

1.2 REFERENCES

A. SCDOT Standard Specifications:
   1. Standard Specifications for Highway Construction, 2007, published by the South Carolina Department of Transportation.

B. SCDOT Construction Manual:
   1. Construction manual, May 2004, published by the South Carolina Department of Transportation.

C. SCDOT Supplemental Specifications:
   1. Supplemental Specification for Emulsified Coal-Tar Pitch Pavement Sealer For Bituminous Pavements, July 13, 1989, published by the South Carolina Department of Transportation.

1.3 SUBMITTALS

A. Section 01 34 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit product information and mix design.

C. Manufacturer's Certification: Certify products are produced at a plant approved by SCDOT and that products meet or exceed specified requirements.

D. Installer Certification: Certify installer is on list of SCDOT approved contractors with an approved Quality Control Plan.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Division 400 of SCDOT Standard Specifications.

B. Maintain on site one copy of each document.

C. Obtain materials from same source throughout.

D. Installer Qualification: Company specializing in performing work of this Section with minimum 5 years' experience.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt base course or intermediate course when ambient air or road surface temperature is less than 35 degrees F. or surface is wet or frozen.

B. Do not place asphalt surface course when ambient air or road surface temperature is less that 50 degrees F. or wet.

C. Place bitumen mixture when temperature is not more than 15 degrees F. below temperature at when initially mixed and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Plant Mix Materials: Conform to Division 400 of SCDOT Standard Specifications.

B. Prime Coat and Tack Coat: Conform to Division 400 of SCDOT Standard Specifications.

C. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt concrete pavements. Conform to Division 400 of SCDOT Standard Specifications.

D. Sand: Fine aggregate, gradation S1 or S2 conforming to Division 300 of SCDOT Standard Specifications.

2.2 ASPHALT PAVING MIX

A. General: Use HMA Type C mix design conforming to Section 401 of SCDOT Standard Specifications.

B. Base Course: Graded Aggregate Base Course.

C. Surface Course: HMA Type C.

D. Wedging or Leveling Mix: HMA Type C.

E. Reclaimed Asphalt Pavement (RAP) Content: Use maximum 50 percent for base and intermediate courses, maximum 15 percent for surface course.

F. Sealer: Use Emulsified Coal-Tar itch Pavement Sealer conforming to Supplemental Specifications, July 13, 1989 of SCDOT Standard Specifications.

2.3 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning Work.

C. Obtain materials from plant approved by SCDOT.

D. Test plant samples in accordance with Section 401 of SCDOT Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade and aggregate base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Verify utility structure frames and lids are installed in correct position and elevation.

3.2 PRIME COAT

A. Apply primer on aggregate base course at uniform rate of 0.2 to 0.28 gal/sq. yd. in accordance with Section 406 of SCDOT Standard Specifications.

B. Apply primer to contact surfaces of curbs and gutters.

C. Use clean sand to blot excess primer.

3.3 TACK COAT

A. Apply tack coat on asphalt or concrete surfaces at uniform rate of 0.05 to 0.15 gallons/square yard in accordance with Section 401 of SCDOT Standard Specifications.

B. Apply tack coat to contact surfaces of curbs and gutters.

C. Coat surfaces of utility structures with oil to prevent bond with asphalt pavement. Do not tack-coat these surfaces.

3.4 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with Section 401 of SCDOT Standard Specifications.

B. Place asphalt within 24 hours of applying prime coat or tack coat.

C. Place asphalt in courses to the thicknesses and dimensions shown on the Drawings.

D. Place binder and intermediate courses.

E. Place surface course within 2 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

F. Place surface course to thicknesses and dimensions shown on the Drawings.

G. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

H. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.5 JOINTS

A. Traverse Joints:
   1. When Work is suspended long enough to allow mixture to chill, construct transverse joint.
   2. Use butt joint when traffic will not pass over pavement.
   3. Use sloped wedge ahead of the end of pavement when traffic will pass over pavement. Place paper parting strip to removal of wedge.
   4. Tack coat edge of pavement prior to placing adjoining pavement.

B. Longitudinal Joints:
   1. Tack the edge of longitudinal joints prior to placing adjoining pavement.
   2. Pinch joint by rolling immediately behind the paver.
   3. Offset longitudinal joints in each layer by approximately 6 inches.

3.6 SEALER

A. Apply emulsified coal-tar pitch pavement sealer in accordance with SCDOT Supplemental Specification, “Emulsified Coal-tar Pitch Pavement Sealer for Bituminous Pavements,” July 13, 1989.

3.7 TOLERANCES

A. Density Compaction: Minimum of 92 percent of Maximum Specific Gravity (G_{mm}).

B. Flatness: Maximum variation of 1/8-inch measured with 10-foot straight edge.

C. Compacted Thickness: Within 1/4-inch.

D. Variation from Indicated Elevation: Within 1/2-inch.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Perform Contractor Quality Control Program in accordance with Appendix C of the SCDOT Construction Manual, May 2004, published by the South Carolina Department of Transportation.

C. Take compaction tests every 1,000 square feet or fraction thereof per day on pavement placed at the paver lay down width.

D. Take 6-inch diameter full depth pavement cores every 1,000 square feet or fraction thereof per day on pavement placed at the paver lay down width.

E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.9 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Immediately after placement, protect pavement from mechanical injury for seven days or until surface temperature is less than 140 degrees F.

END OF SECTION

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SECTION 32 16 23
CONCRETE SIDEWALKS AND PADS

PART 1 GENERAL

1.1 SCOPE

A. Concrete sidewalk shall be constructed of Portland cement concrete, at the locations and to the dimensions, lines, grades and cross section indicated on the Drawings or as directed by the Engineer and in conformity with the provisions and requirements set out in these Specifications.

B. Concrete equipment pads shall be constructed of Portland cement concrete, at the locations and to the dimensions, lines, grades and cross section indicated on the Drawings or as directed by the Engineer, and in conformity with the provisions and requirements set out in these Specifications.

C. Concrete sidewalk and pads shall include all the necessary excavation, unless otherwise indicated, subgrade and subbase preparation, backfilling, final clearing up and completing all incidentals thereto, as indicated on the Drawings or as directed by the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete shall be manufactured of the materials meeting the requirements of and in accordance with the provisions and requirements for Class 3000 concrete as set out in Section 701 of the State of South Carolina Department of Transportation Standard Specifications for Highway Construction (2000).

B. Crushed stone for base shall meet the gradation requirements for Size 7 or 8 as specified in ASTM D 448 or AASHTO M43.

2.2 FORM MATERIAL

A. Forms may be constructed of wood or metal.

B. The lumber to be used in the construction of wood forms shall be free of bulge or warp, of uniform width, not less than 2-inches (commercial) in thickness, except that 1-inch thickness may be used on curves and shall be sound and free from loose knots. Stakes shall be not less than 2 x 4-inch lumber of sufficient length that, when driven, they will hold the forms rigidly in place.

C. Metal forms shall be of approved sections and shall have a flat surface on top. They shall present a smooth surface of the desired contour, sufficiently thick and braced to withstand the weight of the concrete without bulging or becoming displaced.

2.3 CURING AND SEALING COMPOUNDS

A. Curing compound shall be acrylic based type compound conforming to ASTM C309 Type I, Class "B". The curing compound shall form a moisture impermeable film retaining a minimum of 95 percent of the mixing water beyond the required curing time.

B. Sealing compound shall be acrylic based.

C. All curing and sealing products shall be the products of a single manufacturer and when used together shall be specifically designed to be compatible. Curing compound shall be equal to Meadows Sealight CS-309. Sealing compound shall be equal to Meadows Sealight TIAH.

2.4 FILLERS AND SEALANTS

A. Provide fillers and sealants, where shown on the Drawings. Sealant shall be Sikaflex 2c/SL installed with a bond breaker in accordance with the manufacturer's recommendations.

PART 3 EXECUTION

3.1 EQUIPMENT

A. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.

B. Satisfactory floats, edgers, spades and tamps shall be furnished. Tamps of not over 8-inch diameter and weighing not less than 25 pounds shall be provided for tamping subgrade. A 10-foot longitudinal float of the inverted T-type with plough handles attached for manipulation, and a rigid float not less than 18-inches longer than the width of the walk being constructed, shall be provided.

3.2 SUBGRADE PREPARATION

A. The subgrade for sidewalks and pads shall be formed by excavation to a depth equal to the thickness of the concrete +2-inches.

B. All subgrade shall be of such width as to permit the proper installation and bracing of the forms.

C. Yielding, or unsuitable material shall be removed and backfilled with satisfactory material. Place 6-inches of graded aggregate base under pads, compacted thoroughly and finished to a smooth, unyielding surface and proper line, grade and cross section of the proposed construction.

3.3 FORMS

A. All forms shall be set upon the prepared subgrade, true to lines and grade, and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The top of the form shall be set to exact grade and the height shall be equal to not less than the thickness of the proposed concrete.

B. All forms shall be so constructed as to form the cross section, contour, etc., of the proposed construction.

C. Immediately before placing the concrete, the forms shall be given a coat of light oil and where being removed and used again, the forms shall be thoroughly cleaned and oiled each time.

D. Forms shall be removed within 24 hours after placing concrete and no pressure shall be exerted upon the concrete in removing forms.

E. When the sidewalk is to be joined to an existing sidewalk, the existing sidewalk, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface, or as indicated by the Engineer.

3.4 EXPANSION JOINTS

A. Unless otherwise indicated on the Drawings or as directed by the Engineer, premoulded expansion joint filler, 1/2-inch in thickness, shall be placed at the locations and in line with expansion joints in the adjoining pavement, gutter or curb. When expansion joints are not required in the adjoining pavement or gutter, and not otherwise indicated on the Drawings, a 1/2-inch premoulded expansion joint filler shall be placed at intervals of not over 50 feet apart. All premoulded expansion joint filler must be cut to full width or length of the proposed construction and shall extend to within 1/2-inch of the top or finished surface. All longitudinal expansion joints shall be placed as indicated on the Drawings or as directed by the Engineer.

B. All expansion joints shall be true, even and present a satisfactory appearance.

C. All expansion joint material protruding after the concrete has been finished shall be trimmed as directed by the Engineer.

3.5 MANUFACTURING AND PLACING CONCRETE

A. Immediately before placing concrete, the depth of the proposed concrete shall be checked by means of a template cut true to the cross section of the proposed construction and any irregularities shall be corrected.

B. Immediately before placing concrete, all subgrade shall be thoroughly sprinkled or wetted.

C. Concrete shall not be placed upon a frozen subgrade or subbase.

D. Construction joints will be permitted only at grooves or at expansion joints, unless otherwise approved by the Engineer.

E. The concrete shall be placed immediately after mixing; the edges, sides, etc., shall be thoroughly spaded and the surfaces tamped sufficiently to thoroughly compact the concrete and bring the mortar to the surface. The concrete shall be deposited and compacted in a single layer.

3.6 FINISHING

A. The concrete shall be struck-off with a transverse template resting upon the side forms and then shall be floated with a 10-foot longitudinal float working the float transversely across the concrete with a sawing motion, always maintaining it parallel to the edges of the sidewalk, or driveway, where practicable, and in such a manner that all surplus water, laitance and inert material shall be removed from the surface. This operation shall be continued until the surface of the concrete shows no variation from a 10-foot straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float used again. The longitudinal float shall not be moved ahead more than one-half its length at any time.

B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be gone over and finished with a wooden float so as to produce a sandy texture. The longitudinal surface variations shall be not more than 1/4-inch under a 12-foot straightedge, nor more than 1/8-inch on a five-foot transverse section. The surface of the concrete must be finished so as to drain completely at all times.

C. The edges of the sidewalks or driveways shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch.

D. The surface of sidewalks shall be divided into blocks by use of a grooving tool. Grooves shall be placed so as to cause contraction joints to be placed at a groove line, where practical. The grooves shall be spaced approximately five feet apart and the blocks shall be rectangular unless otherwise ordered by the Engineer. The grooves shall be cut to a depth of not less than 1-inch. The edges of the groves shall be edged with an edging tool having a radius of 1/4-inch, and any marks caused by edging or otherwise shall be removed with a wetted brush or wooden float so as to give the surface a uniform texture and finish.

E. The edges of the concrete at contraction joints shall be rounded with an edging tool having a radius of 1/4-inch. The top and ends, where practicable, of expansion joint material shall be cleaned of all concrete and the expansion joint material shall be trimmed so as to be slightly below the surface of the concrete. All marks caused by edging shall be removed with a wetted brush or wooden float.

3.7 PROTECTION AND CURING

Immediately after finishing the concrete, it shall be covered and cured in accordance with the requirements of Section 702.20B of the State of South Carolina Department of Transportation Standard Specifications for Highway Construction. If the temperature falls to below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete at above 45 degrees F.

3.8 BACKFILLING

Immediately after the concrete has set sufficiently, the spaces along the sides or edges of the sidewalk or driveway shall be refilled with suitable material, this material shall be compacted in layers of not over 4-inches each, until firm and solid.

END OF SECTION

SECTION 32 91 13
SITE PREPARATION

PART 1 GENERAL

1.1 SCOPE

A. This Section described materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment and labor necessary to complete the work.

B. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

1.2 CLEARING AND GRUBBING

A. Within the limits shown on the Drawings, the site will be cleared and grubbed to prepare for construction.

B. Clearing

1. All vegetation such as trees, shrubs, brush, logs, upturned stumps and roots of downed trees, and other similar items shall be removed and disposed of properly by the Contractor as specified below. Cultivated growth shall be removed and trees felled as necessary within the construction work site and as indicated.

2. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the appropriate utility.

3. All buildings, fences, lumber piles, trash and obstructions, except utility poles shall be removed and disposed of by the Contractor. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

4. All fences adjoining any excavation or embankment that may be damaged or buried shall be carefully removed, stored and replaced.

C. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of properly by the Contractor as specified below. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.

1.3 PRELIMINARY GRADING

Before beginning construction, the Contractor shall grade the entire work site to conform, in general, to the finish elevations shown on the Drawings. The Drawings show both existing contour elevations and finished contour elevations.

1.4 TESTING AND INSPECTION SERVICES

A. Soil testing will be performed by an independent testing laboratory selected by the Owner. Payment for soil testing shall be made by the Contractor from the "Soils And Concrete Testing" cash allowance.

B. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with ASTM D 1557.

2. Field density tests for each two feet of lift; one test for each 5,000 square feet of fill.

3. Inspecting and testing stripped site, subgrades and proposed fill materials.

C. The Contractor's duties relative to testing include:

1. Notifying the laboratory of conditions requiring testing.

2. Coordinating with the laboratory for field testing.

3. Providing representative fill soil samples to laboratory for test purposes. Provide 50-pound samples of each fill soil.

4. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveal non-conformance with specified requirements.

D. Inspection:

1. Earthwork operations, suitability of excavated materials for fill and backfill, and placing the compaction of fill and backfill is subject to inspection. The Engineer will observe earthwork operations.

2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer to verify suitable bearing and construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PREPARATION

Maintain benchmarks, monuments, and other reference points. Re-establish, at no cost to the Owner, any such reference points, if disturbed or destroyed.

3.2 CLEARING

A. Clear areas required for access to site and execution of work.

B. Remove trees and shrubs within the area to be cleared.

C. Clear undergrowth and deadwood, without disturbing subsoil.

3.3 DISPOSAL AND REFUSE

A. The refuse resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material be left on the Owner's property, shoved onto abutting private properties, or be buried in embankments or trenches on the Owner's property.

B. No burning shall take place on-site.

END OF SECTION

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SECTION 32 93 30
SEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:
1. Section 31 23 33 – Trench Excavation and Backfill.
2. Section 31 25 00 – Erosion and Sediment Control.

1.2 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. SCDOT Standard Specifications:
1. Standard Specifications for Roads and Structures, 2007, published by the South Carolina Department of Transportation.

C. SC DHEC Best Management Practices.
1. SCDHEC Storm Water Management BMP Handbook, latest edition, published by the South Carolina Department of Health and Environmental Control.

1.3 SUBMITTALS

A. Section 01 34 00 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Invoices or proof of purchase to verify quantities specified.

F. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; and, types, application frequency, and recommended coverage of fertilizer.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Section 810 of SCDOT Standard Specifications.

B. Maintain copy of document on site.

1.5 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

B. Installer: Company specializing in performing work of this Section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers showing percentage of seed mix, germination, inert matter and weeds; year of production; net weight; date of packaging; and location of packaging. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.7 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for minimum of three cuttings.

PART 2 PRODUCTS

2.1 TOPSOIL MATERIALS

A. Topsoil: Original surface soil typical of the area, which is capable of supporting native plant growth; free of large stones, roots, waste, debris, contamination, or other unsuitable material, which may be detrimental to plant growth; pH value of 5.4 to 7.0.

2.2 SEED MIXTURE

A. Furnish materials in accordance with South Carolina Board of Agriculture rules and regulations as specified in Section 810 of SCDOT Standard Specifications.

1. Application Rates: See Construction Plans.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis. When test is not available, use 10-10-10 mixture of Nitrogen, phosphoric acid, and soluble potash.

C. Lime: ASTM C602, Class T or Class O agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: As specified per the plan details.

F. Herbicide: As required to combat type of weeds encountered.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting Work.

B. Verify prepared soil base and topsoil are ready to receive the Work of this Section.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed evenly in two intersecting directions at the rates shown above. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

D. Roll seeded area with roller not exceeding 112 lbs/linear foot.

E. Immediately following seeding and rolling, apply mulch to thickness of 1/8 inch. Maintain clear of shrubs and trees.

F. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 6 lbs per 1,000 square feet evenly in one pass.

B. Apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 12 inches. Space stakes at 5 feet on center.

B. Cover seeded slopes where shown on the Drawings and where grade is greater than 3H:1V with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36-inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

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SECTION 40 05 57.
MOTORIZED ACTUATORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of electric motor actuators on valves as specified herein or shown on Contract Drawings.

B. Operating Requirements

1. The motorized multi-turn actuator shall operate on 480 VAC, 3 Phase, 60-Hertz electrical service. Quarter-turn actuators shall operate on 120 VAC or 220 VAC single phase service as shown on the Drawings. All controls shall operate on 120 VAC and a control transformer shall be provided with the actuator.
2. Each actuator shall be capable of fully opening and closing the valves on which it is installed under the maximum load and exposure to varying temperatures. The actuator shall be self-locking under normal operating conditions in order to hold the valve in an intermediate position.
3. Motorized actuators shall be of the non-intrusive design housed in a double sealed watertight enclosure rated to IEC Publication 529, IP88 (6 meters, 48 hours).
4. The actuator shall be capable of operating in an ambient temperature ranging from minus 22 deg. F to 140 deg. F.
5. The actuators shall be capable of mounting in any position and include one integral unit with the motor, power gearing, travel limit switches, torque limit switches, handwheel, terminals for motor power and controls, and separable thrust base and drive nut.
6. Actuators shall be sized and provided by the valve manufacturer to meet the maximum torque and control requirements of the valve.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

C. All actuator submittals shall be assembled with and made a part of the valve manufacturer submittals.

1.3 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are:
1. Auma
2. EIM
3. Limitorque Inc.

PART 2 PRODUCTS

2.1 GENERAL

A. Actuators shall be an electric motor driven gear reducer with integral controls for manual and motorized operation of non-rising stem valves for OPEN-CLOSE or modulating service as specified herein or shown on the Drawings.

B. Contractor shall coordinate the valve stem size and other essential dimensional characteristics.

C. The automated operation and power supply to the actuators shall be integrated into the SCADA system for the corresponding process with power and control wiring installed by the Contractor.

2.2 MULTI-TURN ACTUATORS

A. Actuator shall be an electric motor driven gear reducer with integral controls for motorized and manual operation of valves. The actuating unit shall be mounted on and assembled to the valve.

B. The motor starting torque shall be equal to 2-1/2 times the running torque. The motor shall be 3-phase, 60-hertz, 460 volt with AIEE Class F Installation, and a thermistor embedded within the motor windings to prevent damage due to overload. The motor shall be easily removed using a plug-in connector and shaft coupling. Motor shall have the capacity of removal without the need of draining oil from the actuator gearbox.

C. The power transmission shall be completely bearing – supported and consist of a hardened alloy steel worm and bronze worm gear, lubricated using oil or grease designed specifically for extreme pressure gear transmission service.

D. The actuator shall be furnished with a drive bushing or top entry stem nut easily detachable for matching to suit the valve stem or gearbox input shaft. Thrust bearings, when housed in a separate thrust base, should be of the sealed-for-life type.

E. A handwheel and declutch lever shall be provided for manual operation. The handwheel shall not rotate during electric operation nor can a seized motor prevent manual operation. Changing from motor to manual operation shall be accomplished by engaging the declutch lever. Energizing the motor shall return the actuator to motor operation. The declutch lever shall be pad lockable. Lost motion “hammer blow” effect shall be provided with both direct and independently geared handwheels.

F. The operating speed shall be such as to give valve closing and opening in 60 seconds.

G. All field terminations shall be in a termination chamber that is separately sealed from all other actuator components. Site wiring shall not expose actuator components to the environment. The internal sealing within the termination chamber is suitable for the enclosure rating specified. The chamber shall include screw-type terminals.

H. All calibrations shall be possible without removing any covers and without the use of any special tools. The local operation display and calibration of actuator shall be through a local display.

The local display shall be an LCD message screen. For actuators requiring an infrared setting tool, one tool shall be provided.

I. The unit shall continuously monitor valve position and torque and shall be able to detect the valve position even during a power failure. The actuator shall include an adjustable electronic torque sensor to interrupt the motor power circuit when an obstruction is encountered in either direction of travel or when torque seating/unseating of valves is required for tight shut-off. Where modulating service is shown or specified, control of valve position in proportion to a 4-20 mA signal shall be accomplished by comparing the command signal to an internal position feedback.

J. Remote operation shall be accomplished by use of 2, 3 or 4 wire control and shall be either internally or externally powered.

K. The unit shall transmit a 4-20mA output signal for remote position indication. The system shall allow calibration of Zero, Span, Band and Delay. Both input and output signals shall be optically isolated. The circuit shall be configurable for Remain-In-Last-Position or Travel to any preset position on loss of control signal. Position limit switches shall be provided for both open and close positions of travel.

L. Modulation service shall provide more than 600 starts per hour with an accuracy of 1.0%. All reversing mechanisms shall be of the solid-state type.

M. Local control shall be by an "open-stop-close" control switch. Selection of operation from local or remote source shall be by pad lockable "local-off-remote" selector switch.

2.3 QUARTER-TURN ACTUATORS

A. Actuator shall be a reversible electric motor driven gear reducer with integral controls for motor operation of non-rising stem, quarter-turn plug small butterfly or ball valves.

B. The actuator shall operate the valve from full open to full closed in less than 30 seconds.

C. The actuator shall have the following features:

1. Watertight IP67 enclosure designed to operate from -20 deg.F. to 158 deg.F

2. LOCAL/REMOTE and OPEN/STOP/CLOSE selector switches

2. Two limit switches

3. Valve position indicator

4. Heater and thermostat

5. Manual override -HAND/AUTO declutching mechanism

6. Adjustable cycle time control

7. Position feedback transmitter-DC output

2.3 PAINTING

The actuator shall be shop painted with a high-solids epoxy primer, and finish painted with a polymer powder coat suitable for field recoating.

PART 3 EXECUTION

3.1 ACTUATORS

Actuators shall be installed as shown on the Drawings, specified herein, and in accordance with the manufacturer's recommendations.

3.2 START-UP SERVICES

A. Actuators shall be started up only by an authorized actuator manufacturer representative. All synchronous motors shall be tested with jobsite power to measure and document proper operational parameters for warranty qualification. Proof of test and affidavit of testing shall be required.

B. Performance tests of the actuator equipment shall simulate each typical valve load and the following parameters should be recorded:
   1. Current at maximum torque setting
   2. Torque at maximum torque setting
   3. Flash test voltage
   4. Actuator output speed or operating time

C. After installation, a start-up technician shall inspect the complete installation, place the equipment into permanent operation, instruct the OWNERS's personnel in operation and maintenance and perform field tests to insure proper installation. A minimum of one (1), 8-hour day at the job site excluding travel shall be included for this service.

TABLE 1

ACTUATOR SCHEDULE

Valve No.	Valve Location	Actuator Service	P&ID	Valve Size, inches	Maximum Diff. Pressure, psi
SL-FCV-1	SLUDGE METER STATION	O/C	I-02	4	7
SL-PV-1	SLUDGE METER STATION	O/C	I-02	4	7
SW-BFV-1	SEDIMENTATION BASIN NO. 1	O/C	I-02	24	9

SERVICE: O/C: Open-Close
MOD: Modulating Flow Control - 4-20 mA Input Signal

VALVE: FCV: Flow Control Valve (Pinch Valve)
PV: Plug Valve
BFV: Butterfly Valve

END OF SECTION

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SECTON 40 05 59
STAINLESS STEEL SLIDE GATES

PART 1 GENERAL

1.1 SCOPE

A. Furnish all labor, materials, equipment and incidentals required to complete and make ready for operation, low leakage, stainless steel slide gates complete with slides, frames, operating stem and operator as shown on the Drawings and as specified herein.

1.2 DESIGN REQUIREMENTS

A. Slide gates shall be heavy duty, corrosion resistant and reinforced as required for a maximum deflection under the design head of not more than 1/360 of the span of the gate. Gates shall be flat back wall mounted or embedded as shown on the Drawings, rising stem type. Gates and operators shall be suitable for installation in a water treatment plant with high chlorine concentrations and low pH coagulants. Slide gates as specified herein shall meet the leakage rates for sluice gates as specified in AWWA C501.

1.3 SUBMITTALS

A. Complete shop drawings and engineering data shall be submitted to the Engineer for approval in accordance with Section 01 34 00 of these Specifications.

B. Operating and maintenance data shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.4 STORAGE AND PROTECTION

Gates and all associated accessories shall be stored and protected in accordance with the Manufacturer's requirements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Slide gates shall be manufactured by Waterman Industries, Whipps, Inc., Hydro Gate, or Golden Harvest, Inc.

2.2 MATERIALS AND CONSTRUCTION

A. Fabricated Slide Gates

1. All slide gate parts, including lift, shall be designed for heads shown on the Drawings, with a minimum safety factor of 5 with regard to tensile, comprehensive and shear strengths.

2. Gate slides shall be fabricated from ASTM A 276, Type 304L stainless steel plate, minimum ¼-inch thickness and reinforced with structural shapes sized to withstand the specified seating or unseating heads. Replaceable polymer seating/sliding strips shall be provided around the opening, either on the slide or frame, to ensure the opposing sealing surfaces are of dissimilar materials creating a low coefficient of friction in gate operation. The slides shall be provided with a pocket for attaching the stem. The pocket shall be attached to the slide by welding and shall be capable of taking the full thrust developed during normal gate operation.

3. The gate frame shall be constructed of stainless steel meeting the requirements of ASTM A 276, Type 304L stainless steel, assembled by welding to form the waterway opening. The gate frame shall form guides for the slide and holes shall be provided for anchor bolts. The angle frame shall be sufficiently long to retain at least one-half of the vertical height of the slide in the fully open position. The frame and gate shall be suitable for attaching to a concrete wall or embedded in concrete as shown on the Drawings.

4. A rubber or neoprene seal, suitable for extended use in water containing chlorine and chloramines, shall be securely fastened to the bottom cross member of the frame with a retainer and threaded fasteners. The top surface of the seal shall be flush with the invert of the gate opening for self-contained gates. Channel gates shall have flush bottom seals. Additional seals shall be provided on the sides and top of the gate frame to satisfy the leakage requirements for the heads shown. All seals shall be replaceable without removing gate frame from wall.

5. Fasteners: All anchor bolts, assembly bolts and nuts shall be of ASTM 193, 18-8 stainless steel, or ASTM A 276, Type 304 stainless steel, and of ample section to safely withstand forces created by operation of the gate. Quantity and size shall be recommended by the manufacturer. Anchor bolts shall be furnished with two nuts each to attach gates to concrete. Fasteners shall conform to the requirements of ASTM A 193, Grades B8MN or B8MNA and ASTM A 194, Grade 8M or 8MA.

6. Slide gates shall be of the sizes and have a seating and unseating head as shown on the Drawings.

B. Stems

1. Operating stems shall be of size to safely withstand without buckling or distortion, the stresses induced by normal operating forces. The stems shall be designed to transmit, in compression, at least twice the rated output of the floor stand or bench stand with 40-pound effort on the crank or handwheel.

2. The threaded portion of the stem shall have machined cut threads of the Acme type.

3. Stems of more than one section shall be joined by bronze couplings, threaded and keyed or bored and pinned to the stems. All threaded and keyed couplings of the same size shall be interchangeable.

4. Manually operated rising stem gates shall be provided with an adjustable, bronze stop collar

on the stem above the floor stand lift nut.

5. All stems shall be fabricated from Type 304 Stainless steel and shall not be less than 1-1/2-inches in diameter.

6. Provide a clear, plastic stem cover with mylar position indicator strip.

C. Manual Operator Floor Stands

1. Manual operation shall be crank-operated floor stands as shown on the Drawings. Operators shall have either a single or double gear reduction depending upon the lifting capacity required and shall be provided with a threaded, cast bronze lift nut to engage the operating stem.

2. Tapered roller bearings or ball thrust bearings shall be provided above and below a flange on the operating nut to support both opening and closing thrusts.

3. Floor stands shall operate the gates with not greater than 30 pound pull on the cranks or handwheel. Gears shall be steel or cast iron with machine cut teeth designed for smooth operation. The pinion shafts on crank-operated floor stands, either single or double, shall be supported on tapered roller bearings or needle bearings. All components shall be totally enclosed in a cast iron case and cover. Positive mechanical seals to retain lubricant and to exclude moisture and dirt, shall be provided on the operating nut and the pinion shafts where they extend from the cast iron case or gear box. Lubricating fittings shall be provided for the lubrication of all gears and bearings.

4. The removable crank shall be cast iron with a revolving brass grip. Floor stands shall include a cast iron pedestal design to position the input shaft approximately 48-inches above the operating floor. Pedestals shall be standard or offset type, provided where shown on the Drawings.

PART 3 PRODUCTS

3.1 INSTALLATION

A. Slide gates shall be installed in accordance with the installation manual furnished by the gate manufacturer.

B. Slide gate frames and plates shall be checked, prior to installation, for projections or warpage that would promote excessive leakage. Defective gates and plates shall be removed and replaced.

C. Slide gate frames shall be installed true to the lines and elevations shown and accurately aligned. Frames shall be internally braced and adequately supported during concrete placement and/or installation.

3.2 INSPECTION AND TESTING

Following installation, operating tests will be performed to demonstrate to the Engineer that all slide gates will perform in a satisfactory manner. Leakage tests shall be performed on each gate to the standards listed above. The Contractor shall make, at the Contractor's expense, all necessary modifications, changes and/or adjustments required to ensure satisfactory operation.

3.3 FIELD PAINTING

All equipment shall be cleaned and painted in accordance with the Manufacturer's recommendations.

3.4 CLEANING

Prior to acceptance of the work of this Section, thoroughly clean all installed materials and related areas.

END OF SECTION

SECTION 40 27 23
DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 SCOPE

A. Provide all labor, materials, equipment and incidentals necessary to construct all ductile iron pipe and appurtenances as shown on the Drawings and as specified herein.

1.2 SUBMITTALS

A. Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01 34 00 of these Specifications.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE (DIP)

A. Ductile iron pipe shall be utilized where shown on the Drawings.

B. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300
24	250

2.2 FITTINGS AND ACCESSORIES

A. Fittings shall be ductile iron and shall conform to AWWA C110/ANSI A21.10 or AWWA C153/ANSIA21.53 with a minimum rated working pressure of 250 psi.

B. Flanged elbow fittings shall be ANSI pattern using short radius elbows except where noted differently on the Drawings. Special fittings, ductile iron wall pipes and sleeves shall conform to the dimensions and details as shown on the Drawings.

C. Solid sleeves shall permit the connection of plain end ductile iron pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110 for pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have mechanical or restrained joints as specified in this section and as shown on the Drawings. Solid sleeves shall be used only in locations shown on the Drawings or

at the direction of the Engineer.

2.3 JOINTS

A. General

1. Unless shown or specified otherwise, joints for buried service shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Joints for exposed service shall be flanged for pipe and fittings, unless shown otherwise.

2. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

3. In all cases, gaskets shall be made of material that will not be damaged by the fluid being transported nor by the environment in which the pipe is installed.

B. Push-On and Mechanical Joints

1. Joints shall conform to AWWA C111/ANSI A21.11.

2. Bolts and nuts shall be Tee Head bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimension shown in AWWA C111/ANSI A21.11.

3. Gaskets shall be in accordance with AWWA C111/ANSI A21.11 and shall be constructed of plain rubber unless otherwise shown on the Drawings.

4. Mechanical joint glands shall be ductile iron.

2.4 WALL SLEEVES AND WALL PIPES

A. Where piping passes through concrete structures, furnish and install wall sleeves unless wall pipes or other provisions are specifically shown on the Drawings.

B. Wall Sleeves

1. For pipe sizes smaller than 3-inches, wall sleeves shall be steel oversize sleeves furnished with a full circle, integral or continuously welded waterstop collar. The sleeve seal shall be the mechanically expanded, synthetic rubber type. Provide all associated bolts, seals and seal fittings, pressure clamps or plates necessary to achieve a watertight installation. Sleeves shall extend the full thickness of the concrete. Sleeves and seal shall be Link Seal.

2. For larger pipe sizes, wall sleeves shall be statically cast ductile iron mechanical joint wall sleeves. Unless specified or shown otherwise for a specific situation, wall sleeves shall be mechanical joint bell-plain end type with waterstop/thrust collar. Sleeves shall be constructed with studs and mechanical joint [retainer] gland on the air side of the

concrete structure. Provide retainer gland where shown on the Drawings. Where the concrete structure is exposed to dirt on one side and is wet on the other side, construct with studs and glands on the dirt side.

C. Wall Pipes

1. Wall pipes shall be either statically cast ductile iron with integral waterstop/thrust collar or centrifugally cast ductile iron with a continuously welded waterstop/thrust collar. The welded-on collar shall be attached to the pipe by the manufacturer. The collar shall be capable of withstanding a thrust force caused by a 250 psi dead end load from either direction on that size pipe. Wall pipes shall be furnished uncoated on the outside and cement lined on the inside.

2. Wall pipes shall be cast and/or fabricated and lined in one manufacturer's facility and delivered to the job site ready for use.

2.5 COATINGS

A. The exterior of pipe and fittings for buried service shall be factory coated with an asphaltic coating conforming to AWWA C151/ANSI 21.51 for ductile iron pipe, AWWA C115/ANSI 21.15 for flanged pipe and AWWA C110/ANSI 21.10 for fittings. Pipe and fittings which shall be exposed or submerged shall be factory coated with a general purpose rust inhibitive primer compatible with the type of paint which will be field applied.

B. Exposed or submerged pipe, fittings, valves and supports shall be field coated using a three-coat epoxy system to a minimum 12.0 mils dry film thickness with 4.0 mils minimum thickness each coat.

C. Epoxy coating system for exposed or submerged piping systems shall be Tnemec Series 66 Hi-Build Epoxoline, Sherwin Williams Macropoxy 646, or equal.

2.6 LINING

Pipe and fittings shall be cement lined in accordance with AWWA C104/ ANSI A21.4, standard thickness, unless specified otherwise.

2.7 RETAINER GLANDS

Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or Star Pipe Products StarGrip Series 3000.

PART 3 EXECUTION

3.1 CUTTING

A. When new or existing pipe is required to be cut, the pipe shall be cut in such a manner as to leave a smooth end normal to the axis of the pipe.

B. All cutting of ductile iron pipe shall be performed with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe. All damaged linings and coatings shall be repaired.

3.2 JOINT ASSEMBLY

A. General: Ductile iron pipe shall be assembled in accordance with ANSI/AWWA C600.

B. Push-On Joints: The inside of the bell and the outside of the pipe from the plain end to the guide stripe shall be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe. The plain end shall be centered in the bell and the spigot pushed home.

C. Mechanical Joints

1. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all loose rust or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.

2. Joint bolts shall be tightened by the use of wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, the gland shall be brought up toward the pipe bell. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.

3. After installation, bolts and nuts in buried piping shall be given two heavy coats of a bituminous paint. Bolts and nuts for exposed or submerged service shall be coated in accordance with the Article 2.5 of these Specifications.

3.3 DRILLING AND TAPPING

A. Wherever required ductile iron pipe and fittings shall be drilled and tapped to receive any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.

B. Unless shown otherwise, small diameter pipes, 2-inches and less, shall be connected to ductile iron pipe using one of the following methods:

1. Direct tap.

2. Direct tap with service clamp.

3. Direct tap boss.

4. Tapped plug or flange on tapping saddle.

C. In no case shall the effective number of threads be less than 4.

3.4 CONSTRUCTING WITHIN STRUCTURES

A. Proper and suitable tools and appliances for safe and convenient handling and laying of pipe and fittings shall be used. Care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed by the Engineer.

B. All pipe and fittings shall be carefully examined by the Contractor for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at Contractor's own expense.

C. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

D. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.

E. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed. Pipe passing through the sleeve shall extend no more than three feet beyond the structure without a piping joint.

F. Wall pipe and wall sleeves shall be constructed when the wall or slab is constructed. Blocking out or breaking of the wall for later installation shall not be permitted.

G. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.

H. Exposed ductile iron piping shall be supported as shown on the Drawings.

3.5 FIELD PAINTING

Field painting of exposed and submerged pipe shall be as specified herein.

3.6 TESTING

A. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of line will be considered ready for testing after completion of all thrust restraint and backfilling.

B. Each segment of pipeline between line valves shall be tested individually.

C. Coordinate testing with the Owner and Engineer a minimum of 48 hours in advance and allow witnessing of testing.

D. Test Preparation

1. Flush pipeline section thoroughly at flow velocities greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. Partially operate valves and hydrants to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.

2. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.

3. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.

4. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating. Where necessary, provide temporary back pressure to meet the differential pressure restrictions.

5. Valves and hydrants shall not be operated in either the opening or closing direction at differential pressures above their rated pressure.

E. The test pressure shall be measured at the lowest point in the test segment and shall be maintained for a minimum of two hours. Minimum test pressure shall be 75 psi.

F. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not less than 5 psi.

G. Leakage: Leakage shall be defined as the quantity of water that must be pumped into the test section equal to the sum of the water, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

H. The Owner assumes no responsibility for leakage occurring through existing valves.

I. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD\,(P)1/2}{}$$

133,200

Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds
Per square inch (gauge)

As determined under Section 4 of AWWA C600.

If the pipe section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

J. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings. Provide documentation of test results using Engineer's test forms.

END OF SECTION

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SECTION 40 27 26
PLASTIC PIPE AND FITTINGS

PART 1 GENERAL

1.1 SCOPE

A. Provide all labor, materials, equipment and incidentals necessary to construct all plastic pipe, and appurtenances as shown on the Drawings and as specified herein.

1.2 SUBMITTALS

A. Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01 34 00 of these Specifications.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE

A. Pipe and Fittings, 4 to 15 Inches in Diameter: Pipe and fittings shall meet one of the following requirements:

1. Pipe and fittings shall be manufactured in accordance with ASTM D 3034. The minimum wall thickness shall be that which will provide an SDR of 35. The pipe shall also have a minimum pipe stiffness of 46 psi at 5 percent deflection as determined by ASTM D 2412.

2. Pipe and fittings shall be manufactured in accordance with ASTM F 789. The minimum wall thickness shall conform to T 3 as defined in ASTM F 789. The pipe shall also have a minimum pipe stiffness of 46 psi at 5 percent deflection as determined by ASTM D 2412.

B. PVC gravity pipe shall be supplied in lengths not longer than 13 feet.

C. Fittings: Fittings for pipe 8 inches and less in diameter shall be one piece with no solvent welded joints. Fittings for pipe 10 inches and larger in diameter may be fabricated using solvent welding. No field fabrication of fittings will be allowed. Fabrication shall be performed at the factory and the fittings shall be delivered ready for use.

D. Joints: Joints for pipe and fittings shall be of the integral bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage. Joints shall meet the requirements of ASTM D 3212; gaskets shall meet the requirements of ASTM F 477. The joint system shall be subject to the approval of the Engineer and shall be identical for pipe and fittings.

2.2 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

A. Polyvinyl Chloride Pressure Pipe (SDR Pipe-Buried Service)

1. Pipe: PVC pipe shall conform to ASTM D 2241. The pipe shall have a Standard Dimensional Rating (SDR) of 21 and shall be capable of withstanding a working pressure of 200 psi.

2. PVC Fittings: Fittings for pipe 4-inches and less in diameter shall be one-piece with no solvent-welded joints.

3. PVC pressure pipe shall be supplied in 20 foot nominal lengths.

4. Joints: Pipe and fittings shall have integral bell and spigot type joints with elastomeric gaskets having the capability of absorbing expansion and contraction without leakage. Joints shall meet the requirements of ASTM D 3139; gaskets shall meet the requirements of ASTM F477.

B. Polyvinyl Chloride Pressure Pipe (Schedule Pipe)

1. Unless specified or otherwise shown on the Drawings, use schedule PVC pipe for water and chemical system piping.

2. Pipe shall be Schedule 80 in accordance with ASTM D 1785. Fittings shall be solvent weld socket type, same schedule as the piping conforming to ASTM D 2466 or 2467. Solvent cement shall conform to ASTM 2564.

2.3 POLYETHYLENE PIPE (HDPE)

A. Polyethylene pipe for chemical service shall be flexible iron pipe size (IPS) PE 3408, SDR 11, conforming to ASTM D-3035. Pipe shall be rated for 200 psi working pressure and sized as shown on the Drawings.

B. Fittings shall be injection molded in compliance with ASTM D 2513 and ASTM D 3261.

C. Pipe and fittings shall be joined by butt fusion welding in compliance with the pipe manufacturer's recommendations.

D. Compression-type are permitted for size or material transitions and bends within vault and enclosures where shown on the Drawings or approved by the Engineer.

2.4 POLYVINYL CHLORIDE (PVC) DUCTS

A. Ducts encasing sample and chemical solution lines shall be Schedule 40, Heavy Wall EPC (NEMA TC-2) sized as shown on the Drawings.

B. Fittings shall conform to ASTM F 512 and joints shall be solvent weld. Provide end bells at duct terminations at vaults or enclosures.

C. Changes in duct alignment shall be made with special radius fittings maintaining a bending radius in the HDPE carrier pipe exceeding the manufacturer's published minimum.

PART 3 EXECUTION

3.1 CUTTING

A. When new or existing pipe is required to be cut, the pipe shall be cut in such a manner as to leave a smooth end normal to the axis of the pipe.

B. All cutting of polyvinyl chloride pipe shall be performed with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe.

3.2 JOINT ASSEMBLY

A. Push On Joints: The inside of the bell and the outside of the pipe from the plain end to the guide stripe shall be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe. The plain end shall be centered in the bell and the spigot pushed home.

B. Solvent Welded Joints: All solvent welded joints shall be in accordance with ASTM 2855.

3.3 CONSTRUCTING AT STRUCTURES

A. Proper and suitable tools and appliances for safe and convenient handling and placing of pipe and fittings shall be used. Any damage shall be remedied as directed by the Engineer.

B. All pipe and fittings shall be carefully examined by the Contractor for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at Contractor's own expense.

C. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

D. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.

E. All piping shall be installed in place without springing or forcing.

F. Exposed polyvinyl chloride piping shall be supported as shown on the Drawings.

END OF SECTION

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SECTON 40 27 53
VALVES

PART 1 GENERAL

1.1 SCOPE

A. Furnish all labor, materials, equipment and incidentals required to complete and make ready for operation, all valves and appurtenances as shown on the Drawings and as specified herein.

B. Motorized actuators shall be specified in Section 40 05 57 of these Specifications.

1.2 SUBMITTALS

A. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with Section 01 34 00 of these Specifications. Clearly indicate make, model, location, type, size and pressure rating.

B. Operating and maintenance data for all valves shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 STORAGE AND PROTECTION

Valves and all associated accessories shall be stored and protected in accordance with the Manufacturer’s requirements.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body.

B. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel. All exposed nuts, bolts, springs, washers, and miscellaneous hardware shall be Type 304 or 316 stainless steel.

2.2 COATINGS

A. All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitive primer. The exterior of all buried valves shall have a factory applied, two coat coal tar epoxy coating system. The coal tar epoxy shall be Tnemec Tneme-Tar 46-413, Indurall Ruffstuff 2100 Coal Tar Epoxy or KopCoat Bitumastic No. 300-M. Each coating shall have a dry film thickness of 8-10 mils.

B. Exposed or submerged valves shall be field coated using a three-coat epoxy system to a minimum 12.0 mils dry film thickness with 4.0 mils minimum thickness each coat.

C. Epoxy coating system for exposed or submerged valves shall be Tnemec Series 66 Epoxoline II, Carboline Carboguard 890 or equal.

2.3 GATE VALVES

A. Valves 3-inches in Diameter and Smaller: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded type. Valves shall have a minimum 200 psi working pressure for water. Gate valves shall be equal to Crane No. 428 .

2.4 PLUG VALVES

A. Valves shall be 90 degree turn, non-lubricated, eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.

B. Valves shall provide drip-tight shut-off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi.

C. Valves shall have a port area equal to at least 80 percent of the full pipe area for valves less than 24-inches, and 70 percent for valves 24-inches and larger.

D. Bodies shall be cast-iron, conforming to ASTM A 126, Class B (carbon steel for 2-inch valves).

E. Valve ends shall be restrained mechanical joint, except where flanged ends are shown on the Drawings. Mechanical joint valves shall have bell ends conforming to applicable requirements of AWWA C111/ANSI A21.11. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

F. Valve seats shall be a raised, welded-in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be minimum of 1/8-inch thick.

G. The plug shall be of semi-steel, conforming to ASTM A 126, Class B. The plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for wastewater service.

H. Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C507.

I. The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull-down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C504.

J. Actuators

1. Valves for exposed service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip.

2. Actuators for buried service and valves 10-inches and larger, shall be equipped with manual operated geared actuators. Geared actuators shall be totally enclosed, oil lubricated, worm and gear type. Shaft seals shall be provided to prevent entry of dirt and water into the actuator. All shaft bearings shall be permanently lubricated bronze bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Construction of actuator housing shall be semi-steel. Gear actuators shall comply with requirements of AWWA C504.

3. Gear actuators for buried valves 10-inches and larger shall be mounted above ground on an extended bonnet except when the valve is in paving or has 8 feet or less cover.

4. Valves and operators for submerged or buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. Operator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals.

K. Plug valves shall be manufactured by DeZurik or Pratt.

2.5 CHECK VALVES

A. Check valves shall be wafer-type having an adjustable external lever and spring for installation between ANSI 125 pound flanges.

B. Valve body and shall be cast iron conforming to ASTM A126 Class B. Disc arm and disc plate shall be ASTM 536 ductile iron or stainless steel and hinge shaft shall be stainless steel conforming to ASTM A240. The hinge shaft shall be supported by bronze bearings per ASTM B584-932 and the shaft packing gland shall be adjustable using a compression-type packing.

C. Replaceable valve seat shall be Buna-N and seat follower Bronze 660. Body seat shall be Bronze B-62 or stainless steel and spring shall be 316 stainless steel.

D. Check valves shall be manufactured by GA Industries (Empire Specialty Co.) Figure 230, Prince-Keystone Figure 813, or approved equal.

2.6 BUTTERFLY VALVES

A. Butterfly valves shall be resilient seated, with mechanical joint or flanged ends as required and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.

B. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be ASTM A 276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron with 316 stainless steel disc edge. The resilient valve seat shall be located

either on the valve body and the seat shall be Buna-N.

C. Actuators

1. Provide steel hand lever with non-metallic hand grip for valves less than 10-inches.

2. Valves 10-inches or greater in diameter shall be equipped with geared manual actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Valve actuators shall be capable of withstanding a minimum of 450-foot pounds of input torque in either the open or closed position without damage.

3. Valves 10-inches and larger, for non-buried service, shall have motorized actuator or be equipped with a handwheel operator.

4. Valves shall be installed with disc shaft horizontal, except where extended bonnets are shown on the Drawings. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

D. Manufacturers: Dezurik, or Pratt

2.7 PINCH VALVES

A. Pinch valves shall be full cast metal body, electrically operated type, with flange joint ends for installation between ANSI 125 pound flanges.

B. Two mechanical pinch bars shall open and close a neoprene sleeve. The mechanism shall be direct-acting and reverse acting thread which, when rotated by the motorized actuator, opens and closes the sleeve on centerline.

C. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim.

D. Port areas shall be 100% of the full pipe area at the valve ends. The mechanism shall be supported in the valve body. There shall be no cast parts in the operating mechanism. The mechanism shall be connected to the motorized actuator through an ACME threaded stem. The pinch mechanism shall be adjustable for stroke without removing the valve from the line.

E. Pinch valves shall be Series 5800 as manufactured by the Red Valve Co. or approved equal.

2.8 BALL VALVES (PVC)

A. Ball valves shall be CPVC or PVC, full-port, true union with socket connection. Provide

Viton O-Ring Seals and Teflon seats.

B. Ball valves shall be Hayward Safe Block, or approved equal.

2.9 VALVE OPERATOR ACCESSORIES

A. Pedestal Operators

1. Non-geared pedestal type operators shall be provided and installed as shown on the Drawings. Operators shall be high strength cast iron. Non-geared operators shall be equipped with indicators to show valve position and shall have handwheel operator. Operators shall be non-rising stem or rising stem valves as specified or as shown on the Drawings. The operator shall be sized by the valve manufacturer to provide a minimum of two times the force and torque required to operate the valve with a maximum 40 pound force applied to the handwheel. Operators shall be an accessory product of the valve manufacturer.

2. Geared pedestal operators shall be provided and installed as shown on the Drawings. Geared operators shall have ball thrust bearings sized by the valve manufacturer and shall be equipped with valve position indicators and crank type handle. The operator shall be sized by the valve manufacturer to provide two times the maximum load or torque required to operate the valve with a maximum 40 pound force applied to the crank.

B. Stem Guides: Fully adjustable stem guides with bronze bushings, shall be furnished by the manufacturer of the associated valve and shall be installed as shown on the Drawings and wherever necessary to prevent unsupported stem lengths of 10 feet or more.

C. Extension Stems: Extension stem shall be stainless steel and shall be furnished by the manufacturer of the associated valve to bring the operating nut to within 6-inches of finished grade. Extension stems shall be sized by the valve manufacturer and shall include universal joint as required by the installation arrangement shown on the Drawings.

D. Valve Boxes

1. Valve boxes shall be cast iron two-piece screw type with drop covers and shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary.

2. Valve boxes shall be manufactured by Tyler, Opelika or Star.

2.10 HOSE REELS

A. Hose reels shall be 1-1/2-inxh, manual, direct crank type. All reel components shall be stainless steel. The hose shall pay-out from the bottom and the reel shall be fitted with a low mount, bottom wind roller and spool assembly. The inlet shall be a 90-degree swivel joint with 1-1/2-

inch female NPT threads. Outlet riser shall be 1-1/2-inch female NPT threads.

B. The hose shall be 1-1/2-inch by 75 feet long, lay flat type (3/4=inch by 3-inch), minimum 200 psi rated with nitrile-oil and chemical resistant tube and moisture resistant woven polyester cover.

C. Terminal fittings shall be 1-1/2-inch male NPT with brass terminal nozzle and brass ball-type hose shutoff valve.

D. Hose reel shall be Rannay Reels Model 922-30-31A or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported.

B. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and be responsible for the proper location of these valves and appurtenances during the construction of the structure.

3.2 FIELD PAINTING

Field painting of exposed and submerged valves shall be as specified in Article 2.2 of this Section.

3.3 INSPECTION AND TESTING

Each valve shall be tested in the presence of the Owner or Engineer for proper operation and leak tightness. Any leaks shall be corrected. The Contractor shall make all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

END OF SECTION

SECTION 40 91 00
INSTRUMENTATION DEVICES

PART 1 GENERAL

1.1 SCOPE

A. Furnish, install, test and calibrate all field and panel mounted instrumentation devices shown on the Drawings complete with all necessary signal converters, isolators, amplifiers, power supplies, and other appurtenances necessary for interfacing with other components.

1.2 SUBMITTALS

A. Submit product data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with the requirements of Section 01 70 00 of these Specifications.

PART 2 PRODUCTS

2. 1 FLOW TRANSMITTER – MAGNETIC

A. Type: Pulsed DC coil

1. Flanged Type (for line size 8-inch or larger)
2. Wafer Type (for line size less than 8-inches)

B. Body

1. Flanged Type: 304 stainless steel flow tube, carbon steel ANSI 150 flanges.

2. Wafer Type: Designed to mount between ANSI 150 flanges. Flowmeter housing shall be manufacturer's standard material of construction.

3. Flow tube shall have submersible rating IP88 or NEMA 6P.

C. Electrodes and grounding ring shall be 316 stainless steel.

D. Transmitter:
1. Power: 24 VDC
2. Enclosure: NEMA 4, coated aluminum or fiberglass.
3. Mounting Bracket: 2-inch stainless steel pipe.
4. Provide local indicator
5. Provide cabling sufficient to connect flow element and transmitter.
6. Output: Isolated 4 to 20 mADC.
7. Accuracy: +/- 1.0 percent of flow rate.

E. Schedule

Tag	Calibrated Range	Classification-Service
SL-FM- 1	0-200 gpm	Unclassified - Effluent

F. The maximum cable run from the sensor to the transmitter shall be 125 feet.

G. Acceptable Manufacturers: Rosemount, or approved equal.

2.2 TURBIDIMETER

A. Type: Non-contact nephelometer with digital display and communication interface for automatic, continuous measurement of turbidity in potable water.

B. Range: 0.0 to 100 NTU

C. Acceptable Manufacturers: Swan Analytical Instruments (Monitor AMI Turbiwell with LED and AMI Option Modbus Interface; Product No. A-25.411.700.1 with A-81.420.022; Model No. AMI-2), or approved equal.

2.3 pH CONTROLLER / SENSOR

A. Controller: Display up to two independent liquid analytical measurements; Type 4X, polycarbonate with ½-inch conduit openings, customizable, monochromatic graphic liquid crystal, backlift display, 115/230 VAC, Analog Communication (0/4 – 20 mA).

B. Sensor: Molded Tefzel body with Viton o-rings, general purpose for measuring pH/ORP.

C. Acceptable Manufacturers: Rosemount Analytical (Controller Model 1056-01-22-38-AN with Sensor Model 389 General Purpose pH/ORP), or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate field instruments so they are accessible for maintenance and orient so that indicators are readily visible. Unless otherwise indicated, mount instruments 36 to 60-inches above work surface. Provide 2-inch diameter, 316 stainless steel, Schedule 10 pipe welded to a 10-inch square by ¼-inch thick stainless steel base plate for support unless wall or handrail mounting arrangement as shown on the Drawings. Space instruments at least ½-inch off concrete walls by stainless steel channels or phenolic spacers.

B. Provide stainless steel or aluminum sunscreens or shades for all electronic instruments located outdoors.

3.2 TESTS AND CALIBRATION

A. Perform continuity tests on instrumentation conductors.

B. Calibrate each instrument to its published accuracy. Submit calibration sheets including the instrument tag number or name, the date, name of individual performing calibration, procedures and equipment used, and results obtained.

END OF SECTION

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SECTION 40 95 15
CONTROLS AND SCADA SYSTEM MODIFICATIONS

PART 1 GENERAL

1.1 SCOPE AND CONTROL STRATEGY

A. The Plant control strategy allows centralized monitoring and control of all major process systems with distributed I/O communicated between multiple Local Control Panels (LCP) and a Main Control Panel (MCP/PLC-M) via fiber optic cable.

B. Work under this Section includes integration of LCP-S to control and monitor new Flocculation/Sedimentation Basin No. 2 operation including a Thickened Sludge Control System. Monitoring and control of existing Flocculation/Sedimentation Basin No.1 equipment, settled water monitoring systems and chemical feed systems will be unchanged.

C. Work includes modifications to the existing PLC-M and VTScada interface package to accommodate new I/O consistent with existing software and graphic display content.

D. Current Plant strategy is to operate one flocculation and sedimentation process train with train selection by manual operation of valves at each structure

1.2 FLOCCULATION TANKS (FLC-T-5,6,7,8)

Independent control of four mixers will provide tapered flocculation with I/O communications as follows:

VFD INPUT TO MCP/PLC-M			MCP OUTPUT TO VFD		
XI	RUN	DI	HS	START-STOP	DO
XA	FAULT	DI			

1.3 SETTLED WATER FLOW

A motorized settled water valve (SW-BFV-1) will communicate with LCP-S for effluent flow control from MCP as follows:

LCP-S OUTPUT TO MCP			MCP OUTPUT TO LCP-S		
XI	VALVE IN REMOTE	DO	HS	OPEN VALVE	DO
ZIO	VALVE FULL OPEN	DO	HS	CLOSE VALVE	DO
ZIC	VALVE FULL CLOSE	DO			

1.4 THICKENED SLUDGE COLLECTION SYSTEM

A variable-speed, cable-driven sludge collector and sludge valve (SL-PV-1) is controlled by vendor-furnished FCP-SED-2 with communication to/from MCP via LCP-S to adjust sludge collection cycle duration and collection mode as follows:

	FCP-SED-2 OUTPUT TO MCP			MCP OUTPUT TO FCP-SED-2	
HS	DRIVE AUTO-OFF	DO	HS	DRIVE MODE FORWARD	DO
XI	RUN	DO	HS	DRIVE MODE REVERSE	DO
ZI	COLLECTOR POSITION HOME	DO	SIK	COLLECTOR SPEED	AO
ZI	COLLECTOR POSITION END	DO	HS	HAND-OFF-AUTO	DO
ZIO	VALVE FULL OPEN	DO			
ZIC	VALVE FULL CLOSE	DO			
XA	FAULT	DO			
XI	DRIVE MODE FORWARD	DO			
XI	DRIVE MODE REVERSE	DO			

1.5 THICKEND SLUDGE FLOW

Positioning of valve SL-FCV-1 controls sludge removal rate, removal interval and blowdown duration. Selected sludge flow is metered by SL-FM-1. I/O from field devices is transmitted to LCP-S with MCP communication as follows:

	LCP-S OUTPUT TO MCP			MCP OUTPUT TO LCP-S	
XI	VALVE IN REMOTE	DO	HS	OPEN VALVE`	DO
ZIO	VALVE FULL OPEN	DO	HS	CLOSE VALVE	DO
ZIC	VALVE FULL CLOSE	DO	KIC	TIMER	DO
ZI	VALVE POSITION	AO			
FI	METERED SLUDGE FLOW	AO			

1.6 SUBMITTALS

A. Submit shop drawings, product data and comprehensive bill of materials in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

PART 2 PRODUCTS

2.1 LOCAL CONTROL PANEL

A. Panel LCP-S shall be 12-inches deep, free standing NEMA 4X, stainless steel, minimum 14 gauge, single-door, continuous hinge with three point latch.

B. Provide full-width stainless steel panel sun shield, breather, thermostatically controlled enclosure space heater and corrosion inhibitor blocks.

C. Provide a fluorescent light and GFCI duplex receptacle in the rear of the panel.

PART 3 EXECUTION

3.1 TESTING AND TRAINING

A. Following functional testing of pumping systems, operational tests shall be performed to demonstrate LCP-S and fiber optic communication will function satisfactorily.

B. Furnish the services of a qualified technician, having complete knowledge of the PLC programming and functional requirements for one trip, two eight-hour days to supervise termination checks and functional testing of the control system and to instruct the Owner's personnel.

C. The systems integrator shall also provide a qualified technician for one trip, one eight-hour day for system adjustment and reprogramming as required. This service shall be scheduled approximately 30 days following start-up of all system components.

END OF SECTION

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FOR

CONCRETE, METALS, AND EQUIPMENT SPECIFICATIONS

City of Georgetown

WTP Floc/Sed Basin No. 2

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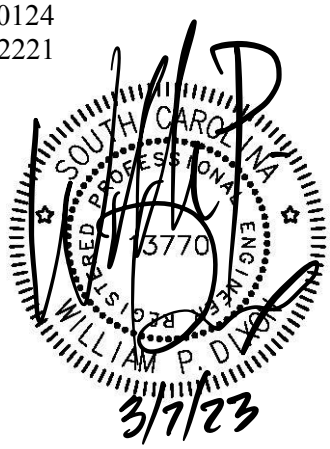

SECTION 46 41 35
FLOCCULATOR EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of flocculator equipment as specified herein or shown on Contract Drawings.

B. General Requirements: All products and materials shall conform to the standards specifications detailed in this document.

Manufacturer shall maintain a Quality Assurance System which complies with NQA-1, ISO 9001:2000, ANSI and MIL-Q-9858A. Upon request from the Engineer, the manufacturer shall submit to an audit to verify compliance with the referenced standards.

The flocculator's wetted parts must be the product of the same manufacturer and designed specifically for mixing applications.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

1.3 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are:
1. SPX Lightnin
2. Philadelphia Mixing Systems
3. Chemineer
4. Hayward Gordon

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 SERVICE CONDITIONS

A. The mixing equipment shall be designed to meet the service conditions specified below and in the Schedule of the Documents.

Four (4) stage flocculator mixers with variable frequency drives required:

Tank Dimensions L x W (ft)	14’-0” x 14’-6”’
Wall Height ft.	25’-6”
Liquid level ft.	24’-0”
Design G Value Units	60 G^{sec-1} to 45 G^{sec-1}
Design Temperature, °F	50
Minimum Impeller Diameter, Inches	72
Maximum Output Speed, RPM	25
Motor HP	2
Minimum Shaft Diameter, Inches	2.5
Wetted Parts	316 Stainless Steel

2.2 DETAILS OF MANUFACTURE

A. General: Each mixer assembly shall consist of an impeller, shaft, coupling, pedestal mounting base, reducer, high speed coupling / C-face adapter and motor as detailed below. All wetted parts shall be of 316L Stainless Steel.

B. Impeller: The flocculator mixers shall have a quantity of one (1) high efficiency axial flow type impeller with a variable angle to attack into the fluid. The impellers shall be of a diameter as specified above. The maximum impeller speed shall be as specified above. Impeller blades shall be bolted to the impeller hub. The impeller and hub assembly shall be attached to the shaft by means of a keyway with a hook key. Tapered-bore and split clamping type hubs will not be acceptable. The maximum stress in any impeller component shall not exceed 12,000 psi under maximum operating loads. The shaft-impeller system design shall be such that its operating speed shall not exceed 75% of its first lateral critical speed. The use of stabilizing rings or fins will not influence this limitation.

C. Impeller Shaft: The shaft diameter shall be as described above. The shaft shall be designed such that the maximum stress shall not exceed 9,000 psi under maximum operating loads. It shall be of overhung design - the use of underwater steady bearings is not permitted.

D. Coupling: The lower mixer shaft shall be connected to the drive output shaft by means of a rigid flanged coupling, of either the welded or interference fit hub type. Coupling face shall have a rabbeted male and female piloted connection for accurate concentricity and shall not require match marks for alignment. Material shall be carbon steel. The coupling assembly shall be located above the concrete support within the mixer drive stand.

E. Mounting Arrangement: The mixer will be mounted on a drive stand, which allows sufficient space for installation and inspection of the rigid coupling. The raised base shall have a minimum of 10" clearance from concrete base.

F. Gear Reducer: Speed reducer shall be specifically designed for mixing duty and shall be suitable for 24hr/day continuous operation. The speed reducer shall be of a modular design with a cast housing. An integral drywell feature shall be a part of the lower casting in order to eliminate the possibility of oil leakage down the output shaft. General Maintenance, specifically including replacement of all anti-friction bearings, oil seals and bearings and lubricant maintenance shall not require removal of the speed reducer housing from its foundations. A single oil drain shall be provided at the lowest point of the reducer to allow oil drainage and a minimum residual of oil no more than ¼" in the drive housing. The American Gear Manufacturers Association (AGMA) service factor shall be not less than 2.0 based on full motor nameplate horsepower. The AGMA service factor shall not be greater than 3.0, based on motor nameplate horsepower, in order to maintain gearbox efficiency. The thermal rating of the speed reducer shall exceed the design mechanical rating to eliminate the need for external cooling devices. External cooling devices are not permitted. The reducer shall bear an AGMA nameplate. All gearing shall be either of all helical configuration or a combination of helical and spiral bevel: AGMA quality 10 minimum and be immersed completely in lubricant. Worm gears are not acceptable. All reducer bearings shall have a minimum B-10 bearing rating of 200,000 hours based on full motor nameplate horsepower and the loads encountered in a mixing application. All bearings shall be immersed in lubricating oil or greased with provisions for regreasing to ensure positive lubrication. Gear drive lubrication shall be achieved by immersion of gears and bearings in an oil bath or splash lubrication. The lubrication shall not require priming, heaters, or other special effort or equipment for start-up in extremely cold or highly variable climates. The reducer will be capable of operating at the full range of shaft speeds specified where a VFD is installed. The full load operating noise levels of the mixer drives shall meet current OSHA Occupational noise standards, and/or AGMA standard 299.1, and shall not exceed 85 dBA at 3 feet from any part of the drive assembly.

G. Drive Motor: The mixer shall be powered by a C-faced TEFC premium efficiency, Mill/Chemical inverter duty motor of Power rating described above to ensure long life. The motor shall be 460 volts, 60-hertz, 3-phase, with a nominal speed of 1800 rpm. Service Factor shall be a minimum of 1.15 on sine wave power, and 1.0 on inverter power. L10 bearing life shall be not less than 50,000 hrs. Motors shall be provided with a motor temperature switch to shutdown motor on excessive temperature. Coordinate with VFD supplier prior providing motor. Motors shall be provided with 120 VAC motor space heaters to prevent motor condensation.

H. Variable Frequency Drive: VFD shall be as specified in Division 26 Electrical and supplied by the Electrical Contractor.

I. Installation: The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

The electrical contractor shall complete power wiring. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

J. Startup: Startup shall be provided for each drive by a factory authorized service technician. A start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

K. Product Support: Factory trained application engineering and service personnel that are thoroughly familiar with the drive products offered will be locally available at both the specifying and installation locations.

L. Coverings: The painting of the mixer system shall include but not be limited to motor, reducer and mounting assembly and be to the manufacturer's standard specification and color coding but, should not be less than the industry standard for such equipment. Stainless steel components shall not be painted.

M. Food-Grade Lubricants: Manufacturer shall provide food-grade lubricants with reducer for initial oil fill, and also recommend the quality and type to be used. All lubricants shall be food-grade.

PART 3 EXECUTION

3.1 GENERAL

A. The equipment shall be installed properly and in accordance with the recommendations set out in manuals supplied by the manufacturer so as to provide a complete working system.

3.2 SUPERVISION

A. The manufacturer or the manufacturer's representative shall provide the following services:

Installation Supervision – estimated 1 day at site
Start-up Supervision – estimated 1 day at site
Field Testing – estimated 1 day at site
Operator Training – estimated 1 day at site

The Contractor will notify the Engineer well in advance of any of the above and schedule the timing accordingly. Supervision shall include all travel to and from the site.

3.3 MANUALS

A. Installation and maintenance manuals will be provided by the Manufacturer well in advance of the equipment being installed at site and be of sufficient detail to allow the contractor to install the equipment without supervision from the Manufacturer.

END OF SECTION

SECTION 46 43 76
INCLINED PLATE SETTLERS AND HOSELESS SLUDGE REMOVAL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, equipment and all else necessary for installation of inclined plate settlers and hoseless sludge removal system as specified herein or shown on Contract Drawings.

B. Each inclined plate settler shall be furnished as a complete and fully functional system requiring only erection and grouting, connection of influent, effluent, and support columns and cross beams. The manufacturer of this system must have been in the business for at least 20 years and have a staff familiar with hydraulics and mechanics with at least 20 years' experience. The system provided must have been provided on at least 25 other installations with the influent and withdrawal system being provided as specified. All hydraulic loading rates shall be supported by independent hydraulic modeling data for the exact system being proposed for this project.

1.2 SUBMITTALS

A. Submit shop drawings and engineering data in accordance with Section 01 34 00 of these Specifications.

All submittal requirements relate to both included plate settlers and hoseless sludge removal.

Materials and Equipment: Manufacturer's descriptive data and technical literature, performance charts, catalog cuts, and installation instructions. Data shall include a complete list of parts and supplies, with current unit prices and source of supply. Include a certificate of NSF-61 approval for the plate settlers that are being proposed. Certificates for materials only will not be acceptable. A written indemnification against patent infringement to the Owner shall be provided.

Drawings: A complete listing of equipment and materials. Drawings containing complete schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

Design Data: Flow diagram of system(s) showing location of equipment and devices.

Evaluations of pertinent equipment including weirs, troughs, pipes, etc.

Headloss, loading rate, hydraulic design calculations sealed by a South Carolina professional engineer.

Structural design calculations for all support systems related to equipment.

B. Operation and maintenance manuals shall be furnished in accordance with Section 01 70 00 of these Specifications.

Required Operational Data: Description of components.

Complete, detailed operating instructions for all equipment including startup, shutdown, and special operating instructions.

Explanation of all safety considerations relating to operation.

Required Maintenance Data: Include all information and instructions required to keep equipment properly lubricated and adjusted so that it functions economically throughout its full design life.

Explanation with illustrations as necessary for each maintenance task. Recommended spart parts lists. Recommended schedule of maintenance tasks. Lubrication charts and table of alternate lubricants. Trouble shooting instructions. List of maintenance tools and equipment. Name, address, and phone number of manufacturer and manufacturer's local service representative.

Include copies of all approved shop drawings.

1.3 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are:
   1. JMS
   2. MRI

1.4 QUALITY ASSURANCE

A. One manufacturer shall supply all equipment specified in this Section. The manufacturer shall provide a reference list of at least thirty (30) installations of all stainless steel plate settlers of a design complying with these specifications and used in municipal applications. Provide names and phone numbers of at least five references in operation for at least five years to be contacted. This minimum level of experience shall also require the manufacturer to demonstrate to the satisfaction of the Engineer that the manufacturer has served as the primary engineering designer for the plate system under consideration and that the manufacturer has performed all of the fabrication / manufacturing functions related to the plate settlers being offered to meet the experience clause. Plate settlers manufactured under different corporate identities or ownership will not be considered as meeting the experience qualifications. FRP shall not be acceptable in the fabrication or supply of the plate system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01 64 00 of these Specifications.

PART 2 PRODUCTS

2.1 INCLINED PLATE SETTLERS

A. Design Requirements: Plate settler equipment shall be installed in the sedimentation basins and shall be designed to clarify flocculated water that has received chemical treatment through the addition of a combination of any or all of the following: coagulant, polymer, and pH adjustment chemicals. Equipment shall be designed for the following:

1. Sedimentation Basins

Number of basins	One (1)
Inside dimensions	per drawings
Minimum flow	1.0 MGD
Design flow	6.0 MGD
Maximum Hydraulic Capacity	8.0 MGD

2. Raw Water Characteristics Prior to Flocculation

Temperature, F	55 - 90
Turbidity, NTU	.25 - 100
pH, Units	5.0 - 8.0

3. Plate Settler Design

Effective plate loading, gpm/sf	0.2 (at design flow)
Maximum weir loading, gpd/ft	20,000 (at design flow)

4. Hydraulics:
   a. Maximum permissible inlet flume velocity at design flow shall be 0.2 ft/s.
   b. Maximum upflow velocity at design flow between plates shall be 0.027 ft/s.
   c. The plate manufacturer shall provide an effective stainless steel inlet diffusion system to reduce the velocity to less than 0.5 ft. per second when entering the feed flumes of the plate settlers. The Contractor shall mount inlet diffusers as shown in the Contract drawings.

B. Materials of Construction: All components of the plate settler equipment shall be fabricated steel materials.

Shapes and bars	ASTM A276, AISI Type 304L or SIS 2333
Plates	ASTM A276, AISI Type 304L or SIS 2333
Weirs	ASTM A276, AISI Type 304L or SIS 2333
Bolts, Nuts, Fasteners, Embedments	IFI-104 GRADE 303, 304 or 305
Washers, Flat	ASTM A276, Type 304L or SIS 2333
Permatex Thread Lubricant	"Nickel Anti-Seize" or equal.

Maximum allowable carbon content of stainless steel shall be 0.05%. No carbon steel, fiberglass, or polystyrene equipment components shall be permitted.

C. Plates: The plate settling units shall operate in counter-current mode with clarified water flowing upward while settled solids move down. The incoming water shall be fed near the lower end of the plate from the side to allow the settled solids to fall to the floor of the clarifier without being re-entrained by the incoming flow.

The plates shall be arranged in packs. The packs shall be installed on cross beams provided by the manufacturer.

The incoming water shall be fed near the lower end of the plate from the side to allow the settled solids to fall to the floor of the basin while minimizing re-entrainment by the incoming flow.

The plates shall be inclined at an angle of 55° from the horizontal. The plate settlers shall have no moving parts and individual plates shall not extend above the water surface.

The effluent flow at the top of the plate shall be removed in at least four (4) points to insure even distribution across the full width of the plate. Plate settlers with less than four (4) take off points per plate or use of full width flow control angles in place of top tubes with flow control orifices are not acceptable. Alternately, each plate shall be equipped with an integral Type 304 stainless steel top flow control device to ensure that there is an even flow distribution across the entire surface area of the plate. The manufacturer shall provide a Registered Professional Engineer stamped report from a third-party testing laboratory in compliance with ASTM E529-94, which proves that a single top flow control device does not experience deflection greater than 3/16" at the midspan with a 300 lb. point load applied. The top flow control device shall not experience any buckling, permanent deformation, or yielding.

The plates shall be removable individually for inspection or repair and to ease initial installation. No structures or troughs shall be required to be removed in order to extract the plates. The effluent troughs shall be located to the side of the plate rows.

Each plate shall be 4.5' wide with a tubular top support structure extending beyond the flow control wier and integral bent sides and bottom framing elements manufactured of 24-gauge (minimum), cold rolled stainless steel, having tensile (yield) strength of 24,000 psi. Each plate shall be manufactured of 24 gauge (0.024" minimum), T-304 stainless steel. Plates greater 4.5' wide or those designed without a top tube shall be 22 gauge (0.0292" minimum), T-304 stainless steel with continuous intermediate stiffeners firmly attached to the plate on not more than 24-inch centers. Each plate settler shall be smooth in texture; the use of FRP (fiberglass) or aluminum, textured, ribbed, or corrugated sheets will not be accepted. Alternatively, manufacturers utilizing 26-gauge, T-304 stainless steel materials shall submit to the Engineer for approval a Registered Professional Engineer stamped report from a third-party testing laboratory in compliance with ASTM E330 and provide details of how the plate systems are tested including details of how the plates are supported during the test.

The plate packs shall be self-supporting and shall not exceed the maximum allowable deflection limits stipulated below.

The package plate settler systems shall be designed so that an operator may walk out onto the plates at any time, even during operation, without the need to remove any components. The entire top of each package plate settler system must be visible for inspection. Local OSHA regulations should be followed.

The plates shall be designed structurally for the following conditions:

1. Loading of 30 lbs. per plate live load.
2. A maximum deflection of 1/360 for all structures, troughs, etc.

3. A concentrated load of 250 lbs. anywhere on the flow deck (top tubes) or top edge of plates.

D. Effluent Collection Troughs: The effluent troughs shall be u-shaped and located to the side of the plate rows. Troughs located over the package plate settler systems obstructing access to the tops of the plates will not be accepted. After exiting the plates, water shall travel no more that ½ of a plate width to reach an effluent trough. Effluent troughs shall be of the dual side loaded design and be located on both sides of the plate settler frame assembly.

The effluent collection troughs shall be manufactured of T-304 stainless steel of minimum 16 gage thickness. All brackets trough supports, reinforcing sections, stiffeners, flanges, weirs, and fasteners shall be of T-304 stainless steel. Include a flat crested weir mounted to the side of each trough to maintain a water level of <2.0" above the plates. Weirs shall be capable of adjustment without bolting.

2.2 HOSELESS SLUDGE COLLECTOR

A. Under this specification, the sludge collector system shall be installed under the package plate settler system as shown in the contract drawings and as described herein. The hoseless sludge removal system and the plate settler system shall be by the same manufacturer.

B. The sludge collector systems shall include tandem collector assemblies, electric drive assemblies, drive cables, sensors, rigid sludge conduit, cable pulleys, main touch panel control system for fully automatic operation, and all other miscellaneous accessories and hardware as required for a complete installation.

C. The sludge collectors shall remove by means of differential head, the settled solids from the basin floor. The solids will be discharged through the rigid sludge conduits which are connected to fixed piping to exit the basin. Flexible hoses shall not be used for sludge removal.

D. Shared Reel Drive Assembly
1. Each drive assembly shall consist of a variable speed electric DC motor which will be coupled to a single rotating drum for manipulation of the cable that is attached to the tandem collector assembly.
2. The cable shall be firmly attached to the rotating drum to prevent slippage. Tensioning the cable between multiple pulleys to prevent slippage will not be allowed.
3. The cable shall store on the reel in a single layer, the placement of which shall be organized by the drive mechanism.
4. The complete drive mechanism shall be packaged on a single base and provided with a safety enclosure.
5. The drive enclosure shall provide a visual indication of the relative position of the collector assembly in the basin.

6. The drive assembly shall include an overload protection device that will not allow excessive loads to be transmitted to the drive cable.
7. The drive cable shall be Type 304 Stainless Steel with a minimum diameter of 3/16".

8. The drive assembly shall be capable of enduring an indefinite stall without damage, and without the need to replace sheer pins or other replacement devices. Upon removal of the obstruction or excessive load the drive mechanism shall automatically resume full operation.
9. The drive assembly shall have integral position sensors which determine when the collector is at the end of the basin, the beginning of the basin and points in-between. No external or under-water position sensors shall be required or allowed.
10. The drive shall have an emergency disconnect button which shall be a large, red palm operated single button.

E. Hoseless Collector Assembly
1. The Hoseless sludge collector assembly shall be manufactured entirely of Type 304 Stainless Steel, with the exception of non-metallic parts such as casters, bushings, orifices, etc. which will be manufactured of plastic, non-metallic materials.
2. Each Hoseless collector assembly shall consist of four sludge collection pipes each equal to half the width of the basin with helical flow orifices or flow balancing diagonals which are, in turn, connected to a center pipe which carries the sludge to the horizontal telescoping pipe sludge conduit. No flexible sludge hoses are allowed. The center pipe shall seal against the horizontal telescoping pipe sludge conduit by means of a UHMW seal.
3. The Hoseless collector assembly shall be designed to operate without the use of guide rails or tracks in the floor of the basin.
4. Operation of the sludge collector shall be controlled by a sludge valve as directed by the control panel by an electrically actuated sludge valve.
5. The manufacturer shall determine the proper number, spacing and angle of the orifices for the most efficient removal of solids from the basin.
6. Each Hoseless collector assembly will be complete with polyurethane rolling casters, side casters, and all necessary mounting hardware.
7. All welds shall be continuous and brushed clean.
8. All underwater bearings shall be specifically designed for underwater use.

F. Control System
1. Each control panel will operate by 110 VAC 20-amp circuit.
2. Each control panel will have the following:
   a. Real time clock for run initiation
   b. Torque monitor to detect and report an alarm condition
   c. Speed control
   d. Manual operation
   e. Alarm condition

2.3 INLET DIFFUSERS

A. Design and Scope of Work: The work shall include supply, delivery, installation, and inspection of equipment. The flow diffusers shall be in number, and dimension as shown in the contract drawings and designed in accordance with the process conditions as specified herein.

The flow diffuser system shall be comprised of the following elements:

Stainless steel inlet diffusers.

All wall mounting brackets, anchors and hardware as required.

B. Process Design and Conditions

Number of Basins	1
Width of each Basin	28 ft.
Design flow, each basin (process)	4,200 gpm
Maximum flow per basin (hydraulic)	5,600 gpm
Exit Velocity at Design flow	<0.5 fps

C. Materials of Construction: All components of the plate settler system shall be fabricated of stainless-steel materials.

Diffusers: ASTM A276, AISI Type 304
Bolts, Nuts, Fasteners: IFI-104 GRADE 304

All fabricated stainless-steel components shall be supplied with standard mill finish. All welded components shall be passivated and cleaned by mechanical methods per ASTM A-380 with an NSF approved acid solution to prevent future corrosion. Nitric acid or other hazardous chemicals shall not be allowed for cleaning and passivation.

D. Inlet Flow Control: The plate manufacturer shall provide inlet diffusers to reduce the velocity to less than 0.5 ft. per second when exiting the diffuser in order to prevent floc damage and to minimize velocity currents.

The inlet diffuser shall be designed without any corners, edges, or obstructions in the path of the incoming flow stream.

The incoming water shall be fed through a series of inlet port openings in the wall sized for less than 2.0 ft/sec as shown on the Contract drawings.

Flow exiting the diffuser shall be approximately 25% of the velocity at the opening port.

The diffuser diameter shall be a minimum of two times the inlet port height. Length shall be 1.5 to 3 times the inlet port width.

Diffusers shall be manufactured of minimum 16gauge T-304 stainless steel materials. (14 GA for 2’ diameter diffusers and 11 GA for 4’ diameter and larger). All reinforcing sections, stiffeners, flanges, and fasteners shall be of T-304 stainless.

The diffusers shall be self-supporting and shall not deflect under the hydraulic forces imposed by flow entering from the inlet port opening.

E. Support System Requirements: To ensure compatibility, the manufacturer shall provide stainless ½”-13 wedge type anchor bolts to mount and support the diffusers.

The manufacturer shall be required to coordinate the structural details of the design with the Engineer and Contractor.

PART 3 EXECUTION

3.1 INSTALLATION

A. The Contractor shall install equipment in conformance with these specifications, as shown on the drawings, and in accordance with the Manufacturer's recommendations.
B. Protect installed stainless components from contamination during the construction process.

3.2 INSPECTION AND START-UP

A. The Contractor shall inspect all equipment prior to erection, and repair or replace damaged items at no additional cost to the Owner.

B. Inspect installation of the equipment and certify that they have been installed in accordance with the Manufacturer’s recommendations.

C. Manufacturer shall include a minimum of two (2) trips and a total of three (3) eight-hour days (not including travel) for inspection, certification, start-up, and training the Owner’s staff in the operation of the system.

3.3 MANUFACTURER’S FIELD SERVICE

A. The Contractor shall coordinate field service work with the Manufacturer's representative, Owner, and Engineer prior to initiating such work.

The equipment manufacturer shall provide the services of a factory field service technician or engineer as follows:

1. Minimum of two (2) trips and a total of three (3) eight-hour days (not including travel) for inspection, certification, start-up, and training the Owner’s staff in the operation of the system.
2. Observe/advise the Contractor on the installation of the equipment.
3. Check and verify that installation of the systems is in accordance with the Drawings and Manufacturer's installation instructions.
4. Assist in start-up and testing of the systems.
5. Instruct the Owner's personnel on operation and maintenance of the equipment.
6. Plant personnel instruction shall consist of not less than 4 hours of classroom and field training. Subjects shall include the following:

    - Start-up procedures
    - Shutdown procedures
    - Troubleshooting
    - Operating adjustments for performance optimization
    - Preventative maintenance
    - Maintenance procedures
    - Emergency procedures
    - Record keeping

APPENDIX

Geotechnical Report

JOEL E. WOOD & ASSOCIATES

PLANNING • ENGINEERING • MANAGEMENT

GEOTECHNICAL INVESTIGATION
GEORGETWON WATER PLANT FILTER ADDITION
GEORGETOWN, SOUTH CAROLINA

For

MBD CONSULTING ENGINEERS

May 12, 2021

JWA File No.: 210505

P.O. Box 296
Clover, South Carolina 29710
2160 Filbert Highway
York, South Carolina 29745
Tel. (803) 684-3390 • Fax. (803) 628-2891
EMAIL: cewood@comporium.net

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Tel.: (704) 739-2565
Fax.: (704) 739-2565

May 12, 2021

Mr. Joseph McGougan, PE
MBD Consulting Engineers
1300 Second Ave.
Conway, SC 29526

Re.: Geotechnical Report
Georgetown Water Plant Filter Addition
Georgetown, South Carolina

Dear Mr. McGougan:

Submitted herein is the report of our geotechnical evaluation for the above referenced project. Included is a summary of our field investigation, findings, and recommendations.

It has been a pleasure working for you on this project and we appreciate the opportunity to be of service. Please notify us if there are any questions or if we may be of further assistance with the implementation of our recommendations.

Sincerely,

JOEL E. WOOD & ASSOCIATES

Christopher E. Wood, P.E.
President

JOEL E. WOOD & ASSOCIATES
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- Site Location Plan – Figure 1
- Soil Test Boring Location Plan – Figure 2
- Boring Logs – B-1 and B-2

1.0 INTRODUCTION

1.1 General

A geotechnical investigation has been performed for the proposed filter addition at the Georgetown Water Plant in Georgetown, South Carolina. The investigation was authorized by Mr. Joseph McGougan of MBD Consulting Engineers.

1.2 Project Objectives

The primary objectives of this investigation were to gather information on subsurface conditions and develop recommendations for foundation type and bearing capacity. The objectives were accomplished by executing the following:

1. Advancing soil test borings to provide data on soil stratigraphy and to obtain samples for evaluation;
2. Characterizing the soils to determine soil index properties and design parameters; and
3. Performing engineering analyses to develop design guidelines and recommendations.

1.3 Project Description

The project will consist of the addition of an above ground filter at the Georgetown Treatment Plant. Based upon the information provided, the improvements will generally consist of concrete filter tank with a wall height of approximately 17 feet and a water depth when full of approximately 15 feet. The layout of these improvements and surrounding structures are shown on the Soil Test Boring Location Plan (Figure 2) in the Appendix.

Subsequent sections of this report contain descriptions of the field investigation, findings, and design recommendations.

2.0 FIELD INVESTIGATION

On April 19 through 20, 2021, two soil test borings (B-1 and B-2) were advanced to depths of approximately 56 feet below existing grades. The soil test borings were advanced utilizing a Diedrich D50 track mounted drill rig and hollow stem augers. Standard split-spoon samples (SPT tests) were obtained at regular intervals throughout the depths of the borings in general accordance with ASTM D-1586 to determine the relative densities and consistencies of the subsurface soils.

The soil samples were visually classified based upon the Unified Soil Classification System. The locations of the borings were determined in the field by MGD Consulting

Engineers personnel. The approximate locations of the soil test borings are provided on the Soil Test Boring Location Plan in the Appendix.

3.0 SITE & SUBSURFACE CONDITIONS

3.1 Site Location and Description

ITEM	DESCRIPTION
Location	The site is located on Anthuan Maybank Dr. in Georgetown, South Carolina.
Existing Development	The proposed project area is part of the existing Georgetown Water Plant.
Current Ground Cover	Location of the proposed filter is a grassed open space.

3.2 Soil Stratigraphy

In general, the soil test borings encountered 6 inches of topsoil below the ground surface. Below the surface materials, the soils generally consist of transitioning layers of very loose to loose sand (SP-SM and SM) and very soft to very stiff silts (ML) to depths of approximately 38 feet. Standard penetration tests (N-counts) within these soils ranged from 2 to 23 blows per foot (bpf). The soils then transition to a very dense calcareous cemented clayey sand (SC) with N-counts in excess of 100 bpf. N-counts above 100 bpf are also classified as partially weathered rock (PWR) and may be difficult to excavate.

Detailed descriptions of the soils encountered are provided on the boring logs in the Appendix. As with any geologic formation, the depth and thickness of the soil strata will vary across the site. Although we have designated strata changes at specific depths in our description of the soil stratigraphy on the boring logs in the Appendix, transitions between soil strata are generally gradual. Therefore, the outlined subsurface data should only be considered general on-site soil conditions and should not be utilized as an absolute indicator.

3.3 Groundwater

Groundwater was encountered within soil test borings at a depth of approximately 3 feet at the time of the field investigation. Groundwater elevations can and will fluctuate with climatic conditions and seasonal changes and may be encountered at depths shallower than those noted at the time of the field investigation. Therefore, the contractor should anticipate and make provisions for dewatering footing excavations and utility trenches.

4.0 RECOMMENDATIONS AND CONCLUSIONS

The recommendations presented in this report are based upon the general soil conditions encountered in the soil test borings, our analyses of the site and subsurface conditions, and our experience on similar projects. The recommendations do not reflect variations in subsurface conditions or the presence of unsuitable soil conditions and obstructions. If subsurface conditions are discovered that would impact the assumptions developed in the design process, JOEL E. WOOD & ASSOCIATES should be contacted to evaluate the impact of the identified conditions.

4.1 Foundations

As a result of the "loose" relative consistency of the soils encountered in the upper 35feet, a deep foundation system is recommended for support of the proposed filter foundations. Based upon the soils encountered within the soil test borings and ultimate pile resistance based upon the SPT method, the following pile foundation is recommended.

TYPE PILE:	12" Square Precast Prestressed Concrete Pile
Penetration Depth:	45' Below Existing Grade
Ultimate Axial Resistance, Q_{ULT}:	135 Tons (Driving Resistance)
Factored Axial Resistance, Q_R:	60 Tons

Based on groundwater encountered at depths as shallow as 3 feet below existing grades, dewatering may be required during construction of the foundations.

In order to establish a driving criteria for the production piling, the following must be established: size, type, and driving force of the actual hammer to be used for installation. The driving criteria are necessary to determine sufficient driving resistance of end-bearing soils to ensure proper embedment of the piling. As a result of the confining end bearing layer, the piles will be driven to practical refusal and should be driven to no more than 5 blows per quarter on an inch. The following parameters are recommended for input values for the GRLWEAP Program.

Skin Damping:	0.05 s/ft
Toe Damping:	0.15 s/ft
Skin Quake:	0.10 in.
Toe Quake:	0.10 in.
Bearing Graph:	Porportional
% Skin Friction:	12

At least one test pile shall be driven and monitored with a pile driving analyzer in order to verify the ultimate axial resistance and driving criteria prior to the installation of production piles. The test pile may be at a production pile location.

4.2 Seismic Activity

The records for seismic activity in the southeast cover a span of about 300 years and consist mostly of non-instrumental data. The seismic activity in the southeast is also infrequent. No large earthquakes have occurred in the memory of the region's present inhabitants. Unlike earthquakes of California, southeastern earthquakes do not cause surface rupture. This makes it difficult for geologists to predict active faults.

No active faults are located in the project area; however, the Charleston area is considered seismically active. The largest reported earthquake in the Charleston area was the earthquake of 1886 which had an intensity of X on the modified Mercali scale. An intensity X earthquake has a return period of approximately 13,000 years with a 1% chance of occurring in 75 years. The modified Mercali scale is presented in Appendix B.

Liquefaction of in-situ soils during a seismic event has been considered and evaluated for the proposed site. Liquefaction occurs in loose, cohesionless saturated granular soils when cyclic shear stresses pass through the soil deposit inducing a progressive increase in excess hydrostatic pore water pressures. The degree of excess pore water generation is a function of the initial density of the material, its fines content, and the level and duration of seismic shaking. Our subsurface investigation identified soils in the upper 35 feet of potentially liquefiable sand. This evaluation is based on the work by Seed and Idriss for which standard penetration values were developed for conditions where liquefaction is unlikely to occur.

Based upon the results of the soil test borings and our experience with geologic conditions in the area, a Site Class "F" classification should be utilized per the International Building Code. These recommendations are based upon the soils encountered and our experience with the geologic conditions in the area.

5.0 LIMITATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained herein are based upon applicable standards in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings will not become evident until construction begins. If variations appear evident, we request the opportunity to re-evaluate the recommendations in this report. In the event that any changes in nature or design of the project are planned, the recommendations contained in the report will not be considered valid unless the changes are reviewed and verified in writing.

SITE LOCATION PLAN

FIGURE 1

SOIL TEST BORING LOCATION PLAN

FIGURE 2

Joel E. Wood & Associates, L.L.C.
Planning • Engineering • Management

Georgetown Water Treatment Plant
Georgetown, SC

LOG OF BORING No. B-1

Station:
Offset:

Date Drilled: 4/20/21 | Supervisor: HBC | Notes: Diedrich D50 Drill Rig

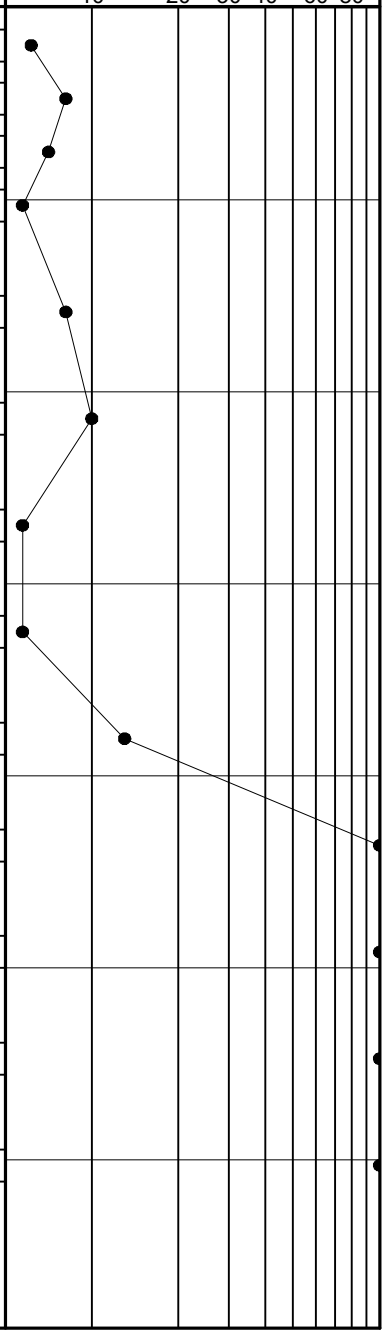
Casing Length: N/A | Ground Elevation:

Hammer Type: ☐ Gravity ☒ Automatic ☐ Other:

Water Level: 3.0' ATD, hours AD | Drilling Method: HSA

Elevation (ft.)	Depth (ft.)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6 in.	2nd 6 in.	3rd 6 in.	N Value
	0.5	6" Grassmat and Topsoil		1.0	SS-1	2	1	2	3
		Very Loose to Loose Tan, Orange,and Gray SAND with Silt (SP -SM)		3.5	SS-2	2	2	5	7
				6.0	SS-3	3	3	2	5
	8.5			8.5	SS-4	WOH	1	1	2
		Very Loose Gray Silty SAND (SM)							
	13.5			13.5	SS-5	3	3	4	7
		Loose Gray SAND with Silt and Shells (SP-SM							
				18.5	SS-6	3	3	7	10
	23.5			23.5	SS-7	WOH	1	1	2
		Very Loose Gray Silty SAND (SM)							
	28.5			28.5	SS-8	WOH	1	1	2
		Very Loose Gray and SAND with Silt (SP-SM)							
				33.5	SS-9	6	7	6	13
		Stiff Gray and Black SILT with Sand (ML)							
	38.5			38.5	SS-10	24	50/2		100
		Very Dense Gray and White Calcareous Cemented Clayey SAND (SC) - Sampled as PWR		43.5	SS-11	50/4			100
				48.5	SS-12	11	50/4		100
				53.5	SS-13	50/1			100
	56.2	Boring Terminated @ 56.2 Feet Due to Auger Refusal							

STD. PENETRATION TEST DATA (blows/foot)
10 20 30 40 60 80



LEGEND

SAMPLER TYPE			
SS	- Split Spoon	NQ	- Rock Core, 1-7/8"
ST	- Shelby Tube	CU	- Cuttings
AWG	- Rock Core, 1-1/8"	CT	- Continuous Tube

DRILLING METHOD			
HSA	- Hollow Stem Auger	RW	- Rotary Wash
CFA	- Continuous Flight Augers	RC	- Rock Core
DC	- Driving Casing		

Joel E. Wood & Associates, L.L.C.
Planning • Engineering • Management

Georgetown Water Treatment Plant
Georgetown, SC

LOG OF BORING No. B-2

Station:
Offset:

Date Drilled: 4/19/21 | Supervisor: HBC | Notes: Diedrich D50 Drill Rig

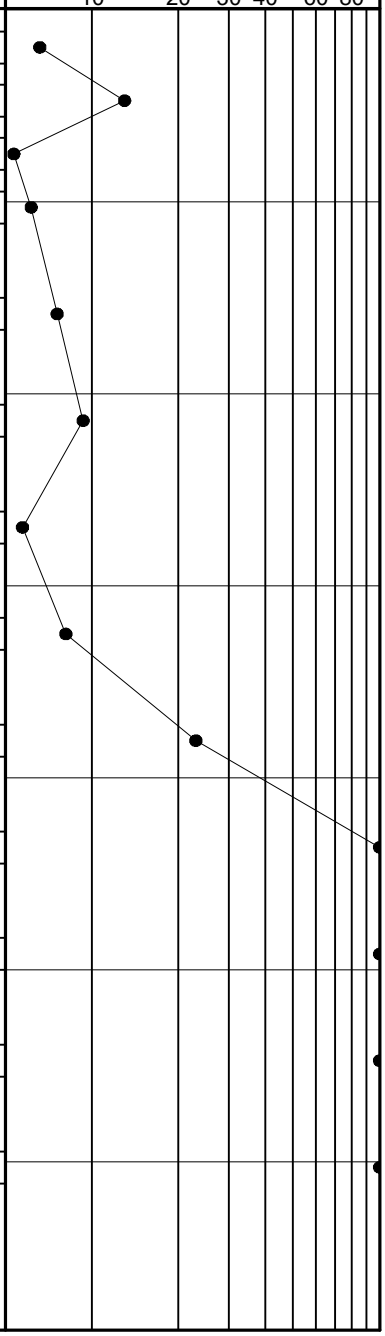
Casing Length: N/A | Ground Elevation:

Hammer Type: ☐ Gravity ☒ Automatic ☐ Other:

Water Level: 3.0' ATD, hours AD | Drilling Method: HSA

Elevation (ft.)	Depth (ft.)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6 in.	2nd 6 in.	3rd 6 in.	N Value
	1.0	12" Topsoil		1.0	SS-1	3	2	2	4
		Firm to Very Loose Gray, Orange, and Black SAND with Silt (SP-SM)		3.5	SS-2	6	6	7	13
	7.0			6.0	SS-3	WOH	WOH	1	1
		Very Loose Gray Silty SAND with Shells (SM)		8.5	SS-4	2	2	1	3
	13.5			13.5	SS-5	5	3	3	6
		Loose Gray SAND with Silt and Shells (SP-SM		18.5	SS-6	5	6	3	9
	23.5			23.5	SS-7	2	1	1	2
		Very Loose to Loose Gray Silty SAND (SM)		28.5	SS-8	2	2	5	7
	33.5			33.5	SS-9	4	8	15	23
		Very Stiff Gray and Black SILT with Sand (ML)		38.5	SS-10	16	43	50/3	100
	38.5			43.5	SS-11	50/5			100
		Very Dense Gray and White Calcareous Cemented Clayey SAND (SC) - Sampled as PWR		48.5	SS-12	50/4			100
				53.5	SS-13	40	50/4		100
	56.3	Boring Terminated @ 56.3 Feet Due to Auger Refusal							

STD. PENETRATION TEST DATA (blows/foot)
10 20 30 40 60 80



LEGEND

SAMPLER TYPE				DRILLING METHOD			
SS	- Split Spoon	NQ	- Rock Core, 1-7/8"	HSA	- Hollow Stem Auger	RW	- Rotary Wash
ST	- Shelby Tube	CU	- Cuttings	CFA	- Continuous Flight Augers	RC	- Rock Core
AWG	- Rock Core, 1-1/8"	CT	- Continuous Tube	DC	- Driving Casing		

SCDHEC and OCRM Permits

Water Supply Construction Permit
Bureau of Water

Rich

dhec
S.C. Department of Health and Environmental Control

Permission is Hereby Granted To: **CITY OF GEORGETOWN**
2377 MAYBANK DR
GEORGETOWN SC 29440

for the construction of a surface water system in accordance with the construction plans, specifications, design calculations and the SC DHEC Construction Permit Application signed by William H Young, Registered Professional Engineer, S.C. Registration Number: 23253.

Project Name: WTP FLOC/SED BASIN NO. 2 **County:** Georgetown
Location: 2355 ANTHUAN MAYBANK DRIVE, GEORGETOWN, SC 29440

Project Description: This project is to add a new, duplicate flocculation and sedimentation to the existing 6-MGD drinking water treatment plant. The sedimentation basins will have plate settlers and sludge removal.

Service By: The water will be provided by Georgetown Water Utilities (System Number: 2210001)

Special Conditions

1. Before an approval to "Place into Operation" can be issued for the proposed construction, an operation and maintenance (O&M) manual must be developed. This must be a comprehensive O&M manual developed for all facility processes. The complete O&M manual must be available for review at the time of final inspection. Note that if an O&M manual already exists for a facility then only an addendum for the proposed work is required.
2. The materials used shall be lead free. EPA defines lead free as a weighted average of 0.25% lead calculated across the wetted surfaces of the pipe, pipe fitting, plumbing fitting, fixtures and 0.2% lead for solder and flux.

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.

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. An Approval to Place in Operation is required and can be obtained following the completion of construction by contacting Mr. Richard A. Welch, P.E., Manager Drinking Water Compliance Section, at 803-898-3546. Additional permits may be required prior to construction (e.g., stormwater).

Permit Number: 36051-WS
Date of Issue: August 02, 2022
Expiration Date: Construction must be completed prior to August 02, 2025 or this permit will expire.
RAW

PE for
Douglas B. Kinard, P.E., Director
Drinking Water & Recreational Waters
Protection Division

General Coastal Zone Consistency Determination

To:	Orlando Arteaga, City of Georgetown
From:	Holli Dawn Martin, OCRM Coastal Zone Consistency Section
Project Name:	WTP Floc/Sed Basin No. 2
Site Location:	2377 Anthuan Maybank Drive, Georgetown, Georgetown County, SC
Ref #:	HPF-847F-S4HCC; GCZC-2017-002
Date:	February 17, 2022

The staff of the Office of Ocean and Coastal Resource Management (OCRM) reviewed the above referenced Coastal Zone Consistency project request for NPDES Stormwater Land Disturbance and Water permits associated with the addition of duplicate flocculation/sedimentation basin added to 6 existing water treatment plant. The total area of disturbance will be 0.4 acre project site and located within the existing, previously disturbed water treatment plant site.

We hereby certify the above referenced project meets the minimum standards for General Coastal Zone Consistency for Minor Project Impacts under GCZC-2017-002 subject to the following conditions and the policies of the South Carolina Coastal Zone Management Program provided the provided the following conditions are included in the permit and adhered to by the applicant.

Conditions for Minor Impact Projects

1. This GCZC does not preclude the applicant from obtaining necessary local, state and/or federal approvals for the development prior to work beginning.

2. This GCZC is conditioned upon the proper use of Best Management Practices (BMPs), which must be installed, inspected and maintained to retain 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. Once stabilization has occurred, all temporary construction BMPs must be properly removed and discarded.

3. Projects that are part of a LCP are authorized/granted coverage provided the consistency determination review for the development including its stormwater management drainage system has been approved under a previously authorized NPDES CGP Land Disturbance Permit (clearing and grading or site development). The development infrastructure, and site layout deemed consistent under the referenced NPDES Land Disturbance Permit's Stormwater Pollution Prevention Plan (SWPPP) remains unchanged from the time of approval as referenced under Section 2.2.2.A of the current NPDES General Permit For Stormwater Discharges From Construction Activities, as well as, compliant with the S.C.

Stormwater Management and Sediment Reduction Regulations (26 S.C. Code Ann. Regs. 72-300) and Chapter III, Section XIII, A, E, and D of the SCCZMP.

4. The project, as applicable, must be compliant with any MOA or Restrictive Covenants/Recorded plats for the project associated with previous Coastal Zone Consistency Determinations of any respective Bureau Permit. Proof of compliance must be included with the request narrative and shown on the lot construction plan sheet.

5. 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 (SHPO) 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.
6. The applicant must continue to adhere to all conditions of any Coastal Zone Consistency Determinations of respective Bureau permits.

7. Project development must not result in adverse impacts through nonpoint stormwater runoff and/or point source water discharge on adjacent lands.

8. For land disturbance stabilization, the applicant is strongly encouraged to utilize ground cover, shrub and canopy species native to the coast of South Carolina in any landscaping plans to recover some of the lost ecosystem functions such as water and air quality protection, mitigation of heat island effects and restoration of coastal zone habitat. Low Impact Development and green infrastructure practices are also strongly recommended.

9. Sediment, erosion and water quality controls required by the current NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities and the S.C. Stormwater Management and Sediment Reduction Regulations (26 S.C. Code Ann. Regs. 72-300, as amended, are satisfied by the project design and are correctly installed and maintained. Additional water quality measures specific to the eight coastal counties, as established in Chapter III, Section XIII, A, E, and D of the SCCZMP, as refined, being satisfied by the project design are applicable. Storage for these activities must be appropriate for the specific site

10. Sewage treatment facilities and transmission systems in the coastal zone must meet applicable Federal, State and local construction and water quality standards.

11. For Sewage Treatment, the project must be consistent with designated 208 Areawide Waste Treatment Management implementation agencies and other agencies with responsibility for implementing comprehensive plans affecting sewage treatment, to ensure that proposed projects are compatible with growth and development plans and that alternative locations for sewage treatment facilities are considered.

12. Minor Project Impacts are not authorized/granted coverage in these instances:

    a. When the proposed construction activity is located in any areas identified as "Areas of Special Resource Significance" as detailed in Chapter III, Section XII of the SCCZMP, as refined, unless the area has been previously developed or concerns are negated by on-site characteristics. Areas of Special Resource Significance include (1) Barrier Islands, (2) Dune Areas (outside of the critical area), (3) Navigation Channels, (4) Public Open Spaces (5) Wetlands or areas known to be subject to hazards, including but not limited flooding and contaminated sites. Barrier Islands identified in this condition include undeveloped areas of barrier islands only. The development or redevelopment of single family residential lots are not included in this definition and are exempt. Public Open Spaces identified in this condition include recreationally open areas such as local parks. State Parks are currently identified as Geographic Areas of Particular Concern (GAPC) and are covered therein.

    b. When the proposed project may impacts areas identified as GAPCs as detailed in Chapter IV of the SCCZMP: Areas of Unique Natural Resource Value (1) Heritage Trust Sites (2) State Wildlife Preserves (3) State Parks (4) Scenic Rivers (5) Marine and Estuarine Sanctuaries (6) Shellfish Areas (7) Groundwater Resources (8) and Threatened and Endangered Species); Activities or Facilities Dependent on Coastal Location (1) State Ports (2) Navigation Channels (3) and Mining Operations; Areas of Special Historic, Archaeological or Cultural Significance (1) special historic (2) archaeological, or (3) culturally significant sites.

This determination shall serve as the DHEC OCRM State/Federal Coastal Zone Consistency Determination for the work described above. This determination ***does not*** serve as the final permitting decision and ***does not*** alleviate the applicant's responsibility to obtain final authorizing State or Federal permit(s). Local government authorizations ***may also*** be required.

McKim & Creed Controls

And

SCADA System Modifications Proposal

McKIM&CREED

ENGINEERS

SURVEYORS

PLANNERS

August 26, 2022 222361

Mr. William H. Young, P.E.
162 Seven Farms Drive, Suite 210
Charleston, SC 29492

RE: Request for Proposal Pre-Selected Allowance Controls and SCADA System Modifications WTP Floc-Sed Basin No. 2 City of Georgetown, South Carolina

Dear Mr. Young,

Per your request we are pleased to offer the following proposal for your consideration.

If you have any questions, or require additional information, please feel free to give me a call.

Sincerely,

Brian Slightom
Programmer

1730 Varsity Dr
Raleigh, NC 27606

919.233.8091
Fax 919.233.8031
www.mckimcreed.com

CITY OF GEORGETOWN
WK DICKSON
WTP Floc-Sed Basin No. 2 Controls and SCADA Modifications
SCOPE OF SERVICES

August 26, 2022

I. PROJECT DESCRIPTION

The City of Georgetown is adding a new Flocculation/Sedimentation Basin No.2 with Thickened Sludge Control System at the Water Treatment Plant. The new system will require a new PLC based control panel and Plant wide SCADA modifications to incorporate the new functionality into the existing system.

The City wishes to hire McKim & Creed (M&C) to provide PLC programming, HMI modifications, communication setup, and startup services for this project.

II. SCOPE OF SERVICES

McKim & Creed will perform the following services:

TASK 1 – Preliminary Planning and Control Panel Design $12,025.00

- **A.** Attend meetings as required by the City
- **B.** Internal project planning and management
- **C.** Provide design services and submit for approval for LCP-S drawings in AutoCAD format.
  Drawings will include the following
  i. Bill of Material
  ii. Layout of interior of panel
  iii. Detailed wiring of components
  iv. Field Connections
- **D.** Perform internal QA/QC of control panel drawings.

TASK 2 – Instrumentation (per Section 40 91 00) $15,671.37

- **A.** Magnetic Flow Meter w/Remote Transmitter (x1) (SL-FM-1)
  Total Cost - $7,276.25
  a. Rosemont 8711 Wafer Style Flow Meter, 4", with Grounding Rings – P/N 8711SSA040L1N5G1
  b. Rosemont 8732E Remote Transmitter P/N 8732EMR2A1N5M4
  c. 125' of Alpha Signal Cable, 2 conductor, 20 AWG, P/N 2411

d. 125' of Alpha Coil Drive Cable, 2 conductor, 14 AWG, P/N 2442

B. Turbidimeter (x1)
Total Cost - $5,655.10
a. Swan - Monitor AMI Turbiwell W/LED – A-25.411.700.1
b. Swan – AMI Modbus Interface – A-81.420.020

C. pH Controller/Sensor (x1)
Total Cost - $2,740.02
a. Dual Channel Transmitter Model 1056-01-22-38-AN
b. pH Sensor Model 389-02-10-54-62

TASK 3 – Control Panel $73,455.00

A. Provide one (1) Control Panel (LCP-S) per Section 40 95 15
a. Enclosure shall be 12 inches deep, free standing, NEMA 4X, Single Door.
b. Stainless steel, breather, thermostatically controlled enclosure space heater, and corrosion inhibitor block, light, and GFCI receptacle.
c. Modicon m340 PLC with 8 slot rack
i. 32 pt Discrete Input card (1x)
ii. 16 pt Discrete Output card (1x)
iii. 8 Ch. Analog Input (4-20 mA) card (1x)
iv. 8 Ch. Analog Output (4-20 mA) card (1x)
a. Modbus communications
b. Fiber to Ethernet gateway
c. Signal and Power Surge Protection

TASK 4 – PLC Programming $8,832.00

A. Program LCP-S, to perform the requirements of the functionals provided by Engineer
B. Research and Modify existing PLC-M program to communicate with LCP-S over Modbus/TCP

TASK 5 – SCADA Modifications $6,624.00

A. Modify existing SCADA application to incorporate new signals for Flocculation/Sedimentation Basin No.2
B. Submit for Owner/Engineer review screenshots of new screens
C. Add new signals for Alarms, Events, and Trending

TASK 6 – Startup, and Commissioning $11,592.00

B. Attend onsite startup (pre-functional demonstration)
   a. PLC-M modifications (1 Day)
   b. Fiber Testing/Termination (1 Day)
   c. Instrumentation Verification (1 Day)
   d. I/O Checkout (2 Days)

C. Commissioning
   a. Functional checkout (4 Days)
   b. Operator training (1 Day)
   c. Follow-up Visit (1 Day)

TASK 7 – PLC-M Communication Parts $1,100.00

A. Provide the following parts
   a. Single-Panel housing box
   b. Connectors and fan out kit
   c. Unmanaged switch and FX/TX convertor
   d. SC to SC, Multimode patch cable

III. ASSUMPTIONS and CLARIFICATIONS

A. Our proposal is based on the design documents created by W.K. Dickson.

B. We will assist the Contractor with the wiring terminations in LCP-S and PLC-M.

C. We have not included any control installation of conduit, electrical panels, level transmitter mounting brackets, lights, grounding, concrete pads, process piping, tubing, valves, hangers, ground cables, ground rods, sleeves, stilling wells or anything else not explicitly included in this scope of work.

D. Equipment specified under other Divisions of the specifications are not included.

E. The supply and installation of any fiber optic cable external to the new LCP-S (between LCP-S and existing MCP) shall be by the Division 26 Contractor.

F. We will utilize existing spare IO for PLC-M signals.

G. No software or software licenses will be provided under this contract

H. The supply and installation of any Cat6 Ethernet cable external to the new LCP-S (between LCP-S and new FCP-SED-2) shall be by the Division 26 Contractor.

IV. BUDGET

M&C has provided the attached price breakdown for convenience. We propose to provide the above scope for the lump sum fee of:

PROJECT FEE	$ 129,299.37
TESTING, TRAINING, AND EXPENSES FEE	$ 4,416.50

V. PROJECT SCHEDULE

We anticipate project completion approximately twelve (12) months after receipt of work authorization to deliver all equipment, complete, and test specified system integration.

Schedule delays due to supply chain issues outside of the control of McKim & Creed are not the responsibility of McKim & Creed.

VI. BILL OF MATERIALS

ITEM	QTY	NAME	DESCRIPTION
1	1	LCP-S	New PLC Control Panel
2	1	SL-FM-1	Magnetic Flow Meter
3	1	Turbidimeter	Turbidimeter with Modbus Communications
4	1	pH Meter	pH Transducer/Transmitter
5	1	PLC-M Fiber Components	Parts required for PLC-M to connect to LCP-S

Billing and Payment. Invoices will be submitted by McKim & Creed, Inc. (the "Consultant") to the Client monthly for services performed and expenses incurred pursuant to this Agreement. Payment of each such invoice will be due upon receipt and considered past due if not paid within thirty (30) days of the date of the invoice. Any retainers shall be credited on the final invoice.

a) Interest. A service charge will be added to delinquent accounts at 18 percent per annum (1.5 percent per month).

b) Suspension of Services. If the Client fails to make any payment due the Consultant for services and expenses within thirty (30) days of the invoice date on the project(s) covered by this agreement or any other project(s) being performed by Consultant for Client, the Consultant may suspend services under this Agreement until it has been paid in full for all past due amounts owed by Client for services and expenses. The Consultant shall have no liability whatsoever to the Client for any costs or damages occurring as a result of such suspension caused by any such breach of this Agreement by Client.

c) Collection Costs. In the event legal action is necessary to enforce the payment provisions of this Agreement, the Consultant shall be entitled to collect from the Client any judgment or settlement sums due, reasonable attorneys' fees, court costs and expenses incurred by the Consultant in connection therewith and, in addition, the reasonable value of the Consultant's time and expenses spent in connection with such collection action, computed at the Consultant's prevailing fee schedule and expense policies.

d) Termination of Services. The failure of the Client to make payment to the Consultant in accordance with the payment terms set forth herein shall constitute a material breach of this Agreement and shall entitle the Consultant, at its option, to terminate the Agreement. Any material breach of this Agreement by the Client shall, at the Consultant's option and in its sole discretion, constitute a breach of and default under any and/or all other agreements between the Client and Consultant.

Confidentiality. The Consultant agrees to keep confidential and not to disclose to any person or entity, other than the Consultant's employees, sub-consultants and the general contractor and subcontractors, if appropriate, any data and information not previously known to and generated by the Consultant or furnished to the Consultant and marked CONFIDENTIAL by the Client. These provisions shall not apply to information in whatever form that comes into the public domain, nor shall it restrict the Consultant from giving notices required by law or complying with an order to provide information or data when such order is issued by a court, administrative agency or other authority with proper jurisdiction, or if it is reasonably necessary for the Consultant to defend itself from any suit or claim.

The Client agrees that the technical methods, techniques and pricing information contained in any proposal submitted by the Consultant pertaining to this project or in this Agreement or any addendum thereto, are to be considered confidential and proprietary, and shall not be released or otherwise made available to any third party without the express written consent of the Consultant.

Consequential Damages. Notwithstanding any other provision of the Agreement, neither party shall be liable to the other for any consequential damages incurred due to the fault of the other party, regardless of the nature of the fault or whether it was committed by the Client or the Consultant, their employees, agents, sub-consultants or subcontractors. Consequential damages include, but are not limited to, loss of use and lost profit.

Non-Contingency. The Client acknowledges and agrees that the payment for services rendered and expenses incurred by the Consultant pursuant to this Agreement is not subject to any contingency unless the same is expressly set forth in this Agreement. Payments to the Consultant shall not be withheld, postponed or made contingent on the financing, construction, completion or success of the project or upon receipt by the Client of offsetting reimbursement or credit from other parties causing Additional Services or expenses. No withholdings, deductions or offsets shall be made from the Consultant's compensation for any reason.

Opinions of Cost.

(a) Since the Consultant has no control over the cost of labor, materials, equipment or services furnished by others, or over methods of determining prices, or over competitive bidding or market conditions, any and all opinions as to costs rendered hereunder, including but not limited to opinions as to the costs of construction and materials, are estimates only and shall be made on the basis of its experience and qualifications and represent its best judgment as an experienced and qualified professional Consultant, familiar with the construction industry; but the Consultant cannot and does not guarantee that proposals, bids or actual costs will not vary from opinions of probable cost prepared by it and the Consultant shall have no liability whatsoever if the actual cost differs from the Consultants estimate. If at any time the Client wishes greater assurance as to the amount of any cost, Client shall employ an independent cost estimator to make such determination. Consulting services required to bring costs within any limitation established by the Client will be paid for as additional services hereunder by the Client.

Termination. The obligation to provide further services under this Agreement may be terminated by either party upon seven (7) days' written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof through no fault of the terminating party. In the event of any termination, the Consultant shall provide a final statement of charges due and will be paid for all services rendered to the date of termination, all expenses subject to reimbursement hereunder, and other reasonable expenses incurred by the Consultant as a result of such termination. In the event the Consultant's compensation under this Agreement is a fixed fee, upon such termination the amount payable to the Consultant for services rendered will be determined using a proportional amount of the total fee based on a ratio of the amount of the work done, as reasonably determined by the Consultant, to the total amount of work which was to have been performed, less prior partial payments, if any, which have been made.

Reuse of Documents. All documents, including but not limited to drawings and specifications, prepared by the Consultant pursuant to this Agreement are related exclusively to the services described herein. They are not intended or represented to be suitable for reuse by the Client or others on extensions of this project or on any other project. Any reuse without written verification or adaptation by the Consultant for specific purposes intended will be at the Client's sole risk and without liability or legal exposure to the Consultant; and the Client releases and shall indemnify and hold the Consultant harmless from all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting there from. Any such verification or

adaptation will entitle the Consultant to further compensation at rates to be agreed upon by the Client and the Consultant.

Liability. The Consultant is protected by Workmen's Compensation Insurance (and/or employer's liability insurance), professional liability insurance, and by public liability insurance for bodily injury and property damage and will furnish certificates of insurance upon request. The Consultant agrees to compensate the Client for loss, damage, injury or liability arising directly and exclusively from the negligent acts or omissions of the Consultant, its employees, agent, subcontractors and their employees and agents but only to the extent that the same is actually covered and paid under the foregoing policies of insurance. If the Client requires increased insurance coverage, the Consultant will, if specifically directed by the Client, take out additional insurance, if obtainable, at the Client's expense. The Client shall provide prompt written notice to the Consultant if the Client becomes aware of any fault or defect in the Project, including errors, omissions or inconsistencies in the Consultant's Instruments of Service.

Limitation of Liability. In performing its professional services hereunder, the Consultant will use that degree of care and skill ordinarily exercised, under similar circumstances, by reputable members of its profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended by the Consultant's undertaking herein or its performance of services hereunder. THE CLIENT UNDERSTANDS AND AGREES THAT THE CONSULTANT HAS NOT MADE AND IS NOT MAKING ANY PROMISE, WARRANTY OR REPRESENTATION EXCEPT THE WARRANTIES EXPRESSLY MADE HEREIN, AND THE CONSULTANT EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER IMPLIED WARRANTIES. It is agreed that, in accordance with and subject to the provisions of the foregoing paragraph (Liability) and this paragraph, any claim for damages, cost of defense, or expenses which the Client or any third party may assert against the Consultant on account of any and all design defects, errors, omissions, and professional negligence shall be limited to $50,000 or the amount of Consultant's fee for this project, whichever is greater. Under no circumstances shall the Consultant be liable for extra costs or other consequences due to changed conditions or for costs related to the failure of the contractor or material men to install work in accordance with the plans and specifications. The limitation of liability to $50,000 or the amount of Consultant's fee for this project is a specifically bargained-for provision of this agreement, reflected in Consultant's fee. The Consultant shall not be liable for errors in judgment or for any loss or damage, which occurs for any reason beyond the control of the Consultant. No action may be instituted hereunder more than one year after the cause of action accrued or should have been discovered by reasonable diligence. The provisions of this paragraph and the previous paragraph (Liability) shall survive the termination of this Agreement.

Limitation of Liability for Construction Staking. It is agreed that, in accordance with and subject to the provisions of the foregoing paragraphs (Liability), (Limitation of Liability) and this paragraph, any claim for damages, cost of defense, or expenses which the Client or any third party may assert against the Consultant on account of or related to construction staking shall be limited to $_____, which amount shall be less than $50,000, or the amount of the Consultant's fee for this project, whichever is greater. The limitation of liability for construction staking is a specifically bargained-for provision of this agreement, reflected in Consultant's fee.

_____

_____

Client initials

Expenses of Litigation. In the event litigation in any way related to the services performed hereunder is initiated against the Consultant by the Client, its contractors, or subcontractors, and such litigation concludes with the entry of a final judgment favorable to the Consultant, the Client shall reimburse the Consultant for all of its reasonable attorneys' fees and other expenses related to said litigation. Such expenses shall include, but shall not be limited to, the cost, determined at the Consultant's normal hourly billing rates, of the time devoted to the defense of such litigation by the Consultant's employees.

Controlling Law. This Agreement is to be governed by the law of the State of North Carolina. The parties agree that any suit or action related to this Agreement shall be instituted and prosecuted in the courts of the County of Wake, State of North Carolina, and each party waives any right or defense relating to such jurisdiction or venue.

Binding Effect. This Agreement shall bind, and the benefits thereof shall inure to the respective parties hereto, their legal representatives, executors, administrators, successors and permitted assigns.

Merger; Amendment. This Agreement constitutes the entire agreement between the Consultant and the Client with respect to its subject matter, and all negotiations and oral understandings between the parties are merged herein. This Agreement can be supplemented and/or amended only by a written document executed by both the Consultant and the Client.

Ownership of Instruments of Service. All reports, plans, specifications, field data, notes and other documents, including all documents on electronic media, prepared by the Consultant as instruments of service shall remain the property of the Consultant. The Consultant shall retain all common law, statutory and other reserved rights, including the copyright thereto.

Photographs. Photographs of any completed project embodying the services of the Consultant provided hereunder may be made by the Consultant and shall be considered as its property, and may be used by it for publication.

Assignment. Neither party to this Agreement shall transfer, sublet or assign any rights under or interest in this Agreement, including but not limited to fees that are due or fees that may be due, without the prior written consent of the other party.

Archiving of Project Documentation. Consultant shall maintain copies of printed project documentation for a period of three years from substantial completion of Consultant's services. Consultant shall maintain copies of all electronic media related to the project for a period of one year from substantial completion of Consultant's services. Requests for reproduction of project documentation after these periods have expired will be considered additional services and will be invoiced at the Consultant's prevailing hourly rates at the time of the request, plus expenses.

Betterment. If, due to the Consultant's error, any required item or component of the project is omitted from the Consultant's construction documents, the Consultant shall not be responsible for paying the cost to

add such item or component to the extent that such item or component would have been otherwise necessary to the project or otherwise adds value or betterment to the project. In no event will the Consultant be responsible for any cost or expense that provides betterment, upgrade or enhancement of the project.

Electronic Files. Because data stored on electronic media can deteriorate undetected or be modified without the Consultant's knowledge, the Client agrees that it will accept responsibility for the completeness, correctness, or readability of any electronic media delivered to the Client after an acceptance period of 30 days after delivery of the electronic files, and that upon the expiration of this acceptance period, Client will release, indemnify and save harmless the Consultant from any and all claims, losses, costs, damages, awards or judgments arising from use of the electronic media files or output generated from them. The Consultant agrees that it is responsible only for the printed and sealed drawings and documents, and if there is a conflict between these printed documents and the electronic media, the sealed documents will govern. Consultant makes no warranties, express or implied, under this agreement or otherwise, in connection with the Consultant's delivery of electronic files.

Certifications, Guarantees and Warranties. The Consultant shall not be required to sign any documents, no matter by whom they may be requested, that would result in the Consultant's having to certify, guarantee or warrant the existence of conditions which the Consultant cannot ascertain. The Client also agrees that it has no right to make the resolution of any dispute with the Consultant or the payment of any amounts due to the Consultant in any way contingent upon the Consultant's signing any such certification.

Corporate Protection. It is intended by the parties to this Agreement that the Consultant's services in connection with the project shall not subject the Consultant's individual employees, officers or directors to any personal legal exposure for the risks associated with this project. Therefore, and notwithstanding anything to the contrary contained herein, the Client agrees that as the Client's sole and exclusive remedy, any claim, demand or suit shall be directed and/or asserted only against the Consultant, a North Carolina corporation, and not against any of the Consultant's employees, shareholders, officers or directors.

Extension of Protection. The Client agrees to extend any and all liability limitations and indemnification's provided by the Client to the Consultant to those individuals and entities the Consultant retains for performance of the services under this Agreement, including but not limited to the Consultant's officers and employees and their heirs and assigns, as well as the Consultant's sub-consultants and their officers, employees, heirs and assigns.

Job-Site Safety. Neither the professional activities of the Consultant, nor the presence of the Consultant or its employees and sub-consultants at a construction site, shall relieve the General Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the Work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Consultant and its personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Client agrees that the General Contractor is solely responsible for job-site safety, and warrants that this intent shall be made evident in the Client's agreement with the General Contractor. The Client also agrees that the Client, the Consultant and the Consultant's consultants shall be indemnified and shall be made additional insured under the General Contractor's general liability insurance policy.

Scope of Services. Services not set forth as Basic Services or Additional Services and listed in this Agreement are excluded from the scope of the Consultant's services and the Consultant assumes no responsibility to perform such services.

Severability and Survival. Any provision of this Agreement later held to be unenforceable for any reason shall be deemed void, and all remaining provisions shall continue in full force and effect. All obligations arising prior to the termination of this Agreement and all provisions of this Agreement allocating responsibility or liability between the Client and the Consultant shall survive the completion of the services hereunder and the termination of this Agreement.

Shop Drawing Review. If included in the scope of services to be provided, the Consultant shall review and approve Contractor submittals, such as shop drawings, product data, samples and other data, as required by the Consultant, but only for the limited purpose of checking for conformance with the design concept and the information expressed in the contract documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Consultant's review shall be conducted with reasonable promptness while allowing sufficient time in the Consultant's judgment to permit adequate review. Review of a specific item shall not indicate that the Consultant has reviewed the entire assembly of which the item is a component. The Consultant shall not be responsible for any deviations from the contract documents not brought to the attention of the Consultant in writing by the Contractor and approved by the Consultant. The Consultant shall not be required to review partial submissions or those for which submissions of correlated items have not been received.

Specification of Materials. The Client understands and agrees that products or building materials, which are permissible under current building codes or ordinances, may, at some future date, be banned or limited in use in the construction industry because of presently unknown hazardous characteristics. The Client agrees that if the Client directs the Consultant to specify any product or material, after the Consultant has informed the Client that such product or material may not be suitable or may embody characteristics that are suspected of causing or may cause the product or material to be considered a hazardous substance in the future, the Client waives all claims as a result thereof against the Consultant. The Client further agrees that if any product or material specified for this project by the Consultant shall, at any future date be suspected or discovered to be a health or safety hazard, the Client hereby releases the Consultant from any and all liabilities and waives all claims against the Consultant relating thereto.

Standard of Care. Services provided by the Consultant under this Agreement will be performed in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances in the same geographic area.

Suspension of Services. If the project is suspended for more than thirty (30) calendar days in the aggregate, the Consultant shall be compensated

for services performed and charges incurred prior to such suspension and, upon resumption of services, the Consultant shall be entitled to an equitable adjustment in fees to accommodate the resulting demobilization and re-mobilization costs. In addition, there shall be an equitable adjustment in the project schedule based on the delay caused by the suspension. If the project is suspended for more than ninety (90) calendar days in the aggregate, the Consultant may, at its option, terminate this Agreement upon giving notice in writing to the Client.

Unauthorized Changes to Documents. In the event the Client consents to, allows, authorizes or approves of changes to any plans, specifications, construction documents or electronic media, and these changes are not approved in writing by the Consultant, the Client recognizes that such changes and the results thereof are not the responsibility of the Consultant. Therefore, the Client releases the Consultant from any liability arising from the construction, use or result of such changes. In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Consultant harmless from any damage, liability or cost (including reasonable attorneys' fees and costs of defense) arising from such changes.

Compensation for Additional Services. The undertaking of the Consultant to perform professional services under this Agreement extends only to those services specifically described herein. If upon the request of the Client, the Consultant agrees to perform additional services hereunder, the Client and the Consultant shall negotiate and agree upon an additional fee to be paid to the Consultant for completion of the agreed upon Additional Services. The Consultant will be under no obligation to begin or complete requested Additional Services until the additional fee has been negotiated and agreed upon in writing by the Client and the Consultant.

Hourly Billing Rates. All services to be billed on an hourly basis under this agreement will be billed using the Consultant's prevailing billing rate schedule at the time services are provided. If a specific rate schedule is to be used for this Agreement, it shall expire no later than one year from the date of this Agreement and will be replaced with the prevailing rate schedule in effect at that time.

Priority over Form Agreements. The parties agree that the provisions of this Agreement shall control and govern over any Work Orders, Purchase Orders or other documents, which the Client may issue to Consultant in regard to the project(s) which is (are) the subject of this Agreement. The Client may issue such documents to Consultant for its convenience for accounting or other purposes, but any such Orders will not alter the terms of this Agreement, regardless of any contrary language appearing therein.

Indemnity. The Client shall and hereby agrees to indemnify and hold harmless the Consultant from and against all losses, costs, damages, expenses and liability of whatever nature, including but not limited to reasonable attorney's fees, litigation and court costs, expert witness fees and expenses, amounts paid in settlement, amounts paid to discharge judgments, penalties, punitive damages, and interest, directly or indirectly resulting from, arising out of or related to one or more Claims, as hereinafter defined. The word "Claims" as used herein shall mean all claims (whether valid or not), lawsuits, causes of action, liens, investigations, administrative proceedings, and other legal actions and proceedings of whatsoever nature that directly or indirectly result from, arise out of or relate to this Agreement, the project which is the subject of this Agreement, and/or any other matter or transaction contemplated hereunder, including without limitation, any failure by the Client to adhere to or comply with any drawing, design, plans, specifications, recommendation or advice given or furnished by the Consultant to the Client; provided however, that the foregoing shall not apply to any claim resulting primarily from the negligence of the Consultant.

Paragraph Headings. The paragraph headings contained in this Agreement are for reference purposes only and shall not affect in any way the meaning or interpretation of this Agreement.

Third Parties. Nothing in this Agreement shall be construed as giving any person, firm, corporation or other entity other than the parties to this Agreement and their respective successors and permitted assigns, any right, remedy or claim under or in respect of this Agreement or any of its provisions.

Default. The Client shall be in default under this Agreement if (i) it fails to pay in full any invoice from the Consultant on the due date or fails to make any other payment due to the Consultant under this Agreement, (ii) it fails to observe or perform any other term, condition or covenant under this Agreement, (iii) it breaches any warranty or representation made under this Agreement, (iv) it dissolves, terminates or liquidates its business, or its business fails or its legal existence is terminated or suspended, (v) any voluntary or involuntary bankruptcy, reorganization, insolvency, receivership, or other similar proceeding is commenced by or against the Client, or (vi) it becomes insolvent, makes an assignment for the benefit of creditors, or conveys substantially all of its assets.

Design without Construction Phase Services. If the services to be provided by Consultant hereunder do not include construction observation and/or construction administration services, or if such services are included in Consultants contracted services and Client later decides to perform these services itself or decides to retain other consultants or individuals to perform these services, Consultant assumes no responsibility for interpretations of the Consultant's services or for any construction observation, construction administration and/or supervision performed by Client or other parties and Client waives any and all claims against Consultant for any losses, claims, costs or damages of any kind whatsoever that may be in any way connected thereto.

In addition Client agrees, to the fullest extent permitted by law, to indemnify and hold Consultant harmless from any loss, claim, damage or cost, including reasonable attorneys' fees and costs of defense, arising or resulting from the performance of construction observation, construction administration and/or supervision by Client, its employees, agents or consultants, and including any and all claims arising from the modification or adjustment of, or any clarifications or interpretations of, the Consultant's Work by others.

Unless, in the Consultant's sole opinion, appropriate levels of construction observation and construction administration services are contracted for and performed by Consultant, Consultant will not be responsible to provide any Consulting or other certifications related to the construction or installation of any improvements.

Reliance on Data Provided by Others. Consultant shall be entitled to reasonably rely on the accuracy of information provided to it by Client or any of Client's other consultants or sub-consultants. Consultant shall not be responsible to extensively review the information provided to insure the accuracy thereof. Client agrees to not hold Consultant responsible for errors or omissions in Consultant's work that are directly

attributable to errors or incorrect data provided to Consultant by Client or Client's other consultants. Client further acknowledges that any redesign or corrective efforts required by Consultant resulting from incorrect information provided by Client or Client's other consultants will be paid for by the Client as additional services.

Consultant Retaining Consultants. In the event that Consultant is required by Client to retain other Consultants to perform necessary services related to the project, the Client agrees to defend, indemnify and hold the Consultant harmless from and against all claims, losses, liabilities and damages arising out of the performance of services by such Consultants. In the event that Client suffers any financial loss or expense resulting from or alleged to result from the performance or the failed performance of any Consultant retained by Consultant, the Client agrees to pursue recovery of and assert any claims based upon its losses, expenses and/or damages solely and directly against those Consultants. The Client agrees to waive any claims, losses, liabilities or damages against Consultant arising out of the performance of such Consultants. In consideration of such indemnity and waiver, the Consultant agrees to assign its rights and/or claims against those Consultants pursuant to the Consultants' agreements with the Consultant to the Owner.

Credit and Financial Obligations. Prior to commencement of the work, Consultant may require that Client provide reasonable credit information and other documentation to confirm that the Client has made financial arrangements to fulfill the Client's payment obligations under this Agreement. Consultant may also require such information at any time during the performance of Consultant's services should the Client fail to make payments per this Agreement, a change in the scope materially changes the contract sum, or Consultant identifies in writing a reasonable concern regarding the Client's ability to make payment when payment is due. The Client may be required to furnish this information prior to further commencement or continuation of services by Consultant and Consultant shall not be responsible for the cost of any delay occurring as a result of such a request.

Markup on Expenses. Unless specified otherwise in our proposal, all sub consultant costs and other project related costs incurred by Consultant will be billed with a 15% markup. Company vehicle mileage and internal reproduction costs will be billed at the Consultant's prevailing rate for those items. Personal vehicle mileage costs incurred on the project by employees of Consultant will be billed at the prevailing IRS mileage rate in effect at the time of travel.

SUE Technical Standards. Quality Level A information obtained by direct exposure of the existing utilities can greatly increase the level of confidence with respect to the location of underground utilities at a particular jobsite. Utility exposure (Quality Level A) permits three-dimensional measurements to be taken on utilities for accurate location at each test hole. The overall level of confidence with respect to the location of site utilities can be raised by increasing the number of test holes examined; however, Consultant provides no guarantee of the location of utilities on the site other than at the locations where test holes have been established.

Quality Level B services include the horizontal, above ground detection, marking and mapping of underground utilities. Geophysical prospecting methods are used to indicate the presence and surface position of buried utilities. Utilities are identified and marked in the field in order to be surveyed and mapped. Quality Level B information should not be used for construction purposes, or where exact horizontal and vertical measurements are required.

The accuracy of Quality Level B designating information and depth of cover readings obtained by utilizing Geophysical and Ground Penetrating Radar equipment and techniques are subject to field and soil conditions beyond our control. Consultant will make reasonable efforts to provide comprehensive and correct positional utility marks to the limits obtainable by the instrumentation used and the existing ground conditions; however, Consultant provides no guarantee that all existing utilities on a particular site will be properly located using these methods.

Utilizing Consultant's SUE services does not relieve any party from their obligation to contact the utility damage prevention system before digging begins. Utility marks placed on the ground by Consultant are not to be used for construction purposes.