

SPECIFICATIONS AND CONTRACT DOCUMENTS

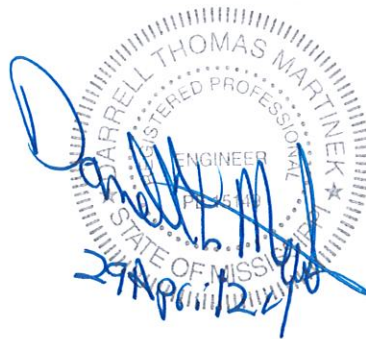
FOR

GS# 323-024

**ARPA INFR. – WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTION
LEAKESVILLE, MISSISSIPPI**

PREPARED FOR:

**STATE OF MISSISSIPPI
BUREAU OF BUILDING, GROUNDS AND REAL PROPERTY MANAGEMENT
501 NORTH WEST STREET
SUITE 1401B [WOOLFOLK BUILDING]
JACKSON, MISSISSIPPI 39201**



April 29, 2024



111 S. WALNUT STREET • P.O. BOX 1293 • GREENVILLE, MS 38702-1293
662.332.2619 • FAX 662.332.2622 • WWW.WLBURLE.COM

**State of Mississippi
Bureau of Building, Grounds and Real Property Management**

**GS# 323-024
ARPA Infr. – Waste Cent. Treatment
South Mississippi Correctional Institution
Leakesville, Mississippi**

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

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GS# 323-024 ARPA INFR.-WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTION
LEAKESVILLE, MISSISSIPPI
APRIL 29, 2024

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PROJECT TEAM LISTING

OWNER

STATE OF MISSISSIPPI
Bureau of Building, Grounds and Real Property Management
501 North West Street, Suite 1401B [Woolfolk Building]
Jackson, MS 39201

INSTITUTION/AGENCY

South Mississippi Correctional Institution
22689 MS Hwy 63 North
Leakesville, MS 39451

ENGINEER OF RECORD

W.L. BURLE ENGINEERS, P.A.
111 South Walnut Street
Greenville, MS 38701
662-332-2619

CONSULTING ENGINEER

ELECTRICAL ENGINEER.....Atwell and Gent, P.A.
309 University Drive
Starkville, MS 39759
662-324-5658

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GS# 323-024 ARPA INFR.-WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTION
LEAKESVILLE, MISSISSIPPI
APRIL 29, 2024

.....

PROJECT ENGINEER

W.L. BURLE ENGINEERS, P.A.
111 South Walnut Street
Greenville, MS 38701
662-332-2619

Darrell T. Martinek, P.E., P.S.
P: 662-332-2619
Email: dtm@wlburle.com



*Drawings and Specification Sections Prepared
by W.L. Burle Engineers, P.A. are
Denoted in the Table of Contents with (BURLE)*

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GS# 323-024 ARPA INFR.-WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTION
LEAKESVILLE, MISSISSIPPI
APRIL 29, 2024

.....

ELECTRICAL ENGINEER

Atwell and Gent, P.A.
309 University Drive
Starkville, MS 39759
662-324-5658

Joey Bowman, P.E.
P: 662-324-5658
Email: jbowman@atwellandgent.com



*Drawings and Specification Sections Prepared
by Atwell and Gent, P.A are
Denoted in the Table of Contents with (AG)*

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**DEPARTMENT OF FINANCE AND ADMINISTRATION
BUREAU OF BUILDING, GROUNDS AND
REAL PROPERTY MANAGEMENT
JACKSON, MISSISSIPPI**

ADVERTISEMENT FOR BIDS

Sealed bids will be received electronically via MAGIC or physically delivered to the office of the Bureau of Building, Grounds and Real Property Management, 501 North West Street, Suite 1401 B, Jackson, Mississippi, 39201, until 2:00:00 p.m. (14:00:00 Military Time) on Thursday, 05/30/2024, for:

RE: GS# 323-024 ARPA Infr. - Waste Cent. Treatment
South Mississippi Correctional Institution
RFx # 3160006572

at which time they will be publicly opened and read. Contract documents may be obtained from:

Professional: W. L. Burle Engineers, P.A.
Address: 111 South Walnut Street
Greenville, Mississippi 38701
Phone: 662-332-2619
Email: dtm@wlburle.com

A deposit of \$200.00 is required. Bid preparation will be in accordance with Instructions to Bidders bound in the project manual. The Bureau of Building, Grounds and Real Property Management reserves the right to waive irregularities and to reject any or all bids. **NOTE: Telephones and desks will not be available for bidders use at the bid site.**

Bureau of Building, Grounds and Real Property Management

Dates of Publication:

04/30/2024
05/07/2024

Note: Whenever reference is made, in any document or meeting, to 2:00:00 p.m., it shall also mean, and be the same as, 14:00:00 Military Time.

INSTRUCTIONS TO BIDDERS
SECTION 00 2100
BIDS WITH UNIT PRICES ONLY
PART 1 - GENERAL

- 1.01 **QUESTIONS:** Questions should be directed to the Professional. Should a Bidder find discrepancies in, or omissions from, the Drawings or Project Manual, or be in doubt as to their meaning, the Bidder should immediately notify the Professional. The Professional will send written instruction(s) or interpretation(s) to all known holders of the documents. Neither the Owner, nor the Professional, will be responsible for any oral instruction or interpretation.
- 1.02 **BIDDER'S QUALIFICATIONS:**
- A. **Certificate of Responsibility:** The Mississippi State Board of Contractors is responsible for issuing Certificates of Responsibility to Contractors. To be awarded a Contract for public work, Sections 31-3-15 and 31-3-21 of the **Mississippi Code 1972, Annotated** requires a Contractor to have a current Certificate of Responsibility at bid time and during the entire length of the job. The Certificate of Responsibility number issued becomes a significant item in all public bidding.
 - B. **Bid Under \$50,000:** If a Bidder submits a bid not exceeding \$50,000, no Certificate of Responsibility number is required; however, a notation stating the *bid does not exceed \$50,000* must appear on the face of the envelope, or a Certificate of Responsibility number.
 - C. **Bid Over \$50,000:** Each Bidder submitting a bid in excess of \$50,000 must show its Certificate of Responsibility number on the bid and on the face of the envelope containing the bid.
 - D. **Joint Venture Bid:** When multiple Contractors submit a joint venture bid in excess of \$50,000, a *joint venture* Certificate of Responsibility number must be shown on the bid and on the face of the envelope containing the bid. If the Multiple-Contractor joint venture has no *joint venture* Certificate of Responsibility number, each of the Contractors participating in the bid must indicate their individual Certificate of Responsibility numbers on the bid and on the face of the envelope.
- 1.03 **NON-RESIDENT BIDDER:** When a non-resident Bidder (a Contractor whose principal place of business is outside the State of Mississippi) submits a bid for a Mississippi public works project, one of the following is required and shall be submitted with the Proposal Form: (Code 31-3-21(3))
- A. **Copy of Law:** If the non-resident Bidder's state has a resident Bidder preference law, a copy of that CURRENT law shall be submitted with the Proposal Form. (modified to "current" August 2016)
 - B. **Statement:** If the state has no such law then a statement indicating *the State of (Name of State) has no resident Contractor preference law* shall be submitted with the Proposal Form.
- 1.04 **DISQUALIFICATION OF BIDDER:** A Bidder may be disqualified for any of the following reasons: (see 600.53)
- A. Failure to comply with the bid requirements.
 - B. Bidder is in arrears on existing Contracts with the Bureau or another state agency, university, community college, or junior college.
 - C. Bidder is involved in an ongoing dispute related to the Bidder's execution, workmanship, or timely performance of a previous Contract with the Bureau or another state agency, university, community college, or junior college.
 - D. Bidder has defaulted on a previous Contract with the Bureau of another state agency, university, community college, or junior college.
- 1.05 **CONDITIONS OF WORK:** Each Bidder must fully inform himself of all conditions relating to the construction of the Project and employment of labor thereon. Failure to do so will not relieve a successful Bidder of obligations to furnish all material and labor necessary to carry out the provisions of the Contract. Insofar as possible, the Bidder must employ methods, or means, which will not cause interruption of, or interference with, the work of any other Bidder, or Contractor.
- 1.06 **EXAMINATION OF SITE:** All Bidders, including the general Contractor and Subcontractors, shall visit the building site, compare the Drawings and Project Manual with any work in place and be informed of all conditions. Failure to visit the site will in no way relieve the successful Bidder from furnishing any materials or performing any work required to complete work in accordance with Drawings and Project Manual without additional cost to the Owner.
- 1.07 **LAWS AND REGULATIONS:** The Bidder's attention is directed to the fact that all applicable Mississippi state laws, rules and regulations of all authorities having jurisdiction over construction of the Project apply to the Contract.

- 1.08 **OBLIGATION OF BIDDER:** At the bid opening, each Bidder will be presumed to have inspected the site, read and become thoroughly familiar with the Drawings and the Project Manual, including all addenda.
- 1.09 **BID DOCUMENT DEPOSIT AND RETURN:** The deposit amount, if any, shall be established as the estimated actual cost of copying and reproduction plus shipping via USPS standard Ground Transportation, ~~is~~ shall be indicated in the Advertisement for Bids. Bidders may request shipping via express carrier or expedited delivery at their own additional cost. Upon returning the documents to the Professional within ten (10) working days of the bid date and in good condition, all document holders will be refunded the full deposit amount. Further, any document holder who is awarded the contract, related subcontracts and/or vendor agreements may elect to retain their documents and request refund of the full deposit amount upon execution of the construction contract and approval of general contractor, however; such documents shall be counted toward the total number of copies furnished free of charge to the general contractor. No partial sets of documents will be issued. Selected trade organizations, plan rooms and web-based distribution networks will be issued one (1) set of documents without charge. (see 600.50) If there is no charge for bid documents, this paragraph does not apply.

PART 2 - PROPOSAL FORM

- 2.01 **METHOD OF BIDDING:** Lump sum, single bids received on a general contract will include general, mechanical and electrical construction and all work shown on Drawings or specified in the Project Manual.
- 2.02 **PROPOSAL FORMS:** The Bidder shall make all proposals on forms provided and shall fill all applicable blank spaces without interlineations or alteration and must not contain recapitulation of the work to be done. No oral or telegraphic proposals will be considered.
- 2.03 **TIME OF COMPLETION:** The Bidder shall agree to commence work on, or before, a date specified in a written *Notice to Proceed* and fully complete the Project within the calendar days indicated on the Proposal Form.
- 2.04 **BASE BID AND ALTERNATES:**
- A. On the Proposal Form, the Bidder shall include a numerical amount for each blank unit price and total price for each pay item. Where blanks are included for both unit prices and total prices, the amounts entered for unit prices shall govern.
 - B. The Proposal Form shall contain a brief description of each alternate modifying the scope. The Bidder shall include a numerical amount for each blank unit price and total price for each pay item for each alternate. Where blanks are included for both unit prices and total prices, the amount entered for unit prices shall govern. Refer to Section 01 2300 entitled *Alternates* for additional information.
- 2.05 **SUBSTITUTIONS:** No substitutions, qualifications or redefining of the Specification requirements are allowed to be marked on the Proposal Form, unless specifically required by the Bid Documents. Refer to Section 01 600 entitled *Substitutions and Product Options* which covers procedures after the award of Contract
- 2.06 **ADDENDA:** Any addenda to the Drawings or Project Manual issued before or during the time of bidding shall be included in the proposal and become a part of the Contract. The Proposal Form will have ample space to indicate the receipt of addenda. When completing the Proposal Form, the Bidder shall list the Addendum number in spaces provided. (see proposal form)
- 2.07 **BIDDER IDENTIFICATION:**
- A. **Signature:** The Proposal Form shall be signed by any individual authorized to enter into a binding agreement for the Business making the bid proposal.
 - B. **Name of Business:** The name appearing on the Proposal Form should be the complete spelling of bidder's name - exact as recorded at the Secretary of State [<http://www.sos.state.ms.us> / Corporations] which should be the same as you applied for at the Mississippi State Board of Contractors [<http://www.msdoc.us>] (see 2.07, 3.01, 5.01, proposal form)
 - C. **Legal Address:** The address appearing on the Proposal Form should be the same address exact as recorded at the Secretary of State [<http://www.sos.state.ms.us> / Corporations] which should be the same as you applied for at the Mississippi State Board of Contractors [<http://www.msdoc.us>]
 - D. **Certificate of Responsibility Number(s):** The Certificate of Responsibility Number(s) appearing on the Proposal Form should be the same number appearing in the current Mississippi State Board of Contractors Roster.

2.08 **BID SECURITY:** The Bid Security shall be in the form of a Bid Bond, or a Certified Check.:

A. Bid Bond: The Bidder may submit a Bid Bond by a Surety licensed in Mississippi in the amount of five percent (5%) of the base bid. The Bid Bond shall be duly executed by the Bidder, a Mississippi Licensed Agent for said Surety approved by the Mississippi Insurance Department OR signed by the Surety AND countersigned by a Mississippi Licensed Agent for said Surety approved by the Mississippi Insurance Department. <https://www.mid.ms.gov> (or most up-to-date link) (No standard form is required for the Bid Bond.) Where bid is to be submitted electronically, a scanned copy of bid bond is acceptable.

B. Certified Check: The Bidder may submit a certified check made out to the *Bureau of Building, Grounds and Real Property Management* in the amount of five percent (5%) of the base bid. All checks received from Bidders will be returned upon request, unless a Bidder is one (1) of the three (3) apparent low Bidders. The three (3) apparent low Bidder's checks will be held for forty-five (45) days, unless a Contract is awarded and executed in less time. Where bid is to be submitted electronically, certified check must be physically delivered to the address indicated on the Advertisement for Bids prior to the time and date stated.

2.09 **POWER OF ATTORNEY:** Each bid security must be accompanied by an appropriate Power of Attorney. No Power of Attorney is necessary with a certified check.

PART 3 - SUBMITTING THE PROPOSAL FORM

3.01 **SUBMITTAL:** A bid must be either submitted electronically via MAGIC or physically delivered to the address indicated on the Advertisement for Bids prior to the time and date stated.

A. Physical Submittal: If physically submitted, only one original of Bid Proposal shall be submitted which should be sealed in an opaque envelope marked, mailed or hand-delivered as shown below:

(In upper left hand corner)

Name of Firm (complete spelling of bidder's name and address – exact as recorded at the Secretary of State which should be the same as you applied for at the Mississippi State Board of Contractors – see 2.07, 3.01, 5.01)

(Bid shall be addressed and delivered to)

Bureau of Building, Grounds and Real Property Management
501 North West Street, Suite 1401B [Woolfolk Building] Jackson,
Mississippi 39201

(In lower left hand corner)

Bid for Project # _____

Title _____

Using Agency _____

Certificate of Responsibility # _____ (for over \$50,000.00) Under
\$50,000.00 (add statement)

If the Bid is mailed, the bid envelope shall be placed inside a second envelope to prevent inadvertent premature opening of the Proposal.

B. Electronic Submittal: Bidders must be registered prior to submitting bids electronically. It is the responsibility of the Bidder to allow sufficient time to complete or confirm such registration before the date and time established to receive bids. Information on registration and bidding electronically may be found at www.dfa.ms.gov/dfa-offices/mmrs/mississippi-suppliers-vendors. For further assistance e-mail mash@dfa.ms.gov OR call (601) 359-1343, Option 2. If a Bidder desires to receive system generated Construction Bid Notices for future Bureau of Building, Grounds and Real Property Management opportunities, use Product Code 90922.

3.02 **MODIFICATION TO BID:** A bidder may modify the bid prior to the scheduled closing time indicated in the Advertisement for Bids in the following manner:

- A. **Notification on Envelope:** A modification may be written on the outside of the sealed envelope containing the bid.
- B. **Electronic Bid:** Information and attachments may be modified and re-submitted via MAGIC.
- C. **Facsimile:** A facsimile (fax) will not be acceptable.

3.03 **WITHDRAWAL OF BID:** Any bid may be withdrawn prior to the scheduled time for opening of bids. However, bids may not be withdrawn until forty-five (45) days after bid opening.

PART 4 - BID OPENING AND AWARD OF CONTRACT

4.01 **OPENING OF BIDS:** Bids will be publicly opened shortly after the time stated in the Advertisement for Bids. Bidder representatives are invited; however, attendance is not mandatory.

Closure of agency preventing the opening of bids at the advertised date and time due to Force Majeure Event reasons will result in bids being publicly opened . . . on the next business day that the agency shall be open and at the previously advertised time . . . See 600.47 of the BoB Procedure Manual for wording in detail.

4.02 **IRREGULARITIES:** The omission of any information requested on the Proposal Form may be considered as an informality, or irregularity, by the awarding public body when in their opinion the omitted information does not alter the amounts contained in the submitted bid proposal, or place other Bidders at a disadvantage.

4.03 **PROTEST:** Any protest must be delivered in writing to the Owner within twenty-four (24) hours after the bid opening.

4.04 **ERRORS:** Any claim of error and request for release from bid must be delivered in writing to the Owner within twenty-four (24) hours after the bid opening. The Bidder shall provide sufficient documentation with the written request clearly proving an error was made.

4.05 **AWARD OF CONTRACT:** The Owner reserves the right to reject any, or all bids. A Contract will be awarded on the basis of the low base bid, or low combination of base bid and those alternates selected by the Owner in any order determined to be in the best interest of the Using Agency and which produces a total within available funds. The base bid and alternate amounts for such award shall be based upon the unit quantities identified on the Proposal Form multiplied by the Unit Prices submitted by the Bidder.

4.06 **FAILURE TO ENTER INTO A CONTRACT:** The Bidder shall forfeit the Bid Security to the Owner as liquidated damages for failure, or refusal, to execute and deliver the Contract, Bond and Certificate of Insurance within ten (10) "working" days after notice of the acceptance of the bid/receipt of Contracts from the Professional.

4.07 **SECURITY FOR FAITHFUL PERFORMANCE:** (modified Dec 2013 SoS; Jan 2015 SoS) (see also 2.08 herein, 600.42, 600.57.9)

Simultaneously, with delivery of the executed Contract, if contract is over \$25,000.00, the Contractor will furnish a Surety Bond, or Bonds, as security for faithful performance, the payment of all persons performing labor on the project, and furnishing materials in connection with this Contract. The Surety on such Bond, or Bonds, will be a duly authorized surety company satisfactory to the Owner and meeting all of the following requirements:

- A. Licensed at the time of award by the State of Mississippi's Commissioner of Insurance for the purpose of providing surety. . http://www.mid.state.ms.us/licapp/search_main.aspx <https://www.mid.ms.gov> (or most up-to-date link)
- B. Listed at the time of award in the Department of the Treasury's Federal Register as a company holding certificates of authority as acceptable sureties on Federal Bonds, commonly referred to as the Treasury List.
- C. All Bonds shall be executed on the form provided in the Project Manual under Section 00600 entitled Contract Bond.
- D. The Contract Bond shall be duly executed by the Bidder, a Surety licensed in Mississippi signed by a Mississippi Licensed Agent for said Surety approved by the Mississippi Insurance Department OR signed by the Surety AND countersigned by a Mississippi Licensed Agent for said Surety approved by the Mississippi Insurance Department with the name and address typed, or lettered legibly. (with Surety Seal, preferably embossed seal). http://www.mid.state.ms.us/licapp/search_main.aspx <https://www.mid.ms.gov> (or most up-to-date link)
- E. All Bonds must be accompanied by an appropriate Power of Attorney dated same as Contract Bond (with Seal, preferably embossed seal).

PART 5 - BIDDER'S CHECKLIST

The following checklist is for the Bidder's assistance only. It is not inclusive and **is not a part of the bid documents**; therefore, this checklist does not have to be included with the Proposal Form when submitting a bid proposal.

5.01 **PROPOSAL FORM:** (only one original proposal form to be submitted) (also see 3.011)

Base Bid

() Write in the amount of each unit price and total price for each pay item for base bid. The unit prices shall govern.

Alternates

() Write in the amount of each unit price and total price for each pay item for each alternate. The unit price shall govern.

Addenda

() Acknowledge the receipt of each addendum by writing in the number of the addendum.

Acceptance

() Proposal is signed by authorized person

() Name of Business - complete spelling of bidder's name and address - exact as recorded at the Secretary of State

[<http://www.sos.state.ms.us>] which should be the same as you applied for at the Mississippi State Board of Contractors [<http://www.msbc.us>] (see 2.07, 3.01, 5.01, proposal form)

() Legal address of the business listed above (at SOS and Contractor's Board)

() Correct Certificate of Responsibility Number(s) as it appears in the current Mississippi State Board of Contractors Roster

Certificate of Responsibility Number(s) on envelope or included with electronic bid (see below for on proposal form) () Base Bid is under \$50,000 and no number is required

() Base Bid is under \$50,000 and the statement "bid does not exceed \$50,000" is on the outside of the sealed envelope or included with electronic bid (modified 01/01/18 for electronic)

() Base Bid is over \$50,000 and number is required

() Joint Venture and *joint venture* number is required

OR

() Joint Venture participants' numbers are required

5.02 **BID SECURITY:**

() Included Bid Bond

OR

() Included Certified Check

5.03 **POWER OF ATTORNEY:**

() Included Power of Attorney

5.04 **NON-RESIDENT BIDDER:**

() Attached a Copy of Non-Resident Bidder's Preference Law

OR

() Attached a Statement

5.05 **SUB-CONTRACTORS NAME Refer to 1.04 for responsiveness**

() List any Mechanical, Plumbing, and/or Electrical Sub-Contractors regardless of cost.

* List name even for under \$50,000 (see 5.06 regarding COR)

* Fire Protection Sprinkler Contractors do not have to be listed

* If there is a separate HVAC/Plumbing Sub-Contractor, so notate as mentioned herein

* If Mechanical, Plumbing, and/or Electrical Sub-Contractor is performed by the General, be sure the General has a COR for said discipline

* If there is no Mechanical, Plumbing, and/or Electrical Sub-Contractor listed, then use of Sub-Contractor to perform such scope will not be permitted.

5.06 **SUB-CONTRACTORS' COR NUMBER Refer to 1.04 for responsiveness**

() * List Certificate of Responsibility Number for any listed Sub-Contractor over \$50,000.00

PROPOSAL FORM

SECTION 00 4200

To: Bureau of Building, Grounds and Real Property Management
501 North West Street, Suite 1401B [Woolfolk Building]
Jackson, Mississippi 39201

Re: Project # GS# 323-024
Project Title ARPA Infr. - Waste Cent. Treatment
Location South Mississippi Correctional Institution, Leakesville, Mississippi

I propose to complete all work in accordance with the Project Manual and Drawings within 500 consecutive calendar days for the sum of: (Professional must specify number of days)

BASE BID: (Write in the amount of the base bid in words and numbers. In case of conflict, the written word governs.)

Words: _____ Dollars (\$ _____)

ALTERNATES: (Write in the amount of all of the alternates in words and numbers. In case of conflict, the written word governs.)

Alternate #1 ☒ Adds ☐ Deducts
Words: _____ Dollars
(\$ _____)
Description Complete all work required to remove, dispose of, and replace the liner in the west lagoon.

Alternate #2 ☒ Adds ☐ Deducts
Words: _____ Dollars
(\$ _____)
Description Complete all work required to dispose of all sludge in both the east and west lagoons at a Subtitle D landfill.

Alternate #3 ☐ Adds ☐ Deducts
Words: N/A _____ Dollars
(\$ _____)
Description N/A

Alternate #4 ☐ Adds ☐ Deducts
Words: N/A _____ Dollars
(\$ _____)
Description N/A

Alternate #5 ☐ Adds ☐ Deducts
Words: N/A _____ Dollars
(\$ _____)
Description N/A

**PROPOSAL FORM
SECTION 00 4200**

To: Bureau of Building, Ground and Real Property Management
501 North West Street, Suite 1401B [Woolfolk Building]
Jackson, Mississippi 39201

Re: Project # - GS# 323-024
Project Title - ARPA Infr. - Waste Cent. Treatment
Location - South Mississippi Correctional Institution, Leakesville, Mississippi

I propose to complete all work in accordance with the Project Manual and Drawings within **500 consecutive calendar days** for the following unit price(s):

Base Bid Items					
Pay Item	Description	Quantity	Units	Unit Price	Total Amount
1	Mobilization/Demobilization, Complete	1	LS		
2	Relocation of Existing Lagoon Aerators, Complete	1	LS		
3	Relocation of Existing Lagoon Aerators Electrical System, Complete	1	LS		
4	Dewater East Lagoon System, Complete	1	LS		
5	Demolition of East Lagoon Liner System, Complete	1	LS		
6	Demolition of Existing Fencing, All Types, Complete	1	LS		
7	Demolition of Existing Sanitary Sewer Piping, Manholes, and Appurtenances, Complete	1	LS		
8	Demolition of Existing Screen Structure, Piping and Appurtenances, Complete	1	LS		
9	Demolition of Existing Pavements, All Types and All Depths, Complete	1	LS		
10	Course Screen System, Complete	1	LS		
11	Course Screen System Electrical, Complete	1	LS		
12	Influent Pump Station, Complete	1	LS		
13	Influent Pump Station Electrical, Complete	1	LS		
14	Fine Screen System, Complete	1	LS		
15	Fine Screen System Electrical, Complete	1	LS		
16	Soda Ash Feed System, Complete	1	LS		
17	Soda Ash Feed System Electrical, Complete	1	LS		
18	Installation of East Lagoon Liner System, Complete	1	LS		
19	Biological Treatment Lagoon System, Complete	1	LS		
20	Biological Treatment Lagoon System Electrical, Complete	1	LS		
21	North Clarifier System, Complete	1	LS		
22	South Clarifier System, Complete	1	LS		
23	North Clarifier System Electrical, Complete	1	LS		
24	South Clarifier System Electrical, Complete	1	LS		
25	Scum Pump Station, Complete	1	LS		
26	Scum Pump Station Electrical, Complete	1	LS		
27	Filter System, Complete	1	LS		
28	Filter System Electrical, Complete	1	LS		
29	Parshall Flume System, Complete	1	LS		

**PROPOSAL FORM
SECTION 00 4200**

Base Bid Items					
Pay Item	Description	Quantity	Units	Unit Price	Total Amount
30	UV Disinfection System, Complete	1	LS		
31	UV Disinfection System Electrical, Complete	1	LS		
32	Effluent Pump Station, Complete	1	LS		
33	Effluent Pump Station Electrical, Complete	1	LS		
34	Erosion Control, Complete	1	LS		
35	Site Lighting, Complete	1	LS		
36	Backup Generator, Complete	1	LS		
37	SCADA System, Complete	1	LS		
38	Removal of Existing Trees All Sizes and Species, Complete	0.37	ACRES		
39	Clearing & Grubbing, Complete	1.3	ACRES		
40	Turfing, Complete	1	ACRES		
41	Installation of Fencing, Complete	1,362	LF		
42	Installation of 4" Gravity Sewer, All Depths, Complete	60	LF		
43	Installation of 6" Gravity Sewer, All Depths, Complete	211	LF		
44	Installation of 10" Gravity Sewer, All Depths, Complete	630	LF		
45	Installation of 12" Gravity Sewer, All Depths, Complete	465	LF		
46	Installation of 14" Gravity Sewer, All Depths, Complete	165	LF		
47	Installation of 15" Gravity Sewer, All Depths, Complete	280	LF		
48	Installation of 18" Gravity Sewer, All Depths, Complete	220	LF		
49	Installation of 3" Sanitary Sewer Force Main, All Depths, Complete	105	LF		
50	Installation of 4" Sanitary Sewer Force Main, All Depths, Complete	115	LF		
51	Installation of 8" Sanitary Sewer Force Main, All Depths, Complete	295	LF		
52	Installation of 10" Sanitary Sewer Force Main, All Depths, Complete	185	LF		
53	Installation of Water Line Piping, All Depths, Complete	330	EA		
54	Installation of Water Faucets, Complete	7	EA		
55	Installation of Sanitary Sewer Manhole, All Depths, Complete	7	EA		
56	Installation of 6" Gravel Surface, Complete	430	SY		
57	Asphalt Pavement, Complete	840	SY		
58	Installation of 4" Concrete Pavement, Complete	175	SY		
59	Installation of 8" Concrete Pavement, Complete	140	SY		
60	Installation of 8" Storm Sewer Line, Complete	46	LF		
61	Installation of 12" Storm Sewer Line, Complete	210	LF		
62	Installation of 18" Storm Sewer Line, Complete	184	LF		
63	Installation of Surface Inlet, 24" x 24" Lockable Cast Iron Grate, Complete	5	EA		
		Total Bid-Base Bid Items			

PROPOSAL FORM
SECTION 00 4200

Add Alternate #1					
Description: Complete all work required on to replace the lagoon liner system in the West Lagoon					
Pay Item	Description	Quantity	Units	Unit Price	Total Amount
1	Dewater West Lagoon System, Complete	1	LS		
2	Demolition of West Lagoon Liner System, Complete	1	LS		
3	Installation of West Lagoon Liner System, Complete	1	LS		
		Total Additive Alternate 1 Items			

Add Alternate #2					
Description: Complete all work required on to remove and dispose of all sludge in both the East and West Lagoons					
Pay Item	Description	Quantity	Units	Unit Price	Total Amount
1	Mobilization - Portable De-watering Equipment	1	LS		
2	Erosion Control	1	LS		
3	Sludge Removal & Disposal, Complete	225	Dry Ton		
		Total Additive Alternate 2 Items			

Bidder acknowledges that (1) each bid unit price includes an amount considered by bidder to be adequate to cover tax, bond, insurance, permit fees, overhead, profit, labor, equipment, and materials for each separately identified bid item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of bids, and final payment for all unit price bid items will be based on actual quantities, determined as provided in the Section 01 8000 Part 7, Measurement and Payment. The Bidder also agrees to perform any increased or decreased quantities of work at the unit prices bid for each item.

ADDENDA ACKNOWLEDGMENT: (modified dates August 2016)

No. _____ No. _____ No. _____
No. _____ No. _____ No. _____

ACCEPTANCE:

I certify that I am authorized to enter into a binding contract, if this Proposal is accepted.

Signature _____ Date _____
Name and Title _____
Name of Business _____

Complete spelling of bidder's name and address - **exact as recorded at the Secretary of State**

[<http://www.sos.state.ms.us/busserv/corp/soskb/csearch.asp>] which should be the same as you applied for at the Mississippi State Board of

Contractors [<http://www.msdoc.us/Search2.CFM>] (see 2.07, 3.01, 5.01) **PLEASE LOOK IT UP at SoS. SoS rules when the 2 are different.**

Address _____ (mailing)

Address _____ (physical)

City/State/Zip Code _____ County _____

Phone _____ Fax _____ Email _____

- **BIDDER'S CERTIFICATE OF RESPONSIBILITY NUMBER(S):** _____
- **MINORITY BUSINESS ENTERPRISE?** Yes _____ No _____ (to assist with Code 57-1-57)

-
- Attach copy of Non-Resident Bidder's Preference Law (5.04 of Bidder's Checklist)

-
- **Mechanical / Plumbing / Electrical Contractors:** (modified Dec 2013 SoS per 10/17/12 Addendum 1 & Feb 2014; 021219 sub over \$50,000.00; modified 04/06/2020)

Regarding said Divisions of the Specifications of the BoB Standard Form of Agreement Between The Owner and The Contractor: List any Mechanical/Plumbing and/or Electrical Sub-Contractors that will perform work of this contract; regardless of cost even for under \$50,000.00. COR must be included where sub-contract exceeds \$50,000.00. If no sub-contractor is listed, and such work is within scope of contract and over \$50,000.00, bidder's own COR classification(s) must be sufficient to self-perform any such work. If no sub-contractor is listed, then use of sub-contractor to perform such scope will not be permitted. This is in accordance with 5.05 and 5.06 of the Bidder's Checklist.

Mechanical Contractor: _____ Certificate of Responsibility No. _____
Plumbing Contractor: _____ Certificate of Responsibility No. _____
Electrical Contractor: _____ Certificate of Responsibility No. _____

■

**STANDARD FORM OF AGREEMENT BETWEEN
THE OWNER AND THE CONTRACTOR SECTION
00 5200**

This Agreement made the _____ day of _____, 20____ between the Owner,

Bureau of Building, Grounds and Real Property Management
501 North West Street, Suite 1401B [Woolfolk Building]
Jackson, Mississippi 39201

created by Section 7-1-451 et seq., and Section 31-11-1, et seq., **Mississippi Code of 1972, Annotated**, and acting for the State of Mississippi;

and between the Contractor:

Business Name _____
Address _____
City/State/Zip _____ Phone: _____ Fax: _____ Email: _____

The Contractor is a (check and complete one of the following):

_____ ☐ CORPORATION or ☐ LLC solely organized and existing under the laws of the State of _____
and having its principal office in _____, _____, _____
(City) (County) (State)

_____ PARTNERSHIP of the following (list all partners):

_____ SOLE PROPRIETORSHIP

For the following Project:

GS# **GS# 323-024**
ARPA Infr. - Waste Cent. Treatment
South Mississippi Correctional Institution, Leakesville, Mississippi

This Agreement entered into as of the day and year first written above:

OWNER: BUREAU OF BUILDING, GROUNDS AND
REAL PROPERTY MANAGEMENT

CONTRACTOR:

By: _____
(Signature)

By: _____
(Signature)

Adrian Massey, Director
(Name and Title)

(Name and Title)

APPROVED AS TO FORM:

By: _____
(Signature of Attorney)

THE OWNER AND THE CONTRACTOR AGREE AS SET FORTH IN PAGES ONE THROUGH THREE, ARTICLES ONE THROUGH FIVE, AS FOLLOWS:

ARTICLE 1: THE WORK AND CONTRACT DOCUMENTS

1.1.1 The Contractor will perform all the work required by the Contract Documents for the Project indicated above.

1.2 THE CONTRACT DOCUMENTS

1.2.1 The Contract Documents which constitute the entire Agreement between the Owner and the Contractor, are enumerated as follows:

1.2.2 Project Manual dated April 29, 2024

BIDDING REQUIREMENTS

Advertisement for Bids

Instructions to Bidders

Proposal Form

STANDARD FORM OF AGREEMENT BETWEEN THE OWNER AND THE CONTRACTOR

CONTRACT BOND

POWER OF ATTORNEY

CERTIFICATE OF INSURANCE

AFFIDAVIT OF PAYMENT TO ALL SUBCONTRACTORS

CONDITIONS OF THE CONTRACT

General Conditions

Supplementary Conditions

Labor Requirements

Minority Participation

Special Conditions

ADDENDA

SPECIFICATIONS (check the specs listed on the contents and included in the manual)

☒ Division 1: General Requirements

☒ Division 2: Existing Conditions

☒ Division 3: Concrete

☐ Division 4: Masonry

☒ Division 5: Metals

☐ Division 6: Wood, Plastics and Composites

☐ Division 7: Thermal and Moisture Protection

☐ Division 8: Openings

☒ Division 9: Finishes

☐ Division 10: Specialties

☐ Division 11: Equipment

☐ Division 12: Furnishings

☒ Division 13: Special Construction

☐ Division 14: Conveying Equipment

☐ Division 21: Fire Suppression

☐ Division 22: Plumbing

☐ Division 23: HVAC

☐ Division 25: Integrated Automation

☐ Division 26: Electrical

☐ Division 27: Communications

☐ Division 28: Electronic Safety and Security

☒ Division 31: Earthwork

☒ Division 32: Exterior Improvements

☒ Division 33: Utilities

☐ Division 34: Transportation

☐ Division 35: Waterway and Marine Construction

☐ Division 40: Process Interconnections

☐ Division 41: Material Processing and Handling Equipment

☐ Division 42: Process Heating, Cooling, and Drying Equipment

☐ Division 43: Process Gas and Liquid Handling, Purification,
and Storage Equipment

☐ Division 44: Pollution and Waste Control Equipment

☐ Division 45: Industry-Specific Manufacturing Equipment

☒ Division 46: Water and Wastewater Equipment

☐ Division 48: Electrical Power Generation

1.2.3 Addenda

Addendum No. 1, dated _____

Addendum No. 2, dated _____

Addendum No. 3, dated _____

Addendum No. 4, dated _____

Addendum No. 5, dated _____

1.2.4 Drawings dated April 29, 2024

Sheets No. C-100 through C-105

Sheets No. C-201 through C-229

Sheets No. C-301 through C-332

Sheets No. C-401 through C-406

Sheets No. C-501 through C-503

Sheets No. C-601 through C-602

Sheets No. C-701 through C-703

Sheets No. C-801 through C-804

Sheets No. C-901 through C-904

Sheets No. E-101 through E-801

Sheets No. _____ through _____

Sheets No. _____ through _____

1.2.5.1 Other documents, dated _____

Division 0

ARTICLE 2: CONTRACT SUM

2.1 CONTRACT SUM

- 2.1.1 The Owner will pay the Contractor in current funds for the performance of the work subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of _____ Dollars

(\$ _____). The Contract sum is determined as follows:

Base Bid	\$ _____
Modifications () Adds () Deducts	\$ _____
Negotiations	\$ _____
Alternate No. _____ () Adds () Deducts	\$ _____
Alternate No. _____ () Adds () Deducts	\$ _____
Alternate No. _____ () Adds () Deducts	\$ _____
Alternate No. _____ () Adds () Deducts	\$ _____
Alternate No. _____ () Adds () Deducts	\$ _____
Total Contract Sum	\$ _____

2.2 LIQUIDATED DAMAGES

- 2.2.1 The stipulated liquidated damages described in Paragraph 9.11 of the *Supplementary Conditions* are in the amount of Two Hundred Fifty and 00/100 dollars _____ Dollars (\$ 250.00) for each calendar day.

ARTICLE 3: CONTRACT TIME

3.1 TIME

- 3.1.1 The work to be performed under this Contract shall be commenced upon the date stated in the *Notice to Proceed*. The work is to be substantially complete, subject to approved Change Orders, no later than 500 calendar days from the date stated in the *Notice to Proceed*.

ARTICLE 4: PAYMENTS AND FINAL PAYMENTS

4.1 PROGRESS PAYMENTS

- 4.1.1 Based upon applications for payment submitted to the Professional by the Contractor and *Certificates for Payment* issued by the Professional, the Owner will make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents.

4.2 FINAL PAYMENT

- 4.2.1 Final payment constituting the entire balance of the Contract Sum will be paid by the Owner to the Contractor when the work has been completed, the Contract fully performed and a final Certificate for Payment has been issued by the Professional and approved by the Owner.

ARTICLE 5: MISCELLANEOUS PROVISIONS

5.1 DEFINITION OF TERMS

- 5.1.1 Terms used in this Agreement which are defined in the General, Supplementary, and Special Conditions of the Contract will have the meanings designated in those Conditions.

5.2 CONTRACTOR'S INTEREST IN AGREEMENT

- 5.2.1 The Contractor will not assign, sublet, or transfer the interest in this Contract agreement without the written consent of the Owner. The Owner and Contractor hereby agree to the full performance of the covenants contained herein.

5.3 PROFESSIONAL

- 5.3.1 The Professional assigned to this Project is as follows:

Name W.L. Burle Engineers, P.A.
Address 111 South Walnut Street, Greenville, MS 38701
Telephone 662-332-2619 Fax Number 662-332-2622 E-Mail Address dtm@wlburle.com

*** END OF SECTION ***

Division 0

CONTRACT BOND

SECTION 00 6100

I. PREAMBLE

KNOW ALL MEN BY THESE PRESENTS: THAT _____,
Principal, a _____, residing at _____,
_____, authorized to do business in the State of Mississippi under
the laws thereof, and _____ Surety, a corporation of the State of
_____, authorized to do business in the State of Mississippi under the laws thereof, are held and firmly bound
unto the Bureau of Building, Grounds and Real Property Management of the State of Mississippi, Oblige, hereinafter referred to as "Owner," for the
use and benefit of the Owner and those claimants and others set forth hereinbelow and described in Sections 31-5-51 and 31-5-3, **Mississippi Code
of 1972, Annotated**, as amended, in the amount of _____
Dollars (\$ _____), lawful
money of the United States, for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and
assigns, jointly and severally, firmly by these present.

WHEREAS, Principal has by written agreement dated _____, 20_____, entered into a Contract with the
Owner for the following:

as provided in said Contract and in accordance with the Contract Documents. All of the terms and provisions of the above mentioned Contract,
drawings, Project Manual, and addenda are by reference made a part hereof and fully incorporated herein, and are hereinafter referred to as "the
Contract." All of the terms and provisions of Sections 31-5-51, 31-5-3, supra, Section 31-5-53 of the **Mississippi Code of 1972, Annotated**, as
amended, and all other code sections cited herein are also by reference made a part hereof and fully incorporated herein.

II. PERFORMANCE BOND

NOW, THEREFORE, the condition of this Performance Bond is such that if Principal shall promptly and faithfully perform said Contract, then this
obligation shall be null and void; otherwise, it shall remain in full force and effect, subject however, to the following conditions:

Whenever the Owner has performed its obligation but the Principal has defaulted under the terms of the Contract, or any portion thereof, and the
Owner has declared the Principal to be in default, the Surety shall promptly:

1. Remedy the default, or
2. Complete the Contract in accordance with its terms and conditions, or
3. Procure the completion of the Contract in accordance with its terms and conditions.

Even if there should be a succession of defaults, the Surety is responsible for completion of the Contract. The Surety shall provide sufficient funds to
pay the cost of completion of the Contract in its entirety including other costs and damages for which the Surety may be liable thereunder, less the
balance of the Contract price. The term "balance of the Contract price," as used in this paragraph, shall mean the total amount payable by Owner to
Principal under the Contract and any Change Orders thereto, less the amount paid by Owner to Principal.

III. LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, the condition of this Labor and Material Payment Bond is such that if Principal shall promptly make payments to all persons
supplying labor or material used in the prosecution of the work under said Contract, then this obligation shall be null and void; otherwise, it shall
remain in full force and effect; however, the Owner shall not be liable for the payment of any costs or expenses of any suit described in Subsection (2)
of Section 31-5-51, supra.

IV. BOND FOR PAYMENT OF TAXES AND OTHER ASSESSMENTS

NOW THEREFORE, the condition of this Bond for Payment of Taxes and Other Assessments is such that if Principal shall promptly make payment of all taxes, licenses, assignments, contributions, damages, penalties, and interest thereon, when and as the same may lawfully be due the State of Mississippi, or any County, Municipality, Board, Department, Commission, or political subdivision thereof, by reason of and directly connected with the performance of said Contract or any part thereof as provided by Sections 27-65-1, 27-65-21, 27-67-1, and 31-5-3, **Mississippi Code 1972, Annotated**, or any other applicable statute or other authority, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

V. GENERAL CONDITIONS

The following conditions apply to all three (3) of the above-mentioned Bonds:

1. The Performance Bond is for an amount equal to the full amount of said Contract.
2. The Labor and Material Payment Bond is for an amount equal to the full amount of said Contract.
3. If any changes are made in the work, or any extensions of time are granted, or any increases in the total dollar amount of the Contract are made, such changes, extensions, increases, or other forbearance on the part of either the Owner or the Principal will not, in any way, release the Principal and Surety, or either of them, from their liability hereunder, or any portion thereof, notice to the Surety of any such change, extension, increase, or forbearance being expressly waived.
4. These Bonds are governed by and shall be construed in accordance with Mississippi law. Any inconsistency with these Bonds and any provision of Mississippi law shall be remedied by deleting the inconsistent portion of these Bonds and leaving the remaining consistent portions in full force and effect.

Signed and sealed this _____ day of _____, 20____ Complete all work required.

SURETY _____

Mississippi NAIC number: _____ Complete all work required to remove, dispose of, and replace the

By: _____
(Signature)

(Typed Name) Attorney-in-Fact (Title)

Surety Agent MS Ins Dept License Number: _____
(Leave blank if you do not have a Mississippi #)

(Surety Address)

(Surety City/State/Zip/Phone)

MISSISSIPPI LICENSED AGENT COMPANY NAME

(add MS Licensed Agent address below)

COUNTERSIGNED: (if Surety Agent above is NOT MS Licensed)

(Signature) _____

(Typed Name) Licensed Mississippi Agent (Title)

Countersignature Agent MS License Number: _____

(MS Licensed Agent Address)

(MS Licensed Agent City/State/Zip/Phone)

PRINCIPAL _____

By: _____
(Signature) (same person on Bond and Contract page)

(Typed Name and Title)

(Address)

(City/State/Zip/Phone)

Surety Company, Surety Agent's Name, Address, etc. should be typed and with seal (preferably embossed seal) on Bond and P/A. The P/A should be for the Attorney-in-Fact with seal (preferably embossed seal).

The Contract Bond shall be duly executed by the Bidder AND a MS Licensed Agent said Surety approved by the MS Ins Dept
OR
signed by the Surety's Agent AND countersigned by a MS Licensed Agent for said Surety approved by the MS Ins Dept.

Countersignature, when signed, can be the same as the Attorney-in-Fact when the Attorney-in-Fact and/or Surety IS licensed in Mississippi. Countersignature will be different when the Attorney-in-Fact and/or Surety is "not" licensed in Mississippi. P/A will be for the Attorney-in-Fact.

Check the Surety Company AND the Surety Agent
AND/OR the Countersignature Company and/or Agent at MS Ins Dept web:
<https://www.mid.ms.gov> (or most up-to-date link)

Easier to locate Agent at MID when name agrees with MID licensed name.)

(Bond Agent MID or Code requirements are different from the Ins Cert Agent MID or Code requirements.)

CERTIFICATE OF INSURANCE

SECTION 00 6216

This certificate of insurance neither affirmatively nor negatively amends, extends, or alters the coverage afforded by the policies below.

INSURED: (Contractor's Name & Address) GS# 323-024				COMPANIES PROVIDING COVERAGE w/ MID Lic or NAIC #		
				A #		
				B #		
				C #		
				D #		
				E #		
				F #		
PROJECT: (Number, Name & Location) GS# 323-024-ARPA Infr. Waste Cent. Treatment South Mississippi Correctional Institution, Leakesville, Mississippi				G #		
				Companies above must be approved by the MS Ins Dept at https://www.mid.ms.gov (or most up-to-date link) per Code & WComp at http://www.mwcc.ms.gov/ (MID mod'd 041615)		
OWNER: Bureau of Building, Grounds & Real Property Management South Mississippi Correctional Institution, Leake						
Type Insurance	Co	Policy Number	Policy Period	Coverage and Minimum Amount		
General Liability Commercial General Liability				General Aggregate \$ 1,000,000		
				Products Comp/Ops (Aggregate) \$ 1,000,000		
				Personal Injury (Per Occurrence) \$ 500,000		
				BI & PD (Per Occurrence) \$ 1,000,000		
				Fire Damage (Per Fire) \$ 50,000		
				Medical Expense (Per Person) \$ 5,000		
Owners/Contractors Protective Liability				General Aggregate \$ 1,000,000		
				Per Occurrence \$ 500,000		
Automobile Liability				Bodily Injury/Property Damage Combined Single Limit (Per Occurrence) \$ 500,000		
				OR	Bodily Injury (Per Person)	\$ 250,000
					Bodily Injury (Per Accident)	\$ 500,000
					Property Damage (Per Occurrence)	\$ 100,000
* Excess Liability (Umbrella on projects over \$500,000)				Aggregate \$ 1,000,000		
				Per Occurrence \$ 1,000,000		
MS Workers' Compensation (As required by Statute) Employers' Liability				Accident (Per Occurrence) \$ 100,000		
				Disease-Policy Limit \$ 500,000		
				Disease-Per Employee \$ 100,000		
Property Insurance (not required when project is demolition ONLY – required for ALL other projects including paving)				OR		
				Builders' Risk	Must be equal to	
				Installation Floater	Value of Work	
Other						
Certification: I certify that these policies (subject to their terms, conditions and exclusions) have been (1) issued to the Insured for the coverages and at least the amounts as indicated by companies licensed in Mississippi; (2) countersigned by a Mississippi Licensed Agent; and (3) endorsed to require the company to give thirty (30) days written notice to the Owner prior to cancellation or non-renewal of above.						
Producing Agent: (Name, Address and Telephone)						
				(Signature) MID Lic # or countersign below		
				(Name and Title of Authorized Representative) (typed)		
				Agent must be approved by the MS Ins Dept or countersign https://www.mid.ms.gov		

☐ Check if Mississippi Licensed Agent
 OR Countersign by Mississippi Licensed Agent MID Lic # _____

Division 0

CERTIFICATE OF INSURANCE INSTRUCTIONS

SECTION 00 6217

1. The *Certificate of Insurance* is a tabulation of insurance required for this Project as specified in Article 11 entitled *Insurance and Bonds* in the General Conditions (AIA Document A201, Sixteenth Edition, 2017).
2. The *Certificate of Insurance* must be completed, certified by the original signature of a Mississippi Licensed Insurance Agent and/or countersignature and bound in each set of the Contract Documents. Insurance Companies providing coverage, and Agent and/or Countersignature Agent, must be approved by the Mississippi Insurance Department on their web at <https://www.mid.ms.gov> (or most up-to-date link). (Agent does not have to be on the MID web “for providers necessarily” – but must be an approved Agent on MID web. Easier to locate Agent at MID when name agrees with MID licensed name.)
3. Indicate Insured, Project, Companies providing coverage, policy numbers and policy periods in the blanks as applicable.
4. If the "OWNERS/CONTRACTORS PROTECTIVE LIABILITY" insurance is part of the Commercial General Liability Insurance Policy, or included by endorsement, indicate the policy number and period of the CGL policy in the "OWNERS/CONTRACTORS PROTECTIVE LIABILITY" blank spaces.
5. Automobile Liability Insurance may be provided which covers Bodily Injury and Property Damage in one (1) Combined Single Limit, or may be provided with separate minimum limits as shown on the Certificate of Insurance and specified in Article 11 of the Supplementary Conditions. The person signing the Certificate of Insurance should show which option the Contractor has selected by marking out the coverage that is not provided under the policies indicated.
6. OTHER INSURANCE (if required) will be indicated by typing in the "OTHER" block and detailed in Article 11 of the Supplementary Conditions.
7. CERTIFICATION wording may not be changed without specific written approval from the Owner.
8. "Riders", Binders, TBA, TBD, or other unsolicited attachments, are not allowed as part of the *Certificate of Insurance* unless specifically requested in writing by the Owner, or specified as part of the requirements for this Project.
9. CAUTION: The *Certificate of Insurance* is intended to be used for all Projects. The Contractor must provide all insurance specified in the Contract Documents for this Project, whether indicated on this form, or not. The Contractor must verify all insurance has been provided as required.
10. In accepting the Insurance Certificate by Owner, it would be helpful if some indication is given when, and if, the Provider is a Surplus Line Carrier, a Broker, or Self Insured (because they may not be on the MID web list referenced herein). (The Owner will have to ask MID (or know) at some point.)
11. The Workers Comp insurance provider must be approved and show up on the Workers Comp web at <http://www.mwcc.state.ms.us> / Services / Proof of Coverage Inquiry / accept / etc. and at the last step – enter the “contractor’s name”.

Note: Regarding #2 and #11. At the MID web – you enter the Surety Company / Provider / Agent. At the MWCC web – You enter the Vendor’s name, then click on the policy number to see the MWCC Ins Provider.

*** END OF SECTION ***

Division 0

AFFIDAVIT CERTIFYING PAYMENT TO ALL SUBCONTRACTORS SECTION 00 6300

Department of Finance and Administration
Bureau of Building, Grounds and Real Property Management

I acknowledge that, pursuant to Miss. Code Ann. §31-5-25 and H.B. 1562, Laws of 2002, that I am required to submit monthly certification indicating payments to subcontractors on prior payment requests. I, the undersigned Contractor, do hereby certify that I have paid the following amounts to subcontractors for Work which has been performed and incorporated into previous Applications for Payment which were issued and payment received from the Owner on the project listed below. I understand that this document must be submitted on a monthly basis after the submittal, approval and payment of Application for Payment #1. I understand that the Bureau of Building reserves the right to require me, the undersigned, to provide verification of payment and/or additional information.

Project Number: _____

Project Name: _____

Using Agency: _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Division 0

Page 2 of 2
DFA/Bureau of Building
Affidavit Certifying Payment Form

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

Subcontractor: _____ Amount: \$ _____

(Attach additional list of subcontractors and amounts, if necessary)

Contractor Name and Title: _____

Contractor Certificate of Responsibility Number: _____

Contractor Signature: _____ Date: _____

STATE OF MISSISSIPPI

COUNTY OF _____

SWORN TO AND SUBSCRIBED BEFORE ME, the undersigned notary public,
this the _____ day of _____, 20____.

NOTARY PUBLIC

My Commission Expires:

Division 0

GENERAL CONDITIONS

SECTION 00 7200

PART 1 - GENERAL

1.01 DESCRIPTION

- A. **SCOPE:** The **General Conditions of the Contract for Construction**, AIA Document A201, Seventeenth Edition, 2017, Articles 1 through 15 inclusive, is a part of this Contract and is incorporated herein.
- B. **BIDDING COPY:** For the purpose of bidding, Contractors are presumed to be familiar with AIA Document A201, a copy of which may be obtained from the Professional, or examined in the Professional's office.

***** END OF SECTION *****

Division 0

ARPA SUPPLEMENTARY CONDITIONS
SECTION 00 7300
PART 1 – GENERAL

1.01 Description

- A. **Owner:** These supplements are necessary because the Owner is an agency, or political subdivision, of the State of Mississippi and occupies a different position from that of the usual Owner.
- B. **Document:** The following supplements modify, change, delete from, or add to the **General Conditions of the Contract**, AIA Document A201, Seventeenth Edition, 2017. When any Article of the **General Conditions** is modified, or deleted, by these *Supplementary Conditions*, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause will remain in effect.

Article 1
GENERAL PROVISIONS

1.1 Basic Definitions

1.1.1 The Contract Documents

Change this subparagraph to read as follows:

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and Special Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for minor changes in the Work issued by the Prime Professional. The Contract Documents also include the advertisement or invitation for bids or proposals, Instructions to Bidders, and the Contractor's bid or proposal.

1.1.2 The Contract

Change each instance of the word “*Architect*” to “*Prime Professional*” and each instance of the word “*Architect's*” to “*Prime Professional's*”.

1.1.7 Instruments of Service

Change the word “*Architect*” to “*Prime Professional*” and change the word “*Architect's*” to “*Prime Professional's*”.

1.1.8 Initial Decision Maker

Change this Subparagraph to read as follows:

The Initial Decision Maker is the person identified as the Professional in Paragraph 5.3.1 of the Standard Form of Agreement Between the Owner and the Contractor and will render initial decisions on Claims in accordance with Section 15.2.

ARPA Division 0

-
- 1.1.9 Add a new Subparagraph as follows:

Commissioning Authority Professional

A professional independent of the Prime Professional retained by the owner who manages a quality-focused process for enhancing the delivery of the project. The process focuses upon verifying and documenting that the facility and all of its systems are planned, designed, installed, tested, operated, and maintained to meet the Owner's project requirements.

- 1.2.1 Change this Subparagraph to read as follows:

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor and unless otherwise provided in the Contract Documents, this shall include all labor, materials, equipment, tools, machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated in the Work. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In case of any direct conflict among the Contract Documents, the specifications shall take precedence over the drawings, supplemental or special conditions shall take precedence over more general conditions or requirements, details shall take precedence over plans, and larger scale drawings shall take precedence over smaller scale drawings.

1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

- 1.5.1 Change each instance of the word “Architect” to “Prime Professional” and each instance of the word “Architect’s” to “Prime Professional’s” and add a new sentence at the end of this Subparagraph:

This Paragraph in no way supersedes the Owner's document rights set forth in the separate Agreement Between the Owner and the Professional.

- 1.5.3 Add a new Subparagraph as follows:

Transparency

In accordance with the Mississippi Accountability and Transparency Act of 2008, §27-104-151, et seq., of the Mississippi Code of 1972, as Amended, the American Accountability and Transparency Act of 2009 (P.L. 111-5), where applicable, and §31-7-13 of the Mississippi Code of 1972, as amended, where applicable, a fully executed copy of this agreement shall be posted to the State of Mississippi's accountability website at: <https://www.transparency.mississippi.gov>

1.6 Notice

- 1.6.1 Change this Subparagraph to read as follows:

Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is address and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if transmitted to the government or business issued e-mail address of the respective party.

1.7 Digital Data Use and Transmission

Delete the last sentence of this Paragraph.

1.8 **Building Information Models Use and Reliance**

Change this Paragraph to read as follows:

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in a written documents shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

Article 2
OWNER

2.1 **General**

2.1.1 Change this Subparagraph to read as follows:

The Owner, as used in these Documents, refers to the Bureau of Building, Grounds and Real Property Management, acting for and on behalf of the State of Mississippi and for the benefit of the Institution, Agency, or Department for which the Work under this Contract is being performed. The Owner is the entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner's representative, who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, is the individual who signed the Agreement Between the Owner and the Contractor, his successor in the case of that individual's retirement or termination, or his direct supervisor in the case of that individual's absence. Except as otherwise provided in Subparagraph 4.2.1, the Prime Professional does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

2.1.2 Delete this Subparagraph in its entirety.

2.2 **Evidence of the Owner's Financial Arrangements**

2.2.1 Delete this Subparagraph in its entirety.

2.2.2 Delete this Subparagraph in its entirety.

2.3.1 Delete this Subparagraph in its entirety.

2.2.3 Delete this Subparagraph in its entirety.

2.2.4 Delete this Subparagraph in its entirety.

2.3 **Information and Services Required of the Owner**

2.3.2 Add the word "or Engineer" following each instance of the word "Architect" and add the words "or engineering respectively" following each instance of the word "architecture".

2.3.3 Add the word "or Engineer" following each instance of the word "Architect".

2.3.6 Change this Subparagraph to read as follows:

Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary, but in no instance to exceed twenty-five (25) copies, for the execution of the Work.

ARPA Division 0

2.4 Owner's Right to Stop the Work

Change this Subparagraph to read as follows:

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, the Owner may issue, or direct the Prime Professional to issue, a written order to the Contractor to stop the Work or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. The rights and remedies under this Subparagraph are in addition to and do not in any respect limit any other rights of the Owner, including the right to terminate in accordance with Article 14.

2.5 Owner's Right to Carry Out the Work

Change this Paragraph read as follows:

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. The Prime Professional may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Prime Professional's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Prime Professional, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

Article 3 **CONTRACTOR**

3.1 General

- 3.1.3 Change the word "Architect" to "Prime Professional" and change the word "Architect's" to "Prime Professional's".

3.2 Review of Contract Documents and Field Conditions by Contractor

- 3.2.2 Change each instance of the word "Architect" to "Prime Professional".
- 3.2.3 Change each instance of the word "Architect" to "Prime Professional".
- 3.2.4 Change the word "Architect" to "Prime Professional".

3.3 Supervision and Construction Procedures

- 3.3.1 Change each instance of the word "Architect" to "Prime Professional".

3.4 Labor and Materials

- 3.4.1 Add a new sentence to the end of this Subparagraph:

Where the Contract Sum is ten million dollars (\$10,000,000.00) or greater, the Contractor shall furnish a written Project Workforce Continuity Plan on or before the date of the Notice to Proceed that affirms that the Contractor has ready access to a sufficient supply of appropriately skilled and unskilled labor to ensure high-quality construction and enumerates steps that the Contractor will take to ensure an adequate workforce is available throughout the life of the project.

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3.4.2 Change each instance of the word “Architect” to “Prime Professional” and add the words “where such substitution results in a modification of the Contract Sum or Contract Time” to the end of this sentence.

3.4.4 Add a new Subparagraph as follows:

Employee Status Verification System *If applicable, the Contractor represents and warrants that it will ensure its compliance with the Mississippi Employment Protection Act, Section 71-11-1, et seq. of the Mississippi Code Annotated (Supp 2008), and will register and participate in the status verification system for all newly hired employees. The term “employee” as used herein means any person that is hired to perform work within the State of Mississippi. As used herein, “status verification system” means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. The Contractor agrees to maintain records of such compliance and, upon request of the State and approval of the Social Security Administration or Department of Homeland Security, where required, to provide a copy of each such verification to the State. The Contractor further represents and warrants that any person assigned to perform services hereunder meets the employment eligibility requirements of all immigration laws of the State of Mississippi. The Contractor understands and agrees that any breach of these warranties may subject the Contractor to the following: (a) termination of this Agreement and ineligibility for any state or public contract in Mississippi for up to three (3) years, with notice of such cancellation/termination being made public, or (b) the loss of any license, permit, certification or other document granted to the Contractor by an agency, department or governmental entity for the right to do business in Mississippi for up to one (1) year, or (c) both. In the event of such cancellation/termination, the Contractor would also be liable for any additional costs incurred by the State due to the contract cancellation or loss of license or permit.*

3.4.5 Add a new Subparagraph as follows:

In providing labor for the proper execution and completion of the Work, the Contractor shall comply with the provisions of Section 31-5-19 of the Mississippi Code of 1972, Annotated.

3.4.6 Add a new Subparagraph as follows:

In providing materials for the proper execution and completion of the Work, the Contractor shall comply with the provisions of Section 31-5-23 of the Mississippi Code of 1972, Annotated.

3.5 **Warranty**

3.5.1 Change each instance of the word “Architect” to “Prime Professional”.

3.7 **Permits, Fees, Notices and Compliance with Laws**

3.7.1 Change this Subparagraph to read as follows:

Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for any applicable permits, fees, licenses, and inspections by government agencies necessary for the proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

3.7.3 Delete the words “knowing it to be” from this Subparagraph.

3.7.4 Change each instance of the word “Architect” to “Prime Professional” and change the word “Architect’s” to “Prime Professional’s”.

3.7.5 Change the word “Architect” to “Prime Professional”.

3.9 Superintendent

3.9.2 Change this Subparagraph to read as follows:

The Contractor, as soon as practicable after award of the Contract, and prior to commencement of any on-site Work, shall notify the Owner and Prime Professional of the name, qualifications and references of the proposed superintendent and any assistant superintendents where provided for in the Contract Documents. Within 14 days of receipt of the information, the Prime Professional shall notify the Contractor stating whether the Owner or the Prime Professional (1) has reasonable objection to the proposed superintendent based upon information provided or other requirements provided for in the Contract Documents or (2) requires additional information or time for review. Failure of the Prime Professional to respond within the 14-day period shall constitute notice of no reasonable objection.

3.9.3 Change the word “Architect” to “Prime Professional”.

3.10 Contractor’s Construction and Submittal Schedules

3.10.1 Change this Subparagraph to read as follows:

The Contractor, promptly after being awarded the Contract, and no later than fifteen days after the date established in the Notice to Proceed, shall submit for the Owner’s and Prime Professional’s information a Contractor’s construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed the time limits current under the Contract Documents. Submission of a schedule that indicates or expresses an intent to complete Work prior to the time limits established by the Contract Documents shall not make the Owner liable to the Contractor for any failure to achieve early completion or obligate the Owner to take or prevent any actions to facilitate the Contractor’s completion prior to the expiration of the Contract Time. The schedule shall be revised monthly or at more frequent intervals as required by the conditions of the Work and Project.

3.10.2 Change each instance of the word “Architect’s” to “Prime Professional’s” and change the word “Architect” to “Prime Professional”.

3.10.3 Change the word “Architect” to “Prime Professional”.

3.11 Documents and Samples at the Site

Change each instance of the word “Architect” to “Prime Professional”.

3.12 Shop Drawings, Product Data and Samples

3.12.4 Change each instance of the word “Architect” to “Prime Professional”.

3.12.5 Change each instance of the word “Architect” to “Prime Professional”.

3.12.6 Change the word “Architect” to “Prime Professional”.

3.12.7 Change the word “Architect” to “Prime Professional”.

3.12.8 Change each instance of the word “Architect’s” to “Prime Professional’s” and change the word “Architect” to “Prime Professional”.

3.12.9 Change the word “Architect” to “Prime Professional” and change the word “Architect’s” to “Prime Professional’s”.

3.12.10.1 Change each instance of the word “Architect” to “Prime Professional”.

3.12.10.2 Change each instance of the word “Architect” to “Prime Professional”.

3.15 **Cleaning Up**

3.15.2 Change this Subparagraph to read as follows:

If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be assessed to the Contractor.

3.16 **Access to Work**

Change this Paragraph to read as follows:

The Contractor shall provide the Owner, Prime Professional, Commissioning Authority Professional, Separate Contractors and their authorized representatives with access to the Work in preparation and progress wherever located. This shall include the provision of lifts, ladders, scaffolding and/or equivalent for access to elevated work.

3.17 **Royalties, Patents and Copyrights**

Change each instance of the word “Architect” to “Prime Professional”.

3.18 **Indemnification**

3.18.1 Change this Subparagraph to read as follows:

To the fullest extent allowed by law, Contractor shall indemnify, defend, save and hold harmless, protect, and exonerate the Owner, Prime Professional, Prime Professional’s consultants, Commissioning Authority Professional, Commissioning Authority Professional’s consultants, as well as the State of Mississippi, its Commissioners, Board Members, officers, employees, agents, and representatives, from and against all claims, demands, liabilities, suits, actions, damages, losses, and costs of every kind and nature whatsoever, including, without limitation, court costs, investigative fees and expenses, and attorneys’ fees, arising out of or caused by Contractor’s and/or its partners, principals, agents, employees, and/or subcontractors in the performance of or failure to perform this Agreement. In the State’s sole discretion, Contractor may be allowed to control the defense of any such claim, suit, etc. In the event Contractor defends said claim, suit, etc., Contractor shall use legal counsel acceptable to the State; Contractor shall be solely liable for all reasonable costs and/or expenses associated with such defense and the State shall be entitled to participate in said defense. Contractor shall not settle any claim, suit, etc., without the State’s concurrence, which the State shall not unreasonably withhold.

Article 4 **ARCHITECT**

Change the title of this article from “ARCHITECT” to “PRIME PROFESSIONAL”.

4.1 **General**

4.1.1 Change this Subparagraph to read as follows:

The Prime Professional is the person identified as the Professional in the Agreement Between the Owner and the Contractor and retained by the Owner pursuant to Section 2.3.2.

ARPA Division 0

4.1.2 Change each instance of the word “Architect” to “Prime Professional”.

4.2 **Administration of the Contract**

4.2.1 Change the first line of this Subparagraph to read as follows:

The Prime Professional will provide administration of the Contract as described in the Contract Documents, and will be the Owner’s representative during construction until the end of the period for correction of Work as described in Section 12.2.

4.2.2 Change each instance of the word “Architect” to “Prime Professional”.

4.2.3 Change each instance of the word “Architect” to “Prime Professional”.

4.2.4 Change each instance of the word “Architect” to “Prime Professional” and each instance of the word “Architect’s” to “Prime Professional’s”.

4.2.5 Change the word “Architect’s” to “Prime Professional’s” and change the word “Architect” to “Prime Professional”.

4.2.6 Change each instance of the word “Architect” to “Prime Professional”.

4.2.7 Change each instance of the word “Architect” to “Prime Professional” and each instance of the word “Architect’s” to “Prime Professional’s”.

4.2.8 Change each instance of the word “Architect” to “Prime Professional”.

4.2.9 Change the word “Architect” to “Prime Professional”.

4.2.10 Change each instance of the word “Architect” to “Prime Professional” and the word “Architect’s” to “Prime Professional’s”.

4.2.11 Change the word “Architect” to “Prime Professional” and the word “Architect’s” to “Prime Professional’s”.

4.2.12 Change each instance of the word “Architect” to “Prime Professional”.

4.2.13 Change the word “Architect’s” to “Prime Professional’s”.

4.2.14 Change each instance of the word “Architect” to “Prime Professional”.

Article 5
SUBCONTRACTORS

5.2 **Award of Subcontracts and Other Contracts for Portions of the Work**

5.2.1 Change this Subparagraph to read as follows:

Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, prior to award of the Contract by the Owner, shall furnish in writing to the Owner through the Prime Professional, the names, classifications, and COR #'s of Sub-Contractors over Fifty Thousand Dollars (\$50,000.00) (as well as entities who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. Such list shall also include any Mechanical, Plumbing, or Electrical Sub-Contractor as listed on Proposal Form regardless of amount. Within 7 days of receipt of the information, the Prime Professional shall notify the Contractor whether the Owner or the Prime Professional (1) has reasonable objection to any such proposed Sub-Contractor or entity based upon information provided or other

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requirements provided for in the Contract Documents or (2) requires additional information or time for review. Failure of the Prime Professional to respond within the 7-day period shall constitute notice of no reasonable objection. Where a Project involves a Mississippi Landmark or a building and/or site potentially eligible for such designation, the Contractor shall also furnish documentation that all Sub-Contractors, regardless of Sub-Contract amount, have at least the minimum number of years of successful experience specified by the Prime Professional in work on previous projects involving State or National Landmarks of similar type, scale and complexity and that all key personnel to be utilized to perform the Work are experienced craftsmen with not less than five (5) years of experience.

5.2.2 Change this Subparagraph to read as follows:

The Contractor shall not contract with a proposed Sub-Contractor or entity to whom the Owner or Prime Professional has made reasonable and timely objection. Other than the Mechanical, Plumbing, or Electrical Sub-Contractors as listed on the Proposal Form, the Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection. Only where the listed Mechanical, Plumbing, or Electrical Sub-Contractor has (1) closed their business (2) entered into bankruptcy or (3) refuses to enter into a contract with the Contractor will substitution of such Sub-Contractor be permitted prior to the execution of the Agreement Between the Owner and Contractor. Substitution for refusal to enter into contract shall not be permitted if the reason for such refusal is due to unilateral reduction by Contractor of such Sub-Contractor's bid price.

5.2.3 Change this Subparagraph to read as follows:

If the Owner or Prime Professional has reasonable objection to a Sub-Contractor or entity proposed by the Contractor, other than the Mechanical, Plumbing, or Electrical Sub-Contractors as listed on the Proposal Form, the Contractor shall propose another to whom the Owner or Prime Professional has no reasonable objection. Neither the Contract Sum nor Contract Time may be increased or decreased due to any change in Sub-Contractor or entity. Failure of Contractor to identify Sub-Contractors or entities to whom the Owner and Prime Professional have no reasonable objections within 10 working days of initial submission shall result in the bid or proposal being deemed non-responsible at which time the Owner may elect to award to the next lowest responsive, responsible bidder or resolicit the project.

5.2.4 Change this Subparagraph to read as follows:

Following the execution of the Agreement Between the Owner and Contractor, the Contractor shall not substitute a Sub-Contractor or entity for one previously selected if the Owner or Prime Professional makes reasonable objection to such substitution. In no case shall substitution of Mechanical, Plumbing or Electrical Sub-Contractors be permitted except where such Sub-Contractor has (1) closed their business (2) entered into bankruptcy (3) becomes in arrears or (4) becomes involved in an ongoing dispute with the Contractor related to the Sub-Contractor's execution, workmanship, or timely performance of their portion of the Work.

Add new Subparagraphs as follows for ARPA:

5.3 CONTRACTING WITH SMALL AND MINORITY BUSINESSES, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS

- 5.3.1 The Contractor shall take all affirmative steps necessary to assure that minority business, women's business enterprises, and labor surplus area firms are used when possible, including those steps listed in 2 C.F.R. § 200.321(b).

5.4 DOMESTIC PREFERENCES FOR PROCUREMENTS

- 5.4.1 To the extent applicable, appropriate, and consistent with law, the Contractor certifies that, during the term of this Contract, it will comply with applicable requirements of 2 C.F.R. § 200.322 and will include these requirements in all agreements with sub-contractors utilized in the work of this agreement.

5.5 PROCUREMENT OF RECOVERED MATERIALS

- 5.5.1 The Contractor certifies that, during the term of this Contract, it will comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act in accordance with the guidelines and requirements of 2 C.F.R. § 200.323 and will include these requirements in all agreements with sub-contractors utilized in the work of this agreement.

5.6 ADDITIONAL FEDERAL REQUIREMENTS

- 5.6.1 This Contract shall be governed by the federal requirements contained in 2 C.F.R. Pt. 200, App. II, where applicable, or not otherwise addressed herein and will include these requirements in all agreements with sub-contractors utilized in the work of this agreement.

Article 6 **CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

- 6.2.2 Change each instance of the word “*Architect*” to “*Prime Professional*”.
- 6.3 Change the word “*Architect*” to “*Prime Professional*”.

Article 7 **CHANGES IN THE WORK**

7.2 Change Orders

- 7.2.1 Change each instance of the word “*Architect*” to “*Prime Professional*”.
- 7.2.2 Add a new Subparagraph as follows:

The maximum mark-up included in a Change Order for profit and overhead is limited to twenty percent (20%) of the total of the actual cost for materials, labor and subcontracts. Profit and overhead include: all taxes, fees, permits, insurance, bond, job superintendent, job and home office expense. All Sub-Contractors and Sub-Sub-Contractors shall acquiesce to the same requirements when participating in a Change Order.

7.3 Construction Change Directives

- 7.3.4 Change the word “*Architect*” to “*Prime Professional*”.
- 7.3.4.1 Change the word “*Architect*” to “*Prime Professional*”.
- 7.3.6 Change this Subparagraph to read as follows:

Upon receipt of a Construction Change Directive signed by the Prime Professional and the Owner, the Contractor shall promptly proceed with the change in the Work and advise the Prime Professional of the Contractor’s agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

- 7.3.7 Change this Subparagraph to read as follows:

A Construction Change Directive signed by the Contractor indicates the Contractor’s agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall become effective once signed by the Prime Professional and the Owner and will subsequently be incorporated into a Change Order.

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7.3.8 Change the word “*Architect*” to “*Prime Professional*”.

7.3.9 Change this Subparagraph to read as follows:

Until such time that a Construction Change Directive is recorded as a Change Order, the Contractor may not request payment for Work completed under the Construction Change Directive in Applications for Payment.

7.3.10 Change each instance of the word “*Architect*” to “*Prime Professional*”.

7.4 Change each instance of the word “*Architect*” to “*Prime Professional*” and the word “*Architect’s*” to “*Prime Professional’s*”.

Article 8

TIME

8.1 Definitions

8.1.2 Change this Subparagraph to read as follows:

The date of commencement of the Work is the date established in the Notice to Proceed.

8.1.3 Change the word “*Architect*” to “*Prime Professional*”.

8.2 Progress and Completion

8.2.1 Change this Subparagraph to read as follows:

Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work and acknowledges that such period includes time for all applicable submittals, selections, reviews, approvals, inspections, meetings, as well as discovery and investigation of any latent conditions.

8.2.2 Change this Subparagraph to read as follows:

The Contractor shall not knowingly commence the Work prior to the date established in the Notice to Proceed or the effective dates of bond and insurance required to be furnished by the Contractor.

8.3 Delays and Extensions of Time

8.3.1 Change this Subparagraph to read as follows:

If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Prime Professional, of an employee of either, or of a Separate Contractor; (2) by labor disputes, pandemics, acts of terrorism, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions in excess of any weather days otherwise provided for in the Contract Documents that are documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor’s control; (3) by delay authorized by the Owner pending dispute resolution; or (4) by other causes that the Contractor asserts, and the Owner, in consultation with the Prime Professional determines justify delay, then the Contract Time shall be extended for such reasonable time as the Owner, in consultation with the Prime Professional, may determine. Such determination shall take into consideration the critical path of the Work and will be reduced by any

Float in the Contractor's Construction Schedule that does not affect the overall completion of the Work. Except where such delay is due to suspension by the Owner in accordance with Article 14 or such delay has the effect of stopping all progress of the Work for 14 calendar days or more, the Contract Sum will not be increased for additional general overhead expenses; however, it may be increased for direct expenses directly related to the delay of specific portions of the Work so delayed. Any claim for loss or any delay occasioned by any Sub-Contractor or entity under contract with the Contractor, shall be settled between the Contractor and such other Sub-Contractor or entity.

Article 9

PAYMENTS AND COMPLETION

9.2 Schedule of Values

Change this Paragraph to read as follows:

Where the Contract is based on a stipulated sum, the Contractor shall submit a schedule of values to the Prime Professional, at least 10 working days before the first Application for Payment, a schedule of values allocating the entire Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Prime Professional. This schedule, unless objected to by the Prime Professional or Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any subsequent changes to the schedule of values shall be submitted to the Prime Professional and supported by such data to substantiate its accuracy as the Prime Professional may require, and unless object to by the Prime Professional or Owner, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

9.3 Applications for Payment

9.3.1 Add a new sentence to the end of this Subparagraph:

The form of Application for Payment will be AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet, or a computer generated form containing similar data.

9.3.1.1 Delete this Subparagraph in its entirety.

9.3.1.3 Add a new Clause to Subparagraph 9.3.1 as follows:

On any contract as described herein, of which the total amount is Two Hundred Fifty Thousand Dollars (\$250,000.00) or greater, or on any contract with a subcontractor, regardless of amount, five percent (5%) shall be retained until the Work is at least fifty percent (50%) complete, on schedule and satisfactory in the Prime Professional's opinion, at which time fifty percent (50%) of the retainage held to date shall be returned, subject to consent of surety, to the prime contractor for distribution to the appropriate subcontractors and suppliers; provided, however, that future retainage shall be withheld at the rate of two and one-half percent (2 1/2%). When submitting request for reduction in retainage, the Contractor will include, with the application, a Consent of Surety to Reduction which is AIA Form G707A, and a Power of Attorney. (Code 31-5-33)

9.3.1.4 Add a new Clause to Subparagraph 9.3.1 as follows:

The Contractor must submit each month with this Application for Payment a separate letter stating that he is requesting an extension of time or that he had no need for an extension for that period of time. No payment on a monthly application will be considered due and payable until the letter is received. Complete justification such as weather reports or other pertinent correspondence must be included for each day's request for extension. A Contractor's letter, or statement, will not be considered as adequate justification. The receipt of this request and data by the Owner will not be considered as approval of the Owner or Prime Professional in any way.

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9.3.2.1 Add a new Clause to Subparagraph 9.3.2 as follows:

Payment in an amount not greater than the documented cost paid by the Contractor for ~~on~~ materials stored at some location other than the Project site, may be approved by the Prime Professional and the Owner after the Contractor has submitted the following items:

- .1 An acceptable Lease Agreement between the General Contractor and the owner of the land, or building, where the materials are stored covering the specific area where the materials are located.*
- .2 Consent of Surety, or other acceptable Bond, to cover the materials stored off-site.*
- .3 All Perils Insurance coverage for the full value of the materials stored off-site.*
- .4 A Bill of Sale from the Manufacturer to the General Contractor for the stored materials.*
- .5 A complete list and inventory of materials manufactured, stored and delivered to the storage site and of materials removed from the storage site and delivered to the job site.*
- .6 A review by the Prime Professional of the materials stored off-site prior to release of payment. Where the storage location is greater than 50 miles of the building site, the Contractor shall pay or reimburse reasonable travel costs of the Prime Professional and/or his Consultants for such review.*
- .7 Guarantee no storage costs, additional delivery fees, or subsequent costs to the Owner.*

9.4 Applications for Payment

9.4.1 Change each instance of the word “Architect” to “Prime Professional” and the word “Architect’s” to “Prime Professional’s”.

9.4.2 Change each instance of the word “Architect” to “Prime Professional” and each instance of the word “Architect’s” to “Prime Professional’s”.

9.5 Decisions to Withhold Certification

9.5.1 Change each instance of the word “Architect” to “Prime Professional” and the word “Architect’s” to “Prime Professional’s”.

9.5.1.7 Delete the word “repeated” from this Clause.

9.5.2 Change the word “Architect” to “Prime Professional”.

9.5.3 Delete this Subparagraph in its entirety.

9.5.4 Change each instance of the word “Architect” to “Prime Professional”.

9.6 Progress Payments

9.6.1 Change each instance of the word “Architect” to “Prime Professional”.

9.6.2 Change the first line of this Subparagraph to read as follows:

The Contractor shall pay each Sub-Contractor and material supplier, in accordance with Section 31-5-27 of the Mississippi Code 1972, Annotated, in proportion to the percentage of work completed by each less applicable retainage.

9.6.3 Change each instance of the word “Architect” to “Prime Professional”.

9.6.4 Change the word “Architect” to “Prime Professional”.

9.6.9 Add a new Subparagraph as follows:

The amount retained by the Contractor from each payment to each Sub-Contractor and material supplier shall not exceed the percentage retained by the Owner from the Contractor.

9.6.9.1 Add a new Clause to Subparagraph 9.6.9 as follows:

The Contractors shall submit monthly certification, in accordance with Section 31-5-25 of the Mississippi Code 1972, Annotated, on Owner's "Affidavit Certifying Payment to All Subcontractors" form, to the Prime Professional indicating payments to subcontractors on prior payment request.

9.6.10 Add a new Subparagraph as follows:

The Owner agrees to make payment in accordance with Mississippi Law on "Time for full and final payment to contractors; exemptions; monthly submission by contractors of proof of payment to subcontractors", Section 31-5-25 of the Mississippi Code of 1972, Annotated, which generally provides for payment of undisputed amounts within forty-five (45) days of when they are due and payable. Payments by state agencies using the statewide electronic payment and remittance vehicle shall be made and remittance information provided electronically as directed by the State. These payments shall be deposited into the bank account of the Contractor's choice. Contractor understands and agrees that the State is exempt from the payment of taxes. All payments shall be in United States currency. No payment, including final payment, shall be construed as acceptance of defective or incomplete work, and the Contractor shall remain responsible and liable for full performance.

9.7 **Failure of Payment**

Change this Paragraph to read as follows:

The Contractor and the Owner shall be subject to the remedies as prescribed in Section 31-5-25 of the Mississippi Code 1972, Annotated.

9.8 **Substantial Completion**

9.8.1 Add the following sentence to the end this Subparagraph to read as follows:

In order to be considered occupiable or utilizable by the Owner, all life safety systems must be operable and tested and the commissioning requirements for the Work or designated portion thereof must be complete except for thermographs of electrical systems, trend log monitoring, seasonal testing, near-warranty end activities and verification of training sessions.

9.8.3 Change this Subparagraph to read as follows:

Upon receipt of the Contractor's list, the Prime Professional will promptly visit the site to determine whether the Work or designated portion thereof is substantially complete. If, in the opinion of the Prime Professional, the Work or designated portion thereof is not substantially complete, the Prime Professional will not proceed with inspection and the Prime Professional will report the reasons for such determination to the Contractor. In such case, the Contractor shall then submit a revised list and request for inspection when these reasons have been resolved.

9.8.4 Change this Subparagraph to read as follows:

When the Work or designated portion thereof is substantially complete and affirmed by the Owner, the Prime Professional will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the punch list accompanying the Certificate. Unless otherwise provided in the Contract Documents, warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

9.9 Partial Occupancy or Use

9.9.1 Change each instance of the word “*Architect*” to “*Prime Professional*”.

9.9.2 Change the word “*Architect*” to “*Prime Professional*”.

9.10 Final Completion and Final Payment

9.10.1 Change this Subparagraph and add the associated Clauses to read as follows:

When, in the opinion of the Contractor, the Work is ready for final inspection and acceptance by the Owner, the Contractor shall make such notice to the Prime Professional.

- 1. Upon receipt of the Contractor’s notice that the Work is ready for final inspection and acceptance by the Owner, the Prime Professional will promptly visit the site and assess the state of the Work to determine if it is ready for final inspection by the Owner. If, in the Prime Professional’s judgment, the Work is not ready for final inspection, the Prime Professional will report the reasons for such determination to the Contractor. In such case, the Contractor shall then submit a revised request for final inspection when these reasons have been resolved.*
- 2. Once the Prime determines the Work is ready for final inspection, the Prime Professional will call for final inspection of the with the Owner for the purpose of determining whether the Work is acceptable under the Contract Documents.*
- 3. The final inspection shall be conducted in the presence of the Owner and a list of defects or discrepancies, if any, will be compiled into a final punch list furnished to all parties.*
- 4. Once corrections of all final punch list items have been confirmed by the Prime Professional, the Prime Professional will provide a letter recommending final acceptance of the Work to the Owner.*

9.10.2 Change this Subparagraph to read as follows:

Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Prime Professional (1) final application for payment, (2) consent of surety to final payment, (3) power of attorney, (4) Contractor’s affidavit of release of liens, (5) Contractor’s affidavit of payment of debts and claims, (6) Contractor’s guarantee of work, (7) Project Record Documents and (8) certificates, warranties, guarantees, bonds or documents as called for in the individual sections of the Project Manual. The final payment will be reduced by the value of any amounts assessed to the Contractor per Section 2.5 Owner’s Right to Carry Out the Work, Section 6.3 Owners Right to Clean Up, or Section 9.11 Liquidated Damages where such amounts have not been reconciled by a Change Order per Section 7.2 prior to final acceptance unless such amounts have been resolved via separate agreement(s) between the Owner and the Contractor.

9.11 Liquidated Damages

9.11.1 Add a new Paragraph as follows:

Time being of the essence and a matter of material consideration thereof, a reasonable estimate in advance is established to cover losses incurred by the Owner if the project is not substantially complete on the date set forth in the Contract Documents. The Contractor and his Surety will be liable for and will be assessed by the Owner the sums stipulated in Paragraph 2.2 of the Standard Form of Agreement Between the Owner and the Contractor as fixed and agreed as liquidated damages for each calendar day of delay until the work is substantially complete unless circumstances dictate otherwise in the discretion of the Owner. The Contractor and his Surety acknowledge that losses to the Owner caused by the delay of the Contractor are not readily ascertainable and that the amount estimated per day and established as liquidated damages is reasonable and not a penalty.

Article 10
PROTECTION OF PERSONS AND PROPERTY

- 10.1 Add a new sentence to the end of this Paragraph:

Where the Contract Sum is ten million dollars (\$10,000,000.00) or greater, such precautions and programs shall include a requirement that all workers of the Contractor, Subcontractor and Sub-subcontractors have not less than OSHA 10 certification and that all supervisors and workers with safety roles have not less than OSHA 30 certification.

- 10.2 **Safety of Persons and Property**

- 10.2.5 Change this Subparagraph to read as follows:

The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Sub-Contractor, a Sub-Sub-Contractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible for Clauses 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss attributable to acts or omissions of the Owner or Prime Professional and not attributable to the fault or negligence of the Contractor. Where damage or loss is insured under property insurance required by the Contract Documents, the Contractor shall promptly report, file and facilitate the claim process so as to minimize any impacts on the timely completion of the Work. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

- 10.3 **HAZARDOUS MATERIALS**

- 10.3.2 Delete this Subparagraph in its entirety.

- 10.3.3 Delete this Subparagraph in its entirety.

- 10.3.4 Delete this Subparagraph in its entirety.

- 10.3.5 Delete this Subparagraph in its entirety.

- 10.3.6 Delete this Subparagraph in its entirety.

Article 11
INSURANCE AND BONDS

- 11.1 **Contractor's Insurance and Bonds**

- 11.1.1 Add a sentence to the end of this Subparagraph as follows:

Insurance shall be purchased to protect the Contractor from claims set forth below for not less than the limits of liability specified below or required by law, whichever coverage is greater, which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Sub-Contractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

Add new Clauses as follows:

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.1 GENERAL LIABILITY:

Commercial General Liability
(Including XCU)

General Aggregate.....	\$ 1,000,000.00 Aggregate
Products & Completed Operations.....	\$ 1,000,000.00 Aggregate
Personal & Advertising Injury.....	\$ 500,000.00 Per Occurrence
Bodily Injury & Property Damage.....	\$ 1,000,000.00 Per Occurrence
Fire Damage Liability.....	\$ 50,000.00 Per Occurrence
Medical Expense.....	\$ 5,000.00 Per Person

.2 OWNERS & CONTRACTORS PROTECTIVE LIABILITY:

Bodily Injury & Property Damage.....	\$ 1,000,000.00 Aggregate
Bodily Injury & Property Damage.....	\$ 500,000.00 Per Occurrence

.3 AUTOMOBILE LIABILITY:

(Owned, Non-owned & Hired Vehicles)

Contractor Insurance Option Number 1:

Bodily Injury & Property Damage.....	\$ 500,000.00 Per Occurrence
(Combined Single Limit)	

Contractor Insurance Option Number 2:

Bodily Injury.....	\$ 250,000.00 Per Person
Bodily Injury.....	\$ 500,000.00 Per Accident
Property Damage.....	\$ 100,000.00 Per Occurrence

.4 EXCESS LIABILITY:

(Umbrella on projects over \$500,000)

Bodily Injury & Property Damage.....	\$ 1,000,000.00 Aggregate
(Combined Single Limit)	

.5 WORKERS' COMPENSATION:

(As required by Statute)

EMPLOYERS' LIABILITY:

Accident.....	\$ 100,000.00 Per Occurrence
Disease.....	\$ 500,000.00 Policy Limit
Disease.....	\$ 100,000.00 Per Employee

.6 PROPERTY INSURANCE:

Builder's Risk.....	\$ Equal to Value of Work
or	
Installation Floater.....	\$ Equal to Value of Work

11.1.5 Add a new Subparagraph to read as follows:

Insurance shall be maintained without interruption from the date of commencement of the Work until the date of final payment unless otherwise noted on the Certificate of Substantial Completion.

11.1.6 Add a new Subparagraph to read as follows:

Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to final execution of the Contract and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

11.1.7 Add a new Subparagraph as follows:

If the coverages are provided on a claims-made basis, the policy date or retroactive date shall predate the Contract; the termination date, or the policy, or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment.

11.1.8 Add a new Subparagraph as follows:

If any insurance requires deductibles, the Contractor shall pay costs not covered because of such deductibles.

11.1.9 Add a new Subparagraph as follows:

The Owner as fiduciary shall have power to adjust and settle a loss with Insurers unless one of the parties in interest shall object in writing within five (5) days after occurrence of loss.

11.2 **Owner's Insurance**

Delete this Paragraph in its entirety and substitute the following:

The Contractor shall purchase and maintain such insurance as will protect the Owner from his contingent liability to others for damages because of bodily injury, including death, and property damage, which may arise from operations under this Contract and other liability for damages which the Contractor is required to insure under any provision of this Contract. Certificate of this insurance will be filed with the Owner and will be the same limits set forth in 11.1.5.

11.2.1 Delete this Subparagraph in its entirety.

11.2.2 Delete this Subparagraph in its entirety.

11.2.3 Delete this Subparagraph in its entirety.

11.3 **Waivers of Subrogation**

11.3.1 Delete this Subparagraph in its entirety.

11.3.2 Delete this Subparagraph in its entirety.

11.5 **Adjustment and Settlement of Insured Loss**

11.5.1 Delete this Subparagraph in its entirety.

11.5.2 Delete this Subparagraph in its entirety.

Article 12
UNCOVERING AND CORRECTION OF WORK

12.1 Uncovering of Work

- 12.1.1 Change each instance of the word “*Architect’s*” to “*Prime Professional’s*”, change the word “*Architect*” to “*Prime Professional*”, and add the words “*or Contract Sum*” at the end of this sentence.
- 12.1.2 Change each instance of the word “*Architect*” to “*Prime Professional*”.

12.2 Correction of Work

- 12.2.1 Change the word “*Architect*” to “*Prime Professional*” and the word “*Architect’s*” to “*Prime Professional’s*”.
- 12.2.2.1 Change the word “*Architect*” to “*Prime Professional*”.

Article 13
MISCELLANEOUS PROVISIONS

13.1 Governing Law

Change this Paragraph to read as follows:

The Contract shall be governed by the laws of the State of Mississippi.

13.3 Rights and Remedies

- 13.3.2 Change the word “*Architect*” to “*Prime Professional*”.

13.4 Tests and Inspections

- 13.4.1 Change each instance of the word “*Architect*” to “*Prime Professional and Commissioning Authority Professional*”.
- 13.4.2 Change the first two instances of the word “*Architect*” to “*Prime Professional*” and the second two instances of the word “*Architect*” to “*Prime Professional and Commissioning Authority Professional*”.
- 13.4.3 Change the word “*Architect*” to “*Prime Professional’s and Commissioning Authority Professional’s*”.
- 13.4.5 Change each instance of the word “*Architect*” to “*Prime Professional and/or the Commissioning Authority Professional*”.
- 13.5 Delete this Paragraph in its entirety.
- 13.6 Add a new Subparagraph as follows for ARPA:

Byrd Anti-Lobbying Certification

Upon construction award, the Contractor will complete and submit the attached Exhibit “B” being Certification Regarding Lobbying to the Owner within seven (7) days of award as a prerequisite to entering into the Contract and as evidence of compliance regarding the use of any Federal appropriated funds for the project stipulated in this Contract and any other stipulations in said Certification Regarding Lobbying; thereby also including said language in sub-contracts, agreements, etc.

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Article 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 Termination by the Contractor

14.1.1.3 Change the word “*Architect*” to “*Prime Professional*”.

14.1.1.4 Delete this Clause in its entirety.

14.1.3 Change the word “*Architect*” to “*Prime Professional*”.

14.1.4 Change the word “*Architect*” to “*Prime Professional*”.

14.2 Termination by the Owner for Cause

14.2.1.1 Delete the word “*repeatedly*” from this Clause.

14.2.1.3 Delete the word “*repeatedly*” from this Clause.

14.2.1.3 Delete the word “or” from this Clause.

14.2.1.4 Change the period to a semi-colon and add the word “*or*” to this Clause.

14.2.1.5 Add a new Clause as follows:

fails to achieve Substantial Completion of the Project within the time limits established by the Contract Documents.

14.2.2 Change the word “*Architect*” to “*Prime Professional*” and change the words “*certification by*” to “*advice of*”.

14.2.4 Change the word “*Architect’s*” to “*Prime Professional’s*”.

Article 15
CLAIMS AND DISPUTES

15.1 Claims

15.1.2 Change this Subparagraph to read as follows:

Commencement of Statutory Limitation Period

The Owner and Contractor shall commence all claims and causes of action within the time period specified by applicable state law.

15.1.3.1 Change each instance of the word “*Architect*” to “*Prime Professional*”.

15.1.4 Change this Subparagraph to read as follows:

Where both the Owner and the Contractor concur with the Initial Decision Maker’s decision, the Contract Sum and Contract Time shall be adjusted in accordance with Article 7 and the Prime Professional will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

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15.1.7 Delete this Subparagraph in its entirety.

15.2 **Initial Decision**

15.2.1 Change this Subparagraph to read as follows:

Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3 and 10.4, shall be referred to the Initial Decision Maker for initial decision. The Prime Professional will serve as the Initial Decision Maker. An initial decision by the Initial Decision Maker shall be required as a condition precedent to arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered by the Initial Decision Maker. The Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

15.2.2 Change the words “approve the Claim” to “recommend approval of the Claim to the Owner”.

15.2.4 Change the words “reject or approve the Claim” to “recommend rejection or approval of the Claim to the Owner”.

15.2.5 Change the Subparagraph to read as follows:

The Initial Decision Maker will render an initial decision to recommend approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision recommendation shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Prime Professional, if the Prime Professional is not serving as the Initial Decision Maker, of any recommended change in the Contract Sum or Contract Time or both. Where the Owner concurs with the recommendation it is binding on the parties but subject to arbitration or litigation.

15.2.6 Delete this Subparagraph in its entirety.

15.2..6.1 Delete this Clause in its entirety.

15.3 **Mediation**

15.3.1 Delete this Subparagraph in its entirety.

15.3.2 Delete this Subparagraph in its entirety.

15.3.3 Delete this Subparagraph in its entirety.

15.3.4 Delete this Subparagraph in its entirety.

15.4 **Arbitration**

15.4.1 Delete this Subparagraph in its entirety.

15.4.1.1 Delete this Clause in its entirety.

15.4.2 Delete this Subparagraph in its entirety.

15.4.3 Delete this Subparagraph in its entirety.

15.4.4 Delete this Subparagraph in its entirety.

15.4.4.1 Delete this Clause in its entirety.

15.4.4.2 Delete this Clause in its entirety.

15.4.4.3 Delete this Clause in its entirety.

15.5 Add a new Paragraph as follows:

Arbitration Procedures for the Department of Finance and Administration's Bureau of Building, Grounds and Real Property Management

All matters of dispute arising out of any agreement with the Department of Finance and Administration for planning, design, engineering, construction, erection, repair, or alteration of any building, structure, fixture, road, highway, utility or any part thereof, or any agreement with the Department of Finance and Administration for architectural, engineering, surveying, planning, and related professional services which provides for mediation or arbitration, shall comply with the following course for resolution. No arbitration hearing shall be granted on any claim in excess of One Hundred Thousand Dollars (\$100,000.00).

15.5.1 Add a new Subparagraph and Clauses as follows:

Conditions Precedent to Arbitration

- .1 The aggrieved party must first notify opposing party in writing in detail of the matter(s) in dispute the amount involved and the remedy sought. Such writing shall include copies of any documents, writings, plans, or other matter pertinent to the resolution of the dispute. The Director of the Bureau of Building and a principal of the opposing party shall be the proper parties for such notice and shall be active parties in any subsequent dispute resolution.*
- .2 If the dispute cannot be satisfactorily resolved, within thirty (30) days of the complaint being rejected in writing by either party, notice by certified mail shall be given to the Deputy Director of the Department of Finance and Administration. A copy of the notice shall be sent by certified mail to the opposing party. Such notice shall be in writing setting forth in detail the matter(s) in dispute, the amount involved, the remedy sought and state that informal resolution between the parties cannot be reached. Such writing shall include copies of any documents, writings, plans, or other matter pertinent to the resolution of the dispute. Opposing party shall have the opportunity to set forth in writing a rebuttal with pertinent documents attached. At the sole discretion of the Deputy Director, oral testimony may be had on the matter.*

15.5.2 Add a new Subparagraph as follows:

Requests for Arbitration

Within thirty (30) days of a claim being rejected in writing by the Deputy Director of the Department of Finance and Administration, either party may request arbitration. Notices for requests for arbitration shall be made in writing to the Executive Director of the Department of Finance and Administration, P.O. Box 267, Jackson, MS 39201. Such notice shall set forth in detail the matter(s) in dispute, the amount involved, and the remedy sought. A copy of the request shall be mailed to the opposite party. The party requesting arbitration must deposit the sum of two hundred (\$200.00) with its request as a deposit against costs incurred by the arbitrators. Each party will be notified in writing in any manner provided by law of certified mail not less than twenty (20) days before the hearing of the date, time and place for the hearing. Appearance at the hearing waives a party's right to notice.

-
- 15.5.3 Add a new Subparagraph as follows:

Selection of Arbitrators

Upon request for arbitration, a panel of three (3) arbitrators shall be chosen. One (1) member shall be appointed by the Executive Director of the Department of Finance and Administration. One (1) member shall be appointed by the executive director of a professional or trade association which represents interests similar to that of the non-state party. The third member shall be appointed by the first two.

- 15.5.4 Add a new Subparagraph as follows:

Hearings

*All hearings shall be open to the public. All hearings will be held in Jackson, Mississippi, unless another location is mutually agreed to by the parties. The hearings shall be conducted as prescribed by **Mississippi Code 1972, Annotated**, Sections 11-15-113, 11-15-115, and 11-15-117. A full and complete record of all proceedings shall be taken by a certified court reporter. The scheduling and cost of retaining the court reporter shall be the responsibility of the party requesting arbitration. The costs of transcription of the record shall be the responsibility of the party requesting such transcript. No arbitration hearing shall be held without a certified court reporter. Deliberations of the arbitrators shall not be part of the record.*

- 15.5.5 Add a new Subparagraph as follows:

Awards

Awards shall be made in writing and signed by the arbitrators joining in the award. A copy of the award shall be delivered to the parties by certified mail.

- 15.5.6 Add a new Subparagraph as follows:

Fees and Expenses

Reasonable fees and expenses, excluding counsel fees, incurred in the conduct of the arbitration shall be at the discretion of the Arbitrator except each party shall bear its own attorney's fees and costs of expert witnesses.

- 15.5.7 Add a new Subparagraph as follows:

Modifications, Confirmations, and Appeals

*All modifications, confirmations and appeals shall be as prescribed by **Mississippi Code 1972, Annotated**, Section 11-15-123 et seq. All awards shall be reduced to judgment and satisfied in the same manner other judgments against the State are satisfied.*

- 15.5.8 Add a new Subparagraph as follows:

Secretary for the Arbitrators

All notices, requests, or other correspondence intended for the arbitrators shall be sent to Executive Director, Department of Finance and Administration, P.O. Box 267, Jackson, MS 39201.

ARPA Division 0

MINORITY PARTICIPATION SECTION 00 7339

PART 1 – PARTICIPATION FORM

1.01 GENERAL

The Contractor will submit the following form within seven (7) days from the Notice to Proceed:

Department of Finance and Administration
Bureau of Building, Grounds and Real Property Management
501 NORTH WEST STREET, SUITE 1401 B • JACKSON, MISSISSIPPI 39201
TEL (601) 359-3621 • FAX (601) 359-2470

Minority Tracking or Participation Form
February 2003

This document will serve as a tracking instrument for minority participation in publicly funded construction projects managed by the Bureau of Building, Grounds and Real Property Management. This document will aid DFA/BOB in its commitment to encourage minority participation during the bidding process. Your conscientious effort and commitment to help establish good business relations with minority subcontractors, consultants, suppliers, partners and/or joint ventures is greatly appreciated.

Any responses will be deemed public information and may be incorporated into reporting information compiled by the Bureau of Building in the following manner: Contractors that listed minority participation, Contractors that did not list minority participation and Contractors that submitted an incomplete (partially filled-out or blank) form.

The Prime General Contractor will submit to the Owner within seven (7) days from the Notice to Proceed, a completed *Minority Tracking Form* (as follows) outlining the use of minority subcontractors that will be used on the project.

Minority - A person who is a citizen or lawful permanent resident of the United States and who is the following:
African American, Hispanic American, Asian American, American Indian or Female

Project Name and Number: _____

General Contractor: (Name) _____

Check the Following Appropriate Box

☐

There are NO minority participants included in this bid proposal.

☐

There are minority participants included in this bid proposal. The minority participants may be defined as: Subcontractor(s)/Consultant(s)/ Supplier(s) / Partner(s) / Joint Ventures(s).

List minority participants and their discipline/responsibility per the above or per Construction Specification Institution (CSI) forty-eight (48) divisions.

Name: _____

Division 0

Division: _____

Amount \$ _____

Page 2 of 3
DFA / Bureau of Building
Minority Participation Form

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division 0

Division: _____

Amount \$ _____

Page 3 of 3 (Submit if necessary)
DFA / Bureau of Building
Minority Participation Form

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

Name: _____

Division: _____

Amount \$ _____

End of Form

Division 0

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, 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, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding 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 of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents of all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients 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, United States 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.

Organization: _____

Street address: _____

City, State, Zip: _____

CERTIFIED BY: (type or print)

TITLE:

(signature)

(date)

Disclosure of Lobbying Activities

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure)

1. Type of Federal Action: a. contract _____ b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	2. Status of Federal Action: a. bid/offer/application _____ b. initial award c. post-award	3. Report Type: a. initial filing _____ b. material change For material change only: Year _____ quarter _____ Date of last report _____
4. Name and Address of Reporting Entity: _____ Prime _____ Subawardee Tier _____, if Known: Congressional District, if known:	5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime: Congressional District, if known:	
6. Federal Department/Agency:	7. Federal Program Name/Description: CFDA Number, if applicable: _____	
8. Federal Action Number, if known:	9. Award Amount, if known: \$	
10. a. Name and Address of Lobbying Registrant <i>(if individual, last name, first name, MI):</i>	b. Individuals Performing Services <i>(including address if different from No. 10a)</i> <i>(last name, first name, MI):</i>	
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.	Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____	
Federal Use Only	Authorized for Local Reproduction Standard Form - LLL (Rev. 7-97)	

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity 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 a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitations for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Included prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

(b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503

LABOR REQUIREMENTS

SECTION 00 7343

PART 1 - EQUAL OPPORTUNITY

1.01 GENERAL

The Contractor will maintain policies of employment as follows:

- A. The Contractor and all Subcontractors will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to their race, religion, color, sex, national origin, or age. Such action will 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, selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
- B. The Contractor and all Subcontractors will, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants receive consideration for employment without regard to race, religion, color, sex, national origin or age.

PART 2 – FEDERAL REQUIREMENTS

2.01 APPLICABILITY

When project funding includes Federal funds, the applicable Federal Labor Standards Provisions will be included herein, to which the Contractor, and all Subcontractors, shall be subject to. Where no such pages are included, then no special provisions shall apply.

PART 3 - WAGE RATES

3.01 GENERAL

When project funding includes Federal funds, the applicable Federal Government Wage Determinations will be included herein, to which the Contractor, and all Subcontractors, shall be subject to. Where no such pages are included, then no special wages shall apply.

"General Decision Number: MS20240074 01/05/2024

Superseded General Decision Number: MS20230074

State: Mississippi

Construction Type: Heavy
HEAVY CONSTRUCTION PROJECTS

Counties: Clarke, George, Greene, Jasper, Kemper, Leake,
Neshoba, Newton, Pearl River, Smith, Stone and Wayne Counties
in Mississippi.

HEAVY CONSTRUCTION PROJECTS EXCLUDING FLOOD CONTROL

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)(1).

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 \$17.20 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 2024.
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 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 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 2024.

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 <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024

ELEC0917-009 12/01/2022

	Rates	Fringes
ELECTRICIAN.....	\$ 30.25	10.64

IRON0469-001 06/01/2017

	Rates	Fringes
IRONWORKER (STRUCTURAL).....	\$ 21.00	8.81

SUMS2015-040 04/03/2017

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 16.54 **	0.00
CEMENT MASON/CONCRETE FINISHER, Includes Water Sewer Lines.....	\$ 14.98 **	0.00
IRONWORKER, REINFORCING.....	\$ 18.50	0.00
LABORER: Common or General, Includes Water Sewer Lines.....	\$ 12.71 **	0.00
LABORER: Pipelayer, Includes Water Sewer Lines.....	\$ 12.00 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe, Includes Water Sewer Lines.....	\$ 14.68 **	0.00

OPERATOR: Bulldozer, Includes
Water Sewer Lines.....\$ 14.71 ** 0.00

TRUCK DRIVER: Dump Truck,
Includes Water Sewer Lines.....\$ 13.25 ** 0.00

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 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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) (iii)).

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 DECISION"

SPECIAL CONDITIONS
SECTION 00 8000

PART 1 - PERFORMANCE INFORMATION

N/A

PART 2 – GRANT CONDITIONS

N/A

PART 3 – OTHER CONDITIONS

N/A

ADDENDA

SECTION 00 9000

1.01 ADDENDA

Any Addendum issued on this Project will be included in Section 00 9000 and become a part of the *Standard Form of Agreement Between the Owner and Contractor*.

SUMMARY OF WORK

SECTION 01 1000

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. **Work Covered:** Work covered by the Contract Documents is as shown in drawings and described in words in the Project Manual. The Project Title and location is indicated on the first page of this Project Manual.
- B. **Start of Work:** Work shall be started immediately upon issuance of a *Notice to Proceed*. Prior to this, all Contracts and beginning documents will have been executed and insurance in force.
- C. **Time of Completion:** The completion of this Work is to be on, or before, the time indicated in the *Standard Form of Agreement Between the Owner and the Contractor*.
- D. **Contractor's Duties:**
 - 1. Except as specifically noted, provide and pay for:
 - a. Labor, materials and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Water, heat and utilities required for construction.
 - d. Other facilities and services necessary for proper execution and completion of the Work.
 - 2. Pay legally required sales, consumer, use, payroll, privilege and other taxes.
 - 3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at the time of the receipt of the bids:
 - a. Permits.
 - b. Government fees.
 - c. Licenses.
 - 4. Give required notices.
 - 5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.
 - 6. Promptly submit written notice to Professional of observed variance of Contract Documents from legal requirements. It is not the Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations. Appropriate modifications to Contract Documents will adjust necessary changes. Assume responsibility for work known to be contrary to such requirements, without notice.
 - 7. Enforce strict discipline and good order among employees. Do not employ or work unfit persons, or persons, not skilled in assigned task.
 - 8. Provide a written safety plan.
- E. **Hazardous Materials:** The Prime General Contractor is responsible for the removal and disposal of any hazardous materials encountered in the performance of the Contract requirements. Hazardous Containing Materials [HCM] include, but are not limited to, Asbestos and Lead Paint and should be identified and removed as a part of the Contract. The absence of details does not relieve the Prime General Contractor from the responsibility of removal and disposal; but, a Change Order could be executed in the absence of identified HCM in the documents.
- F. **Coordination:** The Prime General Contractor is responsible for the coordination of the total project. All other Contractors and all Subcontractors will cooperate with the Prime General Contractor so as to facilitate the general progress of the Work. Each trade shall afford all other trades every reasonable opportunity for the installation of their work. Refer to Section 01 3100 entitled *Project Coordination*.

1.02 CONTRACTS

Contracts: Construct work under a single Prime General Contract. Refer to Section 00 5200 entitled *Standard Form of Agreement Between the Owner and the Contractor*.

1.03 **WORK BY OTHERS**

Work by Others shall be described in each appropriate Project Manual section and noted on the Drawings.

1.04 **OWNER-FURNISHED PRODUCTS**

- A. **Products Furnished By Owner:** Products furnished by Owner shall be described in each appropriate Project Manual section and noted on the Drawings.
- B. **Products:** Delivered and unloaded at site.
- C. **Owner's Duties:**
 - 1. Schedule delivery date with Supplier in accordance with construction schedule.
 - 2. Obtain installation drawings and instructions.
 - 3. Submit claims for transportation damages.
 - 4. Arrange Guarantees, Warranties, etc..
- D. **Contractor's Duties:**
 - 1. Designate required delivery date for each product in construction schedule.
 - 2. Promptly inspect delivered products, report missing, damaged, or defective items.
 - 3. Handle at site, including uncrating and storage.
 - 4. Protect from exposure to elements and from damage.
 - 5. Repair or replace damaged items resulting from Contractor's operations.
 - 6. Install and make final connections.

1.05 **CONTRACTOR'S USE OF PREMISES**

- A. Confine operations at site to areas permitted by:
 - 1. Law.
 - 2. Ordinances.
 - 3. Permits.
 - 4. Contract Documents.
 - 5. Owner.
- B. Do not unreasonably encumber site with materials or equipment.
- C. Do not load structure with weight that will endanger structure.
- D. Assume full responsibility for protection and safekeeping of products stored on premises.
- E. Move any stored products which interfere with operations of Owner or other Contractors.
- F. Obtain and pay for use of additional storage or work areas needed for operations.
- G. Limit use of site for work and storage to the area indicated in the drawings.

1.06 **SPECIAL REQUIREMENTS**

- A. Refer to Section 01 8000 entitled *Special Requirements* for any Project specific summary of work requirements.

ALLOWANCES

SECTION 01 2100

1.01 DESCRIPTION

- A. **Related Work Specified Elsewhere:** Sections of Specifications as listed under Schedule of Allowances.
- B. **Allowances for Products:**
 - 1. Purchase products under each allowance as directed by the Professional.
 - 2. Amount of each allowance includes:
 - a. Net cost of product.
 - b. Delivery and unloading at site.
 - c. Applicable taxes.
 - 3. In addition to amounts of allowances, include in bid, for inclusion in Contract Sum, Contractor's costs for:
 - a. Handling at site, including uncrating and storage.
 - b. Protection from elements and damage.
 - c. Labor, installation and finishing.
 - d. Other expenses required to complete installation.
 - e. Overhead and profit.
- C. **Selection of Products:**
 - 1. **Architect's Duties:** Consult with Contractor in consideration of products and Suppliers; make selections, designate products to be used; and, notify Contractor in writing.
 - 2. **Contractor's Duties:** Assist Professional in determining qualified Suppliers; obtain proposals from Suppliers when requested by the Professional; and, make appropriate recommendations for consideration of the Professional. Upon notification of selection, enter into Purchase Agreement with designated Supplier.
- D. **Delivery:** The Contractor is responsible for arranging all delivery and unloading and should promptly inspect products for damage or defects and submit claims for transportation damage.
- E. **Installation:** Comply with requirements of referenced specification section.
- F. **Adjustment of Costs:** Should actual purchase cost be more, or less, than the specified allowance amount, the Contract Sum will be adjusted by Change Order equal to the amount of the difference.

1.02 SCHEDULE OF ALLOWANCES

- A. Refer to Section 01 8000 entitled *Special Requirements* for Project specific Schedule of Allowances.

ALTERNATES

SECTION 01 2300

1.01 DESCRIPTION

- A. **Scope:** This section describes the changes to be made under each alternate.
- B. **General:** The referenced Specification sections contain the pertinent requirements for materials and methods to achieve the work described herein. Coordinate related work and modify surrounding work, as required, to complete the Project under each alternate designated in the Contract.

Division One

1.02 DESCRIPTION OF ALTERNATES

- A. Refer to Section 01 8000 entitled *Special Requirements* for Project specific description of project Alternates.

CHANGE ORDER PROCEDURES

SECTION 01 2600

1.01 SCOPE

- A. This Section describes the procedures for processing Change Orders to the Contract by the Owner, the Professional and the Contractor.

1.02 CHANGE ORDER PROCEDURES

- A. **Change Proposed by Professional:** The Professional may issue a Change Order Request to the Contractor which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications and a change in Contract Time for executing the change. The Contractor will prepare and submit a Change Order Proposal within ten (10) working days.
- B. **Change Proposed by Contractor:** The Contractor may propose a change by submitting a request for change to the Professional, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01 6000 entitled *Substitutions and Product Options*.
- C. **Contractor's Documentation:**
1. Maintain detailed records of Work completed on a time and material basis. Provide full information required for evaluation of proposed changes, and substantiate costs of changes in the Work.
 2. Document each quotation for a change in cost or time with sufficient data allowing evaluation of the quotation.
 3. On request, provide additional data to support computations:
 - a. Quantities of products, labor, and equipment
 - b. Taxes, insurance and bonds
 - c. Overhead and profit
 - d. Justification for any change in Contract Time
 - e. Credit for deletions from Contract, similarly documented
 4. Support each claim for additional costs, and for Work completed on a time and material basis, with additional information:
 - a. Origin and date of claim
 - b. Dates and times work was performed and by whom
 - c. Time records and wage rates paid
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- D. **Construction Change Directive:** The Professional may issue a document, approved by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time. The change in Work will be promptly executed.
- E. **Format:** The Professional will prepare three (3) originals of the Change Order or Change Directive using the Bureau of Building, Grounds and Real Property Management's *Change Order Form*. Where time is of the essence, and at the sole discretion of the Owner, scanned documents may be deemed acceptable to the Owner where signatures and dates are executed in blue ink.
- F. **Types of Change Orders:**
1. **Stipulated Sum Change Order:** Based on Proposal Request and Contractor's fixed price quotation, or Contractor's request for a Change Order as approved by the Professional.

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2. **Unit Price Change Order:** For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive. Changes in Contract Sum or Contract Time will be computed as specified for Time and Material Change Order.
 3. **Time and Material Change Order:** Submit itemized account and supporting data after completion of change, within time limits indicated in the *Standard Form of Agreement Between the Owner and the Contractor*. The Professional will determine the change allowable in Contract Sum and Contract Time as provided in the Contract Documents. The Contractor shall maintain detailed records of Work accomplished on Time and Material basis and shall provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- G. **Execution of Change Order:** The Professional will issue Change Orders for signatures of parties as provided in the *Standard Form of Agreement Between the Owner and the Contractor*. Final execution of all Change Orders requires approval by the Owner.
- H. **Correlation of Contractor Submittals:** The Contract shall promptly revise *Schedule of Values* and the *Application for Payment* forms to record each authorized Change Order as a separate line item and adjust the Contract Sum. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of Work affected by the change and resubmit. Promptly enter changes in Project Record Documents.

SCHEDULE OF VALUES

SECTION 01 2973

1.01 DESCRIPTION

- A. **Scope:** Submit a *Schedule of Values* to the Professional at least ten (10) days prior to submitting the first Application for Payment. Upon the Professional's request, the Contractor will provide supportive data substantiating their correctness. Use *Schedule of Values* only as basis for Contractor's Application for Payment.
- B. **Form of Submittal:** Submit Schedule of Values on AIA Document G703, or computer generated form containing similar style, using Table of Contents of these Specifications as basis for format for listing costs of work for sections under Divisions 2-48. Identify each line item with number and title as listed in Table of Contents in these Specifications.
- D. **Preparing Schedule of Values:**
1. Itemize separate line item cost for each of the following general cost items: Performance and Payment Bonds, field supervision and layout, temporary facilities and controls.
 2. Itemize separate line item cost for work required by each Section of these Specifications. Break down installed cost with overhead and profit.
 3. Where determined to be feasible by the Owner, for each line item which has installed value of more than \$20,000, break down costs into sub-components or divisions of \$20,000 or less, rounding figures to nearest dollar. Make sum of total costs of all items listed in Schedule equal to total Contract Sum.
- E. **Preparing Schedule of Unit Material Values:**
1. Submit separate Schedule of unit prices for materials to be stored on which progress payments will be made. Make form of submittal parallel to Schedule of Values with each line item identified same as line item in Schedule of Values. Include in unit prices only: cost of material, delivery, unloading at site, and sales tax.
 2. Make sure unit prices multiplied by quantities equal material cost of that item in Schedule of Values.
- F. **Review and Resubmittal:** After Professional's review, if requested, revise and resubmit Schedule of Values in same manner.

Division One

APPLICATIONS FOR PAYMENT

SECTION 01 2976

1.01 SCOPE

- A. This Section describes procedures for preparing and submitting Applications for Payment by the Contractor.

1.02 APPLICATIONS FOR PAYMENT

A. **Format:**

1. Applications for Payments will be prepared on AIA forms G702 - *Application and Certificate for Payment* and G703 - *Continuation Sheet*; or, a computer generated form containing similar data may be used.

B. **Preparation of Application:**

1. Present required information in typewritten form
2. Execute certification by signature of authorized officer
3. Use data from approved *Schedule of Values*. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original Item of Work.
5. Prepare Application for Final Payment as specified in Section 01 7700 entitled *Contract Closeout*.

C. **Submittal Procedures:**

1. Submit original and one (1) copy of each Application for Payment
2. Submit an updated construction schedule with each Application for Payment as described in Section 01 3216 entitled *Progress Schedule* or Section 01 3127 entitled *Network Analysis Schedules*.
3. Submit requests for payment at intervals agreed upon by the Professional, Owner and Contractor.
4. Submit requests to the Professional at agreed upon times, or as may be directed otherwise.

D. **Substantiating Data:**

1. Submit data justifying dollar amounts in question when such information is needed.
2. Provide one (1) copy of the data with a cover letter for each submittal.
3. Indicate the Application number, date and line item number and description.

PROJECT COORDINATION

SECTION 01 3100

1.01 DESCRIPTION

- A. **Scope:** To set forth procedures, conditions and responsibility for coordination of the total project.
- B. **Project Coordinator:** The Contractor, as soon as practicable after the award of each Job Order, and prior to commencement of any on-site Work, shall submit name(s) and qualifications of the proposed superintendent and any assistant superintendents as set forth in the Contract Documents. Upon the approval of the Professional and the Owner, the Project Coordinator will remain until the Project is completed and cannot be removed during construction without the written consent of the Owner and the Professional.
- C. **Project Manager:** Where a Project involves a Mississippi Landmark or a building and/or site potentially eligible for such designation, the Contractor shall also submit name and qualifications of the project home office project manager as set forth in the General and Supplementary Conditions of the Contract. Upon the approval of the Professional and the Owner, the Project Coordinator will remain until the Project is completed and cannot be removed during construction without the written consent of the Owner and the Professional.

DUTIES OF PROJECT COORDINATOR

- A. **General:**
 - 1. **Coordination:** Coordinate the work of all Subcontractors and Material Suppliers.
 - 2. **Supervision:** Supervise the activities of every phase of work taking place on the Project.
 - 3. **Mechanical/Electrical:** Take special care to coordinate and supervise the work of the plumbing, heating and cooling and electrical Subcontractors.
 - 4. **Communication:** Establish lines of authority and communication at the job site.
 - 5. **Location:** The Project Coordinator must be present on the job all of the time.
 - 6. **Permits:** Assist in obtaining building and special permits required for construction.
- B. **Interpretations of Contract Documents:**
 - 1. **Consultation:** Consult with Architects and Engineers to obtain interpretations.
 - 2. **Assistance:** Assist in resolution of any questions.
 - 3. **Transmission:** Transmit written interpretations to concerned parties.
- C. **Cessation of Work:** Stop all work not in accordance with the requirements of the Contract Documents.
- D. **Division One:** Coordinate and assist in the preparation of all requirements of Division One and specifically as follows:
 - 1. **Cutting and Patching:** Supervise and control all cutting and patching of other trades' work.
 - 2. **Project Meetings:** Schedule and preside at all project meetings.
 - 3. **Construction Schedules:** Prepare and submit all construction schedules; supervise work to monitor compliance with schedules.
 - 4. **Shop Drawings, Product Data and Samples:** Administer the processing of all submittals required by the Project Manual.
 - 5. **Schedule of Values:** Assist in preparation and be knowledgeable of each entry in the Schedule of Values.
 - 6. **Testing:** Coordinate all required testing.
 - 7. **Temporary Facilities and Controls:** Allocate, maintain and monitor all temporary facilities.
 - 8. **Substitutions and Product Options:** Administer the processing of all substitutions.
 - 9. **Project Closeout:** Conduct final inspections and assist in collection and preparation of closeout documents.
 - 10. **Cleaning:** Direct and execute a continuing cleaning program throughout construction, requiring each trade to dispose their own debris.
 - 11. **Project Record Documents:** Maintain up-to-date project record documents.
 - 12. **Safety Measures:** Plan and enforce all safety requirements.
- E. **Changes:** Recommend and assist in the preparation of requests to the Professional for any changes in the Contract.
- F. **Application for Payment:** Assist in the preparation and be knowledgeable of each entry in the Application and Certificate for Payment.

SUBCONTRACTOR'S DUTIES

- A. **General:** The Subcontractor is responsible for coordinating and supervising employees in the work to be accomplished under their part of the Contract.
- B. **Schedules:** Conduct work to assure compliance with construction schedules.
- C. **Suppliers:** Transmit all instructions to Material Suppliers.
- D. **Cooperation:** Cooperate with the Project Coordinator and other Subcontractors.

OWNER-PURCHASED PRODUCTS

- A. **General:** Cooperate, accept delivery, arrange storage and protect Owner-purchased products until installation, or final acceptance.

Division One

PROJECT MEETINGS

SECTION 01 3119

1.01 DESCRIPTION

- A. **Contractor's Responsibilities:** The General Contractor will administer all progress meetings which include the following:
1. Prepare agenda
 2. Distribute written notice of meetings to listed attendees seven (7) days in advance
 3. Make physical arrangements for and presiding at the meetings
 4. Record minutes
 5. Distribute copies of the minutes to listed attendees, regardless of actual participation, within four (4) days
- B. **Pre-Construction Meeting:** The Bureau will schedule a pre-construction meeting as soon as possible after the award of Contract and the issuance of a *Notice to Proceed*.
1. **Attendees:**
 - a. Owner
 - b. Professional and Consultants
 - c. General Contractor
 - d. Major Subcontractors, including mechanical and electrical
 - e. Representatives of governmental, or other regulatory agencies
 - f. Commissioning Authority Professional (if Cx on project)
 2. **Minimum Agenda:** (prepared by the General Contractor)
 - a. Distribute and discuss preliminary construction schedule
 - b. Critical work sequencing
 - c. Designation of responsible personnel
 - d. Procedures for maintaining record documents
 - e. Use of premises, including office and storage areas
 - f. Owner's requirements
 - g. Security procedures
 - h. Housekeeping procedures
 - i. Commissioning issues (if Cx on project)
 3. **Utilities:** A written agreement must be reached on how all utilities will be furnished and the rates the Contractor will be charged. This agreement should be resolved at this meeting. Refer to Section 01 5000 entitled *Construction Facilities and Temporary Controls* and Section 01 8000 entitled *Special Requirements* of this Project Manual for additional utility requirements.
- C. **Progress Meetings:**
1. The Bureau will schedule regular meetings at the time of the pre-construction conference
 2. Hold all meetings as progress of work dictates
 3. **Attendees:**
 - a. Owner
 - b. Professional and Consultants
 - c. General Contractor
 - d. Subcontractors, as pertinent to the agenda
 - e. Commissioning Authority Professional (if Cx on project)
 4. **Minimum Agenda:**
 - a. Review, approve minutes of the previous meeting
 - b. Review work progress since last meeting
 - c. Note field inspections, problems and decisions
 - d. Identify problems which impede planned progress
 - e. Review off-site fabrication problems
 - f. Revise construction schedule, as indicated
 - g. Plan progress during the next work period
 - h. Review proposed changes

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- i. Complete other current business
 - j. Commissioning issues (if Cx on project)
- D. **Commissioning Meetings (if Cx on project):**
- 1. The Bureau will schedule a commissioning scoping meeting the pre-construction conference. Regular Commissioning Meetings will coincide with regularly scheduled Progress Meetings until such time that the Commissioning Process requires additional meetings. The Commissioning Authority Professional will chair, facilitate and document all Commissioning Meetings.
 - 2. **Attendees:**
 - a. Owner
 - b. Commissioning Authority Professional
 - c. Professional and Consultants
 - d. General Contractor
 - e. Subcontractors, as pertinent to unresolved issues identified in current Issues Log
 - f. Testing, Adjusting and Balancing Contractor
 - g. Using Agency's Building Operator/Physical Plant Representative
 - 3. **Minimum Agenda:**
 - a. Review, approve minutes of the previous meeting
 - b. Review Issues Log

PROGRESS SCHEDULES

SECTION 01 3216

1.01 DESCRIPTION

- A. **Scope:** Provide projected construction schedules for the entire Work and revise periodically. The following is a minimum requirement and other type schedules are acceptable with Owner's approval. This type of schedule is acceptable for any Project whose initial Contract award amount is **less than** one (1) million dollars (\$1,000,000).
- B. **Form of Schedules:** Prepare in form of horizontal bar chart.
 - 1. Provide separate horizontal bar column for each trade or operation.
 - 2. Place in order of the Table of Contents of Specifications.
 - 3. Identify each column by major Specification section number.
 - 4. Identify the first work day of each week by horizontal time scale.
 - 5. Scale and space to allow for updating.
- C. **Contents of Schedule:**
 - 1. Provide complete sequence of construction by activity.
 - 2. Indicate dates for beginning and completion of each stage of construction.
 - 3. Identify work of separate floors, separate phases, or other logically grouped activities.
 - 4. Show projected percentage of completion for each item of work as of first day of month.
- D. **Updating:**
 - 1. Show all changes occurring since previous submission of updated schedule.
 - 2. Indicate progress of each activity and completion dates.
- E. **Submittals:**
 - 1. Submit initial schedules to the Professional within fifteen (15) days after date of *Notice to Proceed*.
 - 2. Submit to Professional periodically updated schedules accurately depicting progress to first day of each month.
 - 3. Submit two (2) copies, one (1) to be retained by the Professional and the other forwarded to the Owner.

NETWORK ANALYSIS SCHEDULE

SECTION 01 3217

1.01 DESCRIPTION

- A. **Scope:** Provide projected network analysis schedules for the entire Work and revise periodically. This type of schedule is acceptable for any Project whose initial Contract award amount is one million dollars (\$1,000,000), or greater.

1.02 REFERENCES

- A. **Critical Path Methods in Construction Practice, 4th Edition:** Written by James M. Antill and Ronald W. Woodhead, published by Wiley.

1.03 QUALITY ASSURANCE

- A. **Contractor's Administrative Personnel:** Two (2) years minimum experience in using and monitoring CPM schedules on comparable Projects is required.

1.04 FORMAT

- A. **Listings:** Reading from left to right, in ascending order for each activity, identify each activity with the applicable specification section number.
- B. **Diagram Sheet Size:** Height and width as required.
- C. **Scale and Spacing:** To allow for notations and revisions.

1.05 SCHEDULES

- A. **Critical Path Methods:** Prepare network analysis diagrams and supporting mathematical analyses using the critical path method.
- B. **Order of Work:** Illustrate order and interdependence of activities and sequence of Work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. **Complete Sequence of Construction:** Illustrate complete sequence of construction by activity, identifying work of separate stages. Provide dates for submittals and return of submittals; dates for procurement and delivery of products; and dates for installation and provision for testing. Provide legend for symbols and abbreviations used.
- D. **Mathematical Analysis:** Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers
 2. Activity description
 3. Estimated duration of activity, in maximum thirty (30) day intervals
 4. Earliest start date
 5. Earliest finish date
 6. Actual start date
 7. Actual finish date
 8. Latest start date
 9. Latest finish date
 10. Total and free float

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11. Monetary value of activity (keyed to *Schedule of Values*)
 12. Percentage of activity completed
 13. Responsibility
- E. **Analysis Program:** Capable of compiling monetary value of completed and partially completed activities, of accepting revised completion dates, and re-computation of all dates and floats.
- F. **Required Sorts:** List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest
 2. By amount of float, then in order of early start
 3. By responsibility in order of earliest possible start date
 4. In order of latest allowable start dates
 5. In order of latest allowable finish dates
 6. Contractor's periodic payment request sorted by *Schedule of Values* listings, Specifications section
 7. Listing of basic input data which generates the report
 8. Listing of activities on the critical path
 9. Monthly cash flow
- G. **Schedule of Values:** Coordinate contents with *Schedule of Values* in Section 01 2973.

1.06 **SUBMITTALS FOR REVIEW**

- A. **Preliminary Network Diagram:** Within fifteen (15) days after the date established in the *Notice to Proceed* submit proposed preliminary network diagram defining planned operations for the first sixty (60) days of Work, with a general outline for the remaining Work.
- B. **Review:** Participate in review of preliminary and complete network diagrams jointly with the Professional.
- C. **Proposed Complete Network Diagram:** Within twenty (20) days after joint review of proposed preliminary network diagram, submit draft of proposed complete network diagram for review. Include written certification that mechanical and electrical Subcontractors have reviewed and accepted proposed schedule.
- D. **Complete Network Diagram:** Within ten (10) days after joint review, submit complete network analysis consisting of network diagrams and mathematical analysis.
- E. **Updated Network Schedules:** Submit updated network schedules with each Application for Payment.
- F. **Copies:** Submit the number of opaque reproductions the Contractor requires, plus two (2) copies which will be retained by the Professional and the Owner.

1.07 **REVIEW AND EVALUATION**

- A. **Review:** Participate in joint review and evaluation of network diagrams and analysis with the Professional at each submittal.
- B. **Evaluate:** Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
- C. **Revisions:** After review and approval of the Professional, revise as necessary as a result of the review and resubmit within ten (10) days.

1.08 **UPDATING SCHEDULES**

- A. **Schedules:** Maintain schedules to record actual start and finish dates of completed activities.
- B. **Progress:** Indicate progress of each activity to date of revision, with projected completion date of each activity. Update diagrams to graphically depict current status of Work.

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- C. **Modifications:** Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
 - D. **Changes:** Indicate changes required to maintain Date of Substantial or Total Completion. These changes will be made only with the approval of the Professional.
 - E. **Extensions:** Contract completion time will be adjusted only for causes specified in the Contract. Requests for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the Owner may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the Contract. Submission of proof based on revised activity logic duration and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in the request. The Owner's determination as to the total number of days of contract extension shall be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information. Actual delays in activities which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Owner will, within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Owner's decision. The Contractor shall submit each request for a change in the contract completion date to the Owner. The Contractor shall include as a part of each change order proposal, a sketch showing all CPM revisions, duration changes, and cost changes, for the work in question and its relationship to other activities on the approved arrow diagram.
 - F. **Substantiate:** Submit sorts required to support recommended changes.
 - G. **Report:** Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

1.09 **DISTRIBUTION**

- A. **Distribution of Copies:** Following joint review, distribute copies of updated schedules to Contractor's Project site, to Subcontractors, Suppliers, Professional and Owner.
- B. **Reporting Problems:** Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

SECTION 01 3323

1.01 **DESCRIPTION**

- A. **Scope:** Submit to the Professional shop drawings, product data and samples required by Specification sections. Submit an additional copy of shop drawings, product data and samples related to items/systems identified to be commissioned to the Commissioning Authority Professional to be reviewed concurrently with the Professional. (if Cx on project).
- B. **Shop Drawings:** Original drawings prepared by Contractor, Subcontractor, Supplier, or Distributor which illustrate some portion of the Work; showing fabrication, layout, setting, or erection details.
 - 1. Prepared by a qualified detailer.
 - 2. Identify details by reference to sheet and detail numbers shown on Contract drawings.
 - 3. Minimum sheet size: 8 1/2" x 11"
 - 4. Reproductions for submittals: Opaque diazo prints.

C. **Product Data:**

1. **Manufacturer's Standard Schematic Drawings:** Modify drawings to delete information which is not applicable to the Project. Supplement standard information to provide additional information applicable to the Project.
 2. **Manufacturer's Catalog Sheets, Brochures, Diagrams, Schedules, Performance Charts, Illustrations and Other Standard Descriptive Data:** Clearly mark each copy to identify pertinent materials, products, or models. Show dimensions and clearances required. Show performance characteristics and capacities, wiring diagrams and controls.
- D. **Samples:** Physical examples to illustrate materials, equipment or workmanship and to establish standard by which completed work is judged.
1. **Office Samples:** Of sufficient size and quantity to clearly illustrate functional characteristics of products or material with integrally related parts and attachment devices and full range of color samples. After review, samples remain the property of the Professional until completion of the construction project.
 2. **Field Samples and Mock-ups:** Erect on project site at location acceptable to Professional. Construct each sample, or mock-up, completely including work of all trades required in finished work.

E. **Contractor's Responsibilities:**

1. Review shop drawings, product data and samples prior to submission.
2. Verify field measurements, field construction criteria, catalog numbers and similar data.
3. Coordinate each submittal with requirements of work and of Contract Documents.
4. Contractor's responsibility for errors and omissions in submittals is not relieved by the Professional's review of submittals.
5. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Professional's review of submittals unless Professional gives written acceptance of specific deviations.
6. Notify Professional in writing at the time of submission of deviations in submittals from requirements of Contract Documents.
7. Begin no work requiring submittals until the return of submittals bearing Professional's stamp and initials, or signature indicating review.
8. After Professional's review, distribute copies.

F. **Submission Requirements:**

1. Schedule submission with ample time before dates reviewed submittals will be needed.
2. Submit number of copies of shop drawings and product data which Contractor requires for distribution, plus one (1) copy to be retained by the Professional.
3. Submit number of samples specified in each Specification section.
4. Accompany submittals with transmittal letter, in duplicate, containing date, Project title and number; Contractor's name and address; the number of each shop drawings, product data and samples submitted; notification of deviations from Contract Documents; and, other pertinent data.
5. Submittals shall include:
 - a. Date and revision dates.
 - b. Project title and number.
 - c. The names of the Professional, Contractor, Supplier, Manufacturer and separate detailer, when pertinent.
 - d. Identification of product, or material.
 - e. Relation to adjacent structure, or materials.
 - f. Field dimensions clearly identified as such.
 - g. Specification section number.
 - h. Applicable standards such as ASTM number, or federal specifications.
 - i. A blank space (2" x 3") for the Professional's stamp.
 - j. Identification of deviations from Contract Documents.
 - k. Contractor's stamp, initialed or signed, certifying the review of submittal, verification of field measurements and compliance with Contract Documents.

Division One

G. **Resubmission Requirements:**

1. **Shop Drawings:** Revise initial drawings, as required, and resubmit as specified for initial submittal. Indicate on the drawings any changes which have been made other than those required by the Professional.
2. **Product Data and Samples:** Submit new data and samples, as required, for initial submittal.

H. **Distribution of Submittals After Review:**

1. Distribute copies of shop drawings and product data which carry Professional's stamp to Contractor's file, job site file, Subcontractor, Supplier and Fabricator.
2. Distribute samples as directed.

I. **Professional's Duties:**

1. Review submittals with reasonable promptness.
2. Review for design concept of Project and information given in Contract Documents.
3. Review of separate item does not constitute review of an assembly in which item functions.
4. Affix stamp and initials, or signature, certifying the review of submittal.
5. Return submittals to Contractor for distribution.

TESTING LABORATORY SERVICES

SECTION 01 4529

1.01 **DESCRIPTION**

- A. **Scope:** The Contractor will employ and pay for the services of an independent laboratory to perform specified services. In some instances, Owner will provide such testing services through independent testing laboratory retained by the Professional. Employment of a testing laboratory or provision of such services by others shall in no way relieve the Contractor of his obligation to perform work in accordance with the Contract.
- B. **Inspection, Sampling and Testing:** Refer to each individual specification section for specific inspection, sampling and testing requirements.
- C. **Qualification of Laboratory:**
1. Meet the *Recommended Requirements for Independent Laboratory Qualification* published by the American Council of Independent Laboratories.
 2. Meet the basic requirements of ASTM E 329-70, *Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction*.
 3. Responsible Engineer: Perform all testing under the direct supervision of a registered Professional engineer employed full time by the testing laboratory.
 4. Submittals: Submit a copy of the inspection report of the facilities made by materials reference laboratory of National Bureau of Standards of any deficiencies reported by the inspection.
 5. Approval: The Professional must approve the testing laboratory.
- D. **Laboratory's Duties:**
1. Upon notice, cooperate with the Professional and the Contractor to promptly provide qualified personnel. Perform specified inspections, sampling and testing of materials and methods of construction to ascertain compliance with requirements of Contract Documents. Promptly notify the Professional and the Contractor of irregularities or deficiencies of work observed during performance of services.
 2. Reports of inspections and tests will include:
 - a. Date issued
 - b. Project title and number
 - c. Testing laboratory's name and address
 - d. Name and signature of inspector
 - e. Date of inspection, or sampling
 - f. Record of temperature and weather
 - g. Date of test

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- h. Identification of product and Specification section
 - i. Location of Project
 - j. Type of inspection, or test
 - k. Observations regarding compliance with Contract Documents
3. Prompt distribution of copies of the inspection reports and tests to:
- a. Owner
 - b. Professional
 - c. General Contractor
 - d. Consulting Engineer, when pertinent
 - e. Subcontractor, when pertinent

E. **Contractor's Responsibilities:**

- 1. Cooperate with laboratory personnel to provide access to work and to manufacturer's operation. Provide the laboratory with the required quantities of preliminary samples representative of materials to be tested and required quantities. When required, furnish copies of mill test reports. Furnish laboratory casual labor to obtain and handle samples at the site and to facilitate inspections and tests. Provide facilities for laboratory's exclusive use for storage and curing of test samples. Notify laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
- 2. Arrange and pay for additional samples and tests required for Contractor's convenience. When initial tests indicate work does not comply with Contract Documents, the Contractor may employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

SECTION 01 5000

1.01 **DESCRIPTION**

- A. **Scope:** Work required under this section consists of all temporary construction facilities, services and related items to complete the work indicated on the drawings and described in the Project Manual.
- B. **Standards:**
 - 1. Conform to or exceed all temporary construction requirements stated in the current edition of the **International Building Code** [Chapter entitled *Safeguards During Construction*].
 - 2. Refer to Section 00 7200 entitled *General Conditions of the Contract For Construction, Article 10 Protection of Persons and Property* as amended by Section 00 7300 *Supplementary Conditions*.
- C. **Materials:** All materials required by the Work of this section shall be as specified in the respective sections.

1.02 **FACILITIES AND CONTROLS**

- A. **Access:** The Prime General Contractor shall provide an adequate access and/or roads to the site of the structure, if required for the prosecution of work; and, should also provide and maintain at least one (1) temporary, or permanent, access to each working elevation to be permanently occupied.
- B. **Hoisting Facilities:** The Prime General Contractor shall be responsible for providing suitable capacity and hoisting facilities for all people and materials. The use of the hoisting facilities shall be by mutual agreement of the Prime General Contractor and the individual Contractor.
- C. **Field Office and Sheds:** At all times, the Prime General Contractor shall provide and maintain an on-site office with telephone, which may also be used by Subcontractors, the Owner and the Professional. Office location will be approved by the Owner. Where no suitable available space within an existing building is specifically identified for such purposes in Section 01 8000 entitled *Special Requirements* or elsewhere in the Contract Documents, the Prime General Contractor shall provide a trailer with full utilities for such purpose throughout

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the Contract Time with space for both Contractor management personnel as well as for holding progress meetings. Each general and individual Contractor shall provide suitable watertight/dampproof sheds or containers to house their construction materials.

- D. **Sanitation Facilities:** The Prime General Contractor is responsible for furnishing adequate temporary toilet facilities on the job site unless use of existing facilities on site is specifically permitted in Section 01 8000 entitled *Special Requirements* or elsewhere in the Contract Documents.
- E. **Drinking Water:** The Prime General Contractor shall provide at all times sanitary drinking water facilities for all workmen on the job including ice, when required, and paper cups, etc.
- F. **Fire Protection:** The Prime General Contractor shall provide general temporary fire protection except where the Work is within an existing building with operational permanent fire protection systems. Subcontractors will be responsible for their own. Where operational permanent fire protection systems exist, the Prime General Contractor and all Subcontractors shall take care not to damage such systems and take measures to prevent accidentally engaging such systems. Where the temporary disabling of any existing operational system is required for the performance of the Work, such shut-down shall be coordinated with the Owner.
- G. **Storage:** The Prime General Contractor shall coordinate the allocation of storage areas to the various Subcontractors.
- H. **Temporary Heating/Cooling/Dehumidification:** The Prime General Contractor shall provide heating, cooling, dehumidification, fuel and services, as necessary, to protect all work from dampness and cold or excessive heat and humidity until final acceptance. If in the late stages of the construction, mechanical and electrical installations will permit operation without damage to systems, and subject to the approval of the Professional and Owner, the mechanical and electrical facilities may be used to provide heating, cooling, dehumidification and ventilation in strict accordance with conditions established by the Professional and/or his Consultants. However, the Owner is saved harmless of any costs of operation, including the periodic replacement of filters, or responsibility as to acceptance of mechanical and/or electrical installations.
- I. **Utilities:** The Prime General Contractor shall make arrangements for and furnish all water, gas, electricity (lighting and power) and other utilities necessary for construction purposes unless otherwise specified in Section 01 8000 entitled *Special Requirements* or elsewhere in the Contract Documents. Where any such utilities are to be furnished by the Institution or Agency, and such requirements are not detailed in Section 01 8000 or elsewhere in the Contract Documents, a written agreement must be reached on how any such utilities (water, gas, and electricity) will be furnished and the rates the Contractor will be charged by the Institution or Agency prior to initial use of any such utility. A copy of the final agreement signed by the Contractor and the Institution or Agency must be forwarded to the Owner. If the written agreement is not filed with the Owner, the Contractor and the Institution or Agency waives all rights as to the rates charged. The Owner will then determine all utility rates and assess the charges before final payment is rendered.
- J. **Project Sign:** Where required in Section 01 8000 entitled *Special Requirements* or elsewhere in the Contract Documents, the Contractor shall furnish and erect on adequate supports and maintain one (1) neatly constructed sign identifying the names of the Project, Governor, Owner, Prime Professional, Contractor and Using Agency/Institution, and Governing Board as applicable. Sign shall also indicate the source(s) of funds for the project. The erection of additional signs depicting the names of the Contractor, Sub-Contractor, or Vendors is strictly prohibited. Unless a larger sign is otherwise detailed in the Contract Documents, such sign shall be as follows:
 - 1. The Prime General Contractor will erect on adequate supports one (1) neatly constructed and painted or printed four foot by eight foot (4' x 8') plywood or equivalent panel conforming to the Owner's Project Sign Template to be furnished with text, colors, and graphics specific to the Project.
 - 2. No logos, graphics, custom fonts or similar are permitted for Prime Professional or Contractor names depicted on Project Sign.
 - 3. The Prime General Contractor is responsible for maintaining the Project Sign until Final Acceptance of the Work or until Substantial Completion when authorized by the Owner. Any damage, including chipping, peeling or fading of text or images shall be promptly repaired or replaced.

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SUBSTITUTIONS AND PRODUCT OPTIONS

SECTION 01 6000

1.01 DESCRIPTION

A. Scope: To set forth the procedure and conditions for substitutions and to give the product options available to the Contractor.

1.02 PRODUCTS LIST

- A. Within thirty (30) days after the Contract has been signed, the Contractor will submit to the Professional five (5) copies of a complete list of all products proposed for installation.
- B. Tabulate the list by Specification sections.
- C. For products specified under reference standards, include with listing of each product:
 - 1. Name and address of Manufacturer.
 - 2. Trade name.
 - 3. Model, or catalog designation.
 - 4. Manufacturer's data.
 - 5. Performance and test data.
 - 6. Reference standards.
 - 7. Percentage of recovered materials.

1.03 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standards or technical performance requirements, select any product meeting product standards by any Manufacturer.
- B. For products specified by naming a minimum of three (3) products or Manufacturers, select any product and Manufacturer named. Equivalent products of domestic manufacture containing not less than the same percentage of recovered materials as named products will always be accepted if equal in all consequential respects.
- C. For product specified by naming one (1) or more products and/or Manufacturers, but indicating the option of selecting equivalent products by stating "or equal" after specified product and/or Manufacturer, select named product or any product of domestic manufacture containing not less than the same percentage of recovered material as named product meeting specified reference standards or technical performance requirements as represented by the named products and/or Manufacturers.
- D. For products specified by naming only one (1) product and/or Manufacturer as a "basis of design", an equivalent product of domestic manufacture containing not less than the same percentage of recovered materials as named product will always be accepted if it is equal in all consequential respects.
- E. For products specified by naming only one (1) product and Manufacturer and stating no substitutions will be accepted, there is no option and no substitutions will be allowed. This option must have written approval by the Owner before bidding.

1.04 SUBSTITUTIONS

- A. A product or construction method that varies from a product or construction method specified in one or more consequential characteristics, reference standards, or technical performance requirements shall be considered a substitution.
- B. Professional will not consider requests for substitutions during bidding.
- C. Within thirty (30) days after the Contract has been signed, the Professional will consider formal requests from the Contractor for substitution of products in place of those specified. Submit five (5) copies of the request for substitutions. Include in the request:

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1. Narrative summarizing characteristics, reference standards, or technical performance requirements that product varies from and how the proposed product or construction method will meet or exceed project requirements
 2. For products:
 - a. Product identification including Manufacturer's name and address.
 - b. Manufacturer's literature: Product description, performance and test data and reference standards.
 - c. Samples.
 - d. Name and address of similar projects on which product was used and date of installation.
 3. For construction methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 4. Agreement to pay for any additional professional costs if acceptance of substitution will require substantial revision of Contract Documents.
 5. Data relating to any delays to the construction schedule if any will result from proposed substitution.
 6. Accurate cost data on proposed substitution if any project cost increases are anticipated or any cost savings are being offered for proposed substitution.
- D. In making request for substitution, Contractor represents:
1. Proposed product, or method, has been investigated and determined that it is equal or superior in all respects to that specified.
 2. The same or better guarantee and/or warranty will be provided for substitutions for product or method specified.
 3. Installation of accepted substitutions will be coordinated into the Work, making such changes required of work to be complete in all respects at no additional cost to the Owner.
 4. All claims for additional costs related to substitution, including any delays to the construction schedule, which consequently become apparent will be waived.
 5. Unless specifically identified in substitution submittal and such delay is specifically agreed to by Change Order to the Contract, substitution will not cause any delay to the construction schedule.
 6. Proposed product, or method, will not result in any additional costs to the Owner.
- E. Substitutions will not be considered if:
1. Indicated, or implied, on shop drawings or product data submittals without formal request submitted in accordance with this Section.
 2. Acceptance will require substantial revision of Contract Documents unless compensation for such additional professional costs are paid by Contractor at no additional cost to the Owner.
 3. In the Professional's judgment, the product, or material, is not equal.
- F. For products where all named products are of domestic manufacture, substitutions of products of foreign manufacture will not be considered unless Contractor can sufficiently document that one or more of the following conditions exist:
1. No product of domestic manufacture meeting the product specifications is readily available that can be provided within the time constraints of the project requirements.
 2. Cost to provide a product of domestic manufacture meeting the product specifications is significantly greater than proposed product substitute.
- G. Substitutions of products with those of less percentage of recovered material than named product(s) shall only be considered where Contractor can sufficiently document that one or more of the following conditions exist:
1. No product of equal or greater percentage of recovered material as named product(s) is available that can be provided within the time constraints of the project requirements.
 2. Cost to provide a product of equal or greater percentage of recovered material as named product(s) meeting the product specifications is significantly greater than that of named product(s).

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CUTTING AND PATCHING

SECTION 01 7329

1.01 GENERAL DESCRIPTION

- A. **Scope:** To set forth broad, general conditions covering cutting and patching that applies to everyone and everything on the job.
- B. Execute cutting including excavating, fitting, or patching of work required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to Contract requirements.
 - 5. Install specified work in existing construction.
- C. In addition to Contract requirements, upon Professional's written instructions:
 - 1. Uncover work for observation of covered work.
 - 2. Remove samples of installed materials for testing.
 - 3. Remove work to provide alteration of existing work.
- D. Do not cut or alter work of another Contractor without permission.
- E. **Payment of Costs:** Costs caused by ill-timed, or defective work, or work not conforming to Contract Documents will be borne by party responsible for ill-timed, defective work, or non-conforming work.

1.02 MATERIALS/PRODUCTS

- A. **Materials for Replacement or Work Removed:** Comply with Specifications for type of work to be accomplished.

1.03 EXECUTION

- A. **Inspection:** Inspect existing conditions of work, including elements subject to movement, or damage during cutting and patching.
- B. **Preparation Prior to Cutting:** Provide shoring, bracing and support, as required, to maintain structural integrity of the building. Provide protection for other portions of work and protection from the elements.
- C. **Performance:**
 - 1. Execute cutting and demolition by methods which prevent damage to other work and will provide surfaces to receive installation of repairs and new work.
 - 2. Execute excavating and backfilling by methods which prevent damage to other work and prevent settlement.
 - 3. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
 - 4. Refinish entire surfaces, as necessary, to provide an even finish. Refinish continuous surfaces to the nearest intersection and assemblies entirely.

CLEANING

SECTION 01 7400

1.01 DESCRIPTION

- A. **Scope:** Maintain premises and public properties from accumulations of waste, debris and rubbish caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

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1.02 **PRODUCTS**

- A. **Materials:** Use only cleaning materials recommended by Manufacturer of surface to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning materials Manufacturer.

1.03 **EXECUTION**

- A. **During Construction:** Execute cleaning to insure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish. Wet down dry materials and rubbish to lay dust and prevent blowing dust. At reasonable intervals during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or occupancy. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights. Schedule cleaning operations so that dust or other contaminants resulting from cleaning process will not fall on wet or newly painted surfaces.
- B. **Final Cleaning:** Employ experienced workmen, or professional cleaners, for final cleaning. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces and concealed spaces. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed finishes. Repair, patch and touch up marred surfaces to specified finish to match adjacent surfaces. Broom clean paved surfaces; rake clean other surfaces of grounds. Replace air conditioning filters, if units were operated during construction. Clean ducts, blowers and coils if air conditioning units were operated without filters during construction. Maintain cleaning until Project, or respective portions thereof, is occupied by Owner.

STARTING OF SYSTEMS

SECTION 01 7500

1.01 **GENERAL**

- A. **Scope:** This Section describes the procedures for start up of all building equipment and systems including necessary demonstration and instructions.

1.02 **STARTING SYSTEMS**

- A. Coordinate Schedule for start-up of various equipment and systems.
- B. Notify Professional and Owner seven (7) days prior to start-up of each system.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.
- D. Verify that tests, meter readings and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require Manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

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DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

CONTRACT CLOSEOUT

SECTION 01 7700

DESCRIPTION

- A. **Scope:** The work required in this Section consists of the final inspections and the submission of all closeout documents and related items to complete the Work indicated on the Drawings and described in the Project Manual.

FINAL INSPECTIONS

- A. **Professional's Review:** The Contractor shall make written notice that the Work of a Job Order is ready for final inspection and acceptance by the Owner to the Professional; such notice to be given not less than ten (10) days prior to the date desired for inspection. The Professional will promptly visit the site and assess the state of Work of the Job Order to determine if it is ready for final inspection by the Owner. If, in the Professional's judgment, the Work of the Job Order is not ready for final inspection, the Professional will report the reasons for such determination to the Contractor. In such case, the Contractor shall then submit a revised request for final inspection when those reasons have been resolved. Once the Professional determines the Work of the Job Order is ready for final inspection, the Prime Professional will call for final inspection of the Project with the Owner for the purpose of determining whether the Work of the Job Order is acceptable under the Contract Documents.
- B. **Owner's Inspection:** After the Professional has ascertained the Work of the Job Order to be ready, an Owner's inspection will be scheduled within ten (10) days thereafter. The Contractor will have not more than thirty (30) days thereafter, unless a longer time for specific items is mutually agreed to in writing by the Owner and Contractor to make any corrections of the final punch list items and to submit closeout documents.
- C. **Correction of Work Before Final Payment:** The Contractor shall address all defects or discrepancies noted on the final punch list and promptly remove from the Owner's premises all materials condemned for failure to conform to the Contract, whether incorporated in the Work or not, and the Contractor shall, at his own expense, replace such condemned materials with those conforming to the requirements of the Contract. Failure to remedy such defects or discrepancies after thirty (30) days, unless a longer time for specific items is mutually agreed to in writing by the Owner and Contractor, will allow the Owner to make good such defects and such costs shall be deducted from the balance due the Contractor, or charged to the Contractor in the event no payment is due.

CLOSEOUT DOCUMENTS

Unless otherwise notified, the Contractor shall submit to the Owner through the Professional, three (3) copies of the following before final payment is made:

- A. **Request for Final Payment:** AIA Document G702, current edition, completed in full or a computer generated form having similar data.

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- B. **Consent of Surety Company to Final Payment:** AIA Document G707, current edition, completed in full by the Bonding company.
- C. **Power of Attorney:** Closeout documents should be accompanied by an appropriate Power of Attorney.
- D. **Release of Liens and Certification that All Bills Have Been Paid:** AIA Document G706A, current edition, completed in full or a sworn statement and affidavit from the Contractor to the Owner stating that all bills for this job have been paid and that the Owner is released from any and all claims and/or damages.
- E. **Contractor's Affidavit of Payment of Debts and Claims:** AIA Document G706, current edition, completed in full.
- F. **Guarantee of Work:** Sworn statement that all work is guaranteed against defects in materials and workmanship for one (1) year from date of Owner's acceptance, except where specified for longer periods.
1. Word the Guarantee as follows, or in a similar manner:
We hereby guarantee all work performed by us on the above captioned Project to be free from defective materials and workmanship for a period of one (1) year or such longer period of time as may be called for in the Contract Documents for such portions of the Work.
 2. All guarantees and warranties shall be obtained in the Owner's name.
 3. Within the Guaranty period, if repairs or changes are requested in connection with guaranteed work which, in the opinion of the Owner, are rendered necessary as a result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the Contract, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition building, site, equipment or contents thereof. The Contractor shall make good any work, materials, equipment or contents of said buildings or site which may be disturbed by fulfilling any such Guaranty.
 4. If, after notice, the Contractor fails to proceed promptly to comply with the terms of the Guaranty, the Owner may have the defects corrected and the Contractor and his Sureties shall be liable for all expense incurred.
 5. All special guarantees applicable to definite parts of the work stipulated in the Project Manual or other documents forming part of the Contract shall be subject to the terms of this paragraph during the first year of the life of such special guaranty.
- G. **Project Record Documents:** Furnish all other record documents as set forth in Section 01 7800 entitled *Project Record Documents*. Failure provide such documents within thirty (30) days of Request for Final Payment shall result in the Owner, in consultation with the Professional, determining a fair market value of such documents with such costs to be retained or deducted from the balance due the Contractor, or charged to the Contractor in the event no payment is due.
- H. **Additional Documents Specified Within the Project Manual:** Provide all additional certificates, warranties, guarantees, bonds or documents as called for in the individual sections of the Project Manual. The Contractor is responsible for examining the Project Manual for these requirements. Failure provide such documents within thirty (30) days of Request for Final Payment shall result in the Owner, in consultation with the Professional, determining a fair market value of such documents with such costs shall be deducted from the balance due the Contractor, or charged to the Contractor in the event no payment is due.

PROJECT RECORD DOCUMENTS

SECTION 01 7800

1.01 DESCRIPTION

- A. **Scope:** To set forth the procedure and requirements for keeping project record documents.

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- B. **Maintenance Documents:**
1. Throughout the Contract, maintain one (1) copy of all of the following: Contract Drawings, Project Manual, Addenda, Change Order(s), reviewed shop drawings, reviewed submittals, hardware schedules, field, and laboratory test records, equipment brochures, parts lists, operating instructions and other modifications to the Contract.
 2. Store documents on site apart from documents used for construction.
 3. Maintain documents in clean, dry, legible condition. Do not use record documents for construction purposes.
 4. Make documents available, at all times, for inspection by the Professional, Commissioning Authority Professional, and the Owner.
 5. Keep documents in 8 ½" x 11" loose leaf binders. Clearly label each binder on the spine. Sub-divide with permanently marked tabs of card stock. Provide a main tab for each specification section. Provide sub-tabs for each major piece of equipment or component.
 6. Format for information behind each tabbed piece of equipment/component shall be:
 - a. Contractor/Installer Information: Include address, phone number and contact name. Include emergency service contact information as applicable.
 - b. Manufacturer Information: Include address, phone number and contact name.
 - c. Shop Drawings and Product Data
 - d. Operation and Maintenance Instructions
 - e. Control Drawings
- C. **Recording:**
1. **General:** Mark all modifications in red pencil. Keep record documents current. Do not permanently conceal any work until required information has been recorded.
 2. **Contract Drawings:** Legibly mark to record actual construction.
 - a. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - c. Field changes in dimension and detail.
 - d. Changes made by change order(s) or field order(s).
 3. **Project Manual and Addenda:** Legibly mark up each section to record Manufacturer, trade name, catalog number and Supplier of each product and item of equipment actually installed.
 4. **Shop Drawings:** Maintain as record documents. Legibly mark drawings to record changes made after review.
- D. **Submittal:** At completion of Project, deliver two (2) copies of each record document to the Professional, who will transmit both sets to the Institution or Agency. Additionally, provide to Owner updated As-Built Contract Documents in electronic format utilizing electronic format copy of Contract Documents furnished by Professional or by scanning of marked-up contract Documents.

SPECIAL REQUIREMENTS

SECTION 01 8000

PART 1 - SUMMARY OF WORK SUPPLEMENT

1.01 WORK SEQUENCE

- A. Owner will occupy the building during construction, coordinate with Owner's Representative in scheduling work to vacate the areas as the Contractor requires.
- B. Construct work in stages as follows:
 - 1. See Drawing C-101 Drawing Index and General Notes for Work Sequence
 - 2. _____
 - 3. _____

1.02 PARTIAL OWNER OCCUPANCY

- A. Schedule early completion of designated areas for Owner's usage prior to substantial completion of entire Project as follows: N/A
- B. Owner will occupy the following areas throughout the Project or during portions of the Project as follows:
Existing Waste Water Treatment Plant
- C. Prior to occupancy of any portion of the Project, a *Certificate of Substantial Completion* for designated areas shall be executed establishing responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance for such portion of the Work.

PART 2 - ALLOWANCE SUPPLEMENT

2.01 SCHEDULE OF ALLOWANCES

- A. Include in the Bid, for inclusion in the Contract Sum, the amount of \$ N/A for purchase of N/A
(Refer to Section _____, _____)
- B. Include in the Bid, for inclusion in the Contract Sum, the amount of \$ N/A for purchase of N/A
(Refer to Section _____, _____)

PART 3 - ALTERNATE SUPPLEMENT

3.01 DESCRIPTION OF ALTERNATES

- A. Alternate Number One. Complete all work required to remove, dispose of, and replace the liner in the west lagoon.
- B. Alternate Number Two. Complete all work required to dispose of all sludge in both the east and west lagoons at a Subtitle D landfill.
- C. Alternate Number Three. N/A.

D. Alternate Number Four. N/A.

E. Alternate Number Five. N/A.

PART 4 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS SUPPLEMENT

4.01 **FIELD OFFICE**

4.02 **UTILITIES**

4.03 **PROJECT SIGN**

PART 5 – ANTICIPATED DELAYS

5.01 **ADVERSE WEATHER**

PART 6 – INSTITUTION/AGENCY REQUIREMENTS

6.01 **PROHIBITED ACTIVITIES**

6.02 **USE OF PREMISES**

PART 7 - MEASUREMENT AND PAYMENT**7.01 LUMP SUM**

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the PROPOSAL FORM and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum payment item, shall be included in the listed item cost most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials and equipment, and performing any associated quality control, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

7.02 LUMP SUM ITEMS**A. "Mobilization/Demobilization, Complete"**

1. Payment will be made for all costs associated with the mobilization/demobilization of personnel and equipment to/from the project site(s) located in Leakesville, Greene County, MS. Mobilization also includes providing all initial services, bonds, insurance, temporary facilities, Davis-Bacon Poster, and any other required signage.
2. Unit of measure: lump sum.

B. "Relocation of Existing Lagoon Aerators, Complete"

1. Payment will be made for all costs associated with relocating (removing and reinstalling) the existing lagoon aerators in accordance with the Contract Documents. All deteriorated or unusable accessories such as anchorage, connection items, cables, etc. shall be replaced with new accessories of same type and material removed. No separate payment will be made for required accessories to complete relocation.
2. Unit of measure: lump sum.

C. "Relocation of Existing Lagoon Aerators Electrical System, Complete"

1. Payment will be made for all costs associated with relocating (removing and reinstalling) the electrical system for the existing lagoon aerators in accordance with the Contract Documents. All deteriorated or unusable accessories such as wire, connectors, etc. shall be replaced with new accessories of same type and material removed. No separate payment will be made for required accessories to complete relocation.

2. Unit of measure: lump sum.

D. "Dewater East Lagoon System, Complete"

1. Payment will be made for all costs, materials, equipment, labor, quality control services, sampling, testing, and analysis, reports, fees and all costs incidental thereto associated with the transferring of wastewater, sludge, vegetation, and/or other undesirable materials from the eastern lagoon to west lagoon in accordance with the Contract Documents.
2. Unit of measure: lump sum.

E. "Demolition of East Lagoon Liner System, Complete"

1. Payment will be made for all costs, materials, equipment, labor, quality control services, sampling, testing and analysis, reports, fees and all costs incidental thereto associated with the removal, loading, weighing, transporting, unloading and disposal of the existing lagoon liner, vegetation and/or other undesirable materials in accordance with the Contract Documents. Contractor shall furnish to the Professional all truck weight tickets and copies of the waste manifest for all loads hauled to the landfill at no additional cost to the Owner.
2. Unit of measure: lump sum.

F. "Demolition of Existing Fencing, All Types, Complete"

1. Payment will be made for all costs, materials, equipment, labor, and all costs incidental thereto associated with the removal and disposal of the existing fencing (all types) in accordance with the Contract Documents.
2. Unit of measure: lump sum.

G. "Demolition of Existing Sanitary Sewer Piping, Manholes, and Appurtenances, Complete"

1. Payment will be made for all costs associated with the removal and disposal of the existing sanitary sewer piping, manholes, and all associated appurtenances to be demolished as shown in the Contract Documents. Compensation for excavation, backfill, fill, equipment, labor, tests, and incidental items necessary for demolition of existing sanitary sewer piping, manholes, and all associated appurtenances, as shown in the Contract Documents, shall also be included.
2. Unit of measure: lump sum.

- H. "Demolition of Existing Screen Structure, Piping, and Appurtenances, Complete"
1. Payment will be made for all costs associated with the removal and disposal of the existing screen structure, piping, and all associated appurtenances to be demolished as shown in the Contract Documents. Compensation for excavation, backfill, fill, equipment, labor, tests, and incidental items necessary for demolition of existing screen structure, piping, and all associated appurtenances, as shown in the Contract Documents, shall also be included.
 2. Unit of measure: lump sum.
- I. "Demolition of Existing Pavements, All Types and All Depths, Complete"
1. Payment will be made for all costs associated with the removal and disposal of the existing pavements (all types and all depths) and all associated appurtenances to be demolished as shown in the Contract Documents. Compensation for excavation, backfill, fill, equipment, labor, tests, and incidental items necessary for demolition of existing pavements and all associated appurtenances, as shown in the Contract Documents, shall also be included.
 2. Unit of measure: lump sum.
- J. "Course Screen System, Complete"
1. Payment will be made for all costs associated with supplying, assembly, and installation of the multi-rake Course Screen Systems; including but not limited to; fuel, temporary pumps, piping, structures, concrete, reinforcement, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, excavation, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and operational coarse screen system, in accordance with the Contract Documents. Compensation shall also be for providing all submittals, shop drawings, samples, and information, as required by the Contract Documents. Payment also includes the removal of all items required for the installation of the coarse screen systems, start-up and training of Using Agencies' personnel or designated representatives, and all items incidental thereto to complete the fully operational coarse screen system as required by the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

K. "Course Screen System Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical coarse screen system improvements, including but not limited to; installation of the control panel, power supply, ultrasonic level sensors, transmitters, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work, cabling, conduit, conductors, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary for a fully operational electrical coarse screen system improvement in accordance with the Contract Documents.

2. Unit of measure: lump sum.

L. "Influent Pump Station, Complete"

1. Payment shall include furnishing all materials, equipment, and labor for installation of the pump equipment for the Influent Pump Station. This encompasses the pumps, motors, enclosure, fittings, gauges, valves, controls, control panel(s), flow meter, instruments, electrical conduits, and testing. Additionally, it covers concrete equipment pad, pump vaults, structural concrete, mix design, admixtures, water, reinforcing steel, forms, coatings, curing materials, joint filler, sealants, dowel bars, anchors (nuts, bolts, washers, etc.), waterstops, wall pipes, hatch assemblies, thrust blocks, pipe bends and connections, metallic tape, water meter, pipe supports, ladder/rungs, controls, electrical connections, drainage pipes and structures, utility services (power, water, etc.), gravity sewer pipe, pressure sewer pipe, pressure sewer valves, connections to existing sewer, and testing. Payment shall also extend to miscellaneous items necessary for completion, such as utility locates, verification of pipe alignment, excavating, trench safety, shoring, dewatering, base/sub-base preparation, process water by-passing, temporary pumps and piping, fuel, backfill, fill, bedding material, and any associated quality control testing or other work incidental thereto to complete a fully operational pump station system as required by the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

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M. "Influent Pump Station Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical influent pump station improvements, including but not limited to; installation of the control panel, power supply, ultrasonic influent flowmeters, transmitters, sensors, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work, cabling, conduit, conductors, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary for a fully operational electrical influent pump station system improvement in accordance with the Contract Documents.
2. Unit of measure: lump sum.

N. "Fine Screen System, Complete"

1. Payment will be made for all costs associated with supplying, assembly, and installation of the multi-rake Fine Screen Systems; including but not limited to fuel, temporary pumps, piping, structures, concrete, reinforcement, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, excavation, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and operational fine screen system, in accordance with the Contract Documents. Compensation shall also be for providing all submittals, shop drawings, samples, and information, as required by the Contract Documents. Payment also includes the removal of all items required for the installation of the fine screen systems, start-up and training of Using Agencies' personnel or designated representatives, and all items incidental thereto to complete the fully operational fine screen system as required by the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.
2. Unit of measure: lump sum.

O. "Fine Screen System Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical fine

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screen system improvements, including but not limited to; installation of control panel, power supply, the ultrasonic level sensors, transmitters, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work, cabling, conduit, conductors, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary for a fully operational electrical fine screen system improvement in accordance with the Contract Documents.

2. Unit of measure: lump sum.

P. "Soda Ash Feed System, Complete"

1. Payment will be made for all costs associated with supplying, assembly, and installation of the Soda Ash Feed System; including but not limited to; fuel, temporary pumps, piping, structures, metal work and metal building, HVAC, concrete, reinforcement, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, excavation, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and operational soda ash feed system, in accordance with the Contract Documents. Compensation shall also include providing all submittals, shop drawings, samples, an Operation and Maintenance Manual for the system, and shall include start-up/training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

Q. "Soda Ash Feed System Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical work for soda ash feed system and building improvements, including but not limited to; installation of the power supply, building breaker panel, transmitters, sensors, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work for HVAC, electrical work soda ash feed system, electrical work for lifts or cranes, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the

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site, traffic control, utility locates, and all other work/materials necessary for a fully operational soda ash feed system, building wiring, or other electrical improvements in accordance with the Contract Documents.

2. Unit of measure: lump sum.

R. "Installation of East Lagoon Liner System, Complete"

1. Payment will be made for all cost associated with completely installing the East Lagoon Liner System including, but not limited to, site preparation, material procurement, stockpiling, protection, waste management, surface preparation, layout, installation, anchoring and securing, seaming, testing, quality assurance, and reporting in accordance with the contract drawings and specifications. The HDPE liner system will be installed with precise, straight lines, and all grading will adhere to the Contract Documents. The contractor must include provisions for waste, scrap, and overlap in their pricing; no additional payment will be provided for these aspects.

2. Unit of measure: lump sum.

S. "Biological Treatment Lagoon System, Complete"

1. The Contractor shall be responsible for all material, equipment, labor, quality control, submittals, shop drawings, sampling, testing, analysis, fees, permitting, reporting, and scheduling associated with constructing the Biological Treatment Lagoon System. This includes, but is not limited to, the cost of fuel, excavation, grading, temporary pumps, piping, structures, concrete, reinforcement, mix designs, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and fully operational biological treatment system in accordance with the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

T. "Biological Treatment Lagoon System Electrical, Complete"

1. Payment will cover all costs associated with purchasing, transporting, supplying, assembling, and installing electrical components for the biological treatment lagoon system. This includes, but is not limited to, the installation of control panel, power supply, flowmeters, transmitters, sensors, sensor and transmitter mounting, connection to the existing

SCADA system, electrical box enclosures, displays, monitors, mounting equipment, temperature control systems, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, dewatering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other electrical work necessary for a fully operational biological treatment lagoon system in accordance with the Contract Documents..

2. Unit of measure: lump sum.

U. "North Clarifier System, Complete"

1. The Contractor shall be responsible for all material, equipment, labor, quality control, submittals, shop drawings, sampling, testing, analysis, fees, permitting, reporting, and scheduling associated with constructing the North Clarifier System. This includes, but is not limited to, the cost of fuel, excavation, grading, temporary pumps, piping, structures, concrete, reinforcement, mix designs, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and fully operational clarifier system in accordance with the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

V. "South Clarifier System, Complete"

1. The Contractor shall be responsible for all material, equipment, labor, quality control, submittals, shop drawings, sampling, testing, analysis, fees, permitting, reporting, and scheduling associated with constructing the South Clarifier System. This includes, but is not limited to, the cost of fuel, excavation, grading, temporary pumps, piping, structures, concrete, reinforcement, mix designs, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and fully operational clarifier system in accordance with the Contract Documents. Compensation shall also include providing an Operation and Maintenance

Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

W. "North Clarifier System Electrical, Complete"

1. Payment will cover all costs associated with purchasing, transporting, supplying, assembling, and installing electrical components for the North Clarifier System. This includes, but is not limited to, the installation of control panel, power supply, transmitters, sensors, sensor and transmitter mounting, connection to the existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, temperature control systems, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, dewatering, backfilling, turbing, restoration of the site, traffic control, utility locates, and all other electrical work necessary for a fully operational clarifier system in accordance with the Contract Documents..
2. Unit of measure: lump sum.

X. "South Clarifier System Electrical, Complete"

1. Payment will cover all costs associated with purchasing, transporting, supplying, assembling, and installing electrical components for the South Clarifier System. This includes, but is not limited to, the installation of control panel, power supply, transmitters, sensors, sensor and transmitter mounting, connection to the existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, temperature control systems, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, dewatering, backfilling, turbing, restoration of the site, traffic control, utility locates, and all other electrical work necessary for a fully operational clarifier system in accordance with the Contract Documents..
2. Unit of measure: lump sum.

Y. "Scum Pump Station, Complete"

1. Payment shall include furnishing all materials, equipment, and labor for installation of the pump equipment for the Scum Pump Station. This encompasses the pumps, motors, enclosure, fittings, gauges, valves,

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controls, instruments, and testing. Additionally, it covers concrete equipment pad, pump vaults, structural concrete, mix design, admixtures, water, reinforcing steel, forms, coatings, curing materials, joint filler, sealants, dowel bars, anchors (nuts, bolts, washers, etc.), waterstops, wall pipes, hatch assemblies, thrust blocks, pipe bends and connections, metallic tape, water meter, pipe supports, ladder/rungs, drainage pipes and structures, utility services (water, etc.), gravity sewer pipe, pressure sewer pipe, pressure sewer valves, connections to existing sewer, and testing. Payment shall also extend to miscellaneous items necessary for completion, such as utility locates, verification of pipe alignment, excavating, trench safety, shoring, dewatering, base/sub-base preparation, process water by-passing, temporary pumps and piping, fuel, backfill, fill, bedding material, and any associated quality control testing or other work incidental thereto to complete a fully operational pump station system as required by the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

Z. "Scum Pump Station Electrical, Complete"

1. Payment will cover all costs associated with purchasing, transporting, supplying, assembling, and installing electrical components for the Scum Pump Station. This includes, but is not limited to, the installation of control panel, power supply, flowmeters, transmitters, sensors, sensor and transmitter mounting, connection to the existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, temperature control systems, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, dewatering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other electrical work necessary for a fully operational pump station system in accordance with the Contract Documents.

2. Unit of measure: lump sum.

AA. "Filter System, Complete"

1. Payment will be made for all costs associated with equipment, supplying, assembly, and installation of the Filter System; including but not limited to; fuel, temporary pumps, piping, structures, metal work and metal building, HVAC, bridge crane system, concrete, reinforcement, grating,

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fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, excavation, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and operational filtration system, in accordance with the Contract Documents. Compensation shall also include providing all submittals, shop drawings, samples, an Operation and Maintenance Manual for the system, and shall include start-up/training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

BB. "Filter System Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical work for filter system and building improvements, including but not limited to; installation of control panels, power supply, electrical breaker panel, transmitters, sensors, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work for HVAC, electrical work for lifts or cranes, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary for a fully operational filtration system, building wiring, or other electrical improvements in accordance with the Contract Documents.

2. Unit of measure: lump sum.

CC. "Parshall Flume System, Complete"

1. The Contractor shall be responsible for all material, equipment, labor, quality control, submittals, shop drawings, sampling, testing, analysis, fees, permitting, reporting, and scheduling associated with constructing the Parshall Flume System. Payment shall also include, but is not limited to, the cost of fuel, excavation, grading, temporary pumps, piping, structures, concrete, reinforcement, mix designs, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing, and inspection. Additionally, payment shall cover all electrical work, including, but not limited to, the installation of control panel, power supply, flowmeters, transmitters, sensors, mounting, connection to

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SCADA system, electrical box enclosures, displays, monitors, mounting equipment, temperature control systems, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, training, software, hardware, website development, programming, utility locates, and all other electrical work necessary for a fully operational parshall flume system in accordance with the Contract Documents. Compensation shall also include providing, submittals, shop drawings, an Operation and Maintenance Manual for the system, and start-up training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

DD. "UV Disinfection System, Complete"

1. Payment will be made for all costs associated with equipment, supplying, assembly, and installation of the UV Disinfection System; including but not limited to; fuel, temporary pumps, piping, structures, metal work and metal building, HVAC, bridge crane system, concrete, reinforcement, grating, fittings, cutting, drilling, joint restraints, labor, equipment, traffic control, demolition, excavation, trench safety, shoring, dewatering, base/sub-base preparation, backfill, utility locate, anchoring, spare parts, controls, quality control testing and inspection, and all work and/or appurtenances required for a complete and operational disinfection system, in accordance with the Contract Documents. Compensation shall also include providing all submittals, shop drawings, samples, an Operation and Maintenance Manual for the system, and shall include start-up/training for Using Agencies' personnel or designated representatives.
2. Unit of measure: lump sum.

EE. "UV Disinfection System Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical work for the UV Disinfection System and associated building improvements, including but not limited to; installation of control panel, power supply, the ultrasonic influent flowmeters, transmitters, sensors, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work for HVAC, electrical work for lifts or cranes, lighting, cabling, conduit, conductors, controls, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary

for a fully operational disinfection system, building wiring, or other electrical improvements in accordance with the Contract Documents.

2. Unit of measure: lump sum.

FF. "Effluent Pump Station, Complete"

1. Payment shall include furnishing all materials, equipment, and labor for installation of the pump equipment for the Effluent Pump Station. This encompasses the pumps, motors, enclosure, fittings, gauges, valves, controls, and testing. Additionally, it covers concrete equipment pad, pump vaults, structural concrete, mix design, admixtures, water, reinforcing steel, forms, coatings, curing materials, joint filler, sealants, dowel bars, anchors (nuts, bolts, washers, etc.), waterstops, wall pipes, hatch assemblies, thrust blocks, pipe bends and connections, metallic tape, pipe supports, ladder/rungs, controls, electrical connections, drainage pipes and structures, utility services (water, etc.), gravity sewer pipe, pressure sewer pipe, pressure sewer valves, connections to existing sewer, and testing. Payment shall also extend to miscellaneous items necessary for completion, such as utility locates, verification of pipe alignment, excavating, trench safety, shoring, dewatering, base/sub-base preparation, process water by-passing, temporary pumps and piping, fuel, backfill, fill, bedding material, and any associated quality control testing or other work incidental thereto to complete a fully operational pump station system as required by the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

GG. "Effluent Pump Station Electrical, Complete"

1. Payment will be made for all costs associated with purchasing, transporting, supplying, assembling, and installation of electrical effluent pump station improvements, including but not limited to; installation of control panel, power supply, transmitters, sensors, sensor and transmitter mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work, cabling, conduit, conductors, equipment grounding, wiring, process demonstration, training, software, hardware, website development, programming, testing, materials, equipment, tools, labor, trenching, excavating, demolition, de-watering, backfilling, turving, restoration of the site, traffic control, utility locates, and all other work/materials necessary for a fully operational electrical effluent pump station system improvement in accordance with the Contract Documents.

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2. Unit of measure: lump sum.

HH. "Erosion Control, Complete"

1. Payment will be made for all costs associated with preparing a Small Construction Stormwater Pollution Prevention Plan. Payment also includes providing, installing, maintaining, replacement, and removal of all erosion control devices. Payment further includes all inspections, reports and record retention as required by both the Mississippi Department of Environmental Quality (MDEQ) and the Professional.
2. Unit of measure: lump sum.

II. "Site Lighting, Complete"

1. Payment will be made for all labor, materials, equipment, and other associated cost necessary to complete site lighting installations. Payment shall include, but not be limited to, primary line connections, transformer connections, switch panels, secondary service connections, metering, circuiting, lighting control, fixtures, poles, bases, electrical box enclosures, conduit, equipment grounding, wiring, trenching, excavating, de-watering, backfilling, turfing, restoration of the site, traffic control, utility locates, and all other work/materials necessary for complete and fully operational site lighting in accordance with the Contract Documents.
2. Unit of measure: lump sum.

JJ. "Backup Generator, Complete"

1. Payment will be made for all electrical work, tools, labor, materials, equipment, start-up, fuel, and other associated cost necessary to construct and/or install the treatment system backup generator. Payment shall include, but not be limited to, generator set, transfer switch, trenching, excavating/backfilling, turfing, conduits, wiring, service risers, conductors, standoff bracing, demolition of select existing electrical appurtenances, and all work incidental thereto necessary to completely install the treatment system backup generator in accordance with the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.
2. Unit of measure: lump sum.

KK. "SCADA System, Complete"

1. Payment will be made for all costs associated with supplying, assembling, and installation of the SCADA system, transmitters, sensor and transmitter

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mounting, connection to existing SCADA system, electrical box enclosures, displays, monitors, mounting equipment, electrical work, cabling, conduit, equipment grounding, wiring, and all other materials, equipment, labor, and any quality control services incidental to completing the work as shown in the Contract Documents. Payment also includes compensation for all items incidental to the installation of a complete and operational SCADA and flow monitoring system, including but not limited to, process demonstration, training, software, hardware, website development, programming, testing, and all work incidental thereto necessary to install and monitor the SCADA and flow monitoring system, in accordance with the Contract Documents. Compensation shall also include providing an Operation and Maintenance Manual for the system, as well as start-up and training for Using Agencies' personnel or designated representatives.

2. Unit of measure: lump sum.

LL. "Alternate #1 – Dewater West Lagoon System, Complete"

1. Payment will be made for all costs, materials, equipment, labor, quality control services, sampling, testing and analysis, reports, fees and all costs incidental thereto associated with the transferring of wastewater, sludge, vegetation, and/or other undesirable materials from the western lagoon to the east lagoon in accordance with the Contract Documents.

2. Unit of measure: lump sum

MM. "Alternate #1 - Demolition of West Lagoon Liner System, Complete"

1. Payment will be made for all costs, materials, equipment, labor, quality control services, sampling, testing and analysis, reports, fees and all costs incidental thereto associated with the removal, loading, weighing, transporting, unloading and disposal of the existing lagoon liner, vegetation and/or other undesirable materials in accordance with the Contract Documents. Contractor shall furnish to the Professional all truck weight tickets and copies of the waste manifest for all loads hauled to the landfill at no additional cost to the Owner.

2. Unit of measure: lump sum.

NN. "Alternate #1 - Installation of West Lagoon Liner System, Complete"

1. Payment will be made for all cost associated with completely installing the West Lagoon Liner System including, but not limited to, site preparation, material procurement, stockpiling, protection, waste management, surface preparation, layout, installation, anchoring and securing, seaming, testing,

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quality assurance, and reporting in accordance with the contract drawings and specifications. The HDPE liner system will be installed with precise, straight lines, and all grading will adhere to the Contract Documents. The contractor must include provisions for waste, scrap, and overlap in their pricing; no additional payment will be provided for these aspects.

2. Unit of measure: lump sum

OO. "Alternate #2 – Mobilization-Portable De-Watering Equipment"

1. Payment will be made for all costs associated with the mobilization/demobilization of dewatering equipment and personnel to/from the project site located in Leakesville, Greene County, Mississippi. The cost for mobilization shall include dewatering equipment which has the capacity to provide the dewatering of sludge acceptable to the Professional.

2. Unit of measure: lump sum

PP. "Alternate #2 – Erosion Control"

1. Payment will be made for costs associated with including necessary area for operations associated with Alternate #2 work to the stormwater pollution prevention plan. Payment also includes providing, installing, maintaining, replacement, and removal of all erosion control devices. Payment further includes all inspections, reports and record retention as required by both the Mississippi Department of Environmental Quality (MDEQ) and the Professional.

2. Unit of measure: lump sum

7.03 UNIT PRICE

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the PROPOSAL FORM and described below. All costs for items of work, which are not specifically mentioned to be included in a particular unit price payment item, shall be included in the listed item cost most closely associated with the work involved. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated quality control, tests and reports, and for performing all work required for each of the price items.

7.04 UNIT PRICE ITEMS

A. "Removal of Existing Trees All Sizes and Species, Complete"

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1. Payment will be made for all costs associated with the complete removal and disposal of existing trees (all sizes and species) as specified in the Contract Documents.
 2. Unit of measure: acre.
- B. "Clearing and Grubbing, Complete"
1. Payment will be made for all costs associated with the clearing and grubbing of the project site as specified in the Contract Documents.
 2. Unit of measure: acre.
- C. "Turfing, Complete"
1. Payment will be made for all costs associated with the establishment of turf. Payment shall include all testing, fertilizer, seed planting, mulching and all incidentals thereto as specified in the Contract Documents. Measurement for turf will be taken on the slope of the ground to compute the actual surface area.
 2. Unit of measure: acre.
- D. "Installation of Fencing, Complete"
1. Payment will be made for all costs associated with the repairs or new installations of security fencing as shown and/or specified in the Contract Documents. Payment for all work and materials shall include, but not be limited to, framing bars, barbed wire, razor wire, wire fabric, tie rods, tie wire, stretching bars, fittings, gate post, footings, materials, equipment, labor, and all costs incidental thereto.
 2. Unit of measure: linear foot.
- E. "Installation of 4" Gravity Sewer, All Depths, Complete"
1. Payment will be made for all costs associated with constructing the 4" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 4" gravity sewer line system in accordance with the Contract Documents.
 2. Unit of measure: linear foot.
- F. "Installation of 6" Gravity Sewer, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 6" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 6" gravity sewer line system in accordance with the Contract Documents.
 2. Unit of measure: linear foot.
- G. "Installation of 10" Gravity Sewer, All Depths, Complete"
1. Payment will be made for all costs associated with constructing the 10" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 10" gravity sewer line system in accordance with the Contract Documents.
 2. Unit of measure: linear foot.
- H. "Installation of 12" Gravity Sewer, All Depths, Complete"
1. Payment will be made for all costs associated with constructing the 12" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 12" gravity sewer line system in accordance with the Contract Documents.
 2. Unit of measure: linear foot.
- I. "Installation of 14" Gravity Sewer, All Depths, Complete"
1. Payment will be made for all costs associated with constructing the 14" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 14" gravity sewer line system in accordance with the Contract Documents.

2. Unit of measure: linear foot.

J. "Installation of 15" Gravity Sewer, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 15" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 15" gravity sewer line system in accordance with the Contract Documents.

2. Unit of measure: linear foot.

K. "Installation of 18" Gravity Sewer, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 18" gravity sewer line system, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 18" gravity sewer line system in accordance with the Contract Documents.

2. Unit of measure: linear foot.

L. "Installation of 3" Sanitary Sewer Force Main, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 3" sanitary sewer force main, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 3" sanitary sewer force main in accordance with the Contract Documents.

2. Unit of measure: linear foot.

M. "Installation of 4" Sanitary Sewer Force Main, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 4" sanitary sewer force main, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base

preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 4" sanitary sewer force main in accordance with the Contract Documents.

2. Unit of measure: linear foot.

N. "Installation of 8" Sanitary Sewer Force Main, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 8" sanitary sewer force main, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 8" sanitary sewer force main in accordance with the Contract Documents.

2. Unit of measure: linear foot.

O. "Installation of 10" Sanitary Sewer Force Main, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the 10" sanitary sewer force main, including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, manhole penetrations, outfalls, cleanouts, joint restraints, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 10" sanitary sewer force main in accordance with the Contract Documents.

2. Unit of measure: linear foot.

P. "Installation of Water Line Piping, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the water line piping (all sizes and installation depths), including but not limited to, temporary pumps, fuel, temporary piping, piping supports, fittings, connections, joint restraints, splash blocks, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, fill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the required water lines in accordance with the Contract Documents.

2. Unit of measure: linear foot.

Q. "Installation of Water Faucets, Complete"

1. Payment will be made for all costs associated with labor, materials, and equipment required for furnishing and installing the water faucets, and all associated items thereof to complete the work in accordance with the Contract Documents. Payment shall also include, but not be limited to, labor, utility locates, verification of existing and required pipe alignment, connections, fittings, piping, valves, unions, excavating, trenching, shoring, dewatering, base/sub-base preparation, process water by-passing, temporary pumps, fuel, backfill, fill, bedding material, turf establishment and any associated quality control testing, and all work incidental thereto.
2. Unit of measure: each.

R. "Installation of Sanitary Sewer Manhole, All Depths, Complete"

1. Payment will be made for all costs associated with constructing the sanitary sewer manhole (all depths), including but not limited to, temporary pumps, fuel, temporary piping, piping, wall pipes, waterstops, fittings, connections, concrete, covers, frame, reinforcement, joint restraint, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, pipe alignment, demolition, backfill, fill, bedding material, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the sanitary sewer manhole in accordance with the Contract Documents.
2. Unit of measure: each.

S. "Installation of 6" Gravel Surface, Complete"

1. Payment will be made for all fuel, labor, materials, testing, reporting, submittals and equipment cost associated with the installation of the 6" Gravel Surface as specified in the Contract Documents.
2. Unit of measure: square yard.

T. "Asphalt Pavement, Complete"

1. Payment will be made for all costs associated with the construction of the required asphalt pavement. Payment shall include, but not be limited to all labor, materials, equipment, submittals, testing and reporting needed to construct the required asphalt pavement as specified in the Contract Documents.
2. Unit of measure: square yard.

U. "Installation of 4" Concrete Pavement, Complete"

1. Payment will be made for all costs associated with the construction of the required 4" concrete pavement. Payment shall include, but not be limited to all labor, materials, equipment, submittals, testing and reporting needed to construct the required 4" concrete pavement as specified in the Contract Documents.
2. Unit of measure: square yard.

V. "Installation of 8" Concrete Pavement, Complete"

1. Payment will be made for all costs associated with the construction of the required 8" concrete pavement. Payment shall include, but not be limited to all labor, materials, equipment, submittals, testing and reporting needed to construct the required 8" concrete pavement as specified in the Contract Documents.
2. Unit of measure: square yard.

W. "8-Inch Storm Sewer Line, Complete"

1. Payment will be made for all costs associated with constructing the 8-inch storm sewer piping, including but not limited to, temporary pumps, fuel, temporary piping, piping, fittings, connections, outfalls, cleanouts, joint restraints, waterstops, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 8-inch storm sewer in accordance with the Contract Documents.
2. Unit of measure: linear foot.

X. "12-Inch Storm Sewer Line, Complete"

1. Payment will be made for all costs associated with constructing the 12-inch storm sewer piping, including but not limited to, temporary pumps, fuel, temporary piping, piping, fittings, connections, outfalls, cleanouts, joint restraints, waterstops, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 12-inch storm sewer in accordance with the Contract Documents.
2. Unit of measure: linear foot.

Y. "18-Inch Storm Sewer Line, Complete

1. Payment will be made for all costs associated with constructing the 18-inch storm sewer piping, including but not limited to, temporary pumps, fuel, temporary piping, piping, fittings, connections, outfalls, cleanouts, joint restraints, waterstops, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the 18-inch storm sewer in accordance with the Contract Documents.
2. Unit of measure: linear foot.

Z. "Surface Inlet, 24" x 24" Lockable Cast Iron Grate, Complete"

1. Payment will be made for all costs associated with constructing the surface inlet 24"x24" lockable cast iron grate, including but not limited to, temporary pumps, fuel, temporary piping, piping, fittings, connections, concrete, grating, frame, reinforcement, joint restraint, waterstops, labor, equipment, traffic control, excavation, trench safety, shoring, dewatering, base/sub-base preparation, demolition, backfill, utility locates, testing, restoration of the site, and all work incidental thereto necessary to construct the surface inlet 24"x24" lockable cast iron grate in accordance with the Contract Documents.
2. Unit of measure: each.

AA. "Alternate #2 – Sludge Removal & Disposal, Complete"

1. Measurement for sludge removal and disposal shall be with the appropriate means and methods for accurate measurements for payment on basis of actual "dry" tons of sludge loaded, weighed, transported, unloaded and landfilled. There are no certified scales at the Waste Water Treatment Plant (WWTP) or in the immediate vicinity of the project site. The Contractor shall weigh each truck/load at a certified scale or install a certified portable scale on site. The Contractor shall provide proof of certification for either option. Contractor shall be responsible for coordinating the location of the portable scale, procurement, installation and removal of portable scale, obtaining the required certification, and all rental and maintenance costs associated with the scale. All vehicles used for hauling, are to be inspected, measured and assigned a three digit number. After accurate measurement, the Owner's representative will certify a decal or marking affixed on the equipment which shall identify the number assigned to the equipment, the date of measurement and the capacity of the unit equipment. Each individual truck or transport vehicle to be used in "over-the-road" hauling of sludge shall be weighed upon

each mobilization at approved certified scales both empty and full so as to determine the net weight of load being transported to the landfill. Singular measure samples from loads being transported will be combined and thoroughly mixed so as to obtain a representative composite sample on a daily basis. Said composite sample will then be tested for its percent of solid contents. This percentage will be applied to the total of all transported loads for that day. At the end of each day the Contractor shall provide the Owner's representative with truck weight tickets and a copy of the waste manifest for all loads hauled to the landfill. Payment will be made for all costs, materials, equipment, labor, quality control services, sampling, testing and analysis, reports, fees and all costs incidental thereto associated with decanting, treatment and dewatering, loading, weighing, transporting, unloading and landfill disposal of lagoon sludge/residuals (and other associated undesirable materials thereof) from the WWTP.

2. Unit of measure: dry ton.

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PART 3 EXECUTION

- 3.1 QUALITY CONTROL

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DIVISION 02 – EXISTING CONDITIONS

SECTION 02 0513

GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

These Specifications provide for furnishing all equipment, labor and materials and constructing the GS# 323-024 ARPA Infr. – Waste Cent. Treatment, South Mississippi Correctional Institution, Leakesville, Mississippi, and all related work. These Specifications require steady and uninterrupted progress during construction. CONTRACTOR shall diligently prosecute the work and provide the necessary equipment, skilled and experienced crew, and a regular and well-balanced supply of materials to ensure uniform and continuous progress.

All work herein described shall be performed in a skillful and workmanlike manner by the CONTRACTOR and/or the CONTRACTOR's approved Subcontractors. The CONTRACTOR and/or CONTRACTOR's approved Subcontractors, shall bear all responsibility for the work and shall willingly submit to inspection and review of the work at all times by representatives of PROFESSIONAL and OWNER.

CONTRACTOR shall be responsible for all construction surveys, staking and layout. PROFESSIONAL shall furnish CONTRACTOR basic reference lines, grades and benchmarks from which CONTRACTOR shall lay out the work.

1.2 PAYMENT

Payment for all work performed under this contract shall be made at the price as shown on the Bid Proposal. These proposal prices and payment shall constitute full compensation for furnishing all equipment, materials, and labor, for constructing the work as shown on the drawings and as specified herein, and for performing all work incidental thereto.

1.3 REFERENCES

Referenced publications are listed throughout the CONTRACT DOCUMENTS that outline methods and test procedures which are to be implemented and/or followed during the construction of the project. CONTRACTOR shall provide and maintain a copy of these reference standards on site for the duration of the project.

1.4 CONSTRUCTION SITE ACCESS

All CONTRACTOR employees, sub-contractor employees, and delivery drivers must complete the Mississippi Department of Corrections (MDOC) Vendor – Release of Information form attached at the end of this section for a National Crime Information Center (NCIC) background investigation and shall be approved by MDOC prior to accessing the project site.

1.5 LOCATION OF EXISTING UTILITIES

Prior to beginning any work, the CONTRACTOR shall determine the type along with location of all existing utilities within the limits of each work location. The following information shall be obtained for all utilities within ten (10) horizontal feet of required below grade piping and structures:

- a. Horizontal location within 0.1 feet;
- b. Elevation within 0.1 feet;
- c. Diameter; and
- d. Material Type.

CONTRACTOR shall prepare a sketch indicating the locations of existing utilities. This information shall be provided to the PROFESSIONAL in both pdf and text file format.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 QUALITY CONTROL

CONTRACTOR shall establish and maintain a quality control system that is managed by the Resident Superintendent and assure that all work performed complies with the contract requirements. The Resident Superintendent shall perform the following quality control duties:

- 3.1.1 Maintain a list that shows the status of all submittals. Layout the required work.
- 3.1.2 Review the appropriate submittals, contract requirements, materials, and equipment immediately before a new phase of work begins and instruct employees about the requirements of the new phase of work.
- 3.1.3 Schedule meetings between PROFESSIONAL and CONTRACTOR's employees and CONTRACTOR's approved Subcontractors' employees for PROFESSIONAL to review the contract requirements prior to beginning a new phase of work.
- 3.1.4 Review work performed each day and determine if it has been constructed as required.
- 3.1.5 Assure that the required testing is performed by a laboratory that is approved by PROFESSIONAL.
- 3.1.6 The CONTRACTOR shall be responsible for preparing a report each day (even if no work is performed) that includes project title, CONTRACTOR's name, date, weather, suitability for work, major pieces of equipment on site, work performed by the CONTRACTOR, Subcontractors names and work performed by each Subcontractor, results of reviewing work performed, results of all tests performed and any appropriate remarks. Each report shall be signed and dated by the Resident Superintendent and contain the following statement:

“On behalf of the Contractor, I certify that this report is complete and correct and that all materials and equipment used and work performed this day are in compliance with the contract requirements to the best of my knowledge, except as noted above.”

A copy of each daily report shall be submitted to PROFESSIONAL within 48 hours of the date the report covers.

- End of Section -



MISSISSIPPI DEPARTMENT OF CORRECTIONS
Vendor - Release of Information

To Whom It May Concern:

The Mississippi Department of Corrections will conduct a background investigation to verify information that you have provided in conjunction with your planned visit to our facilities. In order to conduct the investigation, the following information is required.

Social Security #: _____ Date of Birth: _____ Race: _____ Sex: _____

Driver's License Number: _____ State Issued: _____

Current Address: _____
Street Apt #
City State Zip Code

Have you ever been arrested and or convicted of a crime? Yes _____ No _____ If yes: Date: _____

Charge: _____ City: _____ State: _____

Have you ever been associated with a street gang? _____ Yes _____ No

Do you have any tattoos on your body? _____ Yes _____ No If you answered yes, what does it symbolize? _____

In order that the investigation can be completed, I hereby authorize the Mississippi Department of Corrections and any of its authorized employees to receive and collect information from any law enforcement agency and or judicial entity. I also give MDOC permission to run a NCIC with the information that I provided above for a security clearance.

Name (Print) Signature Date

.....
NCIC Completed: _____ By: _____
Date Signature of MDOC Staff

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SECTION 02 1051

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

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DIVISION 02 – SITE WORK

SECTION 02 1051

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

These specifications provide for furnishing reports, all equipment, labor and materials and constructing the Storm Water Pollution Prevention Plan (SWPPP) and all related work. These specifications require steady and uninterrupted progress during construction. The CONTRACTOR shall diligently prosecute the work and provide the necessary equipment, skilled and experienced crew, and a regular and well-balanced supply of materials to ensure uniform and continuous progress.

All work herein described shall be performed in a skillful and workmanlike manner by the CONTRACTOR, or CONTRACTOR'S approved Subcontractors, who shall bear all responsibility for the work and who shall willingly submit to inspection and review of the work at all times by representatives of the PROFESSIONAL and the OWNER.

The CONTRACTOR shall be responsible for all construction surveys, staking and layout. The PROFESSIONAL shall furnish the CONTRACTOR basic reference lines, grades, and benchmarks from which the CONTRACTOR shall lay out the work.

1.2 REFERENCES

Referenced publications are listed throughout the contract documents that outline methods and test procedures which are to be implemented and/or followed during the construction of the project. The CONTRACTOR shall provide and maintain a copy of these reference standards on site for the duration of the project.

1.3 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A Small Construction Storm Water Pollution Prevention Plan (SWPPP) shall be prepared by the CONTRACTOR and submitted to the OWNER and PROFESSIONAL for review. A copy of the Small Construction SWPPP shall be kept on the project site by the CONTRACTOR. The CONTRACTOR shall perform all of the requirements of the State of Mississippi, Mississippi Department of Environmental Quality (MDEQ) Office of Pollution Control

(OPC) Small Construction General Permit for Land Disturbing Activities from One (1) Acre to less than Five (5) Acres.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SWPPP DEVELOPMENT

The CONTRACTOR shall develop, prepare, construct, monitor, and maintain a Small Construction Storm Water Pollution Prevention Plan (SWPPP) and submit the plan to the OWNER and PROFESSIONAL for review. The SWPPP shall be developed in accordance with the MDEQ SWPPP Guidance Manual for Construction Activities which can be found at the following web address:

<http://www.mdeq.ms.gov/wp-content/uploads/2017/06/ConstructionGM.pdf>

The CONTRACTOR shall not begin any work on the site until the OWNER has approved the SWPPP. Prior to beginning work, the CONTRACTOR shall submit all required notices to MDEQ. The CONTRACTOR shall be responsible for installation and monitoring of erosion control measures, performing all required inspections and documenting the results.

3.2 QUALITY RECORDS

The CONTRACTOR shall complete and maintain all records required by MDEQ. A copy of all records shall be provided to the OWNER and PROFESSIONAL upon completion of the project or upon request.

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DIVISION 02 – EXISTING CONDITIONS

SECTION 02 4100

DEMOLITION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Demolition

Demolition is the complete removal of existing features as required to provide for the specified construction. CONTRACTOR shall patch, trim-out, refinish, or otherwise prepare and restore to its original condition existing work partially demolished which is to remain, receive new finish, connect to, or be a part of existing or new work.

1.1.2 Salvage

CONTRACTOR shall remove the items designated on the drawings. Unless otherwise shown on the drawings, all materials and/or items removed under this Contract shall become the property of CONTRACTOR and shall be promptly removed from the site.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SCHEDULE

CONTRACTOR shall notify PROFESSIONAL at least seven (7) calendar days prior to commencing work on each major demolition segment or item, schedule all work to avoid damage, nuisance, and harm to persons or property, and shall not interfere with OWNER's daily operations.

3.2 UTILITIES

CONTRACTOR shall protect all utilities to remain and shall disconnect all utilities to be removed before commencing any other work under this Section. CONTRACTOR shall coordinate protection and disconnection of utilities with the Facilities Manager of the University of Mississippi and/or the utility owner. Special care shall be exercised in disconnecting any utilities which might cause damage or harm to persons or property.

3.3 EXISTING ITEMS NOT TO BE DEMOLISHED

CONTRACTOR shall execute all demolition work in an orderly and careful manner with due consideration for existing items not to be demolished, including parts of surrounding areas to remain. CONTRACTOR shall repair or replace damaged items as approved by PROFESSIONAL at no additional cost to OWNER.

3.4 ITEMS TO BE DEMOLISHED

3.4.1 Fencing

Demolition of the fencing includes removal and proper disposal of the fence fabric, fasteners, posts, gates, wire and all associated appurtenances as required for the required construction as shown on the drawings.

3.4.2 Utilities

Demolition of utilities includes the removal and proper disposal of all items associated with utilities, including but not limited to, piping, fittings, inlets, valves, manholes, concrete structures, bollards, appurtenances and all items incidental thereto as required for the work described in CONTRACT DOCUMENTS.

3.4.3 Pavement

Demolition of pavement includes the full depth removal and proper disposal of all concrete paving, asphalt paving, and gravel pavement as required for the required construction as shown on the drawings.

3.4.4 Lagoon Liner

Demolition of the lagoon liner includes the removal and proper disposal of all lagoon liner materials, anchors, connections and all associated appurtenances as required for the required construction as shown on the drawings.

3.4.5 Soil

Demolition of soil includes the removal of soil as required for the required construction as shown on the drawings.

3.4.6 Backfill

Where items are removed from below the elevation of the existing ground surface, the resulting voids shall be backfilled to the elevation of the adjacent existing ground in accordance with Section 31 2323.11 BACKFILL AND FILL.

3.4.7 Appurtenances

Demolition of appurtenances includes the removal and proper disposal of sidewalks, fences, signs, brick columns, shrubs and any other obstruction required to complete the project as shown on the drawings or encountered in the field. All perimeter fencing and security systems shall be reinstalled at the end of each work day in accordance with South Mississippi Correctional Institution's requirements.

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SECTION 02 6550

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DIVISION 02 – SITE WORK

SECTION 02 6550

SPECIAL WASTE/BIOSOLID REMOVAL AND DISPOSAL OPERATIONS

PART 1 GENERAL

1.1 DEFINITIONS

1. Special Waste – Shall be any unprocessed sludge residuals in the upper six (6) inches to one (1) foot of the lagoon(s) sludge bed, and/or the upper portion of the sludge bed consisting of any pertinent plant growth (grass, shrubs, and/or brush), grubbing, and other undesirable materials that must be landfilled at a certified landfill facility permitted to receive the special waste materials.
2. Biosolids – Shall be all sludge bed materials below the designated upper six (6) inch to lower one (1) foot special waste layer, and/or all processed sludge materials capable of being land applied at a land application site. Biosolids to be received at a certified land application site shall be processed sludge that has been dewatered, screened (through ½” screen opening) of undesirable materials and grinded to pass a ¼” sieve (at shoreline processing station). Biosolids to be land applied will be paid for at the unit price “Biosolids Removal/Land Application Disposal, Complete”. Biosolids to be landfilled will be at the unit price for “Special Waste/Biosolids Removal Landfill Disposal, Complete”. Landfilled biosolids do not have to be processed through a shoreline processing station.

1.2 SCOPE OF WORK

All work shall comply with all existing Federal and State laws and regulations that apply to special waste and biosolid disposal practices, including, but not limited to, the 40 CFR Part 503 rules and regulations, the MDEQ National Pollutant Discharge Elimination System (NPDES) Permit (Permit No. MS0050750), the land application site permit, the Mississippi Nonhazardous Waste Management Regulations, and the CWA Section 405(d) technical standards.

1.2.1 Special Waste/Biosolids Removal Landfill Disposal, Complete

For all removal and offsite disposal of Special Waste/Biosolid materials, the Contractor shall landfill a portion and/or all the Special Waste and Biosolids removed from each lagoon system located at the South Mississippi Correctional Institution (SMCI), 22689 MS Highway 63 North, Leakesville,

MS. Disposal amounts and disposal requirements shall be dependent up the requirements of the Certified Landfill Facility being used by the Contractor at no additional cost to the Owner. Special Waste and Biosolids to be landfilled do not have to be processed through a shore line processing station. All Special Waste and Biosolids to be landfilled must pass the required Paint Filter Test (SE-846 Test Method 9095B: Paint Filter Liquids Test).

1.2.2 Special Waste Removal/Landfill Disposal, Complete

The Contractor shall provide all monitoring, sampling, testing, reporting, labor, materials, and equipment required to remove all Special Waste from the lagoon(s) located at SMCi Waste Water Treatment Plant (WWTP), 22669 Highway 63 North, Leakesville, Greene County, MS. The estimated total volume of residual Special Waste/Biosolids materials is approximately 200 dry tons in the eastern lagoon and approximately 300 dry tons in the western lagoon (an estimated 500 dry tons overall from both lagoons). The Contractor shall transport/dispose of the Special Waste at a certified landfill facility. All special waste materials must pass the Environmental Protection Agency's (EPA's) Paint Filter Test (SW-846 Test Method 90295B Paint filter Liquids Test; herein, referred to as "Paint Filter Test"). Disposal amounts and disposal requirements shall be dependent up the requirements of the Certified Landfill Facility being used by the Contractor at no additional cost to the Owner.

1.2.3 Biosolids Removal/Land Application Disposal, Complete

All land applied biosolids removed from the lagoon(s) shall be dewatered, screened (through ½" screen opening) of undesirable materials, and grinded to pass a ¼" sieve (at shoreline processing station) for any application of biosolids at a permitted land application site.

The Contractor shall responsible for all monitoring, sampling, testing, reporting, labor, materials, and equipment required to remove, dewater, process, transport and dispose of all remaining Biosolids from the lagoon(s) located at the SMCi Waste Water Treatment Plant (WWTP), 22669 Highway 63 North, Leakesville, Greene County, MS. The Contractor shall transport/dispose of the Biosolids to an approved land application facility permitted to receive Biosolids from the SMCi WWTP facility. Classification, sampling, testing, and analysis of the Biosolid materials at the SMCi WWTP shall be the responsibility of the Contractor at no additional cost to the Owner.

1.3 REFERENCES

The current edition of the publications listed below form a part of this specification to

the extent referenced. The publications are referred to in the text by basic designation only.

CODE OF FEDERAL REGULATIONS

40 CFR PART 253 Rule	State of Mississippi Non-hazardous Solid Waste Management Regulations
40 CFR PART 503 Rule	Standards for the Use or Disposal of Sewage Sludge; Current Edition.

ADMINISTRATIVE PROCEDURES ACT RULES (APAR)/MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ)

APAR TITLE 11, PART 3, Rule	Hazardous Waste Regulations
APAR TITLE 11, PART 4, Rule	Nonhazardous Solid Waste Management Regulations
APAR TITLE 11, PART 6, Rule	Wastewater Pollution Control Regulations
MDEQ NPDES Permit No. MS0050750	WWTP National Pollutant Discharge Elimination System Permit

1.4 REQUIREMENTS OF REGULATORY AGENCIES

The Contractor shall comply with all applicable requirements of the Mississippi Department of Environmental Quality (MDEQ), Division of Solid Waste, U.S. Environmental Protection Agency (EPA), and/or other agencies or authorities having jurisdiction over the hauling and disposal requirements of special waste and biosolid materials. The Contractor shall apply for, pay for, and obtain necessary and/or required permits for all operations to dispose of the Special Waste materials at an approved landfill facility and/or Biosolids at an approved land application site, each permitted to receive these materials.

1.5 PERTINENT INFORMATION

1.5.1 Project Site

1. Location: The SMCI WWTP lagoons are located at 22669 Highway 63 North, Leakesville, MS, in Section 32, Township 3 North, Range 6 West, Greene County, MS (Coordinates: Latitude 31.1745° North, Longitude -88.6096° West).
2. Ownership: The property is owned by the State of Mississippi.
3. Size: The eastern lagoon is approximately nine-tenths (0.90) of an acre and the western lagoon is approximately seven-tenths (0.70) of an acre.
4. Lagoon Depth: The average depth of the eastern lagoon is

approximately thirteen (13) feet deep with an average sludge depth of approximately two (2) feet deep across the lagoon and the average depth of the western lagoon is approximately fifteen (15) feet deep with an average sludge depth of approximately four and a quarter (4.25) feet deep across the lagoon.

5. Site Access: A construction access to the SMCI WWTP is located on the north right of way of Old Highway 24 approximately 4,425.0 feet west of the intersection of Highway 63 and Old Highway 24.

1.5.2 Truck Hauling Route

The Contractor shall submit truck hauling routes from SMCI WWTP to each disposal site, for the Professional's approval. Trucks transporting special waste/biosolid materials from the SMCI WWTP facility shall not deviate from the approved routes while loaded.

1.5.3 Landfill Disposal Site

1. Landfill Name/Address/Submittals: The contractor shall submit the name, address and landfill submittal documents to Owner and Professional for approval.
2. Landfill Hours of Operation: The Contractor shall coordinate all disposal operations with the certified landfill facilities hours of operation at no additional cost to the Owner.
3. Access: The Contractor's drivers shall coordinate with the landfill personnel as to where to dump loads.
4. Landfill Disposal Cost: Contractor shall be responsible for special waste/biosolid removal and landfill disposal. Special Waste/biosolid materials transported off the SMCI WWTP property, shall become sole ownership of the Contractor.
5. Hauling Requirements: The Contractor must have a certified Commercial Driver's License (CDL) that meets local, state, and federal standards/requirements and state/federal endorsements for hauling hazardous and non-hazardous waste materials.
6. Material Profile and Analytical Testing: The Contractor shall be responsible for all profiling and analytical testing. The Contractor shall ensure that Special Waste materials are tested, profiled, and approved by the approved Landfill Facility prior to hauling and delivery operations. A Material Profile and Analytical testing shall be required as specified by the approved landfill facility at no additional cost to the Owner. A waste manifest shall be delivered with each load of Special Waste materials disposed of at the approved landfill facility.
7. Landfill Submittal Forms: An electronic copy of the Contractors submittals for landfill's Special Waste Application, MDEQ Industrial

Waste Profile (Explanation of Incomplete TCLP Analysis/Waste Assessment), and Non-Hazardous Waste Manifest shall be provided to the Owner and Engineer. Copies of these forms shall be submitted and approved by the Engineer prior to disposal operations.

8. Analytical Test Required: Analysis of Special Waste materials shall be representative. The required landfill analysis shall include, but not be limited to, TCLP Metals (RCRA 8 Heavy Metals), TCLP VOC's, TCLP SVOC's, Flash Test, pH Test and Paint Filter Test. Contractor shall be responsible for submitting all required lab analysis to the approved landfill facility along with any material profile documentation at no additional cost to the Owner. Two (2) paint filter test will be required for each load; each load must pass a paint filter test prior to leaving the WWTP and pass a paint filter test prior to disposal at the approved landfill facility.

1.5.4 Land Application Disposal Site

The Contractor shall have the option to utilize permitted land application site(s) for disposal or lease an existing permitted land application facility, permitted to receive Biosolids from the SMCi WWTP, under the requirements for that facilities' particular land application permit and/or the leaser's requirements.

The Contractor may dispose of Biosolids at any approved certified land application facility permitted to receive Biosolids from the SMCi WWTP. All labor, equipment, and material cost, including but not limited to, permitting a land application site, dewatering, loading, the processing/conditioning of the Biosolids, transporting, disposal, sludge and soil testing, sampling and analysis; lime application, field application of Biosolids, field buffer layouts, planning around weather and seasonal restrictions, planning around crop schedules, complying with Local, State, and Federal authorities, monitoring, reporting, and all other permitting cost/land application activities; shall be the Contractor's responsibility for incorporating all cost to complete the desired outcome of the Contract Documents. All cost shall be incorporated into the CONTRACTOR's BASE BID under this contract with no additional cost to the OWNER.

1. Biosolid Disposal Requirements: The Contractor shall be responsible for the removal, transport, disposal, sampling, testing/analysis, and reporting of Biosolid removal and disposal of biosolid materials. The Contractor shall dewater all biosolids to a minimum 18% total solids, screened (through ½" screen opening) of undesirable materials and grinded to pass a ¼" sieve at the Contractors shoreline processing station prior to loading, transporting, and disposal at the Land Application site. The Contractor shall ensure that all Biosolids pass a

- Mesh No. 60 ($\pm 5\%$) paint filter (Paint Filter Test Method 9095B) on Biosolids not less than 40 °F. The Contractor shall be responsible for all sludge sampling, testing and analysis for Biosolid Land Application disposal operations. The Biosolids sampling and frequency of sampling shall be incorporated into the base bid item for Biosolids disposal.
2. The Contractor shall be responsible for all sampling, testing and analysis of soil, annual reporting, and all other local, state and federal requirements.
 3. Submittals: The site name, location, site access, application acreage, application rate, application period, shall be submitted to Owner and Professional at the pre-construction meeting. During construction, copies of weight tickets and associated sludge %TS analysis must be provided to Owner and Professional within 24 hours of the date of application.

1.6 PERMITS, LICENSES, AND REGULATIONS

1.6.1 General

All work and cost associated with providing and/or obtaining the necessary permits from the local, State and Federal jurisdictions, for the lagoon Special Waste/Biosolids removal, landfill/land application disposal, and protecting the environment during and after the operation, shall be the responsibility of the Contractor. The Contractor shall maintain all regulatory permits, license applications, and renewals throughout the course of the project.

1.6.2 Regulatory Requirements

1. The Contractor shall comply with all existing Federal and State laws and regulations that apply to the disposal practices of Special Waste/Biosolid materials, including, but not limited to, the 40 CFR Part 503 rules and regulations, the MDEQ National Pollutant Discharge Elimination System (NPDES) Permit (Permit No. MS0050750), the associated MDEQ Biosolids Land Application Permit, the Mississippi Nonhazardous Waste Management Regulations, and with the CWA Section 405(d) technical standards, where applicable.
2. The Contractor shall schedule, perform, operate and/or maintain all equipment, Special Waste handling and disposal operations, sampling and analysis, monitoring, and reporting to achieve compliance to local, State and Federal requirements. Contractor shall submit copies of all required and/or record documents to Owner, Professional and any Local, State and Federal regulatory agencies within both reasonable and required time frames.

3. The Contractor shall furnish unto the Owner and Professional, within reasonable time, any relevant information requested by any Local, State and Federal regulatory agencies to determine compliance with this project at no additional expense to the Owner.

1.7 GROUNDWATER AND SURFACE DRAINAGE

The Contractor shall anticipate an influx of water into the lagoon. All water shall be transferred to the adjacent sludge lagoons in accordance with the order of work and as specified in the contract documents. No separate payment will be made for the handling, disposing, or pumping of water.

1.8 SPILL RESPONSE

The Contractor shall develop and have approved by the Professional, an emergency spill control plan. The Contractor will follow the plan while conducting operations. The plan shall provide for the prompt cleanup of spills in compliance with all applicable requirements under the permit and state and federal regulations. The plan shall remain available at the SMCI WWTP site as well as in all vehicles transporting special waste/biosolid materials. All spills shall be reported to the Owner, Professional, and using agency immediately, if on the using agency's property, or within 12 hours, if not on the using agency's property. The Contractor shall be responsible for all additional reporting of such spills, as required by the permit and/or all local, state, and federal regulations. The Contractor shall have equipment readily available to clean major and minor spills immediately in the event one occurs and shall be solely responsible for all costs associated with the cleanup with no additional cost to the Owner.

1.9 DIGITAL VIDEO RECORDING

1.9.1 General

All digital video shall be DVD format and in color. DVDs shall be indexed and catalogued in such a manner that each recorded area is readily identifiable, and shall also indicate the date and time on which the recording was made. Owner and Professional shall be supplied copies of all DVDs prior to and after construction. All DVD copyrights shall become the property of the Owner.

1.9.2 Project Site

Prior to commencing work, the Contractor shall have a digital video taken of all areas where operations are to take place. The video shall be provided to the Professional prior to commencing work. The video shall serve as a record of the existing conditions for disputes arising from restoration, and should

therefore be taken along the line of construction and site access and staging areas at sufficient detail as necessary to clearly depict details of existing conditions. The Contractor shall also have digital video taken of any unusual conditions encountered during construction that are not already a matter of video or photographic record. In any areas where existing conditions cannot be determined by means of video, the area shall be restored as approved by the Professional at no cost to the Owner. No separate payment shall be made for work defined in this section and all costs in connection therewith, shall be included in the unit price bid.

1.10 CONTRACTOR COORDINATION

The Contractor shall be made aware of other contracts within the work area. The Contractor shall cooperate with other contractors regarding staging, site access and any other needs as directed by the Professional. No separate payment shall be made for work defined in this section and all costs in connection therewith, shall be included in the unit price bid.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall remove, dewater, load, transport and landfill dispose of all materials not suitable for Biosolids Land Application, as a Special Waste. The contractor may remove, dewater, screen, grind, load, transport and dispose of all other applicable Biosolid materials to a permitted biosolids land application site. Processed material screening and grinding operations will not be required for material going to a permitted and approved landfill facility. It is the Contractor's sole responsibility to ensure that all work is performed in accordance with the contract documents and drawings and all local, state and federal laws and regulations.

The Contractor shall be responsible for all methods used for the removal of the Special Waste/Biosolid materials from the Lagoon; however, any method employed must be approved by the Professional. The Contractor's selection of equipment and methods used to remove the Special Waste/Biosolids shall take into consideration the removal of the existing waste in the lagoon, the size of the available work areas, existing WWTP operations, and any other factors that may affect the work under this project.

3.2 PRE-CONSTRUCTION ACTIVITIES

3.2.1 Sludge Sampling and Testing

3.2.1.1 General

The Contractor shall be responsible for sampling and analyzing the Special Waste. The Contractor's sampling and preservation methods shall conform to the methods of the approved laboratory and as outlined in the sources of guidance for EPA's POTW Sludge Sampling and Analysis Guidance Document, the EPA Sewage Sludge Sampling Video, and Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge. The Contractor shall provide a sampling and testing schedule to the project Engineer prior to sampling and testing operations. All sampling/testing field notes and analysis shall be submitted to the Professional and shall be retained by the Contractor and kept on file for one (1) year after the contract close out or as required by local, state, and federal authorities.

3.2.1.2 Special Waste Sampling, Testing and Analysis

Analysis of sludge or other Special Waste materials shall be representative. The required landfill analysis shall include, but may not be limited to, TCLP Metals (RCRA 8 Heavy Metals), TCLP VOC's, TCLP SVOC's, Flash Test, pH Test and Paint Filter Test. Lab Analysis shall be submitted to the landfill for approval along with the material profile documentation. Two (2) paint filter test will be required for each load of sludge materials disposed of at the landfill. Each load must pass a paint filter test prior to leaving the WWTP. Each load must pass a paint filter test prior to disposal at approved landfill facility. The Contractor shall ensure that Special Waste materials are tested, profiled, and approved by the approved landfill facility prior to hauling and delivery operations. The frequency of the landfills Material Profile and Analytical testing shall be as required by the approved landfill facility at no additional cost to the Owner.

3.2.1.3 Biosolids Sampling, Testing, and Analysis

All biosolids applied to land must meet the state, and federal ceiling concentrations for pollutants listed in the EPA 40 CFR Part 503 Rules, and the MDEQ Biosolids Land Application Permit for the application site. The Contractor shall sample and obtain analysis from a Certified Laboratory, approved by the Professional. The pollutants/parameters to be sampled for, shall include, but not be limited to, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc (10 Heavy Metal Pollutants), Polychlorinated Biphenyls (PCB), Total Kjeldahl

Nitrogen (TKN), Ammonia Nitrogen (NH₃-N), Nitrate Nitrogen, Nitrite Nitrogen, Phosphorus, Potassium, Percent Total Solids (%TS), Percent Volatile Solids (%VS), pH, and Fecal Coliform (7 samples/sludge locations in lagoon to ensure the calculated geometric mean is below 2,000,000 cfu or mpn).

Frequency of sampling and analysis shall be the responsibility of the Contractor based on the number of dry tons of Biosolids disposed of at the land application site. The frequency of the sampling and analysis shall be in accordance with all state and federal authorities' latest regulations and requirements. The table below outlines the typical frequency for monitoring based on the amount of biosolids being land applied.

TABLE 1 – Frequency of Monitoring for Surface Disposal of Biosolids

Amounts of Biosolids* (metric tons per 365-day period)	Frequency
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1,500	Once per quarter (4 times/Yr.)
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (6 times/Yr.)
Equal to or greater than 15,000	Once per month (12 times/Yr.)

*1 Metric Ton = 1.1 US Ton

3.2.2 Mississippi One-Call Notification

All underground utilities must be identified and clearly marked prior to any excavation at the site. The Contractor must call Mississippi One Call System, Inc. at least 48 hours prior to any construction activities are to occur at the site. A copy of the locate request form must be submitted to the Professional prior to excavation.

3.3 SLUDGE REMOVAL OPERATIONS

All sludge residuals and undesirables inside the lagoons shall be removed by the Contractor. This work includes furnishing all labor, materials, equipment, tools and performing all operations in connection with pumping standing/decant water from the Eastern Lagoon over to an adjacent lagoon and disposing of the sludge and undesirable material at the designated disposal sites (or vice versa). The Contractor is responsible for all methods used for the removal of the sludge and undesirable materials; however, any method employed shall be approved by the Professional. The Contractor's selection of equipment and methods used to remove the sludge and

undesirable materials shall take into consideration the work required and any other factors that may affect the work under this project.

3.3.1 Lagoon Decantation

The Contractor shall transfer decanted water to the adjacent lagoon. The volume of water removed shall be limited to the extent needed for completing all operations. The Contractor shall use the appropriate means and methods necessary to ensure that solids and/or special waste are not transferred to the adjacent lagoon during the decanting process. Under special circumstances, following written authorization by the Professional, the Contractor may add water to sludge material for purposes of pumping operations. The domestic water supply shall be protected by a Contractor provided and installed reduced pressure backflow preventer at no additional cost to the Owner.

3.3.2 Quantity of Special Waste

The Contractor shall be responsible for removing all special waste material from the western and/or eastern lagoons. Approximately 200 dry tons of special waste materials estimated to be inside the eastern lagoon approximately 300 dry tons of special waste materials are estimated to be inside the western lagoon.

3.3.3 Quantity of Biosolids

There is the possibility of zero (0) up to 500 dry tons of biosolids which can be processed and land applied.

3.3.4 Limits of Work

The Contractor shall confine his operations to the limits of the work areas as designated on the Contract Drawings and as designated by the Owner, Professional, and/or Using Agency. Any damage resulting from work outside the limits of work shall be restored by the Contractor and shall be subject to approval by the Professional. Upon completion of all work required under this Contract, the Contractor shall restore the areas used for his work to the original condition and to a condition acceptable to the Professional and Owner. Restoration shall include but is not limited to grading as required, furnishing and installing topsoil, and seeding/sodding. The Contractor shall remove Special Waste as required for clearing/grubbing, liner removal, and/or other requirements as outlined by the contract documents. Disposal methods thereafter, being either Special Waste Landfill Disposal or Biosolids Land Application Disposal, shall be based on the disposal requirement needs for completing the project and the preference of the Contractors methods for disposal, and the Contract Base Bid, Bid Item unit price. Any over

excavation caused by the Contractor's operations during sludge removal operations may result in fill replacement by Contractor at no additional cost to the Owner.

3.3.5 Equipment

Any combination of machines or equipment of the common practice that are in good, safe working condition and that will produce the required results may be used with approval of the Professional, except where certain types of equipment are specified in the project documents. Equipment necessary for the proper execution of the work shall be on the project and have been approved by the Professional prior to its use in the special waste/biosolid removal and dewatering operations. The machines and equipment shall be maintained in a satisfactory operation condition at all times during use. Equipment with leakage of water, oil, grease, or other objectionable materials shall be corrected promptly or removed from the worksite and replaced with satisfactory equipment.

Power for the equipment can be supplied through temporary electrical facilities and Contractor must make all necessary provisions to provide temporary power for all equipment at no additional contract cost to the Owner. Contractor shall provide and install all means for electrical power including, but not limited to, electrical cables, fuses, breakers, and all other electrical components necessary for operations.

The Using Agency may provide power free of charge and the Contractor must utilize a licensed electrical contractor to make and remove any and all connections to the existing power supply. Only electrical power connected downstream of the existing facilities electrical meter will be provided at no charge to the Contractor. All electrical installations shall be in compliance with the National Electric Code and all other applicable local, state, and federal codes. Connections to the existing power supply shall in no way interfere with the operation of the belt press building and associated equipment required for the Owner to dewater sludge.

The Contractor shall provide and install all temporary means for water to be used in the cleaning of equipment or other required operations. The Contractor shall be responsible for obtaining, providing, and installing the necessary pressure and flow for all hook ups, hoses, pumps, valves, back-flow-preventers and enclosures and other necessary means. The Using Agencies water supply shall be protected by a Contractor provided reduced pressure backflow preventer.

3.4 SLUDGE TREATMENT AND DEWATERING

3.4.1 Special Waste/Biosolid Landfill Materials

The Contractor shall dewater all Special Waste and/or Biosolids to ensure there are no free liquids evident and that it passes a Mesh No. 60 ($\pm 5\%$) paint filter (Paint Filter Test Method 9095B) on special waste material not less than 40 °F. If the special waste and/or biosolids do not meet/pass the Paint Filter Test criteria, the Contractor shall provide means to treat the special waste and/or biosolids to meet the criteria. The Contractor shall be responsible for all sludge sampling, testing and analysis for Special Waste and/or biosolids disposal operations. The Special Waste and/or Biosolids sampling, testing, analysis and frequency thereof, shall be incorporated into the bid item(s) for which the work is most closely associated along with all other necessary operations to complete the work and achieve the desired outcome.

3.4.2 Biosolid Land Applied Materials

The Contractor shall ensure all biosolids have been screened (through ½" screen opening) of undesirable materials and grinded to pass a ¼" sieve at the Contractors shoreline processing station prior to loading, transporting, and disposal at an approved Land Application site. The Contractor shall ensure that all Biosolids pass a Mesh No. 60 ($\pm 5\%$) paint filter (Paint Filter Test Method 9095B) on biosolids not less than 40 °F. The Contractor shall be responsible for all sludge sampling, testing and analysis for Biosolid Land Application disposal operations. The Biosolids sampling, testing, analysis and frequency thereof, shall be incorporated into the bid item for Biosolids disposal along with all other necessary operations to complete the work and achieve the desired outcome.

3.5 SLUDGE LOADING OPERATIONS

The Contractor shall furnish all watertight transport containers and/or vehicles for Special Waste/Biosolid materials. The loading operations will occur adjacent to the edge of the lagoons at the SMCI WWTP. The Contractor shall use the appropriate means and methods necessary for all loading operations.

3.5.1 Operation Hours

The Contractor shall not conduct operations required by this contract on Sundays or on State of Mississippi legal holidays without the written permission from the Using Agency. Decanting and loading operations shall be limited from 6 A.M. to 5 P.M.

3.5.2 Loading during Inclement Weather Conditions

No loading operations shall be performed during periods of heavy rainfall.

All trucks trailers must be equipped with tarping devices that fully cover the trailer so as to divert rainwater (snow, etc.) from entering the loaded trailer. Any load that remains onsite overnight un-tarped during periods of inclement weather shall be disposed at the approved landfill facility by the Contractor at no cost to the Owner, unless that load was pre-weighed immediately after loading with a Professional's or Owner's representative onsite during weigh-in (No Exceptions). Weights of trailers pre-weighed prior to any period of inclement weather and prior to going to the landfill shall be used to determine the disposal cost.

Empty trailers exposed to inclement weather prior to loading shall be drained or cleanout prior to loading Special Waste/Biosolid Materials. Special Waste/Biosolid materials loaded into trailers with standing water, snow, or other related materials shall be disposed at the approved landfill facility by the Contractor at no cost to the Owner (No Exceptions).

Any trailer loaded with "Special Waste" or "Biosolids" and containing waste material generated by the Contractor and/or materials not classified as a "Special Waste" or "Biosolids" removed from the lagoon under this section shall be disposed of at the approved landfill facility by the Contractor, at no cost to the Owner (No Exceptions).

3.6 HAULING AND ROUTES

The Contractor shall furnish all watertight transport containers and/or vehicles for transportation of special waste/biosolid materials and pay for all operation handling and hauling, disposal, maintenance, taxes, fees, tolls, and any other costs to remove and transport waste from the SMCi WWTP lagoon to an approved landfill facility and/or application site. The transport vehicles will be inspected, licensed and appropriately marked for the purpose of transporting both classifications of materials.

The transport trucks will deliver approved Special Waste/Biosolid materials to their designated disposal site. Special Waste materials will generally be delivered to the landfill site between the hours of operation at the approved landfill facility. Transport trucks delivering Biosolids to the land application site will be limited to the hours of the land application operations designated by the land application permit holder.

The Contractor shall use the appropriate means and methods for calculating accurate haul load weights and measurements (Refer to Section 01025 Measurement and Payment). All equipment shall comply with all vehicle licensing, registration, and weight restriction laws and requirements. The Contractor shall be responsible for unloading all waste out of the transport vehicles at the approved disposal site. A site representative from each disposal site will inspect the loads and instruct drivers upon arrival to each disposal site of the unloading operations and where to unload.

3.6.1 Hauling and Routing Requirements

1. The Contractor shall use only the approved truck routes to transport waste from the SMCI WWTP to the landfill or land application site. No transport vehicle shall travel on any local street or through any residential area and all transport vehicles shall remain on primary highways. The Contractor shall use the hauling routes which were submitted to/approved by, the Professional.
2. The Contractor shall be responsible for having a sufficient number of vehicles to assure availability and completion of the work within the project schedule.
3. All transport vehicles shall be operated within the weight limits established in the states and localities through which the transport vehicles must travel, and shall be equipped with adequate fire extinguishing equipment.
4. Storage time in a transportation vehicle shall not exceed State and Federal regulations. Transport vehicles shall be readily cleanable and shall be maintained in clean, sanitary condition to prevent odors, insects, rodents, or other nuisance conditions.
5. Methods employed by the Contractor to haul and dispose of Special Waste/Biosolid materials shall meet all permit requirements, local ordinances, and all local, state, and federal laws in effect at the time of this Contract.
6. All hauling and handling equipment and labor shall be provided by the Contractor. Hauling equipment shall not permit leakage, splash or blow out onto roads during the loading or transporting of materials. The Contractor shall use bed liners, covers/tarps, and all other equipment necessary to prevent spillage, leakage, blow-out or seepage during transporting operations. The Contractor shall be responsible for all costs for cleaning up any tracked, spilled, leaked, or splashed sludge materials, soils, and other contents on roads or other areas at or away from the site of Work.
7. The Contractor shall coordinate his hauling operations with the facilities' operations and with other Contractors/subcontractors performing work at the project site and disposal sites. Any loading and transporting operations by the Contractor shall be scheduled in order to avoid conflicts with disposal delivery operations, disposal site hours of operations, other active work operations encountered during this project.

The Owner will designate routes or roadways at the treatment facility for the Contractor's use. The hauling operation shall be limited to these designated routes or roadways.

8. The Contractor shall transport materials directly from the SMCI WWTP to the designated disposal site. Under no circumstances shall the Contractor be allowed to make any additional stops in transit to the disposal site to haul any payload other than the special waste or biosolid materials from the project site. All loads transported shall be pre-weighed with a certified onsite set of scales provided by the Contractor prior to weighing in at the approved landfill facility and delivery/disposal at the approved land application site.

3.6.2 Trucks and Identification

Special Waste/Biosolid materials may be transported in side dump trailers, end dump trailers with leak proof tailgates, or other type trailers with leak-proof systems may be used only after approval from the Professional. Trucks and trailers must meet all state and local regulations. Open trucks must be covered with a tarpaulin or similar device as necessary to prevent windblown removal of material during transport. The capacity will be certified by an independent agency capable of performing such certifications, and Contractor shall furnish the Owner a copy of said certification prior to use. The truck must be uniquely and legibly numbered on the sides with letter and/or numbers at least 4 inches high. These identification numbers must correspond with the certification document as to capacity.

3.6.3 Operation Hours

The Contractor shall not conduct transporting/hauling operations required by this contract on Sundays or on SMCI State of Mississippi holidays without the written permission of the Owner and/or Using Agency. Hauling and disposal of special waste or biosolid materials shall be restricted to the landfill or land application sites hours of operation.

3.6.4 Measuring Tonnage

All vehicles used for hauling, are to be inspected, measured and assigned a three digit number. After accurate measurement, the Professional will certify a decal or marking affixed on the equipment which shall identify the number assigned to the equipment, the date of measurement and the capacity of the unit equipment.

Each individual truck or transport vehicle to be used in "over-the-road" hauling of special waste or biosolid materials shall be weighed upon each

mobilization at approved certified scales both empty and full so as to determine the net weight of load being transported to the disposal site. The Engineer shall be present at initial weigh-in of each truck.

3.6.4.1 Load Tickets and Submittals

Engineer will verify the fullness, monitor/inspect and gather uniform samples provided by the Contractor for each load prior to its departure. Load tickets shall bear the following:

1. Vessel's Identification Number
2. Vessel's Certified Contents Capacity
3. Date/Time
4. Project Name and Number
5. Owner, Using Agency, or Professional's Personnel Signature
6. Contractor's Truck Driver's Signature

At the end of each day the Contractor shall provide the Professional with field sampling forms, truck weight tickets and a copy of the waste manifest for all loads hauled.

3.7 LAGOON LINER

The Contractor shall remove all sludge residuals and undesirable materials down to the top of the HDPE liner. Liners scheduled to be demolished shall be removed, transported and disposed of in accordance with the Contract Documents.

3.8 RECORDS AND SUBMITTALS

3.8.1 Suspensions and Delays

An interruption in the Contractor's operation for a period of time longer than twenty-four (24) hours shall be reported in writing by the Contractor to the Owner, Using Agency, and Professional immediately.

3.8.2 Records of Special Waste/Biosolids Removed

The Contractor shall maintain and submit record documents including, but not limited to, the weight tickets, waste manifest, paint filter test results, truck logs, sludge disposal analysis, tonnage of materials disposed, %TS sampling

records and analysis, and other required records in a form and manner as directed by the Owner and Professional. The Professional shall be given copies of these submittals on the next available work day and within receipt of any lab analysis results.

3.8.2.1 Truck Loading Log

The Contractor shall ensure that information in the truck loading log is correctly and legibly documented. Failure to properly, correctly and/or legibly document any load shall result in non-payment for that load. The log shall include, but not be limited to, the following information:

- a. Date Loaded and Load Identification Number;
- b. Date delivered if different from loaded date;
- c. Identity of driver;
- d. Time loading operations began;
- e. If paint filter test was performed and results;
- f. The truck number and/or identification number;
- g. Any leaks observed and corrective actions;
- h. Are tarps, covers, liners, etc. in place for transport;
- i. The time the loaded vehicle left the WWTP;
- j. The time the vehicle delivered the load;
- k. Any reasons for delay or return of load;
- l. Total Weight of loaded truck;
- m. Empty Weight of unloaded truck; and
- n. Number of tons delivered that load.

3.8.2.2 Field Data Log

The field log shall include, but not be limited to, the following information:

- a. Date of Operation;
- b. Truck driver name, truck number or identification number;
- c. Land Application Site Operator's name(s) (if applicable);
- d. Time truck loading operation began;
- e. Time truck loading operation ended;
- f. If paint filter test was performed and results;
- g. Time the percent solids sample taken;
- h. Method of sample preservation;
- i. Reasons for downtime, delay, spills or leaks and corrective actions taken;
- j. Number of loads delivered;
- k. Number of loads returned and reason; and

- l. Number of tons delivered that day.

3.8.2.3 Monitoring, Analysis, and Submittals

Contractor shall monitor all activities on a daily basis through use of Truck Logs/Field Logs/Daily Reports and on a weekly basis through the use of a Weekly Reports.

Contractor shall retain, maintain, and provide all required permitting, rate calculations, and monitoring information, including copies of all testing and analysis reports (including the chain of custody) and records to the Owner and Professional which are required by the landfill, and any other local, state, and federal agencies.

Records of monitoring information shall include:

- a. The dates, specific locations, and time of sampling or measurements;
- b. The individuals who performed the sampling or measurements;
- c. The date(s) analyses were performed;
- d. The individual(s) who performed the analyses;
- e. The analytical techniques or methods used; and
- f. The results of such analyses

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SECTION 03 1100

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DIVISION 03 – CONCRETE

SECTION 03 1100

CONCRETE FORMING

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

1.1.2 Openings for other work.

1.1.3 Form accessories.

1.1.4 Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

1.2.1 Section 03 2000 – Concrete Reinforcing.

1.2.2 Section 03 3000 – Cast-in-Place Concrete: Supply of concrete and accessories for placement by this Section.

1.3 RELATED SECTIONS

1.3.1 Section 03 2000 – Concrete Reinforcing.

1.3.2 Section 03 3000 – Cast-in-Place Concrete.

1.4 REFERENCES

1.4.1 ACI 301 – Structural Concrete for Buildings.

1.4.2 ACI 318 – Building Code Requirements for Reinforced Concrete.

1.4.3 ACI 347 – Guide to Formwork for Concrete.

1.4.4 PS 1 – Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

1.5.1 Design, engineer and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 QUALITY ASSURANCE

1.6.1 Perform work in accordance with ACI 347.

1.6.2 Maintain one copy of document on site.

1.7 QUALIFICATIONS

1.7.1 Design framework under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Mississippi.

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Deliver, store, protect and handle products to site.

1.9 COORDINATION

1.9.1 Coordinate this Section with other Sections of work which require attachment of components to formwork.

1.9.2 If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from PROFESSIONAL.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

2.1.1 Softwood Plywood: PS 1, B Grade, Group 1, Exterior.

2.1.2 Softwood Plywood: PS 1, HDO, Group 1, Exterior.

2.1.3 Lumber: No. 2 grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

- 2.2.1 Preformed Steel Forms: Tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces. Special care shall be used at areas of exposed concrete.

2.3 FORMWORK ACCESSORIES

- 2.3.1 Form Ties: Snap-off type, adjustable length, free of defects that could leave holes larger than ½ inch in concrete surface.
- 2.3.2 Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- 2.3.3 Corners: Chamfer type; ¾ x ¾ inch.
- 2.3.4 Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION AND QUALITY CONTROL

- 3.1.1 Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.
- 3.1.2 Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- 3.1.3 Do not reuse wood formwork more than 6 times for concrete surfaces to be exposed to view.

3.2 EARTH FORMS

- 3.2.1 Earth forms are permitted for below ground footings.

3.3 ERECTION – FORMWORK

- 3.3.1 Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- 3.3.2 Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
- 3.3.3 Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- 3.3.4 Align joints and make watertight. Keep form joints to a minimum.
- 3.3.5 Formwork ties for grade beams with exposed exterior shall be uniformly spaced horizontally and vertically.
- 3.3.6 Obtain approval before framing openings in structural members which are not indicated on Drawings.
- 3.3.7 Provide chamfer strips on external corners of beams, columns and walls.

3.4 APPLICATION – FORM RELEASE AGENT

- 3.4.1 Apply form release agent on formwork in accordance with manufacturer's recommendations.
- 3.4.2 Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- 3.4.3 Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- 3.5.1 Provide formed openings where required for items to be embedded in passing through concrete work.
- 3.5.2 Locate and set in place items which will be cast directly into concrete.

- 3.5.3 Coordinate with work of other Sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- 3.5.4 Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- 3.5.5 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- 3.5.6 Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- 3.6.1 Clean forms as erection proceeds to remove foreign matter within forms.
- 3.6.2 Clean formed cavities of debris prior to placing concrete.
- 3.6.3 Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- 3.6.4 During cold weather, remove ice and snow from within forms. Do not use de-icing agents. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

- 3.7.1 Construct formwork to maintain tolerances required by ACI 301.

3.8 FORM REMOVAL

- 3.8.1 Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- 3.8.2 Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

3.8.3 Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.9 SCHEDULE

3.9.1 Grade B plywood for areas not exposed.

3.9.2 HDO plywood for Grade Beams and wall to be exposed.

3.9.3 Steel column forms for exposed concrete columns.

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DIVISION 03 – CONCRETE

SECTION 03 2000

CONCRETE REINFORCING

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1.1.1 Reinforcing steel bars and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

1.2.1 Section 03 1100 – Concrete Forming.

1.2.2 Section 03 3000 – Cast-in-Place Concrete.

1.2.3 Section 01 4529 – Testing Laboratory Services.

1.3 REFERENCES

1.3.1 ACI 301 – Specifications for Structural Concrete.

1.3.2 ACI 318 – Building Code Requirements for Structural Concrete.

1.3.3 ACI SP-66 – American Concrete Institute – Detailing Manual.

1.3.4 ANSI/AWS D 1.4 – Structural Welding Code –Reinforcing Steel.

1.3.5 ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.3.6 ASTM A 1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

1.3.7 AWS D 12.1 – Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

1.3.8 CRSI – Concrete Reinforcing Steel Institute – Manual of Practice.

1.3.9 CRSI 63 – Recommended Practice for Placing Reinforcing Bars.

1.4 SUBMITTALS

1.4.1 Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

1.4.2 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

1.5.1 Contractor Quality Assurance

1.5.1.1 Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, ACI SP-66, and ACI 318.

1.5.1.2 Maintain one copy of each document on site.

1.5.1.3 Submit certified copies of mill test report of reinforcement materials analysis.

1.5.2 Testing Laboratory Quality Assurance

CONTRACTOR shall coordinate and schedule in a timely manner with the testing laboratory to perform the following inspections and tests:

1.5.2.1 Verify reinforcing steel for size, spacing, location and support.

1.5.2.2 Verify proper reinforcing steel concrete coverage.

1.6 QUALIFICATIONS

1.6.1 Welders' Certificates: Submit certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.7 COORDINATION

1.7.1 Coordinate with placement of formwork, formed opening and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

2.1.1 Reinforcing Steel: ASTM A 615, 60 ksi yield grade; deformed billet steel bars.

2.1.2 Fiber Reinforcement: Similar and equal to Fibermesh InForce as manufactured by Synthetic Industries. Application rate shall be 1.5 pounds per cubic yard. Fiber reinforcement shall not be considered as an alternative to reinforcing steel unless otherwise noted herein or upon written approval from the PROFESSIONAL. Fiber reinforcement shall only be considered as a supplement in addition to reinforcing steel unless otherwise noted.

2.2 ACCESSORY MATERIALS

2.2.1 Tie Wire: Minimum 16 gage annealed type.

2.2.2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

2.2.3 Special Chairs, Bolsters, Bar Support, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

2.3.1 Fabricate concrete reinforcing in accordance with ACI 318.

2.3.2 Weld reinforcement in accordance with ANSI/AWS D 1.4 and ANSI/AWS D 12.1.

2.3.3 Locate reinforcing splices not indicated on drawings, at point of minimum stress.

PART 3 EXECUTION

3.1 PLACEMENT

- 3.1.1 Place, support and secure reinforcement against displacement. Do not deviate from required position.
- 3.1.2 Do not displace or damage vapor barrier.
- 3.1.3 Accommodate placement of formed openings. Do not cut bars.
- 3.1.4 Maintain concrete cover around reinforcing as per ACI 318.

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DIVISION 03 – CONCRETE

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 This work includes all cast-in-place concrete and other related items necessary to complete the project indicated by the CONTRACT DOCUMENTS, unless specifically excluded.

1.1.2 Related Work Specified Elsewhere:

1.1.2.1 Quality Control

1.1.2.2 Formwork

1.1.2.3 Reinforcing

1.2 QUALITY ASSURANCE

1.2.1 Testing Laboratory

1.2.1.1 CONTRACTOR will engage the services of a recognized independent testing laboratory approved by PROFESSIONAL to perform the following services:

- A. Test of cement.
- B. Test of coarse and fine aggregate.
- C. Design and control of the concrete mix.
- D. Test all mixtures as established by CONTRACTOR to be used on the job as specified.

- E. Field testing of concrete and laboratory compression test on concrete cylinders.
- F. Reports of all tests.

1.2.2 Certificates

- 1.2.2.1 CONTRACTOR shall obtain Certificates from the manufacturer of the cement confirming that all cement used on the project was tested in accordance with ASTM C 150, together with reports of the test results. CONTRACTOR shall furnish two (2) copies of these certificates to PROFESSIONAL.
- 1.2.2.2 CONTRACTOR shall obtain delivery tickets from the ready-mix plant for all concrete furnished to the project and shall furnish one (1) copy of each ticket to PROFESSIONAL. Information shown on the delivery ticket shall consist of items 15.1.1 through 15.1.10 and items 15.2.1 through 15.2.8 of ASTM C 94.

1.2.3 Design Mix

- 1.2.3.1 A design mix shall be established for each required strength and mix as specified herein.
- 1.2.3.2 Design mix is to be established to provide concrete of 10% higher strength than the specified job strength, and the proposed mix is to be submitted to PROFESSIONAL for review and approval prior to use on the job. Laboratory cylinders are to be made according to ASTM C 192 and compression tests according to ASTM C 39, using representative materials. Control of mixes is to be maintained at the ready-mix plant and on the job and be reviewed and checked by the testing laboratory previously mentioned in this Section.
- 1.2.3.3 When the mix is approved, no change shall be made without the written consent of PROFESSIONAL.

1.2.4 Testing

- 1.2.4.1 The required tests on cement and aggregate are covered by ASTM C 150 and ASTM C 33, respectively.

- 1.2.4.2 The testing of concrete shall be in accordance with the procedure outlined in ASTM C 31 and laboratory compression tests in accordance with ASTM C 39. Temperature shall be tested in accordance with ASTM C 1064, slump shall be tested in accordance with ASTM C 143. Air content shall be tested in accordance with either ASTM C 173 or ASTM C 231. All testing of concrete shall be conducted by or under the direction of a registered Professional Engineer employed full time by the testing laboratory.
- 1.2.4.3 A field test shall be conducted on the first load of each class of concrete delivered to the site each day and for every 50 cubic yards, or fraction thereof, of each class of concrete placed each day. In addition, a test shall be conducted at any other time during the progress of the work when requested by PROFESSIONAL.
- 1.2.4.4 A sample for a field test shall be taken from the center of the load of concrete. This sample shall be of a large enough volume to conduct two full tests or in conformance with ASTM C 172, whichever is larger.
- 1.2.4.5 A field test of concrete shall conform to ASTM C 39 and consist of measuring the slump, determining the air content (when required), determining the weight per cubic foot, and making a minimum of five (5) test cylinders. These test cylinders are to be labeled with an identification number, stored, and tested in accordance with ASTM C 39. Additional Information to be recorded shall be time and date of field test, truck identification number and batch number, weather data (air temperature and humidity), the temperature of the concrete, and the place of depositing in the structure of the sampled batch of concrete. All this information and test data shall be recorded on the testing laboratory's test report.
- 1.2.4.6 A slump exceeding the specified maximum in two consecutive tests on different portions of the sample will be cause for rejection of the load.
- 1.2.4.7 Laboratory Compression tests shall be conducted on one (1) test cylinder from each field test at seven (7) days, and three (3) cylinders at twenty-eight (28) days. The strength of concrete will be considered satisfactory so long as the average of the three test results equals or exceeds the specified compressive strength, f'c, and no individual acceptance test result is below the specified f'c by more than 500 psi. The remaining

cylinder from each field test shall be stored by the testing laboratory and tested at the direction of PROFESSIONAL.

- 1.2.4.8 The testing laboratory shall write a test report on each test cylinder that is broken. In addition to any information required elsewhere, this report shall include all information and test data recorded in the field test when the cylinder was made, cylinder identification number, date test cylinder was received at the testing laboratory, age of cylinder when broken, weight of cylinder before broken, actual compression strength of the cylinder, and type of fracture. The testing laboratory shall provide CONTRACTOR and PROFESSIONAL with two (2) copies of each test report within five (5) days after the test cylinder is broken.

1.2.5 Evaluation of Concrete Strength

- 1.2.5.1 If tests of concrete strength are questionable, the strength of the concrete in place shall be considered questionable and shall be subject to further testing at the expense of CONTRACTOR.
- 1.2.5.2 These additional tests of questionable concrete shall be conducted by an independent testing laboratory approved by OWNER and PROFESSIONAL. Tests shall be conducted in accordance with ASTM C 42 (when concrete cores may be obtained in the field) or by load tests conducted and results evaluated in accordance with Chapter 2 of ACI 318.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cement

- 2.1.1.1 Portland Cement, ASTM C 150, Type 1 or ASTM C 595, Type IL (10) shall be used in concrete placed for building footings, bollards, fence posts and pavement.
- 2.1.1.2 Portland Cement, ASTM C150, Type II or ASTM C595 Type IL (MS) shall be used in concrete placed for manholes, pump stations, coarse screen, fine screen, clarifiers, filters and disinfection system structures.

2.1.2 Aggregate

2.1.2.1 ASTM C 33 with maximum size of 1", except for toppings with maximum size of ¾".

2.1.2.2 Aggregate must be free from lignite or any other deleterious materials (0.5 percent limit).

2.1.3 Water

From the South Mississippi Correctional Institution's water supply.

2.1.4 Admixtures

2.1.4.1 Air-Entraining, ASTM C 260, 3%.

2.1.4.2 Retardant – Pozzoloth by Master Builders Company, Sonotard by Sonneborn, Plastiment by Sika Chemical Company, or equal.

2.1.5 Moisture/Vapor Barrier

10 mil polyethylene film.

2.1.6 Concrete Sealer

Sono-Glaze by Sonneborn, or approved equal.

2.1.7 Bonding Agent

Blue Bond as manufactured by Blue Bond Co., Acryl 60 as manufactured by Standard Dry Wall Products, Inc., or approved equal.

2.1.8 Waterstops

2.1.8.1 Waterstops between required concrete pours shall be flat dumbbell or centerbulb type, PVC (CRD C 572); 6".

2.1.8.2 Waterstops between existing and required concrete SikaSwell S-2 as manufactured by Sika Corporation, or approved equal.

2.1.9 Curing

4 mil polyethylene, washed or clean river sand, or burlap.

2.1.10 Non-slip aggregate

Pure aluminum oxide or silicon carbide aggregate, No. 12 to 30 combination.

2.2 SAMPLES

2.2.1 PROFESSIONAL and the Testing Laboratory shall have free access to all materials used, and the required samples are to be furnished by CONTRACTOR, as desired.

2.3 CONCRETE MIXES

2.3.1 Use ready mix concrete, mixed and delivered in accordance with requirements of ASTM C 94. The concrete strengths listed below are the required compressive strength at the end of twenty-eight (28) days. The proportions of material weight shall be uniformly and accurately controlled. Control mixes for concrete shall be as follows:

2.3.1.1 3500 psi – at least 6 sacks of cement per cubic yard, not over 5 gallons of water per sack.

2.3.1.2 4000 psi – at least 6-1/2 sacks of cement per cubic yard, not over 5 gallons of water per sack.

2.3.1.3 5000 psi – at least 7 sacks of cement per cubic yard, not over 5 gallons of water per sack.

2.3.2 Slump for all concrete mixes shall not exceed 5".

2.3.3 Calcium chloride shall not be used.

2.3.4 It is the responsibility of CONTRACTOR to furnish concrete which conforms to the quality and strength specified.

PART 3 EXECUTION

3.1 PLACING CONCRETE

- 3.1.1 Water may be added at the job site if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded. All concrete delivery trucks will have actual batch weight tickets available that clearly indicate the quantity of water that may be added at the jobsite that will not exceed the maximum water/cement ratio.
- 3.1.2 Concrete shall be placed so as to avoid segregation of materials and to prevent cold joints by avoiding rehandling, by keeping pours naturally level, and by adequate vibration.
- 3.1.3 Placing is not to be started during rain or snow, and if placing is underway when such conditions occur, continue operations only long enough to provide a suitable construction joint.
- 3.1.4 During hot weather or periods of low humidity combined with a definite breeze, rapid loss of moisture shall be discouraged by thorough wetting of forms and by using a fine fog spray when finishing. At these times particular attention shall be given to providing an adequate number of finishers to expedite this operation.
- 3.1.5 During cold weather fresh concrete shall be protected from freezing.
- 3.1.6 Prior to placing, forms shall be cleaned free of foreign material and shall be washed down with water.
- 3.1.7 Placing shall be a continuous operation between planned construction joints with fresh cement mixed only with plastic concrete already in place. Avoid cold joints.
- 3.1.8 Vibration shall be thorough, using vibrators small enough to work within reinforcing. The vibrator shall be inserted at many points about 24" apart. Avoid over-vibration and transporting concrete in forms by vibration. Two vibrators shall be immediately available at all times.
- 3.1.9 Any pumped concrete shall be placed by a Subcontractor fully experienced in this type of work, using equipment which readily handles the concrete specified without interruption of placing.

- 3.1.10 Footings may be placed separately from the stems or piers and grade beams, and shall be allowed to cure a minimum of 7 days before placing construction loads on the footings.
- 3.1.11 Concrete shall be discharged at the job within 1-1/2 hours after water has been added to the cement and aggregates or cement batched with the aggregates, unless a longer time is specifically authorized by PROFESSIONAL. During hot weather and under other conditions contributing to quick stiffening of concrete, or when high early-strength cement is being used, PROFESSIONAL may require a reduction in this elapsed time at no additional cost to OWNER.
- 3.1.12 Deposit concrete in uniform horizontal layers a maximum of 12 inches deep. Concrete shall not be dropped from a conveyor or buggy a distance greater than 5 feet to the point of deposit. For greater height, a chute is to be used.
- 3.1.13 CONTRACTOR shall keep a complete record at the job site of every concrete pour. This record shall include the date, the time the concrete pour began and ended, weather date, quantity of pour, location of the concrete within the structure, and the number of test cylinders taken. CONTRACTOR shall also record in this same record the time and date when the test cylinders are removed from the site.
- 3.1.14 Place no concrete before embedded items are in place and not before forms, reinforcing and affected work of other trades have been examined. Notify PROFESSIONAL and all trades affected as to when concrete will be placed, and allow adequate time for installation of all necessary parts.
- 3.1.15 Sleeves, conduit and other pipes passing through the floors, walls or beams shall be such size and, in such location, as not to impair significantly the strength of construction. All pipes and sleeves shall be at least equal to Standard Schedule 40 steel pipe and shall be spaced not less than 3 diameters on center.
- 3.1.16 Care shall be taken to see that all reinforced steel in the form-work is kept a minimum of 1.5" clear of any form, either bottom or side.
- 3.1.17 No concrete shall be deposited when the air temperature is below 35 degrees F or when the temperature is forecast to go below 35 degrees F within the next 12 hours after placing. Whenever the temperature of surrounding areas is below 35 degrees F or likely to drop, adequate equipment to provide for heating or concrete materials and for protecting concrete is required. All concrete when placed shall

have a temperature of between 50 and 90 degrees F. This temperature range shall be maintained for at least 72 hours or for as much as may be necessary to insure a proper rate of curing. No anti-freeze chemical will be permitted.

3.1.18 At the time of concrete placement, CONTRACTOR shall review with PROFESSIONAL the amount of concrete to be placed. There shall be an adequate number of experienced technicians, adequate equipment to handle the concrete, and adequate concrete at site during the entire pour. Partial pours which sit unfinished for over 45 minutes shall be removed at the discretion of PROFESSIONAL.

3.1.19 Notify PROFESSIONAL at least 48 hours prior to each pour.

3.2 CONSTRUCTION JOINTS

3.2.1 Locate construction joints in grade beams and slabs midway between supports and provide shear keys as directed by PROFESSIONAL.

3.2.2 Allow concrete to set for 24 hours before an adjoining pour is started. Slabs across the joint shall be level, and the surface shall not be feathered.

3.2.3 Before proceeding with the following pour at the joint, thoroughly clean the joint, remove all loose laitance, and brush in a thick cement slurry.

3.2.4 Where the top of grade beams extend above finished grade or above finished floor, provide a continuous vertical water-stop in all grade beam construction joints. Waterstops shall begin at the bottom of the grade beams and extend up to either the top, or a point 2'0" above grade and/or compacted fill.

3.2.5 At all construction joints located at the junction of interior concrete slab floors to grade beams, provide a continuous horizontal waterstop.

3.3 CURING

3.3.1 Keep all concrete moist for 5 days after placing. Cover with 4 mil polyethylene film, and leave forms in place.

3.4 PATCHING

- 3.4.1 Honeycombed and defective concrete shall be removed and replaced or repaired, as directed by PROFESSIONAL.
- 3.4.2 Defective concrete as determined by PROFESSIONAL shall be repaired as follows:
 - 3.4.2.1 The completed patch shall be indistinguishable from surrounding surfaces in color and texture.
 - 3.4.2.2 Patching mixture, using same cement sand as used in concrete shall consist of one part cement to 2-1/2 parts sand, with just enough mixing water to permit placing. Premix mixture, allow to stand at least 30 minutes before using, and stir with trowel during this period.
 - 3.4.2.3 Remove material to sound concrete, dampen surface and brush thick 1 to 1 cement sand bond coat into surface.
 - 3.4.2.4 When bond coat begins to lose water sheen, thoroughly pack patching mixture in place, leaving it somewhat higher than adjacent surface. Embed pieces of gravel by hand into patch.
 - 3.4.2.5 Finish to duplicate major surface and wet cure for 5 days.

3.5 FINISHES FOR FLAT WORK

- 3.5.1 Trowel finish floor surfaces scheduled as concrete finish surfaces or floor surfaces scheduled to receive floor covering. Trowel finished surfaces shall be rule planes within 1/8" in 10' as determined by a 10' straight-edge placed anywhere on the slab in any direction.
- 3.5.2 Smooth trowel finish after the slab is screeded and floated. Start troweling when all water has disappeared from the surface to first level the surface, then start final troweling when concrete has set where it no longer shows indentation from finger pressure. Trowel to a hard, smooth surface free of marks. Dusting of cement and sand will not be permitted.
- 3.5.3 Exterior walks and drives shall have smooth trowel and fine broom finish.

- 3.5.4 Floors which are to receive quarry or ceramic tile shall be screeded and floated to an elevation which will allow proper space for setting beds, and the structural slab shall be sloped to the floor drains.
- 3.5.5 Slope floors to drains, where shown.
- 3.5.6 Trowel concrete steps and landings smooth with a troweled finish.
- 3.5.7 Make all exterior concrete stairs, ramps, and loading docks non-slip by applying non-slip aggregate at the rate of 25 pounds per 100 square feet during concrete installation, in strict accordance with the manufacturer's instructions.
- 3.5.8 Floor slabs with a scheduled concrete finish shall receive three full treatments of chemical hardener applied according to the manufacturer's printed instructions. After the slabs are well cured, allowed to dry, cleaned, and free of any foreign matter, use one gallon of hardener for each 100 square feet for each treatment.

3.6 FINISHES FOR GRADE BEAMS

- 3.6.1 Exposed grade beam faces shall have a smooth form finish. Repair and patch defective areas with all fins or other projections completely removed and smoothed. Provide grout cleaned finish consisting of one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to the consistency of thick paint. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that the final color meets PROFESSIONAL's approval.
- 3.6.2 Thoroughly wet concrete surfaces and apply grout immediately to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray at least 36 hours after rubbing.

3.7 FLOOR SLABS ON EARTH

- 3.7.1 Concrete floor slabs on earth shall be placed over a well compacted subgrade. Roll or tamp fill until thoroughly compacted to 95 percent standard proctor. Over fill, lay moisture/vapor barrier polyethylene film, lap joints 6" and seal with tape or mastic. Film shall be fabricated into as large sheets as possible. Turn film up on walls approximately 3". Stretch and weight edges and laps to maintain their positions until concrete is placed. Do not displace the film. Immediately place

concrete of required thickness and strike off at proper level to receive finishes specified.

3.8 EXPANSION JOINTS

3.8.1 Form expansion joints as indicated and keep free of all foreign materials. Maintain clear widths shown between adjoining concrete and masonry surfaces.

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SECTION 03 6200

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DIVISION 03 – CONCRETE

SECTION 03 6200

NON-SHRINK GROUTING

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.5 R	Guide for Submittal of Concrete Proportions
ACI 214 R	Guide to Evaluation of Strength Test Results of Concrete
ACI 311.4 R	Guide for Concrete Inspection
ACI MCP SET	Manual of Concrete Practice

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33/C 33M	Standard Specification for Concrete Aggregates
ASTM C 150/C 150M	Standard Specification for Portland Cement
ASTM C 595	Standard Specification for Blended Hydraulic Cements
ASTM C 1107/C 1107M	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

CORPS OF ENGINEERS (COE)

COE CRD C 400

Requirements for Water for Use in Mixing or Curing
Concrete

1.2 SUBMITTALS

The following submittals are required:

1.2.1 Manufacturer's literature shall be submitted which demonstrates compliance with the applicable specifications.

1.2.2 Gradation laboratory reports.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Portland Cement

Provide Portland cement grout conforming to ASTM C 150/C 150M for Cement, Type I or ASTM C 595 Type IL (10).

2.1.2 Aggregates

Submit samples reports conforming to ASTM C 33/C 33M for aggregates and the gradation as directed.

2.1.3 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali, except that unpotable water may be used if it meets the requirements of COE CRD C 400.

PART 3 EXECUTION

3.1 PREPARATION

Prepare cavities for grouting by cleaning away foreign matter, laitance, dirt, grease, or oil. Clean all contact surfaces of concrete and masonry no less than 24 hours before grout application.

3.1.1 Mixing

3.1.1.1 Mix grout ingredients for both cementitious grout and epoxy grout in accordance with the manufacturer's written mixing instructions and recommendations.

3.1.1.2 Mix grout materials in proper mechanical mixers.

3.1.1.3 Mix grout as close to the work area as possible.

3.2 APPLICATION

3.2.1 Placing Grout

Place grout in accordance with the manufacturer's written installation instructions and recommendations. Do not use grout that has begun to set or if more than one (1) hour has elapsed after initial mixing.

3.3 FIELD QUALITY CONTROL

Provide testing and submit test reports in accordance with ASTM C 1107/C 1107M for the expansive grout to meet the following performance requirements:

Compressive Strength: 5,000 psi

3.4 PROTECTION

Protect freshly placed grout from premature drying and excessive cold or hot temperatures. Comply with manufacturer's written requirements for cold-weather and hot-weather protection during curing.

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SECTION 05 5000

METAL FABRICATIONS

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3.3 SHOP PAINTING

3.4 GENERAL INSTALLATION REQUIREMENTS

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DIVISION 05 – METAL FABRICATIONS

SECTION 05 5000

METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 / A 36M	Carbon Structural Steel
ASTM A 123 / A 123M	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 193	Standard Specification for Stainless Steel Bolting Materials
ASTM A 240	Standard Specification for Stainless Steel Plates

AMERICAN WELDING SOCIETY (AWS)

AWS D 1.1 / D 1.1M	Structural Welding Code – Steel
AWS D 1.6 / D 1.6M	Structural Steel Welding Code – Stainless Steel

1.2 SUBMITTALS

The CONTRACTOR shall submit product data that demonstrate that the required material is provided and shall submit manufacturer's recommended installation instructions.

1.3 GENERAL REQUIREMENTS

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 D 1.1 / D 1.1M. Items specified to be galvanized shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123 / A 123M. 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. Structural steel shall comply with ASTM A 36 / A 36M.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 WORKMANSHIP

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. 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.

3.2 ANCHORAGE

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.

3.3 SHOP PAINTING

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.

3.4 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations.

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SECTION 09 9000

PAINTING AND COATING, GENERAL

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- 3.4 SURFACES TO BE PAINTED
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DIVISION 09 – FINISHES

SECTION 09 9000

PAINTING AND COATING, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publication listed below forms a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-SP3

Power Tool Cleaning

1.2 SUBMITTALS

The following submittals are required:

1.2.1 Manufacturer's product data for each type of paint that demonstrates compliance with the contract requirements.

1.2.2 Manufacturer's recommendations for surface preparation, application, and for clean-up for each type of paint.

1.3 GENERAL REQUIREMENTS

Surface preparation and high-performance coatings application to substrates encountered in water/wastewater treatment facilities as noted on the drawings and as specified herein. The CONTRACTOR shall furnish all labor, material, and equipment required to complete the project in a manner satisfactory to the Engineer.

PART 2 PRODUCTS

2.1 PAINT

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat.

2.1.1 Exterior Metal

- 2.1.1.1 Items to Receive Paint: All mild steel, see Section 05 5000 for air piping coating requirements.
- 2.1.1.2 Surface Preparation: Shall meet SSCP-SP3 Power Tool Cleaning.
- 2.1.1.3 Surface Profile: 1.5 to 2.5 mils.
- 2.1.1.4 Primer: PermaClean II Epoxy Primer as manufactured by Induron Protective Coatings, or approved equal, applied to achieve 3.0 to 5.0 dry mils. Color shall be Tan.
- 2.1.1.5 Second Coat: PermaClean II Epoxy as manufactured by Induron Protective Coatings, or approved equal, applied to achieve 2.0 to 4.0 dry mils. Color shall be Hi Vis Yellow 0350.
- 2.1.1.6 Total System Minimum DFT: 5.0 mils.

2.2 DELIVERY, STORAGE, AND HANDLING

- 2.2.1 Material shall be delivered to the site in original containers with labels intact and seals unbroken. Labels should provide the following information: material name, coating manufacturer, color name and number, batch or lot number, date of manufacture, mixing, and thinning instructions.
- 2.2.2 All coatings shall be stored in an enclosed structure to protect them from weather and excessive heat or cold. Flammable coatings must be stored to conform to City, County, State, and Federal safety codes for flammable coatings or paint materials. At all times coatings shall be protected from freezing.
- 2.2.3 All empty containers shall be disposed of in accordance with local, state, and federal regulations.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted, which are in contact with, adjacent to or near painted surfaces, shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

Surfaces to be painted shall be prepared in accordance with the paint manufacturer's recommendations.

3.3 APPLICATION

Paint shall be applied in accordance with paint manufacturer's recommendations.

3.4 SURFACES TO BE PAINTED

All mild steel, see Section 05 5000 for coating requirements.

3.5 CLEANING

Debris that may constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, paint and other deposits on adjacent surfaces shall be removed and the entire job left in a neat and clean condition.

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DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13 3419

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DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13 3419

PREENGINEERED METAL BUILDING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Scope of Work

The work required by this Section consists of furnishing all labor, materials, and equipment necessary for the design, fabrication, delivery, and erection of metal buildings of the style and dimensions as shown on the drawings and in accordance with the specifications. The work required by this section also includes all labor, materials, and equipment necessary for the design and construction of the metal building foundation including excavation and backfill.

1.1.2 Related Work

The related work shall include all labor, materials, and equipment necessary to construct the site piping, electrical work, and all other related work as shown on the drawings and as required by the specifications.

1.1.3 Description of Buildings

1.1.3.1 Building Dimensions

Building dimensions shall be as standard with manufacturer, not less than those indicated, but exceeding the indicated dimensions only by the amount of the closest standard size thereto. Eave height shall be measured from the top of finished floor to intersection of insides of roof and sidewall sheets. The clear height between finished floor and bottom of roof steel shall be as indicated.

1.1.3.2 Framing

The buildings to be provided shall have vertical walls and a single-slope roof. The buildings shall be a single-span structure with one of the following framing systems: self-framing, column with single-span or continuous trusses, continuous beam frames, column with rigid frames, or rigid frame type, similar to AISC 335, Type I construction. End walls shall be beam and column design. Roof slope shall be as shown on the drawings. Design framed openings structurally.

1.1.3.3 Foundation

- a. The concrete foundation shall be designed by the contractor.
- b. Concrete shall comply with the following sections:

SECTION 03100 CONCRETE FORMWORK
SECTION 03200 CONCRETE REINFORCEMENT
SECTION 03300 CONCRETE
- c. A safety factor of 1.5 for overturning, sliding and uplift shall be used.
- d. The foundation loads shall be supplied by the building manufacturer.

1.2 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALLUMINUM ASSOCATION (AA)

AA ADM	Aluminum Structures, Construction Manual Series Section 1

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC FCD	Quality Certification Program

AISC 335	Structural Steel Buildings Allowable Stress Design and Plastic Design

AISC 348	Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 446	Steel Sheet, Zinc-Coated (Galvanized) By the Hot-Dip Process for Storm Sewer and Drainage Pipe

Surface Burning Characteristics of Building Materials

Structural Welding Code – Steel

MBMA Low Rise Manual Low Rise Metal Building
Systems Manual

Motor-Operated Appliances

Uplift Resistance of Roof Assemblies

1.5 DESIGN REQUIREMENTS

MBMA Low Rise Manual, for loading combinations and definitions with the exceptions of wind load and special collateral loads. Design for each material shall be as specified by the Design Authority as listed in MBMA Low Rise Manual.

1.5.1 Roof Dead, Live and Snow Loads

Live loads shall be based on 20 psf as applied according to MBMA Low Rise Manual criteria. No tributary load reduction will be allowed.

1.5.2 Wind Loads

Wind loads shall be based on 125 mph in accordance with MBMA Low Rise Manual criteria.

1.5.3 Collateral Load

Collateral load will be based on 5 psf.

1.5.4 Seismic Loads

Procedures for determining and applying seismic forces shall be in accordance with the 2018 IBC.

1.5.5 Deflection

1.5.5.1 Structural Members

The maximum deflection of main framing members shall not exceed $1/240^{\text{th}}$ of their respective spans. The maximum deflection due to live load in roof panels and purlins shall not exceed $1/180^{\text{th}}$ of their respective spans.

1.5.5.2 Roof Panels

The roof panels shall be “PBR” profile, UL 580, Class 90. The design analysis shall establish that the roof when deflected under dead plus live or snow loads, will not result in a negative gradient. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition, the roof decking shall be designed for 300-pounds.

Panels thinner than 0.03 inches are not permitted for diaphragms used to resist seismic loads in Seismic Zones 2 through 4.

1.5.5.3 Wall Panels

The wall panels shall be “PBR” profile. The maximum deflection due to wind on wall panels and girts shall be limited to 1/120th of their respective spans except that when interior finishes are used the maximum allowable deflection shall be limited to 1/180th of their respective spans.

1.5.5.4 Openings

Limit deflections of steel framing above and along the side of door openings to ensure proper operation. Frame all equipment openings over 12 by 12 inches.

1.6 DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle manufactured items so that materials remain dry and undamaged. Do not store material in contact with materials that may cause staining.

1.7 WARRANTY

In addition to the warranty required by the General Conditions of the contract, the CONTRACTOR shall furnish the OWNER the manufacturer’s standard Certificate of Warranty which will warranty to the Owner the integrity of the building against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of no less than 20 years.

PART 2 PRODUCTS

2.1 WALL AND ROOF PANELS

Roof panel material shall be 26-gauge galvalume as manufactured by National Steel Corporation, conforming to the requirements of ASTM A 446 Grade E. Minimum yield stress shall be 80,000 psi for Grade E. Wall panel material shall have “Siliconized Polyester.”

2.2 INSULATION

Fiberglass insulation facing shall be laminated on one side of the facing with polypropylene/fiberglass scrim reinforcement/0.00035” aluminum foil/6” fiberglass insulation. The insulation shall have the following properties:

Fire Hazard Classification	ASTM E84/UL-73
Water Vapor Transmission	0.02 PERMS
Cold Weather Workability to	20 degrees F
Mullen Bursting Strength	100 psi

PART 3 EXECUTION

3.1 ERECTION

Erect in accordance with the manufacturer's approved erection instructions and diagrams. Correct defects and errors in the fabrication of building components in a manner approved by the Engineer. If defects or errors in fabrication of components cannot be corrected, remove, and provide non-defective components. When installing wall and roof systems, install closure strips, flashing, sealing material, and other accessories in accordance with building manufacturer's instructions to provide a weathertight system, free of abrasions, loose fasteners, and deformations. After erection is complete, repair and coat abraded and damaged, primed or factory-finished surfaces to match adjacent surfaces.

3.1.1 Dissimilar Metals

Prevent direct contact between aluminum surfaces, and ferrous or other incompatible metals, by one of the following methods:

- a. Paint the incompatible metal with a coating of manufacturer's standard heavy-bodied paint.
- b. Paint the incompatible metal with a prime coat of corrosion inhibitive primer followed by two coats of aluminum metal-and-masonry paint, or other suitable protective coating, excluding products containing lead and chromium pigmentation.
- c. Provide an approved non-absorptive gasket.
- d. Apply an approved caulking between the aluminum and the incompatible metal.

If drainage from incompatible metal passes over aluminum, paint the incompatible metal by method (a) or (b). Paint aluminum surfaces in contact with concrete by method (a).

3.1.2 Rigid Frames, Bases and Sill Members

Brace frames as necessary to ensure safety. Set accurately, using a non-shrink grout to obtain uniform bearing on the concrete and to maintain a level base line elevation. Clean surfaces to receive the mortar and thoroughly moisten immediately before placement of mortar. Water cure exposed surfaces of mortar with wet burlap for 7 days. End walls shall be of the non-expandable rigid frame design.

3.1.2.1 Field Welding

Field welding of steel shall be performed in accordance with AWS D1.1. Field welding of aluminum shall be performed in accordance with AA ADM.

3.1.2.2 Field Bolting

Field bolting shall be performed in accordance with AISC 348.

3.1.3 Wall Construction

Apply panels full water heights from base to eave with no horizontal joints except at the junctions of door frames, window frames and similar locations. Lay side laps away from the prevailing winds. Seal side and end laps with the joint sealing material recommended by the manufacturer. Flash or seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Flashing will not be required where approved "self-flashing" panels are used. Minimum end laps for all types of panels shall be 2-1/2 inches. Minimum side laps for all types of panels shall be one corrugation, one configuration or an interlocking joint.

3.1.4 Roof Construction

Apply the roofing panels in the longest lengths obtainable with end laps occurring only at structural members with no transverse joints except at the junction of ventilators, curbs, light transmitting roof panels and similar openings. Lay side laps away from the prevailing wind, and seal side and end laps with joint sealing material. Flash and seal the roof at eaves and rakes, at projections through the roof, and elsewhere as necessary. Minimum side lap shall be one corrugation, configuration, or interlocking rib except 1-1/2 corrugations for standard corrugated sheets. End laps shall not be less than 6 inches and shall occur only over purlins.

3.1.5 Minimum Fastener Spacing

Space fasteners according to manufacturer's instructions, but not to exceed:

- a. 8 inches on center (o.c.) at end laps of covering.
- b. 12 inches o.c. at connection of covering to intermediate supports.
- c. 12 inches o.c. side laps of roof coverings, 18 inches o.c. at side laps of wall.

3.1.6 Installation of Insulation

3.1.6.1 Roof Insulation

Install over purlins before roof coverings are applied. Hold insulation rigid until secured in place. Insulation facing shall be exposed on the interior side of the building. Fold and staple facing tabs of insulation on 6-inch centers, from exterior side of building to completely seal joints. If folding and stapling can only be accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets and cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from purlin to purlin and in accordance with the metal building manufacturer's recommendations.

3.1.6.2 Wall Insulation

Install over girts before wall covering are applied. Hold insulation rigid until secured in place. Expose facing toward the interior side of the building. Fold and staple facing tabs of insulation on 6-inch centers, from exterior side of building, to completely seal joints. If folding and stapling can only be accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets and cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from girt to girt and in accordance with the metal building manufacturer's recommendations.

3.2 FIELD PAINTING

Immediately upon detection, abraded or corroded areas on shop painted surfaces shall be cleaned and painted in accordance with SECTION 09900 PAINTING AND COATING, GENERAL with the same color and material used for the shop coat.

- End of Section -

SECTION 25 31 00

PROCESS INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section shall include configuring software, hardware integration with field installation, commissioning, instrumentation calibration, wiring, warranty, training, and technical field services as needed.
- B. These specifications cover the intended function of the equipment, but do not necessarily cover all details necessary for a complete, operable and functional system. The CONTRACTOR shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduits
- C. Section 26 05 19 - Wires and Cables
- D. Section 26 05 35 - Junction Boxes
- E. Section 26 05 29 - Supporting Devices
- F. Section 26 05 26 - Grounding
- G. Section 25 31 01 - Control System Integration
- H. Section 25 31 02 - SCADA System
- I. Section 25 31 03 - Influent Pump Station Control Panel
- J. Section 25 31 04 - Effluent Pump Station Control Panel

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- C. The specific item proposed and its area of application shall be marked on the catalog cuts.
- D. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the ENGINEER, for their review, submittal documents in accordance with Section 26 05 00. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and

documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the CONTRACTOR shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
 2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operational Description shall include the principal functions/capabilities of the PLC's and remote terminal units as provided and configured /programmed. Included shall be a description of system communications.
 4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
- E. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.
- F. Operations and Maintenance Data: At a minimum, include the following information in accordance with Section 26 05 00.
1. Operating and Calibration instructions.
 2. Troubleshooting Information.
 3. Wiring Diagrams with wire numbers and termination point.

1.04 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of all control panels, instrumentation, SCADA RTUs, and SCADA Antenna. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets.
- B. Operation and Maintenance Data: Submit bound copies of operating and programming instructions, and include card replacement, adjustments, and preventive maintenance

procedures and materials.

1.05 QUALIFICATIONS

- A. All control systems equipment shall be furnished and installed by the CONTRACTOR. The CONTRACTOR shall provide and be responsible for the proper operation of all SCADA System and required Controls. The CONTRACTOR is responsible for the installation of indicated instruments.
- B. The CONTRACTOR shall be responsible for all coordination necessary in order to furnish, to supervise installation and connections, to calibrate, and to place into operation the SCADA antenna, control instrumentation and controls along with all other equipment and accessories as specified.
- C. Guarantee on the control system function and equipment shall be one (1) year from date of final acceptance by the OWNER. The CONTRACTOR shall promptly replace, without additional cost to the OWNER, any part of this process and control installation which is found to be defective within said period of one year, ordinary wear and tear and lighting damage excepted.

1.06 GENERAL REQUIREMENTS

- A. All control wires shall be stranded copper Type THHN or MTW respectively, except where indicated on the Drawings. All 4-20 ma signal control wire shall be #18 shielded TC cable or as shown on the Drawings.
- B. All materials, equipment, and devices shall meet the requirements of UL where UL standards are established for those items and the requirements of NFPA-70.
- C. All electrical components of the system shall operate on 120 VAC, 60 Hz, single phase power source except as otherwise noted. Any other devices necessary to obtain proper operation of the instrumentation and control system from these energy sources shall be furnished with the system.
- D. Instrumentation equipment and enclosures shall be suitable for the environmental conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines and electrical equipment.
- E. All work and materials shall comply with the National Electrical code and applicable local regulations and ordinances. Where required by applicable codes, panel assemblies, materials and equipment shall be approved, identified, labeled or listed by Underwriters' Laboratories or other testing organization acceptable to the governing authority.
- F. All instrumentation shall meet or exceed I.S.A. Standards and Recommended Practices, ANSI OSHA and any other applicable code.

1.07 INTERFACE WITH OTHER PRODUCTS AND EQUIPMENT

- A. Provide all required cables, cords, and connective devices for interface with other control system components.
- B. Coordinate size and configuration of enclosure to meet project requirements.

1.08 MAINTENANCE

- A. The control system supplier shall maintain on call qualified field service electricians and electronic technicians to assist with system maintenance.
- B. In the event emergency repairs is required on the control system. The control system supplier shall have a qualified technician trained on the system and on the OWNER'S premises within a maximum of 24 hours.

PART 2 - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION:

- A. Provide all required hardware, software, programming, and commissioning services.
- B. Installation shall be in accordance with the NEC, and as shown on the drawings.
- C. Installation of instruments as shown on the drawings.

3.02 TRAINING

- A. Train Owner's maintenance personnel to adjust, operate, and maintain control devices.
- B. Train Owner's maintenance personnel on procedures and schedules for maintaining control devices.
- C. Review data in Operations & Maintenance Manuals.
- D. Schedule training with Owner, through Engineer, with at least (7) days' advance notice.

END OF SECTION

SECTION 25 31 01

CONTROL SYSTEM INTEGRATION

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the control equipment and system integrations for the Work as shown on the Drawings and as Specified in the Project Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 19 - Wires and Cables
- C. Section 26 05 26 - Grounding
- D. Section 25 31 00 - Process Instrumentation and Controls
- E. Section 25 31 02 - SCADA System
- F. Section 25 31 03 - Influent Pump Station Control Panel
- G. Section 25 31 04 - Effluent Pump Station Control Panel

1.03 RELATED DOCUMENTS

- A. Other Specifications Sections not specifically mentioned apply to this Section.

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the ENGINEER, for review, submittal documents in accordance with Section 26 05 00. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the CONTRACTOR shall submit the following materials:
 - 1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.

2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operational Description shall include the principal functions/capabilities of the PLC's as provided and configured /programmed. Included shall be a description of system communications.
 4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
 5. Training Material
- C. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with the Specifications.
- D. Operations and Maintenance Data: At a minimum, include the following information in accordance with Section 26 05 00.
1. Operating and Calibration instructions.
 2. Troubleshooting Information.
 3. Wiring Diagrams with wire numbers and termination point.

1.04 COORDINATION

- A. All programming and wire termination in the System Integrator's equipment shall be performed by a systems integrator.
- B. Equipment Installation: by General Contractor and Electrical Contractor.

1.05 QUALITY ASSURANCE

- A. The CONTRACTOR'S attention is directed to the fact that all specified instruments and controls must form a completely integrated system and, as such, the System Integrator shall become familiar with requirements necessary to provide equipment specified for the system regardless of manufacture, and shall be responsible to the CONTRACTOR for the complete and satisfactory operation of the entire plant instrumentation and control system.
- B. CONTRACTOR shall use a Systems Integrator that has a least 5 years experience in installation and programming similar size projects. System Integrator shall be responsible for all final terminations from the control panel and instruments to the control termination points. Electrical Contractor shall pull all wires to this point, label

each wire, and provide this list to the System Integrator.

C. All components shall be from the same manufacturer and supplied by a single source, the system integrator.

D. Individual Responsibilities

1. System Integrator

a. The System Integrator shall have the authority to organize the data layout within each individual device used in the user interface system. This said data layout will be based on the device provider's listing of available data points for monitor and control. The System Integrator will dictate the data used and the layout needed to facilitate the most efficient system possible. This efficient system methodology will be to minimize the number of queries needed to retrieve the necessary information. The System Integrator may also require the separation of status and control registers to more easily facilitate expansion and/or changes to the data structure. The System Integrator does not have the authority to change the program algorithm for the subsystem device. The actual functionality of the system is under direct control of the ENGINEER and the pertinent specifications. The System Integrator is responsible for contacting each device provider and attaining the listing of data available and then communicating with the provider the proper organization of data in the system.

2. Device Providers

a. Device providers must generate a listing of all pertinent data available for monitor and control within the user interface system. It is the device provider's responsibility to be in contact with the System Integrator to ensure proper operation within the integrators scope of work. The device provider has direct control over the program algorithm for the portion of the system the said device is specified.

1.06 APPLICABLE PUBLICATIONS:

A. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this Specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.

1. National Fire Protection Association (NFPA) Publication:
No. 70.....National Electrical Code (NEC)

2. National Electrical Manufacturers Association (NEMA) Publications:

No. ICS-1 General Standards for Industrial Control and Systems

No. ICS-2 Industrial Control Devices, Controllers and Assemblies

No. ICS-4 Terminal Blocks for Industrial Control Equipment and
Systems

No. ICS-6 Enclosures for Industrial Control and Systems

3. Underwriters Laboratories, Inc. (UL) Publications:

UL 50 Cabinets and Enclosures For Electrical Equipment

UL 508 Safety Standard For Industrial Control Equipment

PART 2 - PRODUCTS

2.01 GENERAL

- A. Control Panels, Equipment, Instruments and Meters furnished by the CONTRACTOR

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this Section and other Sections that will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

END OF SECTION

SECTION 25 31 02

SCADA SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. SCADA System for transmission of data between the Waste Water Treatment Plant Central Terminal Unit (CTU) and Remote Terminal Units (RTU's). The Plant SCADA System shall communicate with the existing Owner's Network. The SCADA System shall include all equipment, devices, wiring, and incidental materials to operate the system and display or relay information in accordance with these specifications. The intention of this Section is to secure a complete SCADA System that will operate and monitor equipment in accordance with narratives and requirements indicated in the plans, these specifications, and manufacturer's literature for the equipment installed. All circuits and devices for protection of installed equipment shall be included in the price bid.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduits
- C. Section 26 05 19 - Wire and Cables
- D. Section 26 05 35 - Junction Boxes
- E. Section 26 05 29 - Supporting Devices
- F. Section 26 05 26 - Grounding
- G. Section 25 31 00 - Process Instrumentation and Controls
- H. Section 25 31 02 - Control System Integration
- I. Section 27 13 43 - Communications Services Cabling

1.03 SYSTEM DESCRIPTION

- A. System shall consist of a fiber optic backbone for communications between the Waste Water Treatment Plant CTU and all RTU's. In addition, local connections to control panels and Owner's network shall consist of Category 6 Ethernet cabling. Instrument cabling shall be including where applicable.
- B. Remote Terminal Units located at the following:
 1. Clarifiers (includes connections to Aerators and Clarifier Rakes).

2. Filters & Biolac System
3. UV Disinfection System.
4. Effluent Pump Statopm
5. Headworks (includes connections to Influent Pump Station, Fine Screen, and Coarse Screen).

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for SCADA System equipment.
 1. Include plans, elevations, sections, details, and attachments to other work.
 2. For coaxial cable, include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.
 3. Wiring diagrams.
 4. Design Calculations including line of sight and antenna requirements.
 5. Control Panel Drawings
- C. Equipment list.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: Submit bound copies of operating and programming instructions, and include card replacement, adjustments, and preventive maintenance procedures and materials.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 BASIS OF DESIGN

- A. Provide products to meet requirements, acceptable SCADA Integrators are:
 1. Dexter Fortson.

2.02 CENTRAL OFFICE

- A. The Central Office location shall consist of the following SCADA hardware, software, terminal devices, and accessories:
 1. Rack mounted HMI Server Computer shall be a Dell desktop computer with Dual

24"LCD monitors with minimum requirements:

- a. Dell Precision 7910XL, Xeon Processor, 64GB RAM, Dual 2TB SDD
- b. Windows® Office Professional 2021 w/ Window® 11 License
- c. CD-RW/DVD Combo
- d. 3 Year Basic Limited Warranty
- e. Microsoft antivirus protection
- f. Wireless Keyboard & Mouse
- g. Adobe Acrobat X Standard
- h. Rack mount Tripplite 1500VA UPS SMART 1500RM2U
- i. HP OfficeJet All-in-One inkjet Printer.

2. Wall Mount Rack Enclosure with the following:

- a. 12U rack spaces
- b. Lightning arrestor protection as required.
- c. Fiber Patch Panel with connector shelf, Black Box JPM427A-R2
- d. Networking Patch Panel, Black Box JPM624A with panel adapters
- e. 24 Port Ethernet Network Switch with integral Fiber Optic Media Converters.
- f. Voice Synthesized Dialer.

3. HMI SCADA software shall be provided. Installation integrator shall have an installed base of this platform of HMI applications. Once install is complete and tested integrator must provide a hard drive image with restore disk as part of deliverables. This should include a manual for hard drive restore process. The Software shall include the following:

- a. Backup / Imaging software installed on HMI Server to meet or exceed the following:
 - 1) A disk image file contains the exact, byte-by-byte copy of a hard drive, partition or logical disk and can be created with various compression levels on the fly without stopping Windows OS and therefore without interrupting your business.
 - 2) Drive image files can then be stored in a variety of places, including various removable media such as CD-R(W)/DVD and Cloud Storage.
 - 3) Restores the images on the original disks, on any other partitions or even on a hard drive's free space on the fly.
- b. Remote Alarm Software shall be installed on HMI server as listed above. Alarm notifications will be noted in each section as well as alarm method.
- c. All HMI Data logging will be logged to a database server for long term storage. The Database server shall be installed on the HMI server as listed above. Logged data points will be listed in each section. In addition to general logged data points the following shall be logged.
 - 1) Activity Log
- d. All SCADA, RTU and system component collateral shall be able to be viewed from within the HMI. This includes but is not limited to the

following:

- 1) Installation and configuration manuals (PDF)
- 2) RTU Drawings with component list (PDF)
- 3) System and network drawings (PDF)

e. Integrator shall provide and install interface to SCADA HMI Screens allow remote access via existing LCIDA SCADA Network.

f. Include the following SCADA Software:

- 1) Tag Database System (National Instruments Labview backbone)
- 2) Reports Generation Toolkit
- 3) Ethernet/IP Driver
- 4) OpenLink Protocol Driver
- 5) Alarm Notification System (Voice, Text, E-mail)
- 6) Compatible with existing LCIDA SCADA System.

B. Central Office shall include a Central Terminal Unit (CTU). The CTU shall be provided per paragraph 2.04 “REMOTE TERMINAL UNIT (RTU)”.

2.03 COMMUNICATIONS CABLING

A. Provide Fiber Optic Backbone for Plant SCADA Communications between RTU and SCADA Network Equipment. Provide Category 6 Ethernet Cable for Horizontal Cabling from CTU, Server, and SCADA Network Equipment. Refer to Specifications Section 27 13 43 - Communications Services Cabling.

2.04 REMOTE TERMINAL UNIT (RTU)

A. Each Remote Terminal Unit shall include but is not limited to the following specifications. Each RTU shall be interchangeable where the only difference is in program and enclosure type. All components shall be off the shelf products and non-proprietary. With exception of Ethernet radios, all components shall be available to be purchased locally within 250 miles of installation area:

1. Each RTU shall use a PLC controller. Allen-Bradley Compactlogix 1769-L33ER Processor (I/O Build 32DI, 8DO, 8AI, 4AO).
2. Each RTU shall include a Fiber Optic Media Converter and Ethernet CAT 6 Eight Port Switch.
3. Each RTU shall include a power supply and a UPS.
4. Each RTU shall include terminals.
5. Each RTU shall include Line Surge Protection and Line Filter.
6. Each of the RTU controller outputs shall be individually fused to protect controller's outputs.
7. Each wire shall be labeled with Brady label that correspond to number on associated drawing.
8. Each RTU shall be protected with main breaker and duplex receptacle.
9. Each RTU shall contain wire way with covers to protect internal wiring.
10. Each RTU shall include battery backup. A SPDT relay will be installed into each RTU such that each node's battery backup and power fail indicator can be tested remotely from HMI.

11. Each RTU Enclosure shall be as follows. Accepted manufacturers include, Hoffman, Hubbell, and Hammond enclosures will be accepted.
 - a. Enclosures that are located outside shall be of NEMA type 4X stainless steel.
 - b. Enclosures that are located inside shall be NEMA type 1.
 - c. Minimum enclosure dimensions shall be 36"H x 36"W x 12"D with 3-point latch and capable of wall or unistrut mounting.
 - d. Include Door Position Switch for Intrusion Alarm.

B. Remote Terminal Unit (RTU) I/O Schedules:

1. Electrical Power Distribution System
 - a. Alarm: Power Fail
 - b. Status: Generator Run Status
 - c. Status: ATS Position (Normal/Emergency)
2. All CTU's & RTU's
 - a. Alarm: Comm Fail
 - b. Alarm: Power Fail
 - c. Alarm: Intrusion Detection
3. Headworks System
 - a. Alarm: Influent Pump Station Control Panel Power Fail
 - b. Alarm: Influent Pump Station Control Panel Comm Fail
 - c. Alarm: Influent Pump Motor(s) Fail
 - d. Alarm: Fine Screen Motor(s) Fail
 - e. Alarm: Coarse Screen Motor(s) Fail
 - f. Status: Influent Pump Motor(s) Running
 - g. Status: Influent Pump(s) H-O-A Selector Switch Position
 - h. Status: Fine Screen Motor(s) Running
 - i. Status: Coarse Screen Motor(s) Running
 - j. Status: Coarse Screen Motor(s) H-O-A Selector Switch Position
 - k. Status: Influent Pump Station Flow Meter.
 - l. Analog Out: IPS Flow Meter signal to Soda Ash Control Panel.
4. Aerators
 - a. Alarm: Aerator Control Panel Power Fail
 - b. Alarm: Aerator Control Comm Fail
 - c. Alarm: Aerator Motor(s) Fail
 - d. Status: Aerator Motor(s) Running
 - e. Status: Aerator Motor(s) H-O-A Selector Switch Position
5. Clarifiers
 - a. Alarms: Rake Drive Motor(s) Fail
 - b. Alarms: Scum Pump Motor(s) Fail
 - c. Status: Rake Drive Motor(s) Running
 - d. Status: Rake Drive Motor(s) H-O-A Selector Switch Position
 - e. Status: Scum Pump Motor(s) Running
 - f. Status: Scum Pump Motor(s) H-O-A Selector Switch Position

6. Filters & Blowers

- a. Alarm: Filter Control Panel(s) Power Fail
- b. Alarm: Filter Control Panel(s) Comm Fail
- c. Alarm: Biolac Control Panel Power Fail
- d. Alarm: Biolac Control Panel Comm Fail
- e. Alarm: Blower Motor(s) Fail
- f. Status: Blower Motor(s) Running
- g. Status: Blower(s) H-O-A Selector Switch Position

7. UV Disinfection

- a. Alarms: SCC, PDC #1A, PDC #1B, PDC #1C & HSC Power Fail
- b. Alarm: SCC Comm Fail
- c. Alarm: No Flow
- d. Status: PDC #1A, PDC #1B and PDC #1C ON/OFF
- e. Status: Parshall Flume Flow from SCC
- f. Status: Level Sensor Alarm

8. Effluent Pump Station

- a. Alarm: Effluent Pump Station Control Panel Power Fail
- b. Alarm: Effluent Pump Station Control Panel Comm Fail
- c. Alarm: Effluent Pump Motor(s) Fail
- d. Status: Influent Pump Motor(s) Running
- e. Status: Influent Pump(s) H-O-A Selector Switch Position

PART 3- EXECUTION

3.01 INSTALLATION

- A. Install surge suppressors.

3.02 GENERAL WIRING

- A. Wiring Method: Install cables in raceways except as otherwise indicated.
- B. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- C. Grounding: According to recommendations in IEEE 142 and IEEE 1100.

3.03 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Section 26 05 53 "Identification of Electrical Systems".

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

connections, and to assist in field testing. Report results in writing.

- B. Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
- C. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
- D. Train Owner Representatives in operation and maintenance of SCADA System. Include a minimum of 16 hours of instruction.

END OF SECTION

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SECTION 25 31 03

INFLUENT PUMP STATION CONTROL PANEL

PART 1 - GENERAL

1.01 SCOPE

- A. The work covered under this section of the specifications includes the furnishing and installation of a complete pump station electrical control system as hereinafter described and all necessary appurtenances to provide a complete control system for this installation.
- B. The pump station control panel shall be factory assembled, wired and tested and covered by complete electrical drawings and instructions.
- C. The pump control panel and control system described hereafter shall be supplied by the pump supplier to provide single source responsibility for complete functioning system.
- D. The CONTRACTOR shall include in the bid all cost for factory-trained service personnel to adjust all the equipment until the system has been completely accepted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 06 - Grounding
- C. Section 26 05 29 - Supporting Devices
- D. Section 26 05 33 – Conduits
- E. Section 25 31 02 - SCADA System

1.03 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.
 - 2. NEMA ICS 6 - Industrial Control and Systems: Enclosures.

1.04 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the ENGINEER, for their review, submittal documents in accordance with Section 26 05 00. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and

documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the CONTRACTOR shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
 2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operational Description shall include the principal functions/capabilities of the control systems as provided and configured /programmed. Included shall be a description of system communications.
 4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
- C. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.
- D. Operations and Maintenance Data: At a minimum, include the following information in accordance with Section 26 05 00.
1. Operating and Calibration instructions.
 2. Troubleshooting Information.
 3. Wiring Diagrams with wire numbers and termination point.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of control panels and input and output devices connected to control system. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets. Include copy of manufacturer's certified drawings.

- B. Operation and Maintenance Data: Submit bound copies of operating and programming instructions, and include card replacement, adjustments, and preventive maintenance procedures and materials.

1.06 QUALITY ASSURANCE

- A. All instrumentation and control systems equipment shall be furnished and installed by the CONTRACTOR. The CONTRACTOR shall provide and be responsible for the proper operation of the pumping station control system. The CONTRACTOR shall perform in house submittal drawings and assembly of products. Subcontracting submittal drawings and equipment assembly will not be permitted.
- B. The CONTRACTOR shall be responsible for all coordination necessary in order to furnish, to supervise installation and connections, to calibrate, and to place into operation all the controls along with all other equipment and accessories as specified.
- C. Guarantee on the control system function and equipment shall be one (1) year from date of final acceptance by the OWNER. The CONTRACTOR shall promptly replace, without additional cost to the OWNER, any part of this process and control installation which is found to be defective within said period of one year, ordinary wear and tear and lighting damage excepted.

1.07 GENERAL REQUIREMENTS

- A. All control wires shall be stranded copper Type THHN or MTW respectively, except where indicated on the Drawings. All 4-20 ma signal control wire shall be #16 shielded TC cable or as shown on the Drawings.
- B. All materials, equipment, and devices shall meet the requirements of UL where UL standards are established for those items and the requirements of NFPA-70.
- C. All electrical components of the system shall operate on 120 VAC, 60 Hz, single phase power source except as otherwise noted. Any other devices necessary to obtain proper operation of the instrumentation and control system from these energy sources shall be furnished with the system.
- D. Instrumentation equipment and enclosures shall be suitable for the environmental conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines and electrical equipment.
- E. All work and materials shall comply with the National Electrical Code and applicable local regulations and ordinances. Where required by applicable codes, panel assemblies, materials and equipment shall be approved, identified, labeled or listed by Underwriters' Laboratories or other testing organization acceptable to the governing authority.

- F. All instrumentation shall meet or exceed I.S.A. Standards and Recommended Practices, ANSI OSHA and any other applicable code.

1.08 INTERFACE WITH OTHER PRODUCTS AND EQUIPMENT

- A. Provide all required cables, cords, and connective devices for interface with other control system components.
- B. Coordinate size and configuration of enclosure to meet project requirements.

1.09 TRAINING

- A. A training program for the OWNER'S personnel shall be included. The training program shall instruct the owner's personnel in the operation and philosophy of the equipment so that they have a firm understanding of the configuration and operation of the system. The training program shall additionally instruct the OWNER's personnel in the use of the various maintenance aids and equipment available to isolate and correct each circuit malfunction in the minimum possible time.
- B. A minimum of four (4) hours training shall be provided on the pumping station control system operation and maintenance and shall be scheduled with the OWNER or OWNER'S representative.

1.09 CONTROL STRATEGY

- A. **FOR INFLUENT PUMP STATION**, pumps shall operate on a lead/lag/lag basis as controlled by the triplex pump controller. In the automatic mode, the triplex pump controller shall receive stop, start, and speed commands based upon the level in the pump station wet well as sensed by the submersible level transmitter.
- B. **FOR INFLUENT PUMP STATION**, a back-up float system shall be utilized in the event of submersible pressure transmitter failure for high and low level alarms.
- C. Pump(s) shall not be allowed to operate on high temperature and shall automatically switch to the other pump.
- D. Pump(s) shall alternate on pump failure and seal failure when a failure condition is detected, and the pumps are in the automatic mode. The failed pump shall become the lag pump on future cycles until the failure condition is corrected.
- E. Pumps shall automatically alternate and exercise uniformly. Each motor shall be able to be selected for Lead operation or fully automatic alternation on each call-for cycle.

- F. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure.
- G. Provide variable delays for Power-On, Pump Failure and Improper Sequence Pump Off delays. Field adjustable motor failure delays shall be provided in the range of five (5) seconds to eight (8) minutes. Upon motor failure, the remaining functional motor shall be made Lead until the failure is corrected and manually reset. The failed motor shall only be called to operate at the lag pump operating level. Individual, adjustable power-on delays shall also be supplied which delay pump start during initial startup or after a power failure. In the event that both motors are called for at the same time, there shall be a minimum of five (5) seconds between motor starts and stops.
- H. Level inputs shall be optically isolated and intrinsic safe. All setpoints shall be approved by the Project Engineer.

PART 2 - CONTROL PANEL SPECIFICATIONS

2.01 GENERAL

- A. The described equipment shall be housed in a NEMA 4X stainless steel enclosure, properly sized in accordance with manufacturer's recommendations. The enclosure shall be designed specifically for mounting in an unprotected outdoor location. The enclosure shall have a gasketed hinged, front weather door with locking capability and an internally mounted hinged deadfront panel so that all the components normally actuated by Operating Personnel are accessible without opening the dead front panel and yet are not exposed to the elements or to unauthorized personnel. The exterior door of the enclosure shall be provided with a lockable door operator with a three point latching system.
- B. The control panel shall be designed for the voltage available at each site as indicated on the drawings.
- C. Provide a properly sized Main Circuit Breaker. In addition, provide a deadfront operator mounted on the interior deadfront door. The operator shall prevent the deadfront door from being opened while the breaker is in the "ON" position. The main circuit breaker must have a minimum ampere interrupting capacity of 42,000 at symmetrical RMS amps. The main circuit breaker shall have a trip rating to allow full voltage starting and continuous operation of the motors. The circuit breaker shall be manufactured by Square-D or as accepted.
- D. Individual thermal magnetic circuit breakers or motor circuit protectors shall be supplied as branch circuit protection for each pump motor. The circuit breaker must have a minimum ampere interrupting capacity of 42,000 at symmetrical RMS amps. The circuit breakers or motor circuit protectors shall be provided with adjustable trip units.

The circuit breaker shall be operable through the operator's door of the enclosure and shall have a trip rating to allow full voltage starting and continuous operation of the motors. The circuit breaker shall be manufactured by Square-D, Eaton, or as accepted. The circuit breaker or motor circuit protector shall be provided with lockout-tag out provisions to allow the operator to padlock the circuit breaker or motor circuit protector in the OFF position.

- E. Provide properly sized Power Distribution Block(s) (PDB), as required for the control panel. Power distribution blocks shall be manufactured by Marathon, Square D, or as accepted.
- F. Provide a service entrance rated Type 2, AC power distribution Surge Protection Device designed to protect all types of loads fed from the distribution panels, branch panels and/or individual equipment panels. Units shall be UL listed and shall bear a UL label. Surge Protection Device shall be rated for 160kA per phase and 80kA per mode. Unit shall come complete with a properly rated sized circuit breaker for disconnect means.
- G. The control panel shall be supplied with a properly sized control power circuit breaker and fused control power transformer where necessary. The control power circuit breaker shall supply power to all control wiring within the enclosure.
- H. Independent voltage monitors shall be provided on the load side of the pump disconnects to monitor incoming voltage and provide protection to the motors. These monitors shall detect incoming service abnormalities including unbalance, reversal, over voltage, under-voltage and rapid cycling protection and provide automatic cutout of pumps and provide local alarm. Upon detection that incoming power has returned to normal, the unit will restore pump operation and discontinue alarm. This device shall have a nominal 2-4 second dropout delay and (2-300 second) adjustable restoration time delay. Phase monitor shall be protected by 1 amp, 240 volts fuses on the primary side.
- I. **FOR INFLUENT PUMP STATION**, the control panel shall be provided with variable frequency drive (VFD), for 3-phase starting for each pump motor. Each VFD shall be equipped with auxiliary contacts on the starter contactor and the overload relay for all required interlocking and "overload tripped" indication. Each VFD shall include an adjustable solid-state overload protection relay and an H-O-A selector switch. Each VFD and overload relay shall be properly sized for the motors furnished on this project.
- J. The control panel shall be provided with elapsed time meters for each pump motor.
- K. 120 VAC control power for each motor starter coil and H-O-A selector switch shall be provided.
- L. A control power circuit breaker shall be provided and operable through the inner dead front panel of the control panel to provide a disconnect means and short circuit protection for any 120 VAC (or less) devices not powered from motor starter circuits.

- M. The control panel shall have three position selector switches mounted on the interior dead front panel for Hand-Off-Auto operation of each pump. In the Hand position the motor shall be called to operate. In the Off mode the motor shall not be allowed to operate. In the Auto mode, the motor shall operate in response to control signals from the controller. Selector Switch(s) shall be of the maintained position type. The selector switch(s) shall be operator's door mounted, 30.5mm diameter, NEMA Type 4X furnished with industrial rated heavy duty NEMA Type 4X with modular contact block assemblies. Contact Blocks shall be stacking screw together type with parallel double break contacts with wiping action. Contact blocks shall be rated NEMA A600, 600 Volt, 10A continuous duty, 7200VA make, 720VA break AC. Contacts shall have compression type screw terminals with self lifting spring washers to insure that the wire remains secure even under severe vibration. Snap together contact blocks are not acceptable. Selector switches shall be Square D Series 9001, Siemens Class 52, or Allen-Bradley 800-H Line.
- N. Provide a single "Lamp Test" pushbutton with dual-input lights for all specified alarm conditions. Lamp test shall also test the external, top mounted, common alarm light. Door-mounted indicator lights shall be the LED type, NEMA 4X rated.
- O. **FOR INFLUENT PUMP STATION**, provide a triplex pump controller, to interface with wet well submersible transducer and high/low level floats to provide control of the pump station pumps. The triplex pump controller shall be a microprocessor based pump controller or shall consist of a level/meter controller and a separated triplex controller for monitoring and automatically controlling three submersible pumps in a pump down mode of operation in response to wet well fluid levels. The triplex pump controller shall allow an operator to control setpoints which shall be field adjustable throughout the complete signal range from the front of the controller. Setpoints shall be displayed on an LCD or digital readout at any time via keypad or pushbutton. The setpoints shall be field adjustable to operate on rising above or falling below the desired setpoint. The controller shall receive an analog signal from the wet well submersible pressure level transmitter. Back-up float switches shall be utilized in the event of a submersible pressure level transmitter failure and activate the common alarm light. The controller shall provide the following OFF-ON set point controls:
1. High Level Alarm (Rising Level)
 2. Lag Pump Start (Rising Level)
 3. Lag Pump Start (Rising Level)
 4. Lead Pump Start (Rising Level)
 5. Pump(s) Stop (Falling Level)
 6. Low Level Alarm (Falling Level)

The triplex pump controller shall additionally control the operation of the pumps. The controller shall be able to control the pumps via submersible transducer. The controller shall be provided with dry contact outputs for All-Stop, Lead Start and Lag/Lag Start

during normal operation. Each dry contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. In the automatic mode, the triplex pump controller shall provide stop, start, and speed commands based upon the fluid level in the station wetwell as sensed by a submersible transducer. Back-up float switches shall be utilized in the event of a submersible pressure level transmitter failure and activate the common alarm light. The triplex controller shall exercise the pumps uniformly. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure. The Triplex Pump Controller shall provide adjustable variable delays for Power-On, Motor Failure, Motor Start, and Short Cycle. Field adjustable motor failure delays shall be provided in the range of five (5) seconds to five (5) minutes. Adjustable power-on delay shall also be included for the pump during initial startup or after a power failure. The controller shall provide local display of each pump run status, each pump total run time, each pump average daily starts. The controller shall be provided with pump high temperature/seal failure controls. The controller shall disable/fail the affected pump when a high temperature or seal failure signal is received and provide local alarm. The controller shall disable the affected pump and automatically operate the non-affected pump. The controller shall include built-in Pump Failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed, and the next available pump based on the selected alternation sequence shall be requested to start. The controller shall contain all relays and electronic equipment required to interface with each pump motor thermal protection and seal failure switches. The controller shall also be furnished with all relays and electronic devices required to interface with the solid state motor overload relays, and motor contactor auxiliary switches. The duplex pump controller shall be constructed for industrial applications for use in harsh environments. Unit(s) shall have a Temperature Operating range of -40 to + 85 Deg C, and be able to operate in environments with 10-90% non condensing humidity. Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions and CE IEC61000 Surge Withstand certifications. The Triplex Pump Controller shall be a standard, catalogued product of a water and wastewater automation equipment manufacturer regularly engaged in the design and manufacture of such equipment for a period of at least fifteen (15) years.

- P. Provide ethernet port and connection to SCADA system. Coordinate all I/O requirements with the SCADA system supplier.
- Q. Provide an analog signal Line Filter for the pump controller. Line filter shall protect associated equipment from transient voltage surges and induced voltages.
- R. Provide and install all control relays to interface between control devices as required.
- S. Provide a single phase, in-line (series) 120 volt, single-phase, continuous power Surge Protection Device designed to protect all of the loads fed from the control power circuit. Device shall have protection modes and protection status indication of each mode when

power is present (L-N, L-G, N-G).

- R. Provide a condensation protective heater and adjustable high temperature cutout thermostwitch in the control panel. The heater shall operate at 120 VAC. The heater's surface area for heat dissipation shall be large enough to prevent a skin burn (if an operator's hand should inadvertently come in contact with the unit when energized). The heater shall be regulated by a humidistat located within the control panel enclosure.
- T. Provide a 120-volt, 15-amp, Weatherproof Duplex GFCI Receptacle mounted on the side of the enclosure for electrical hand tool use. Receptacle shall come complete with a weatherproof cover. Cover shall be UL listed for wet locations and shall be constructed of tough plastic that is resistant to high impact and sunlight. In addition, the cover shall be non-corrosive, non-conductive and protect against rain, snow and ice.
- U. Provide thermostatically controlled exhaust fans to properly ventilate the controller enclosure. Exhaust fans shall operate based on temperature setting. Exhaust fans shall be mounted near the top of the enclosure.
- V. Provide a weatherproof exterior common Alarm Light with red Lexan lens mounted on side of enclosure. The alarm light shall burn dim during normal conditions to indicate "Power On" and "Light Bulb Good" and shall flash brightly during any alarm condition.

PART 3 FIELD INSTRUMENTATION AND MODIFICATIONS

- 3.01 SUBMERSIBLE PRESSURE/LEVEL TRANSMITTER: Provide a solid-state direct submersible level sensor and transducer designed as pressure sensor for continuous, hydrostatic level measurement in open containers/basins. Transmitter shall have a high resistance to overload and aggressive media with a ceramic diaphragm and enclosed in 316L stainless steel housing. The range of the transmitter shall be as required for the desired application with excitation voltage of 10 - 35V DC. Instrument cable shall be commercially available shielded instrument cable with a minimum of forty-foot (40') cable length. The transmitter shall be capable of being supported by its own cable. The electronics shall be completely potted and provide an analog output to drive a level meter controller. The output shall be 4 - 20mA. The operating temperature shall be -20 to +70°C (-4 to +158°F) and the accuracy shall be $\pm 0.2\%$ full scale. Pressure overload rating shall be 40 times the adjusted span. Long term drift shall be $\pm 0.1\%$ full scale per year. The transmitter shall be mounted near the bottom of the vessel with support bracket and be cable connected. Transmitter shall have approvals by: ATEX, FM, and CSA.
- 3.02 JUNCTION BOX AND ANALOG SIGNAL LINE FILTER: Provide and install a properly sized NEMA 4 rated junction box, suited for outdoor/wet locations, complete with an analog signal Line Filter (LF), per Component Specifications, for the wetwell pressure/level transmitter. Junction shall have a 1/8" drain/breather hole installed in the bottom of the enclosure. Line filter shall protect associated equipment from transient voltage surges and induced voltages. Junction box shall be field installed by the

Contractor in close proximity of the submersible pressure level transmitter. The Contractor shall be responsible for properly sealing the conduits entering junction box.

- 3.03 FLOAT SWITCHES: Provide a float control system for the pumping station to operate the pumps in the event of a submersible pressure/level transmitter failure or standalone for Pump Station No. 5. Provide a High Level, Lead and Lag Start, and an All Stop back-up Float Switches mounted in wet well. Float switches shall be set at one foot (1') above (High) and below (Low) normal operating levels. Normal operating levels shall be set per Project Engineers direction. The float switch shall be a direct acting switch and contain a single pole mercury switch, which actuates when the longitudinal axis of the float is horizontal and deactuates when the liquid level falls 1" below the actuation elevation. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable shall be permanently connected to the enclosed mercury switch and the entire assembly shall be capsulated to form a completely watertight and impact resistance unit. Provide the following float switches and control points:
- A. High Level Alarm/All Run
 - E. Low Level Alarm/All Stop

PART 4 EXECUTION

4.01 CONTROL PANEL SERVICE AND TRAINING

- A. The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment.
- B. After the control panel has been installed, the Supplier shall demonstrate with performance of each unit, and document that the system operates properly as specified.
- C. The Supplier shall provide systems training for operations staff totaling no less than 4 hours, refer to Section 1.09 Training.
- D. All training shall be conducted at the job site. Travel expenses are the responsibility of the supplier.

4.02 GENERAL INSTALLATION

- A. Installation of instrumentation and controls shall be in strict compliance with the manufacturer's instructions. The location of these items as shown on the Contract Drawings are approximate only. Exact locations shall be as approved by the ENGINEER during construction. It is the duty of the CONTRACTOR to obtain in the

field all relevant information required for proper placement of instrumentation and controls. In the case of interference with other work, proceed as instructed by the ENGINEER and provide all materials and labor required to prevent construction delays.

- B. Execution of the installation shall be in full accordance with codes and local rulings. The CONTRACTOR shall be responsible for any expenses that are a result of work performed contrary to said codes and regulations.

END OF SECTION

SECTION 25 31 04

EFFLUENT PUMP STATION CONTROL PANEL

PART 1 - GENERAL

1.01 SCOPE

- A. The work covered under this section of the specifications includes the furnishing and installation of a complete pump station electrical control system as hereinafter described and all necessary appurtenances to provide a complete control system for this installation.
- B. The pump station control panel shall be factory assembled, wired and tested and covered by complete electrical drawings and instructions.
- C. The pump control panel and control system described hereafter shall be supplied by the pump supplier to provide single source responsibility for complete functioning system.
- D. The CONTRACTOR shall include in the bid all cost for factory-trained service personnel to adjust all the equipment until the system has been completely accepted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 06 - Grounding
- C. Section 26 05 29 - Supporting Devices
- D. Section 26 05 33 – Conduits
- E. Section 25 31 02 - SCADA System

1.03 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.
 - 2. NEMA ICS 6 - Industrial Control and Systems: Enclosures.

1.04 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the ENGINEER, for their review, submittal documents in accordance with Section 26 05 00. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and

documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the CONTRACTOR shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
 2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operational Description shall include the principal functions/capabilities of the control systems as provided and configured /programmed. Included shall be a description of system communications.
 4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
- C. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.
- D. Operations and Maintenance Data: At a minimum, include the following information in accordance with Section 26 05 00.
1. Operating and Calibration instructions.
 2. Troubleshooting Information.
 3. Wiring Diagrams with wire numbers and termination point.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of control panels and input and output devices connected to control system. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets. Include copy of manufacturer's certified drawings.

- B. Operation and Maintenance Data: Submit bound copies of operating and programming instructions, and include card replacement, adjustments, and preventive maintenance procedures and materials.

1.06 QUALITY ASSURANCE

- A. All instrumentation and control systems equipment shall be furnished and installed by the CONTRACTOR. The CONTRACTOR shall provide and be responsible for the proper operation of the pumping station control system. The CONTRACTOR shall perform in house submittal drawings and assembly of products. Subcontracting submittal drawings and equipment assembly will not be permitted.
- B. The CONTRACTOR shall be responsible for all coordination necessary in order to furnish, to supervise installation and connections, to calibrate, and to place into operation all the controls along with all other equipment and accessories as specified.
- C. Guarantee on the control system function and equipment shall be one (1) year from date of final acceptance by the OWNER. The CONTRACTOR shall promptly replace, without additional cost to the OWNER, any part of this process and control installation which is found to be defective within said period of one year, ordinary wear and tear and lighting damage excepted.

1.07 GENERAL REQUIREMENTS

- A. All control wires shall be stranded copper Type THHN or MTW respectively, except where indicated on the Drawings. All 4-20 ma signal control wire shall be #16 shielded TC cable or as shown on the Drawings.
- B. All materials, equipment, and devices shall meet the requirements of UL where UL standards are established for those items and the requirements of NFPA-70.
- C. All electrical components of the system shall operate on 120 VAC, 60 Hz, single phase power source except as otherwise noted. Any other devices necessary to obtain proper operation of the instrumentation and control system from these energy sources shall be furnished with the system.
- D. Instrumentation equipment and enclosures shall be suitable for the environmental conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines and electrical equipment.
- E. All work and materials shall comply with the National Electrical Code and applicable local regulations and ordinances. Where required by applicable codes, panel assemblies, materials and equipment shall be approved, identified, labeled or listed by Underwriters' Laboratories or other testing organization acceptable to the governing authority.

- F. All instrumentation shall meet or exceed I.S.A. Standards and Recommended Practices, ANSI OSHA and any other applicable code.

1.08 INTERFACE WITH OTHER PRODUCTS AND EQUIPMENT

- A. Provide all required cables, cords, and connective devices for interface with other control system components.
- B. Coordinate size and configuration of enclosure to meet project requirements.

1.09 TRAINING

- A. A training program for the OWNER'S personnel shall be included. The training program shall instruct the owner's personnel in the operation and philosophy of the equipment so that they have a firm understanding of the configuration and operation of the system. The training program shall additionally instruct the OWNER's personnel in the use of the various maintenance aids and equipment available to isolate and correct each circuit malfunction in the minimum possible time.
- B. A minimum of four (4) hours training shall be provided on the pumping station control system operation and maintenance and shall be scheduled with the OWNER or OWNER'S representative.

1.09 CONTROL STRATEGY

- A. **FOR EFFLUENT PUMP STATION**, pumps shall operate on a lead/lag/lag basis as controlled by the triplex pump controller. In the automatic mode, the triplex pump controller shall receive stop, start, and speed commands based upon the level in the pump station wet well as sensed by the submersible level transmitter.
- B. **FOR EFFLUENT PUMP STATION**, a back-up float system shall be utilized in the event of submersible pressure transmitter failure for high and low level alarms.
- C. Pump(s) shall not be allowed to operate on high temperature and shall automatically switch to the other pump.
- D. Pump(s) shall alternate on pump failure and seal failure when a failure condition is detected, and the pumps are in the automatic mode. The failed pump shall become the lag pump on future cycles until the failure condition is corrected.
- E. Pumps shall automatically alternate and exercise uniformly. Each motor shall be able to be selected for Lead operation or fully automatic alternation on each call-for cycle.

- F. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure.
- G. Provide variable delays for Power-On, Pump Failure and Improper Sequence Pump Off delays. Field adjustable motor failure delays shall be provided in the range of five (5) seconds to eight (8) minutes. Upon motor failure, the remaining functional motor shall be made Lead until the failure is corrected and manually reset. The failed motor shall only be called to operate at the lag pump operating level. Individual, adjustable power-on delays shall also be supplied which delay pump start during initial startup or after a power failure. In the event that both motors are called for at the same time, there shall be a minimum of five (5) seconds between motor starts and stops.
- H. Level inputs shall be optically isolated and intrinsic safe. All setpoints shall be approved by the Project Engineer.

PART 2 - CONTROL PANEL SPECIFICATIONS

2.01 GENERAL

- A. The described equipment shall be housed in a NEMA 4X stainless steel enclosure, properly sized in accordance with manufacturer's recommendations. The enclosure shall be designed specifically for mounting in an unprotected outdoor location. The enclosure shall have a gasketed hinged, front weather door with locking capability and an internally mounted hinged deadfront panel so that all the components normally actuated by Operating Personnel are accessible without opening the dead front panel and yet are not exposed to the elements or to unauthorized personnel. The exterior door of the enclosure shall be provided with a lockable door operator with a three point latching system.
- B. The control panel shall be designed for the voltage available at each site as indicated on the drawings.
- C. Provide a properly sized Main Circuit Breaker. In addition, provide a deadfront operator mounted on the interior deadfront door. The operator shall prevent the deadfront door from being opened while the breaker is in the "ON" position. The main circuit breaker must have a minimum ampere interrupting capacity of 42,000 at symmetrical RMS amps. The main circuit breaker shall have a trip rating to allow full voltage starting and continuous operation of the motors. The circuit breaker shall be manufactured by Square-D or as accepted.
- D. Individual thermal magnetic circuit breakers or motor circuit protectors shall be supplied as branch circuit protection for each pump motor. The circuit breaker must have a minimum ampere interrupting capacity of 42,000 at symmetrical RMS amps. The circuit breakers or motor circuit protectors shall be provided with adjustable trip units.

The circuit breaker shall be operable through the operator's door of the enclosure and shall have a trip rating to allow full voltage starting and continuous operation of the motors. The circuit breaker shall be manufactured by Square-D, Eaton, or as accepted. The circuit breaker or motor circuit protector shall be provided with lockout-tag out provisions to allow the operator to padlock the circuit breaker or motor circuit protector in the OFF position.

- E. Provide properly sized Power Distribution Block(s) (PDB), as required for the control panel. Power distribution blocks shall be manufactured by Marathon, Square D, or as accepted.
- F. Provide a service entrance rated Type 2, AC power distribution Surge Protection Device designed to protect all types of loads fed from the distribution panels, branch panels and/or individual equipment panels. Units shall be UL listed and shall bear a UL label. Surge Protection Device shall be rated for 160kA per phase and 80kA per mode. Unit shall come complete with a properly rated sized circuit breaker for disconnect means.
- G. The control panel shall be supplied with a properly sized control power circuit breaker and fused control power transformer where necessary. The control power circuit breaker shall supply power to all control wiring within the enclosure.
- H. Independent voltage monitors shall be provided on the load side of the pump disconnects to monitor incoming voltage and provide protection to the motors. These monitors shall detect incoming service abnormalities including unbalance, reversal, over voltage, under-voltage and rapid cycling protection and provide automatic cutout of pumps and provide local alarm. Upon detection that incoming power has returned to normal, the unit will restore pump operation and discontinue alarm. This device shall have a nominal 2-4 second dropout delay and (2-300 second) adjustable restoration time delay. Phase monitor shall be protected by 1 amp, 240 volts fuses on the primary side.
- I. **FOR EFFLUENT PUMP STATION**, the control panel shall be provided with variable frequency drive (VFD), for 3-phase starting for each pump motor. Each VFD shall be equipped with auxiliary contacts on the starter contactor and the overload relay for all required interlocking and "overload tripped" indication. Each VFD shall include an adjustable solid-state overload protection relay and an H-O-A selector switch. Each VFD and overload relay shall be properly sized for the motors furnished on this project.
- J. The control panel shall be provided with elapsed time meters for each pump motor.
- K. 120 VAC control power for each motor starter coil and H-O-A selector switch shall be provided.
- L. A control power circuit breaker shall be provided and operable through the inner dead front panel of the control panel to provide a disconnect means and short circuit protection for any 120 VAC (or less) devices not powered from motor starter circuits.

- M. The control panel shall have three position selector switches mounted on the interior dead front panel for Hand-Off-Auto operation of each pump. In the Hand position the motor shall be called to operate. In the Off mode the motor shall not be allowed to operate. In the Auto mode, the motor shall operate in response to control signals from the controller. Selector Switch(s) shall be of the maintained position type. The selector switch(s) shall be operator's door mounted, 30.5mm diameter, NEMA Type 4X furnished with industrial rated heavy duty NEMA Type 4X with modular contact block assemblies. Contact Blocks shall be stacking screw together type with parallel double break contacts with wiping action. Contact blocks shall be rated NEMA A600, 600 Volt, 10A continuous duty, 7200VA make, 720VA break AC. Contacts shall have compression type screw terminals with self lifting spring washers to insure that the wire remains secure even under severe vibration. Snap together contact blocks are not acceptable. Selector switches shall be Square D Series 9001, Siemens Class 52, or Allen-Bradley 800-H Line.
- N. Provide a single "Lamp Test" pushbutton with dual-input lights for all specified alarm conditions. Lamp test shall also test the external, top mounted, common alarm light. Door-mounted indicator lights shall be the LED type, NEMA 4X rated.
- O. **FOR EFFLUENT PUMP STATION**, provide a triplex pump controller, to interface with wet well submersible transducer and high/low level floats to provide control of the pump station pumps. The triplex pump controller shall be a microprocessor based pump controller or shall consist of a level/meter controller and a separated triplex controller for monitoring and automatically controlling three submersible pumps in a pump down mode of operation in response to wet well fluid levels. The triplex pump controller shall allow an operator to control setpoints which shall be field adjustable throughout the complete signal range from the front of the controller. Setpoints shall be displayed on an LCD or digital readout at any time via keypad or pushbutton. The setpoints shall be field adjustable to operate on rising above or falling below the desired setpoint. The controller shall receive an analog signal from the wet well submersible pressure level transmitter. Back-up float switches shall be utilized in the event of a submersible pressure level transmitter failure and activate the common alarm light. The controller shall provide the following OFF-ON set point controls:
1. High Level Alarm (Rising Level)
 2. Lag Pump Start (Rising Level)
 3. Lag Pump Start (Rising Level)
 4. Lead Pump Start (Rising Level)
 5. Pump(s) Stop (Falling Level)
 6. Low Level Alarm (Falling Level)

The triplex pump controller shall additionally control the operation of the pumps. The controller shall be able to control the pumps via submersible transducer. The controller shall be provided with dry contact outputs for All-Stop, Lead Start and Lag/Lag Start

during normal operation. Each dry contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. In the automatic mode, the triplex pump controller shall provide stop, start, and speed commands based upon the fluid level in the station wetwell as sensed by a submersible transducer. Back-up float switches shall be utilized in the event of a submersible pressure level transmitter failure and activate the common alarm light. The triplex controller shall exercise the pumps uniformly. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure. The Triplex Pump Controller shall provide adjustable variable delays for Power-On, Motor Failure, Motor Start, and Short Cycle. Field adjustable motor failure delays shall be provided in the range of five (5) seconds to five (5) minutes. Adjustable power-on delay shall also be included for the pump during initial startup or after a power failure. The controller shall provide local display of each pump run status, each pump total run time, each pump average daily starts. The controller shall be provided with pump high temperature/seal failure controls. The controller shall disable/fail the affected pump when a high temperature or seal failure signal is received and provide local alarm. The controller shall disable the affected pump and automatically operate the non-affected pump. The controller shall include built-in Pump Failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed, and the next available pump based on the selected alternation sequence shall be requested to start. The controller shall contain all relays and electronic equipment required to interface with each pump motor thermal protection and seal failure switches. The controller shall also be furnished with all relays and electronic devices required to interface with the solid state motor overload relays, and motor contactor auxiliary switches. The duplex pump controller shall be constructed for industrial applications for use in harsh environments. Unit(s) shall have a Temperature Operating range of -40 to + 85 Deg C, and be able to operate in environments with 10-90% non condensing humidity. Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions and CE IEC61000 Surge Withstand certifications. The Triplex Pump Controller shall be a standard, catalogued product of a water and wastewater automation equipment manufacturer regularly engaged in the design and manufacture of such equipment for a period of at least fifteen (15) years.

- P. Provide ethernet port and connection to SCADA system. Coordinate all I/O requirements with the SCADA system supplier.
- Q. Provide an analog signal Line Filter for the pump controller. Line filter shall protect associated equipment from transient voltage surges and induced voltages.
- R. Provide and install all control relays to interface between control devices as required.
- S. Provide a single phase, in-line (series) 120 volt, single-phase, continuous power Surge Protection Device designed to protect all of the loads fed from the control power circuit. Device shall have protection modes and protection status indication of each mode when

power is present (L-N, L-G, N-G).

- R. Provide a condensation protective heater and adjustable high temperature cutout thermostwitch in the control panel. The heater shall operate at 120 VAC. The heater's surface area for heat dissipation shall be large enough to prevent a skin burn (if an operator's hand should inadvertently come in contact with the unit when energized). The heater shall be regulated by a humidistat located within the control panel enclosure.
- T. Provide a 120-volt, 15-amp, Weatherproof Duplex GFCI Receptacle mounted on the side of the enclosure for electrical hand tool use. Receptacle shall come complete with a weatherproof cover. Cover shall be UL listed for wet locations and shall be constructed of tough plastic that is resistant to high impact and sunlight. In addition, the cover shall be non-corrosive, non-conductive and protect against rain, snow and ice.
- U. Provide thermostatically controlled exhaust fans to properly ventilate the controller enclosure. Exhaust fans shall operate based on temperature setting. Exhaust fans shall be mounted near the top of the enclosure.
- V. Provide a weatherproof exterior common Alarm Light with red Lexan lens mounted on side of enclosure. The alarm light shall burn dim during normal conditions to indicate "Power On" and "Light Bulb Good" and shall flash brightly during any alarm condition.

PART 3 FIELD INSTRUMENTATION AND MODIFICATIONS

- 3.01 SUBMERSIBLE PRESSURE/LEVEL TRANSMITTER: Provide a solid-state direct submersible level sensor and transducer designed as pressure sensor for continuous, hydrostatic level measurement in open containers/basins. Transmitter shall have a high resistance to overload and aggressive media with a ceramic diaphragm and enclosed in 316L stainless steel housing. The range of the transmitter shall be as required for the desired application with excitation voltage of 10 - 35V DC. Instrument cable shall be commercially available shielded instrument cable with a minimum of forty-foot (40') cable length. The transmitter shall be capable of being supported by its own cable. The electronics shall be completely potted and provide an analog output to drive a level meter controller. The output shall be 4 - 20mA. The operating temperature shall be -20 to +70°C (-4 to +158°F) and the accuracy shall be $\pm 0.2\%$ full scale. Pressure overload rating shall be 40 times the adjusted span. Long term drift shall be $\pm 0.1\%$ full scale per year. The transmitter shall be mounted near the bottom of the vessel with support bracket and be cable connected. Transmitter shall have approvals by: ATEX, FM, and CSA.
- 3.02 JUNCTION BOX AND ANALOG SIGNAL LINE FILTER: Provide and install a properly sized NEMA 4 rated junction box, suited for outdoor/wet locations, complete with an analog signal Line Filter (LF), per Component Specifications, for the wetwell pressure/level transmitter. Junction shall have a 1/8" drain/breather hole installed in the bottom of the enclosure. Line filter shall protect associated equipment from transient voltage surges and induced voltages. Junction box shall be field installed by the

Contractor in close proximity of the submersible pressure level transmitter. The Contractor shall be responsible for properly sealing the conduits entering junction box.

- 3.03 FLOAT SWITCHES: Provide a float control system for the pumping station to operate the pumps in the event of a submersible pressure/level transmitter failure or standalone for Pump Station No. 5. Provide a High Level, Lead and Lag Start, and an All Stop back-up Float Switches mounted in wet well. Float switches shall be set at one foot (1') above (High) and below (Low) normal operating levels. Normal operating levels shall be set per Project Engineers direction. The float switch shall be a direct acting switch and contain a single pole mercury switch, which actuates when the longitudinal axis of the float is horizontal and deactuates when the liquid level falls 1" below the actuation elevation. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable shall be permanently connected to the enclosed mercury switch and the entire assembly shall be capsulated to form a completely watertight and impact resistance unit. Provide the following float switches and control points:
- A. High Level Alarm/All Run
 - E. Low Level Alarm/All Stop

PART 4 EXECUTION

4.01 CONTROL PANEL SERVICE AND TRAINING

- A. The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment.
- B. After the control panel has been installed, the Supplier shall demonstrate with performance of each unit, and document that the system operates properly as specified.
- C. The Supplier shall provide systems training for operations staff totaling no less than 4 hours, refer to Section 1.09 Training.
- D. All training shall be conducted at the job site. Travel expenses are the responsibility of the supplier.

4.02 GENERAL INSTALLATION

- A. Installation of instrumentation and controls shall be in strict compliance with the manufacturer's instructions. The location of these items as shown on the Contract Drawings are approximate only. Exact locations shall be as approved by the ENGINEER during construction. It is the duty of the CONTRACTOR to obtain in the

field all relevant information required for proper placement of instrumentation and controls. In the case of interference with other work, proceed as instructed by the ENGINEER and provide all materials and labor required to prevent construction delays.

- B. Execution of the installation shall be in full accordance with codes and local rulings. The CONTRACTOR shall be responsible for any expenses that are a result of work performed contrary to said codes and regulations.

END OF SECTION

SECTION 25 31 05

AERATOR CONTROL PANEL

PART 1 - GENERAL

1.01 SCOPE

- A. The work covered under this section of the specifications includes the furnishing and installing all controls hereinafter specified to perform the intended function. The Aerator Control Panel shall be supplied with RVSS Starter(s).

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 25 31 00 - Process Instrumentation and Controls
- C. Section 25 31 01 - Control System Integration
- D. Section 25 31 02 - SCADA System
- E. Section 26 05 26 - Grounding and Bonding for Electrical Systems
- F. Section 26 05 29 - Hangers and Supports for Electrical Systems
- G. Section 26 05 33 - Raceways and Boxes for Electrical Systems
- H. Section 26 29 13 - Enclosed Controllers

1.03 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA IA 2.2 - Programmable Controllers-Equipment Requirements and Tests.
 - 2. NEMA IA 2.3 - Programmable Controllers - Programming Languages.
 - 3. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.
 - 4. NEMA ICS 6 - Industrial Control and Systems: Enclosures.

1.04 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the ENGINEER, for their review, submittal documents in accordance with Section 26 05 00. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the CONTRACTOR shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. All diagrams shall be in an 11 by 17 format. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
 2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.
 3. Operational Description shall include the principal functions/capabilities of the PLC's as provided and configured /programmed. Included shall be a description of system communications.
 4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.
- C. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.
- D. Operations and Maintenance Data: At a minimum, include the following information in accordance with Section 26 05 00.
1. Operating and Calibration instructions.
 2. Troubleshooting Information.
 3. Wiring Diagrams with wire numbers and termination point.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit bound copies of operating and programming instructions, adjustments, and preventive maintenance procedures and materials.

1.06 QUALIFICATIONS

- A. All instrumentation and control systems equipment shall be furnished and installed by the CONTRACTOR. The CONTRACTOR shall provide and be responsible for the proper operation of the AERATOR control system. The CONTRACTOR shall perform in house submittal drawings and assembly of products. Subcontracting submittal drawings and equipment assembly will not be permitted.

- B. The CONTRACTOR shall be responsible for all coordination necessary to furnish, and to supervise installation and connections, to calibrate, and to place into operation all the controls along with all other equipment and accessories as specified.
- C. Guarantee on the control system function and equipment shall be one (1) year from date of final acceptance by the OWNER. The CONTRACTOR shall promptly replace, without additional cost to the OWNER, any part of this process and control installation which is found to be defective within said period of one year, ordinary wear and tear and lighting damage excepted.

1.07 GENERAL REQUIREMENTS

- A. All control wires shall be stranded copper Type THHN or MTW respectively, except where indicated on the Drawings. All 4-20 ma signal control wire shall be #16 shielded TC cable or as shown on the Drawings.
- B. All materials, equipment, and devices shall meet the requirements of UL where UL standards are established for those items and the requirements of NFPA-70.
- C. All electrical components of the system shall operate on 120 VAC, 60 Hz, single phase power source except as otherwise noted. Any other devices necessary to obtain proper operation of the instrumentation and control system from these energy sources shall be furnished with the system.
- D. Instrumentation equipment and enclosures shall be suitable for the environmental conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines and electrical equipment.
- E. All work and materials shall comply with the National Electrical Code and applicable local regulations and ordinances. Where required by applicable codes, panel assemblies, materials and equipment shall be approved, identified, labeled, or listed by Underwriters' Laboratories or other testing organization acceptable to the governing authority.
- F. All instrumentation shall meet or exceed I.S.A. Standards and Recommended Practices, ANSI OSHA and any other applicable code.

1.08 INTERFACE WITH OTHER PRODUCTS AND EQUIPMENT

- A. Provide all required cables, cords, and connective devices for interface with other control system components.
- B. Coordinate size and configuration of enclosure to meet project requirements.

1.09 TRAINING

- A. A training program for the OWNER'S personnel shall be included. The training program shall instruct the owner's personnel in the operation and philosophy of the equipment so that they have a firm understanding of the configuration and operation of the system. The training program shall additionally instruct the OWNER's personnel in the use of the various maintenance aids and equipment available to isolate and correct each circuit malfunction in the minimum possible time.
- B. A minimum of four (4) hours training shall be provided on the Aerating station control system operation and maintenance and shall be scheduled with the OWNER or OWNER'S representative.

1.10 CONTROL STRATEGY

- A. Aerators shall operate on a manual or automatic as controlled by the controller.
- B. In the automatic mode, the controller shall receive stop and start commands for each aerator from remote SCADA operator input including timer mode.
- C. In timer mode, aerators shall run at setpoints per operator's input. Timer shall be capable of being set from 0 - 24 hours.
- D. The Aerators shall be capable of being monitored and controlled remotely from the SCADA System.
- E. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto-Timer switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The described equipment shall be housed in a NEMA Type 4X ANSI 304 Stainless Steel enclosure, properly sized in accordance with manufacturer's recommendations. The enclosure shall be designed specifically for mounting in an unprotected outdoor location. The enclosure shall have a gasketed hinged, front weather door with locking capability and an internally mounted hinged dead front panel so that all the components normally actuated by Operating Personnel are accessible without opening the dead front panel and yet are not exposed to the elements or to unauthorized personnel.

- B. The control panel shall be designed for 277/480 Volt, three-phase, four-wire power.
 - C. Provide properly sized Power Distribution Block(s) (PDB), as required for the control panel. Power distribution blocks shall be manufactured by Marathon, Square D, or approved equal.
- 2.02 SURGE PROTECTION DEVICE (SPD/TVSS): The SPD/TVSS shall be mounted in the control panel adjacent to the Main Breaker. The SPD/TVSS is connected to the main bus in the panel with conductors of size and of no greater length than indicated in the Surge Protection Device manufacturer's installation instructions. SPD/TVSS shall be a Type 2 device ideal for distribution panels, branch panels and critical loads. Unit shall come complete with 30 Amp circuit breaker for disconnect means. Unit shall have the following features.
- A. Provide SPD/TVSS in accordance with specification section 26 35 53 - Voltage Regulators.
- 2.03 Provide a Power Monitor. The power monitor shall constantly monitor the three-phase voltages to detect harmful power line conditions, caused by single phasing, low voltage, phase reversal and voltage unbalance. When a harmful condition is detected, no three-phase motors shall be allowed to operate. Phase monitor shall be protected by 1 amp, 480 volt fuses on the primary side.
- 2.04 AERATORS NO.1 & NO.2: Provide a combination circuit breaker and Reduced Voltage Soft Starter (RVSS), for each Aerator. Refer to Specification Section 26 29 13 - Enclosed Controllers. In addition, provide the following additional equipment and controls for both Aerators.
- A. The Aerators shall be controlled by a PLC Controller. The controller shall be capable of operating manually. In the automatic mode, the Aerator Controller shall receive stop and start commands from the SCADA System input, as described below. C. In timer mode, aerators shall run at setpoints per operator's input. The timer shall be capable of being set from 0 - 24 hours. The Aerators shall be capable of being monitored and controlled remotely from the SCADA System. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure. The Controller shall be a standard, catalogued product of a water and wastewater automation equipment manufacturer regularly engaged in the design and manufacture of such equipment for a period of at least fifteen (15) years. The Controller shall have the following operators and indicators:
 - 1. Manual-Off-Automatic selector switch for each aerator motor
 - 2. Green "Running" pilot light for each aerator motor
 - 3. Red "Failure" pilot light for
 - 4. Adjustable Timer either locally or remotely set by SCADA.

- 2.05 MAIN BREAKER: Provide a properly sized Main Breaker and for the actual motor horsepower being furnished. In addition, provide a through the deadfront operator mounted on the deadfront door. The operator shall prevent the deadfront door from being opened while the breaker is in the “ON” position.
- 2.06 Control Relays - Control Relays shall be plug-in enclosed polycarbonate type. Coil winding shall be polyurethane insulated with insulation resistance of 100 megohms minimum. Dielectric strength shall be 1400 volts R.M.S. and temperature range of -50 degrees C to 65 degrees C. Mechanical life expectancy shall be in excess of 20 million operations. Pull-in speed shall be 14 milliseconds typical with 10 milliseconds typical drop-out speed. Relay shall have a continuous duty cycle and be UL recognized. Control relays shall be manufactured by Square D, Allen Bradley, Time Mark or as accepted.
- 2.07 ANALOG SIGNAL LINE FILTER: Provide an analog signal Line Filter for the controller. Line filter shall protect associated equipment from transient voltage surges and induced voltages.
- 2.08 CONTROL POWER SURGE PROTECTOR: Provide a single phase, in-line (series) 120 volt, single-phase, 20A continuous power Surge Protection Device (SPD-2), per Specifications, designed to protect all of the loads fed from the control power circuit. Device shall have protection modes and protection status indication of each mode when power is present (L-N, L-G, N-G).
- 2.09 TRANSFORMER MAIN BREAKER: Provide a 20-amp, 2-pole, 480-volt circuit breaker for transformer primary side protection and disconnect.
- 2.10 DISTRIBUTION TRANSFORMER: Provide a general purpose transformer with a 480 Volt primary, 120/240 Volt, single-phase, three-wire secondary, 1.5-kVA, dry type distribution transformer. Transformer shall be dry type with 115-degree temperature rise under full load. Transformer shall be resin-filled general purpose transformer with epoxy encapsulation. The enclosure has no openings, so that airborne particles or contaminants cannot be detrimental to operation. The core-and-coil assembly shall be embedded in an epoxy resin compound and mounted on the bottom right side of the control panel center. Transformer shall be UL Listed and CSA Certified.
- 2.11 BRANCH CIRCUIT BREAKERS: Provide the following 120/240 volt branch circuit breakers.
1. 20 amp – 1 pole, for Control Power and Alarm Light
 2. 20 amp – 1 pole, for Exhaust Fan
 3. 20 amp – 1 pole, for SPARE
 4. 20 amp – 1 pole, for GFCI Duplex Receptacles
- 2.12 DUPLEX RECEPTACLE: Provide a 120V, 15 amp, duplex receptacle mounted on the

backplate of the controller enclosure for programming and diagnostic equipment use. Receptacle shall come complete with handy box.

- 2.13 GROUND FAULT INTERRUPTER RECEPTACLE: Provide a 120 Volt, 15 amp, Weatherproof Duplex GFCI Receptacle mounted on the side of enclosure for electrical hand tool use. Receptacle shall come complete with a weatherproof cover. Cover shall be UL listed for wet locations, with cover closed, and shall be constructed of tough plastic that is resistant to high impact and sunlight. In addition, the cover shall be non-corrosive, non-conductive and protect against rain, snow and ice.
- 2.14 CABINET INTERIOR LIGHTING: Provide two (2), fifteen-inch (15”) long fluorescent light stripes mounted inside the control panel enclosure that will automatically illuminate interior dead front and cabinet interior when either controller cabinet doors are opened. Light bulbs shall be 8 Watts. Fixtures shall be centered over each door of the enclosure.
- 2.15 ANTI-CONDENSATION HEATER: Provide a thermostatically controlled cabinet heater mounted inside the control panel enclosure. Cabinet heater shall be 250 Watt, 120VAC with field adjustable thermostat in NEMA 1 enclosure. Heater shall be wired with high temperature wire and connectors. Thermostat shall be adjustable from 50°F to 90°F with 2°F fixed differential and mounted on the back plate of the enclosure.
- 2.16 GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE: Provide a 120-volt, 15-amp, Weatherproof Duplex GFCI Receptacle mounted on the side of the enclosure for electrical hand tool use. Receptacle shall come complete with a weatherproof cover. Cover shall be UL listed for wet locations and shall be constructed of tough plastic that is resistant to high impact and sunlight. In addition, the cover shall be non-corrosive, non-conductive and protect against rain, snow, and ice.
- 2.17 EXHAUST FANS: Provide four (4) filtered steel louvers and two (2) ten-inch (10”) thermostatically controlled exhaust fans to properly ventilate the controller enclosure. Exhaust fans shall operate based on temperature setting or when the variable frequency drive operates. Exhaust fans shall be mounted near the top of the enclosure.
- 2.18 COMMON ALARM LIGHT: Provide a weatherproof exterior common Alarm Light with red Lexan lens mounted on side of enclosure. The alarm light shall burn dim during normal conditions to indicate “Power On” and “Light Bulb Good” and shall flash brightly during any alarm condition.
- 2.19 CIRCUIT BREAKERS: The Circuit Breaker for each Aerator, dry-type transformer, and controls shall be properly sized for the served devices, per NEC (NFPA 70). The operating handles of the circuit breakers shall be operable through the interior dead front panel of the control panel. The minimum interrupting rating for the 480-volt circuit breakers shall be 35 kA.
- 2.20 SCADA INTERFACE: Provide ethernet port and connection to SCADA System. Verify

SCADA I/O requirements with SCADA supplier.

PART 3 EXECUTION

3.01 ENGINEERING SUPERVISION

- A. A minimum of one (1) days and two (2) trips start-up service and training operating personnel shall be included. During the first year of operations following acceptance, the system supplier shall check the calibration and operation of the system at intervals of four (4) months for periods of not less than one (1) days or for as long as may be required to correct any deficiencies covered by the equipment and/or system warranty. These services shall be furnished by the CONTRACTOR as a part of the Work included under this section of the Specifications.

3.02 GENERAL INSTALLATION

- A. Installation of instrumentation and controls shall be in strict compliance with the manufacturer's instructions. The location of these items as shown on the Contract Drawings are approximate only. Exact locations shall be as approved by the ENGINEER during construction. It is the duty of the CONTRACTOR to obtain in the field all relevant information required for proper placement of instrumentation and controls. In the case of interference with other work, proceed as instructed by the ENGINEER and provide all materials and labor required to prevent construction delays.
- B. Execution of the installation shall be in full accordance with codes and local rulings. The CONTRACTOR shall be responsible for any expenses that are a result of work performed contrary to said codes and regulations.

END OF SECTION

SECTION 26 05 00

GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 GENERAL

- A. The General Conditions, Supplementary Conditions, Instructions to Bidders, General Requirements, Special Conditions, Addenda, and other pertinent documents issued by the ENGINEER are part of these Specifications and shall be complied with in every respect.
- B. Furnish all labor, materials, services, and equipment required to complete the installation of a complete and acceptable electrical system in accordance with these Specifications and the Contract Drawings.
- C. Electrical Division Index:
 - 1. Section 25 31 00 - Process Instrumentation and Controls.
 - 2. Section 25 31 01 - Control System Integration.
 - 3. Section 25 31 02 - SCADA System.
 - 4. Section 25 31 03 - Influent Pump Station Control Panel.
 - 5. Section 25 31 04 - Effluent Pump Station Control Panel.
 - 6. Section 26 05 00 - General Electrical Provisions.
 - 7. Section 26 05 02 - Electric Service.
 - 8. Section 26 05 03 - Metering.
 - 9. Section 26 05 19 - Wires and Cables.
 - 10. Section 26 05 26 - Grounding.
 - 11. Section 26 05 29 - Supporting Devices.
 - 12. Section 26 05 33 - Conduits.
 - 13. Section 26 05 35 - Pull, Junction, and Outlet Boxes.
 - 14. Section 26 05 43 - Underground Ducts and Handholes for Electrical Systems.
 - 15. Section 26 05 53 - Identification of Electrical Systems.
 - 16. Section 26 05 73 - Overcurrent Protective Device Coordination.
 - 17. Section 26 21 13 - Emergency Generators.
 - 18. Section 26 22 00 - Low-Voltage Transformers.
 - 19. Section 26 24 16 - Panelboards.
 - 20. Section 26 27 26 - Wall Switches.
 - 21. Section 26 27 27 - Receptacles.
 - 22. Section 26 27 28 - Plate Covers.
 - 23. Section 26 28 19 - Motor and Circuit Disconnects.
 - 24. Section 26 29 13 - Enclosed Controllers.
 - 25. Section 26 29 23 - Variable Frequency Drives
 - 26. Section 26 35 53 - Voltage Regulators.
 - 27. Section 26 36 00 - Automatic Transfer Switch.

- 28. Section 26 51 00 - Interior Building Lighting.
- 29. Section 26 56 00 - Site Lighting.
- 30. Section 27 13 43 - Communications Service Cabling.

1.02 SCOPE

- A. The Work under these specifications shall, in general include but is not limited to, furnishing and installing the following:
 - 1. Complete installation of obstruction lighting on the new elevated tank, including lighting fixture, lamps, junction boxes, photoelectric control, branch circuit wiring and conduit as specified herein and as shown on the Drawings.
 - 2. Complete installation of the elevated tank grounding system as specified herein and as shown on the Drawings.
 - 2. Complete relocation of remote terminal unit antenna and pressure/level transducer specified herein and as shown on the Drawings.

1.03 COORDINATION

- A. Review installation procedures under other Sections and coordinate the installation of items that must be installed with other Sections.

1.04 ACCURACY OF DATA AND DRAWINGS

- A. Plans are diagrammatic and judgement and care shall be exercised to install all electrical work in a practical manner which shall function properly and fit elevated tank finishes and the requirements of the OWNER.
- B. The Drawings, where not dimensioned or detailed, indicate approximate locations and general arrangements of electrical work. All electrical work offset, risers, and fittings are not necessarily shown; however, provide these as required by the conditions involved.

1.05 INTERFERENCES

- A. All work shall be installed to conform as nearly as possible with the dimensions, elevations, locations, and arrangements indicated, with only such minor adjustments as necessary to coordinate the work of the various trades and specification divisions and/or sections; to accommodate the actual equipment furnished; to avoid all interferences between the various parts of the work; and to accommodate existing conditions which may differ from those indicated. Any and all parts of the work installed under this contract which interfere with other parts of the work or which deviate from the drawings and specifications without the ENGINEER's prior approval shall be altered by the CONTRACTOR at his own expense, to clear such interferences, or to comply with the

drawings and specifications. All interferences or discrepancies which may be discovered or anticipated shall be reported promptly to the ENGINEER for decision before proceeding with the work. The ENGINEER shall have the privilege of authorizing minor changes without additional cost, provided that such changes are made prior to the commencing of work on the item involved.

1.06 INTENT

- A. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and inter-connected with other equipment so as to render the installations complete for successful operation, regardless of whether all the connections and inter-connections are specifically mentioned in the Specifications or shown on the Drawings.

1.07 REQUIREMENTS OR REGULATORY AGENCIES AND STANDARDS

- A. Regulatory Agencies: Installations, materials, equipment and workmanship shall conform to the applicable provisions of the National Electrical Code (NEC), the National Electrical Safety Code (NESC), and the terms and conditions of the service requirements of the serving utility and other authorities having lawful jurisdiction pertaining to the work required. All modifications required by these codes, rules, regulations, and authorities shall be made by the CONTRACTOR without additional charge to the OWNER.
- B. Standards: Where referenced in these Specifications or on the Drawings, the publications and standards of the following organizations shall apply: American Society of Testing and Materials (ASTM), Institute of Electrical and Electronic Engineers (IEEE), Insulated Power Cable Engineers Association (IPCEA), National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), American National Standards Institute (ANSI), and Underwriters Laboratory (U.L.)

1.08 PERMITS AND FEES

- A. The CONTRACTOR shall secure and pay for all permits and pay all fees necessary for the prosecution and completion of his work.

1.09 SUBMITTALS

- A. Prior to purchasing equipment, the CONTRACTOR shall submit to the ENGINEER SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for acceptance manufacturer's data and/or shop drawings as required in the following sections.
- B. MANUFACTURER'S DATA: Submittals for each manufactured item shall be manufacturer's descriptive literature, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Each submittal shall include the manufacturer's

name, trade name, catalog number or model, nameplate data, size layout dimensions, capacity, specification reference, applicable Federal, Military, and industry specification references, and all other information necessary to establish contract compliance.

- C. SHOP DRAWINGS: Shop drawings shall show types, sizes accessories, elevations, section views, installation details, elementary diagrams, and wiring diagrams. Wiring diagrams shall identify circuit terminals and shall indicate the internal wiring for each item of equipment and the inter-connection between the items. Drawings shall also indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If any equipment is disapproved, the drawings shall be revised to show acceptable equipment and shall be resubmitted.

1.10 TESTS AND ADJUSTMENTS

- A. Furnish all labor, materials, instruments, etc. and all other services required for complete and satisfactory test and adjustments of electrical systems and related work furnished and/or installed by electrical CONTRACTOR. Requirements include cleaning of electrical equipment, lighting fixtures, conduit, etc., checking of all electrical and control wiring, interlocks, etc., to determine that wiring is correct.

1.11 RECORD DRAWINGS

- A. Furnish to the ENGINEER at job acceptance and completion the following:
 - 1. One (1) set of blue line prints marked in red showing all variations of the work actually installed related to the original drawings. The drawings shall include all approved and installed change orders, field conditions changes, and other variations from the original plans and specifications.
 - 2. Three (3) sets of shop drawings, manufacturer's brochures, control diagrams, maintenance instructions, and other data required by the specifications reflecting the as-built fabrication of the materials actually installed. These sets of data shall be post-bound and indexed and tabbed for permanent files. The OWNER's representative shall be thoroughly instructed in the proper operation, maintenance, and test procedures of all equipment and systems.

1.12 GUARANTEE

- A. The CONTRACTOR shall guarantee the work to be free from defects in workmanship and materials for a period of one year from the date of final acceptance by the OWNER. The CONTRACTOR shall promptly replace, without additional cost to the OWNER, any part of this electrical installation which is found to be defective within said period of one year, ordinary wear and tear excepted.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment furnished under this contract shall be new, free from defects, and shall conform with the standards of the U.L., Inc. where such standard has been established, and shall be so labeled. Manufacturers' names and catalog numbers are used to designate the item of material or equipment as a means of establishing grade and quality. Manufacturers of a similar quality product will be considered. ENGINEER's opinion is final on equality of any substituted items.

2.02 PROTECTION OF EQUIPMENT

- A. Protect from damage all apparatus and equipment furnished on this Contract. Any item marred or damaged shall be properly repaired, repainted and/or replaced to the satisfaction of the ENGINEER.

203. EXISTING UTILITIES, STRUCTURES, AND OTHER PROPERTY

1. Prior to any excavation, the CONTRACTOR shall determine the locations of all existing water, gas, sewer, electric, telephone, and other underground utilities and structures. Obtain location drawings and other assistance from the various local utility departments and other applicable agencies, and make other investigations as required to accomplish this.
2. After commencing work, use every precaution to avoid interferences with existing underground and surface utilities and structures, and protect them from damage.
3. WHERE THE LOCATIONS OF EXISTING UNDERGROUND AND SURFACE UTILITIES AND STRUCTURES ARE INDICATE, THESE LOCATIONS ARE GENERALLY APPROXIMATE, AND ALL ITEMS WHICH MAY BE ENCOUNTERED DURING THE WORK ARE NOT NECESSARILY INDICATED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATIONS OF ALL ITEMS INDICATED, AND THE EXISTENCE AND LOCATIONS OF ALL ITEMS NOT INDICATED.
4. The CONTRACTOR shall repair or pay for all damage caused by his operations to all existing utility property, public property, and private property, whether it is below ground or above ground, and he shall settle in total cost all damage suits which may arise as a result of his operations.
5. CONTRACTOR shall take special precautions to prevent damage to property, both public and private, caused by improper connections which may provide improper voltage or phase rotation. CONTRACTOR shall settle all claims for improper connections prior to final acceptance of this project by the OWNER.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Workmanship shall be neat, have good mechanical appearance, and conform to the best electrical construction practices.

END OF SECTION

SECTION 26 05 02

ELECTRIC SERVICE

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the electric service at the Waste Water Treatment Plant as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduit
- C. Section 26 05 19 - Wires and Cables
- D. Section 26 05 26 - Grounding

1.03 ELECTRIC SERVICE

- A. The service to Waste Water Treatment Plant shall be 277/480 volt, 3 phase, 4 wire, wye connected.

1.04 COORDINATION

- A. The CONTRACTOR shall be responsible for contacting the Power Company and making arrangements for and paying all fees associated with obtaining electric service from the Power Company for this project. The requirements of the Power Company shall be followed by the CONTRACTOR, and significant deviations from Drawings and Specifications shall be reported to the ENGINEER prior to constructing these facilities.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Provide conduit for Secondary Service complete with watertight connectors and couplings as specified in Section 26 05 33.
- B. Grounding shall be in accordance with the requirements of the NEC and Section 26 05 26 of these Specifications.
- C. Meter socket shall be in accordance with Section 26 05 03.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide underground secondary service conductors and conduits, and meter socket in accordance with Power Company requirements and drawings.

END OF SECTION

SECTION 26 05 03

METERING

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of metering shown on the Drawings and hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduit
- C. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all meter sockets to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cut.

1.04 APPLICABLE STANDARDS

- A. Meter sockets shall meet or exceed applicable ASTM specifications and shall conform to Underwriters Laboratories Standard UL-414, latest revision.

PART 2 - PRODUCTS

2.01 METERING DEVICES

- A. All electrical meters shall be furnished and installed by the Power Company.
- B. Meter sockets and/or boxes to be furnished and installed by the CONTRACTOR. Meter socket shall be of a type and style approved by the Power Company.

PART 3 - EXECUTION

3.01 GENERAL

- A. Meter sockets shall be installed at locations shown on the Drawings and at a height as approved by the Power Company.
- B. CONTRACTOR shall be responsible for contacting Power Company to determine the Power Company's requirements for metering of electric service. Power Company's requirements shall be followed in every respect and CONTRACTOR shall pay all costs not paid by Power Company.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of electrical wiring as shown on the Drawings and hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduits
- C. Section 26 05 35 - Junction Boxes
- D. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all wires and cables to be utilized on this project.
- C. Sufficient information, clearly presented shall be included to determine compliance with drawings and specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Dual rated type THHN-THWN wire shall meet or exceed all applicable ASTM specifications, Underwriters Laboratories standard UL-83, and Federal Specification J-C-30, latest revision.
- B. Plastic electrical tape shall meet the requirements of ASTM D-3005-72 and Underwriters Laboratories standard UL-510, latest revision.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. All conductors shall be of 98% conductivity copper.
- B. Minimum wire size shall be #12 AWG unless otherwise shown on the drawings or specified herein. Where conductor sizes are not shown, use #12 AWG or size required by the NEC.

2.02 INSULATION

- A. Conductors shall be standard annealed copper, rated 600 volts with mechanical strength, insulation and current carrying capacity adequate for the particular conditions under which they are used and in accordance with the following schedule:
 - 1. In dry locations, dual rated THHN-THWN.
 - 2. In wet locations, dual rated THHN-THWN.
- B. The following conductor insulation color coding shall be observed throughout the project. Any variations shall be approved in writing by the ENGINEER prior to any wiring being delivered to the job site.

120/208 Volt Single Phase System

Phase A	Black
Phase B.....	Red
Phase C	Blue
Neutral.....	White
Equipment Ground.....	Green

277/480 Volt Three Phase System

Phase A	Brown
Phase B.....	Orange
Phase C.....	Yellow
Neutral.....	White
Equipment Ground.....	Green

- C. All No. 12 and No.10 branch circuit conductors shall have solid color compound or solid color coating. All neutral sizes shall have solid color compound or solid color coating.

2.03 VFD CABLE

- A. Manufacturer: Belden “VFD Cable – Classic Symmetrical Design”.
- B. Conductor: Copper, 98% Conductivity.
- C. Insulation Voltage Rating: 600 volts.
- B. Insulation Temperature Rating: 90 degrees C.
- B. Insulation Material: XLPE.
- B. Shielding: Two (2) spiral copper tape shields.
- B. Grounding: Three (3) symmetrical copper ground conductors
- B. Jacket: PVC.

2.04 SPLICES AND JOINTS

- A. Splices for #10 AWG or smaller conductors shall be made with wire nuts, approved mechanical pressure connectors, or soldered and taped connectors.
- B. All splices shall be taped with Scotch Brand No. 33+ or approved electrical tape and shall be of equal thickness and rating of the conductor insulation.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERALLY

- A. Installation shall be in accordance with the National Electrical Code, latest edition and as shown on the Drawings and as hereinafter specified.
- B. All wiring shall be installed in raceway systems unless specifically shown otherwise on the Drawings or specified otherwise in other Sections of these Specifications.

3.02 WIRE PULLING

- A. Use only approved lubricants which will be non-injurious to conductor insulation while pulling conductors into raceways and conduits.
- B. Provide suitable installation equipment to prevent cutting or abrasion of conduits during pulling of conductors.

- C. All cables in a single conduit shall be pulled together.

3.03 SPLICE INSTALLATION

- A. All splices and connections shall be made in accessible boxes or cabinets only.
- B. Splices and terminations shall be mechanically and electrically secure.
- C. Where the ENGINEER determines that unsatisfactory splices or terminations have been installed, the device(s) shall be removed and approved devices, properly installed, and shall be provided at no additional cost to the OWNER.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the grounding system as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduits
- C. Section 26 05 19 - Wires and Cables

1.03 GENERAL DESCRIPTION

A. System Grounding:

- 1. Secondary service neutrals shall be grounded at the supply side of the secondary disconnecting means and at the related transformers.
- 2. Separately derived systems (transformers downstream from the service entrance) shall have secondary neutral grounded.

B. Equipment Grounding:

- 1. All metallic structures, enclosures, raceways, junction boxes and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

C. Structure Grounding:

- 1. Structures shall be grounded to copper grounding grid to be installed as shown on the Drawings and as specified herein.

1.04 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 10 of these Specifications.
- B. Submit data on all ground rods to be utilized on this Project.

- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.05 APPLICABLE STANDARDS

- A. Ground rods, clamps and other grounding equipment shall meet or exceed applicable ASTM Specifications and shall conform to Underwriters Laboratories Standard UL-20, latest revision.

PART 2 - PRODUCTS

2.01 GROUND RODS

- A. Ground rods shall be installed as shown on the plans and as required by the NEC whether shown on the plans or not. Ground rods shall be 5/8" x 10' copperclad steel type, Joslyn J8350 or as approved. Each ground rod shall have ground rod clamp constructed of copperclad steel or shall be exothermally welded to the grounding conductor.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERALLY

- A. The grounding system shall be in accordance with Article 230-63 and Article 250 of the National Electrical Code.

3.02 SECONDARY EQUIPMENT AND CIRCUITS:

- A. Main Bonding Jumper:
 - 1. Connect the secondary service neutral to the ground bus in the service equipment.
- B. Water Pipe and Supplemental Electrode:
 - 1. Grounding electrode conductor: Provide a connection between the service equipment ground bus and the metallic water pipe system. Jumper insulating joints in the water pipe.
 - 2. Provide a supplemental ground electrode and bond to the water pipe ground, or connect to the service equipment ground bus.

C. Service Disconnect (Main Switchboard):

1. Provide a ground bar bolted to the enclosure with lugs for connecting the various ground conductors.

D. Motor Control Center:

1. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. Connect the grounding electrode conductor to the ground bus.
3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and ground wire to the ground bus.

E. Automatic Transfer Switches (Service Entrance Rated)

1. Connect the secondary service neutral to the ground bus in the service equipment.
2. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
3. Connect the grounding electrode conductor to the ground bus.
4. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and ground wire to the ground bus.

F. Transformers:

1. Separately derived systems (transformers downstream from service equipment):
Ground the secondary neutral at the transformer.

G. Conduit Systems:

1. Ground all metallic conduit systems.
2. Non-metallic conduit systems shall contain a grounding conductor.
3. Conduit provided for mechanical protection and containing only a grounding conductor shall be bonded to that conductor at the entrance and exit from the conduit.

H. Feeders and Branch Circuits: Install green grounding conductors with all feeders and branch circuits sized the same as the branch circuit conductors or as noted on the drawings as follows:

1. All feeders.
2. All receptacle outlets.
3. All motors and motor controllers.
4. All fixed equipment and appliances.
5. All items of equipment where the final connection is made with flexible metal conduit.
6. All additional locations and systems as shown on the Drawings.

I. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the grounding wires to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground wires pass.
2. Provide ground bars in panelboard, bolted to the housing, with sufficient lugs for terminating the ground wires.

J. Motors and Starter:

1. Provide lugs in motor terminal box and starter housing for ground wire termination.
2. Make ground wire connections to ground bus in motor starter enclosure.

K. Receptacles: Equipment grounding terminal (green) of all grounding type receptacles shall be bonded to its equipment grounding conductor.

L. Lighting Fixtures: Shall be grounded through the equipment grounding terminal in the fixture.

3.03 GROUND ROD INSTALLATION:

- A. Distance: Drive each rod vertically for not less than eight feet.
- B. Multiple Rods: Where required to obtain the specified ground resistance, install multiple rods. Provide a minimum of three ground rods interconnected per plans.
- C. Where ground connections will be permanently concealed, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.

- D. Where the rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches to achieve the specified resistance.

3.04 STRUCTURE GROUNDING SYSTEM INSTALLATION

- A. Install the structure grounding system as shown on the Drawings. Install grounding conductor 24" below grade at the locations shown.
- B. Drive ground rods to be connected to grounding grid 24" below grade and make connection to the grounding conductors at this depth.
- C. Make all Cadweld connections in accordance with manufacturer's installation instructions. DO NOT backfill over Cadweld connections until approved by the ENGINEER.

END OF SECTION

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SECTION 26 05 29

SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of supporting devices as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduits
- C. Section 26 05 35 - Junction Boxes

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all supporting devices to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Pipe straps shall meet the requirements of Federal Specification FF-S-760, Type 1, Style A or B.

PART 2 - PRODUCTS

2.01 DEVICES

- A. All parts and hardware associated with supporting devices shall be zinc coated or have equivalent corrosion protection.
- B. Conduit supports for single conduit runs shall be galvanized conduit straps or ring bolt type hangers with specialty spring clips. Plumbers perforated straps are not acceptable.

2.02 ANCHOR METHODS

- A. Supporting devices shall be anchored in metal surfaces by machine screws, bolt, or welded studs.

PART 3 - EXECUTION

3.01 GENERAL

- A. Support conduit every five (5') feet or less as follows:
 - 1. By one or two-hole straps or by individual conduit hangers.
 - 2. By one or two hole malleable iron clamps for exposed work.
- B. Layout conduit supports to maintain headroom, neat mechanical appearance, and to support equipment loads required.
- C. Safe working load shall not exceed 25% of proof test on fastening devices.
- D. Conduit shall be supported independently of junction boxes, fixtures, etc.
- E. Attachments by wood plugs, rawl plug, plastic, lead, or soft metal anchors, or wood blocking is not acceptable.

END OF SECTION

SECTION 26 05 33

CONDUITS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the electrical conduit system as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 19 - Wire and Cables
- C. Section 26 05 35 - Junction Boxes
- D. Section 26 05 29 - Supporting Devices
- E. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all conduit and fittings to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Rigid Aluminum conduit shall conform to Underwriters Laboratories standard UL-6, ANSI standard C80.5, latest revision.
- B. Rigid NON-metallic conduit shall conform to Underwriters Laboratories standard UL-651, NEMA TC-2, and Federal Specification WC-1094A, latest revision.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Minimum conduit size shall be as follows:
 - 1. 1" for power, branch, and circuit wiring
- B. Raceways shall be rigid aluminum conduit, electrical metallic tubing, rigid non-metallic conduit, or flexible metal type conduit as hereinafter specified. Conduit size shall not be less than shown on the Drawings and where conduit sizes are not shown on the Drawings, size shall be in accordance with the latest edition of the NEC for the number and size of conductors installed. All conductors shall be installed in conduit, unless specifically indicated otherwise.
- C. Flexible conduit utilized shall be liquid-tight with proper liquid-tight fittings. Provide ground wire from conduit to equipment to maintain continuity.
- D. Raceways for underground distribution system shall be Schedule 40 rigid non-metallic conduit, with adapters to rigid steel in all instances where conduit is exposed above grade.
- E. Raceways installed to be rigidly supported as described in 2011 NEC.

2.02 CONDUIT FITTINGS

- A. Rigid aluminum conduit fittings:
 - 1. Fittings shall be standard threaded couplings, locknuts, bushings, and elbows. Material shall be match conduit.
 - 2. Locknuts shall be of the bonding type with sharp edges for cutting into the metal wall of an enclosure.
 - 3. Bushings shall be of the metallic insulating type, and consist of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or non-metallic material are not permitted.
 - 4. Utilize Myers Hubs on all conduit terminations to equipment enclosure installed in wet locations (Outdoors).
 - 5. All conduit fittings installed/utilized on this project shall be of the type as required for installation location (Wet, Raintight, etc.) by the NEC.
- B. Flexible Metallic Conduit Fittings:

1. Fittings for liquid-tight flexible metal conduit shall be steel or malleable iron only and shall be of a type incorporating a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

C. Rigid Non-Metallic Conduit Fittings:

1. Fittings for rigid non-metallic conduit shall be of the same schedule as the conduit and shall be of a type as recommended by the manufacturer of the conduit.

2.03 WARNING TAPE

- A. Warning Tape: Standard, 4-Mil polyethylene 76mm (3 inch) wide tape detectable type, red with black letters, and imprinted with "CAUTION BURIED ELECTRIC LINE BELOW".

PART 3 - EXECUTION

3.01 GROUNDING

- A. All metallic conduits to be grounded in accordance with requirements of the latest edition of the NEC.
- B. Assure ground continuity on all branch circuit conduits by two locknuts, one inside and one outside of all boxes, cabinets, and gutters for rigid conduit. Follow Article 250 of the latest edition of the National Electrical Code.

3.02 GENERAL

- A. Conduit shall be installed in accordance with the following schedule:
 1. In exposed and concealed locations indoors except as noted on the Drawings: electrical metallic tubing.
 2. In exposed locations out of doors: Rigid aluminum conduit unless noted otherwise on Drawings. Use white lead sealer or RTV silicon sill on all male threads.
 3. In underground locations out of doors: rigid non-metallic conduit.
- B. Ream ends of all conduits after cutting. Prior to wire pulling, keep all open conduit ends plugged, and swab out all trapped conduits in which water or moisture has collected. Where conduits are concealed in walls, install these conduits so that the exposed wall faces will not be marred.

- C. Where conduit routings are detailed or dimensioned, install conduits accordingly: OTHERWISE, install all conduits in straight, level, and plumb lines, parallel with or at right angles with beams, walls, ceilings, and other building lines.
- D. Branch circuit conduit routings: except where detailed or dimensioned, the indicated branch circuit conduit routings are generally diagrammatic, and are intended to show the required circuitry from device to device.
- E. All raceways installed exterior to buildings shall be installed underground.
- F. Conduit shall be installed as complete runs before pulling wire.
- G. Flattened, dented, or deformed conduit is not permitted and shall be removed and replaced.
- H. Conduit systems shall be installed so that they will not obstruct headroom, walkways, or doorways.
- I. Conduit shall be supported within one foot of all changes in direction, and within one foot of each enclosure to which connected.
- J. Conduits shall be secured to cabinets, junction boxes, pull boxes, and outlet boxes by bonding type locknuts. Conduit connections shall not be made to junction box covers.

3.03 BENDS

- A. All conduit bends shall be made in strict accordance with the requirements of the latest edition of the NEC.
- B. Conduit bends shall be made with standard conduit bending machines.
- C. Conduits hickey may be used for slight offsets and for straightening stubbed out conduits.
- D. Conduits shall not be bent with a pipe tee or vise.

3.04 PENETRATIONS

- A. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer drills are not allowed except where permitted by the ENGINEER as required by limited working space.
- B. Holes shall be located so as not to affect structural sections such as ribs or beams.

3.05 EXPOSED WORK INSTALLATION

- A. Conduit shall be run parallel or perpendicular to the building lines.
- B. Horizontal runs shall be installed close to the ceiling or beams and secured with approved conduit straps.
- C. Horizontal or vertical runs shall be supported at not over five foot intervals.

3.06 DIRECT BURIAL INSTALLATION

- A. Rigid non-metallic conduit shall be marked at uniform intervals to indicate the kind of material, direct burial type, and the UL approved label.
- B. Proper conduit fittings and terminations shall be installed as recommended by the conduit manufacturer.
- C. Install adapters to rigid steel conduit below grade on all risers. Rigid non-metallic conduit shall not be utilized above grade.
- D. Warning tape shall be continuously placed 300 mm (12 inches) above conduits or electric lines.
- E. Tops of non-metallic conduits shall not be less than 30 inches below finished grade and not less than shown on the Drawings.
- F. Seal conduits, including spare conduits at building entrances and at outdoor terminations for equipment with a suitable compound to prevent the entrance of moisture and gases.
- G. Where metal conduit is in contact with soil install threaded rigid aluminum conduit with a 20 mil bonded PVC coating; or rigid aluminum conduit PVC coated or standard coated with bituminous asphaltic compound. Top of conduit shall be not less than 24 inches below finished grade and not less than shown on the Drawings.

END OF SECTION

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SECTION 26 05 35

PULL, JUNCTION, AND OUTLET BOXES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of pull, junction, and outlet boxes as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 33 - Conduit
- C. Section 26 05 19 - Wires and Cables
- D. Section 26 27 26 - Wall Switches
- E. Section 26 27 27 - Receptacles
- F. Section 26 27 28 - Plate Covers
- G. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all pull, junction, and outlet boxes to be utilized on this project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Pull boxes and junction boxes shall meet or exceed applicable ASTM specifications and shall conform to Underwriters Laboratories Standard UL-50, latest revision.
- B. Outlet boxes shall meet or exceed applicable ASTM specifications and shall conform to Underwriters Laboratories Standard UL-54, latest revision.

PART 2 - PRODUCTS

2.01 PULL AND JUNCTION BOXES

- A. All exterior above ground junction and/or pull boxes shall be cast steel or aluminum with hubs and shall be provided with gaskets or covers to assure watertight construction.
- B. All interior junction or pull boxes shall be sheet metal type, NEMA OS 1, galvanized steel. The junction or pull boxes shall be of the proper size for the devices and for the wiring installed per the National Electrical Code.

2.02 OUTLET BOXES

- A. Interior concealed outlet boxes shall be sheet metal type box for use with metallic conduit, NEMA OS1, galvanized steel. Interior exposed outlet boxes shall be cast type box for use with metallic conduit, NEMA FB, Type FD, cast ferroalloy with gasketed cover and threaded hubs. The outlet boxes shall be of the proper size for the device and/or wiring to be installed per the National Electrical Code.
- B. Exterior outlet boxes shall be shall be cast type box for use with metallic conduit, NEMA FB, Type FD, cast ferroalloy with gasketed cover and threaded hubs, deep type of the proper size for the device and/or wiring to be installed per the National Electrical Code.
- C. Ceiling outlet boxes shall be 4 inch octagonal boxes or sized per the National Electrical Code.

2.03 IN-GRADE PULL BOXES

- A. Pull boxes to be installed shall be a polymer concrete Quazite Box complete with bolted polymer concrete Cover, ANSI 77 Tier 15. Size for required conduits. The Pull Box Covers shall have the LOGO "ELECTRIC" or "TELECOMMUNICATIONS" stamped on the lid. Refer to details on drawings.

PART 3 - EXECUTION

3.01 PULL AND JUNCTION BOXES

- A. Install all junction or pull boxes required by field conditions whether or not they are shown on the Drawings.
- B. Where size of box is not indicated, it shall be of sufficient size to pull, rack and splice the cables to be contained there in accordance with the requirements of the NEC.

3.02 OUTLET BOXES

- A. Remove only knockouts as required in outlet boxes and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for stamped steel boxes.
- B. Location of outlets is approximate unless specifically dimensioned. Review Drawings for greater accuracy. Any box may be moved up to ten (10) feet by the direction of the ENGINEER at no additional cost to the OWNER if directed before the box has been roughed-in.
- C. The exact height of each switch, receptacle, light fixture, or other outlet shall be determined on the job site in conference with the ENGINEER, GENERAL CONTRACTOR, and the OWNER. Unless specified or otherwise noted on the Drawings, the following normal mounting heights to the center of the box above the finished floor shall apply:

Wall switches - 48" A.F.F.

Receptacles - 18" A.F.F.

Disconnect Switches - 42" A.F.F.

Wall Mounted Light Fixture - 78" A.F.F.

- D. For outlets, adjust outlet mounting height to agree with required location of equipment served.
- E. Where devices of the same mounting height are shown in close proximity on the same wall it is intended that they be ganged under one cover plate. If the size of a device prohibits ganging, this device shall be located close to the single or ganged devices even though the scale prevents them from being shown close together on the drawings.

END OF SECTION

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SECTION 26 05 43

UNDERGROUND DUCTS AND HANDHOLES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. Section Includes:

1. Duct and Duct Accessories - Ductbank.
2. Non-Metallic Conduit - Trench.
3. Electrical Handholes.

B. Related Sections:

1. Section 26 05 00 - General Electrical Provisions.
2. Section 26 05 02 - Electric Service.

1.2 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of ducts and handholes for low-voltage electrical systems as shown on the Drawings and as hereinafter specified.

1.3 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI 77 - Specification for Underground Enclosure Integrity.

B. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE C2 - National Electrical Safety Code.

C. National Electrical Contractors Association (NECA):

1. NECA 605 - Installing Underground Nonmetallic Duct.

D. National Electrical Manufacturers Association (NEMA):

1. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.
2. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

3. NEMA TC 10 - PVC and ABS Plastic Communications Duct for Underground Installation.

E. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

F. National Utility Contractors Association (NUCA):

1. NUCA - HDD Installation Guidelines.

G. Underwriters Laboratories (UL):

1. UL 651B - Continuous Length HDPE Conduit.

1.4 SYSTEM DESCRIPTION

A. Interconnected system of encased conduits and handholes to distribute low-voltage and communications cables.

B. Risers: Use rigid galvanized steel or intermediate metal conduit and fittings.

C. Underground Ductbank Beyond Riser Ells: Type EB-20 concrete encased duct and fittings.

D. Underground Duct in Trench Beyond Riser Ells: Type Schedule-40 PVC duct and fittings.

1.5 SUBMITTALS

A. Section 26 00 00 - General Provisions for All Electrical Systems: Submittal procedures.

B. Submit catalog data on all equipment items specified in this section to be utilized on this Project.

C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.

D. The specific item proposed and its area of application shall be marked on the catalog cuts.

E. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of handholes. Record actual depth of pipe at 25 foot intervals. Show depth and location of abandoned ducts.

1.7 QUALITY ASSURANCE

- A. Conform to IEEE C2, NFPA 70, and NECA 605.

1.8 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum five (5) years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage by storing in original packaging.
- C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.
- D. Protect conduit from corrosion and entrance of debris by storing above-grade. Provide appropriate covering.
- E. Provide temporary end caps and closures on piping and fittings until pipe is installed.
- F. Protect pipe from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.
- G. Accept products on site in manufacturer's original containers or configuration. Inspect for damage.
- H. Use shipping braces between layers of stacked pipe. Stack piping lengths no more than 3 layers high.
- I. Store field joint materials indoors in dry area in original shipping containers. Maintain storage temperature of 60 to 85° F.
- J. Support pipes with nylon slings during handling.

1.10 COORDINATION

- A. Coordinate Work with existing underground utilities and structures.
- B. Coordinate final locations and elevations of ductbanks and ductbank entrances into electrical equipment and handholes with other electrical (low voltage) and communications ductbanks, handholes, and appurtenances, other site utilities (e.g. water, sanitary sewer, storm drainage, natural gas, etc.), underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and as approved by Electrical Engineer.
- C. Complete installation of below-grade conduits prior to concrete and/or asphalt placement.

PART 2 PRODUCTS

2.1 DUCT AND DUCT ACCESSORIES - DUCTBANK

- A. Size: Ducts shall be sized as shown on the Drawings.
- B. Duct:
 - 1. Manufacturers: Carlon, Cantex, or as accepted.
 - 2. Plastic Utilities Duct: NEMA TC 6; PVC Type EB.
- C. Manufactured Bends:
 - 1. Manufacturers: Carlon, Cantex, or as accepted.
 - 2. Product Description: NEMA TC 2, Schedule 40 PVC.
- D. Plastic Utility Duct Fittings: NEMA TC 9.
- E. Duct Adhesives: As recommended by duct manufacturer's written instructions.
- F. Duct Spacers: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum 3" edge-to-edge duct spacing while supporting ducts during concreting or backfilling.
 - 1. Manufacturer: Carlon, Cantex, or as accepted.
 - 2. Duct Spacers: NEMA TC-6.
- G. Pull Tape:
 - 1. Manufacturers: Arnco "Tone Tape", NEPTCO Inc. "MuleTape", or as accepted.

2. Product Description: Furnish locatable pull tape made of aramid fiber, minimum tensile strength rating of 1,250 pounds, with sequential foot markings printed on tape.

H. Warning Tape:

1. Manufacturer: Seton Identification Products, or as accepted.
2. Warning Tape: Power: Red warning ribbon PVC tape, minimum 5 mils thick and 6 inches wide, permanently imprinted with "CAUTION - BURIED ELECTRIC LINE BELOW" in black letters, minimum 1 inch high.

2.2 NONMETALLIC CONDUIT - TRENCH

A. Size: Ducts shall be sized as shown on the Drawings.

B. Duct:

1. Manufacturers: Carlon, Cantex, or as accepted.
2. Plastic Utilities Duct: NEMA TC 2; Schedule 40 PVC.

C. Manufactured Bends:

1. Manufacturers: Carlon, Cantex, or as accepted.
2. Product Description: NEMA TC 2, Schedule 40 PVC, minimum 36" radius for medium-voltage conduits.

D. Fittings and Conduit Bodies: NEMA TC 3.

2.3 ELECTRICAL AND COMMUNICATION HANDHOLES

A. Manufacturers: Quazite Type "PG", or as accepted.

B. Product Description: Concrete composite handhole, open bottom type.

C. Construction: Handhole shall be molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

D. Dimensions: Handhole shall have minimum interior dimensions of 24" x 24" x 24" deep, with heavy duty cover.

E. Load Rating: Handhole and handhole cover shall be designed for driveways, parking lots and off road application subject to occasional non-deliberate traffic, ANSI Tier 22.

- F. Cover: Weatherproof, single piece, gasketed, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 - 1. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 2. Cover Legend: Molded lettering, "ELECTRICAL".
 - 3. Cover Legend: Molded lettering, "COMMUNICATIONS".
- G. Finish: Box and cover color shall have natural gray finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Duct bank system routing shown on Drawings is in approximate locations unless dimensioned. Ductbank elevations and depths shown are approximate. Coordinate final locations and elevations of handholes and ductbanks with other electrical (low voltage) and communications ductbanks, handholes, and appurtenances, other site utilities (e.g. water, sanitary sewer, storm drainage, natural gas, etc.), underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and as approved by Electrical Engineer.
- B. Route as required to complete the system.
 - 1. Coordinate underground ductbank system work to avoid interference with other trades and existing utilities.
 - 2. Verify routing and termination locations of duct banks before excavation for rough-in.
 - 3. Verify that field measurements and elevations are as shown on Drawings.
 - 4. Verify locations of handholes prior to excavating for installation.
- C. Examine substrates, areas, and conditions to receive ducts and utility structures for compliance with requirements for installation tolerances and other conditions affecting performance of underground ducts and utility structures. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 SITE PROTECTION

- A. CONTRACTOR shall verify locations of all utilities prior to the start of directional boring and excavation for ductbanks, handholes, and pad mounted transformer pad foundations.

- B. When the planned excavation path falls within 3 feet of an existing utility, the utility shall be located by pot-holing prior to commencement of excavation or directional boring to determine the exact location and depth of the utility.
- C. CONTRACTOR is responsible for the protection of surroundings while excavating or directional drilling including but not limited to: underground utilities, irrigation systems, sidewalks, streets, curbs, trees, shrubs, etc. Any damage resulting from CONTRACTOR's operations shall be the responsibility of the CONTRACTOR and shall be corrected at no expense to the OWNER.

3.3 SITE DEMOLITION

A. Protections:

1. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities, and structures, or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of the construction site. Comply with requirements of Article 22 of the Public Convenience and Safety.
2. Provide safeguards, including warning signs, barricades, temporary fences, warning light, and other similar items that are required for protection of all personnel during demolition and removal operations.
3. Fences, barricades, lights, and other similar items around exposed excavations shall be maintained until such excavations have been completely filled.
4. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum.
5. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. All possible users shall be instructed in use of fire extinguishers.

B. Clean Up:

1. The construction site shall be cleaned on a daily basis and shall include off-site disposal of all items and materials not required to remain the property of the Owner. Debris and rubbish resulting from demolition operations shall be disposed of off-site on a daily basis.

3.4 INSTALLATION - GENERAL

- A. Install in accordance with IEEE C2, NECA 605, NFPA 70, and the requirements of this Section.

- B. Install nonmetallic conduit as indicated on the Drawings, according to manufacturer's written instructions.
- C. Risers: At conduit risers at pad-mounted equipment and electrical equipment racks, make transition from underground duct to rigid or intermediate steel conduit below grade to exposed riser point using manufactured Schedule 40 PVC long sweep ells. Use fittings and adhesives manufactured for that purpose.
- D. Curves and Bends: At locations other than risers, field bend ducts with a minimum radius of 35 feet, both horizontally and vertically. The total number of bends in ducts shall not exceed three 90-degree bends or an equivalent of sweeps and radius bends.
- E. Cut the trenches neatly and uniformly. Excavate trench bottom to provide firm and uniform support for duct bank. Refer to Section 31 23 16.13.
- F. Sheet and shore as required.
- G. Dewater trench as required.
- H. Install conduit to locate top of conduits at depths as indicated on Drawings.
- I. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- J. Insert conduit to shoulder of fittings; fasten securely.
- K. Join conduit using adhesive as recommended by manufacturer.
- L. Wipe nonmetallic conduit and duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- M. Install no more than equivalent of three 90-degree bends between pull points. Use factory elbows for bends to make changes in direction. Field bend conduit only where approved by conduit manufacturer and in strict conformance with manufacturer's printed instructions.
- N. Install fittings to accommodate expansion and deflection.
- O. Provide suitable pull string in each empty duct except sleeves and nipples.
- P. Protect all conduit terminations from mechanical injury. Prevent the entry of moisture and foreign matter into the conduit system by properly installing duct plugs in all conduits.
- Q. Install an underground-line warning tape as shown on the Drawings.

3.5 INSTALLATION - DUCT BANK

- A. Stagger conduit and duct joints vertically in concrete encasement 6 inches minimum.
- B. Use suitable separators and chairs installed no greater than 5 feet on centers. Secure separators and chairs to trench bottom prior to concrete pour.
- C. Securely anchor conduit and duct to prevent movement during concrete placement.
- D. Install ducts with minimum 3 inch concrete cover at bottom, top, and sides.
- E. Place concrete in accordance with Section 03 30 00.
- F. Once concrete has achieved sufficient strength, backfill trenches in accordance with Section 31 23 23.13.

3.6 PRECAST ELECTRICAL HANDHOLE INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for handholes in accordance with Section 31 23 16 in location and to depth shown.
 - 2. Sheet and shore as required. Refer to Section 31 23 16.
 - 3. When groundwater is encountered, prevent accumulation of water in excavations. Place handholes in dry excavation. Dewater excavation as required. Refer to Section 31 23 16.
- B. Install handhole at locations shown on the Drawings with due consideration given to the location of other utilities, grades, paving, and other obstructions. All electrical handhole locations shall be approved by the Electrical Engineer.
- C. Support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- D. Install precast components in accordance with manufacturer's requirements.
- E. Install handhole plumb.
- F. The top of electrical handhole cover and concrete rings shall be flush with finished grade.
- G. Stub out conduits minimum 20', and as shown on the Drawings, for each spare duct, sleeve and cap conduits.
- H. Backfill handhole excavation in accordance with Section 31 23 23.13.

- I. Install protective reinforced concrete ring surrounding handhole as shown on the Drawings. Refer to Section 03 30 00.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Underground Warning Tape.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's catalog literature for each product required.
 - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- B. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Accept identification products on site in original containers. Inspect for damage.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved white letters on black contrasting background color.
- B. Letter Size:

1. ¼ inch high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 1/8 inch.

2.2 UNDERGROUND WARNING TAPE

- A. Description: 4 inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install identifying devices after completion of painting.

B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
6. Install nameplates for the following:
 - a. Automatic Transfer Switches
 - b. Main Switchboard.
 - c. Engine Generators.
 - d. Motor Control Centers.
 - e. Panelboards.
 - f. Transformers.
 - g. Disconnect
 - h. Control Panels

C. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes short circuit and protective device coordination study and arc flash hazard analysis study encompassing portions of existing electrical distribution system from normal power source or sources up to and including existing main breaker in main distribution panel, variable frequency controllers, enclosed motor controllers, and main breaker in each panelboard.
- B. Related Sections:
 - 1. Section 26 05 19 - Wire and Cables.
 - 2. Section 26 21 13 - Emergency Generator.
 - 3. Section 26 24 16 - Panelboards.
 - 4. Section 26 24 19 - Motor Control Centers.
 - 5. Section 26 28 19 - Motor and Circuit Disconnects.
 - 6. Section 26 29 13 - Enclosed Controllers.
 - 7. Section 26 36 00 - Automatic Transfer Switch.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).
 - 2. IEEE 1584 – Guide to Performing Arc-Flash Calculations.
- B. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 70E – Standard for Electrical Safety in the Workplace.

1.3 DESIGN REQUIREMENTS

- A. Complete Short Circuit and Protective Device Coordination Study to meet requirements of NFPA 70.
- B. Complete Arc Flash Hazard Analysis Study to meet requirements of NFPA 70E.
- C. Report Preparation:
 - 1. Prepare study prior to ordering distribution equipment to verify equipment ratings required.
 - 2. Perform study with aid of computer software program.

3. Calculate short circuit interrupting and, when applicable, momentary duties for assumed 3-phase bolted fault short circuit current and phase to ground fault short circuit current at each of the following:
 - a. Utility supply bus.
 - b. Secondary unit substations.
 - c. Main Switchboard
 - d. Automatic transfer switch.
 - e. Engine generator.
 - f. Distribution panelboards.
 - g. Branch circuit panelboards.
 - h. Control Panels.
 - i. Each other significant equipment location throughout system.
4. Calculate maximum arc flash energy and hazard classification at each equipment listed above.

D. Report Contents:

1. Include the following:
 - a. Calculation methods and assumptions.
 - b. Base per unit value selected.
 - c. One-line diagram.
 - d. Source impedance data including power company system available power and characteristics.
 - e. Typical calculations.
 - 1) Fault impedance.
 - 2) X to R ratios.
 - 3) Asymmetry factors.
 - 4) Motor fault contribution.
 - 5) Short circuit kVA.
 - 6) Symmetrical and asymmetrical phase-to-phase and phase-to-ground fault currents.
 - 7) Tabulations of calculation quantities and results.
 - f. One-line diagram revised by adding actual instantaneous short circuits available.
 - g. State conclusions and recommendations.
 - h. Arc Flash Hazard Analysis with assessments and recommendations for labeling.
2. Prepare time-current device coordination curves graphically indicating coordination proposed for system, centered on conventional, full-size, log-log forms.
3. Prepare with each time-curve sheet complete title and one-line diagram with legend identifying specific portion of system covered by that particular curve sheet.
4. Prepare detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate

recommended device tap, time dial, pickup, instantaneous, and time delay settings.

5. Plot device characteristic curves at point reflecting maximum symmetrical fault current to which device is exposed. Include on curve sheets the following:
 - a. Power company relay characteristics.
 - b. Power company fuse characteristics.
 - c. Low voltage equipment circuit breaker trip device characteristics.
 - d. Low voltage equipment fuse characteristics.
 - e. Cable damage point characteristics.
 - f. Pertinent transformer characteristics including:
 - 1) Transformer full load current.
 - 2) Transformer magnetizing inrush.
 - 3) ANSI transformer withstand parameters.
 - 4) Significant symmetrical fault current.
 - g. Pertinent motor characteristics.
 - h. Generator characteristics including:
 - 1) Phase and ground coordination of generator protective devices.
 - 2) Decrement curve and damage curve.
 - 3) Operating characteristic of protective devices.
 - 4) Actual impedance value.
 - 5) Time constants.
 - 6) Current boost data.
 - 7) Do not use typical values for generator.
 - i. Transfer switch characteristics.
 - j. Other system load protective device characteristics.

1.4 SUBMITTALS

- A. Qualifications Data: Submit the following for review prior to starting study.
 1. Submit qualifications and background of firm.
 2. Submit qualifications of Professional Engineer performing study.
- B. Software: Submit for review information on software proposed to be used in performing study.
- C. Product Data: Submit the following:
 1. Report: Summarize results of study in report format including the following:
 - a. Descriptions, purpose, basis, and scope of study.
 - b. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.

- c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - d. Fault current calculations including definition of terms and guide for interpretation of computer printout.
 - e. Arc Flash Hazard Analysis with proposed labeling.
- D. Submit copies of final report signed by professional engineer. Make additions or changes required by review comments.
- E. IMPORTANT: Submit documents listed above with Switchboard, Motor Control Center, and Panelboard submittals. The Switchboard, Motor Control Center, and Panelboard submittals will be rejected and returned without comment if the Overcurrent Protective Device Coordination Study is not provided.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of document on site.
- B. Use commercially available software, designed specifically for short circuit and protective device coordination studies with minimum of 3 years availability.
- C. Perform study in accordance with IEEE 242.

1.6 QUALIFICATIONS

- A. Study Preparer: Company specializing in performing work of this section with minimum 3 years' experience.
- B. Perform study under direct supervision of Professional Engineer experienced in design of this Work.
- C. Demonstrate company performing study has capability and experience to provide assistance during system start up.

1.7 SEQUENCING

- A. Submit short circuit and protective device coordination study to Architect/Engineer prior to receiving final approval of distribution equipment shop drawings and prior to releasing equipment for manufacturing.
- B. When formal completion of study will cause delay in equipment manufacturing, obtain approval from Architect/Engineer for preliminary submittal of study data sufficient in scope to ensure selection of device ratings and characteristics will be satisfactory.

1.8 SCHEDULING

- A. Schedule work to expedite collection of data to ensure completion of study for final approval of distribution equipment shop drawings prior to release of equipment for manufacturing.

1.9 COORDINATION

- A. Coordinate work with local power company.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Provide assistance to electrical distribution system equipment manufacturer during start up of electrical system and equipment.
- B. Select each primary protective device for delta-wye connected transformer so device's characteristic or operating band is within transformer characteristics, including point equal to 58 percent of ANSI withstand point to provide secondary line-to-ground fault protection.
- C. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by 16 percent current margin to provide proper coordination and protection in event of secondary line-to-line faults.
- D. Separate medium-voltage relay characteristic curves from curves for other devices by at least 0.4 second time margin.

3.2 ARC FLASH HAZARD LABELING

- A. Install labeling on equipment identified in Arc Flash Hazard Analysis Study.

3.3 ADJUSTING

- A. Perform field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust settings in accordance with approved short circuit and protective device coordination study.

END OF SECTION

SECTION 26 21 13

EMERGENCY GENERATORS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the emergency generator(s) at the Waste Water Treatment Plant site including installation of the concrete pad foundations as shown on the Drawings and as hereinafter specified.
- B. **All generator sets furnished and installed on this project shall be of the same manufacturer.**

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions.
- B. Section 26 05 19 - Wire and Cables.
- C. Section 26 05 26 - Grounding.
- D. Section 26 05 33 - Conduits.
- E. Section 26 05 35 - Pull, Junction, and Outlet Boxes.
- F. Section 26 05 73 - Overcurrent Protective Device Coordination Study.
- G. Section 26 36 00 - Automatic Transfer Switches.

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all emergency generators to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
 - 1. Data shall be submitted in the following form:
 - a. Technical data sheets: These include published performance, rating and derating curves, published ratings, catalog cuts, pictures, manufacturer's specifications, material composition, gauge thickness, etc.
 - b. Description of operation: Manufacturer's literature and, if suitable, diagrams.
 - c. Calculations: Detailed engineering calculations with all equations, graphs,

- assumptions, and approximations shown, and data sources referenced.
- d. Shop Drawings: Scaled drawings showing dimensions, plan views, side views, elevations and cross sections.
- e. Diagrams: These include control system diagrams, elementary diagrams, control sequence diagram or table, wiring diagrams, interconnections diagrams, wireless connection diagrams, illustrative diagrams, and flow diagrams, etc.
- f. Provide Generator Sizing Calculations and Calculation of voltage drop on generator starting based on the following information:

Wastewater Treatment Plant Site:

Refer to Panelboard Schedules and Mechanical Equipment Schedules for load information.

- 2. Prior to fabrication, submit for approval the following data for each engine-generator set, transfer device and control and supervisory equipment:
 - a. Engine generator set: Technical Data and Shop Drawings.
 - b. Engine jacket water heaters: Technical Data.
 - c. Muffler assembly: Technical Data.
 - d. Fuel tank and pumps: Technical Data.
 - e. Batteries, jacks and charger: Technical Data and Calculations.
 - f. Torsional Vibration: Certification.
 - g. Control and Supervisory Equipment: Technical Data, Diagrams, Operation, Shop Drawings.
 - h. Performance:
 - (1) Voltage regulating equipment: Technical Data.
 - (2) Frequency regulating Equipment: Technical Data.
 - (3) Voltage and frequency dips and recovery times due to specified motor loading.
 - (4) Antifreeze derating: Technical Data.
 - (5) Ambient derating: Technical Data.
 - i. Fuel oil system: Diagrams.
 - j. Cooling system: Diagrams.
 - k. Vibration Isolators: Technical Data, Shop Drawings.

1.04 STORAGE AND HANDLING:

- A. Design the equipment to withstand the mechanical stresses caused by rough handling during shipment in addition to the electrical and mechanical stresses which occur during operation of the system.

- B. Store the equipment in a location selected by the OWNER.

1.05 JOB CONDITIONS:

- A. Space: Shall conform to the arrangements and details shown on the Drawings and to the spaces designated for their installation. The dimensions, enclosures and arrangements shall permit the operating personnel to safely and conveniently operate and maintain the system in the space designated for installation.
- B. Unless specified otherwise, each component of the engine-generator system shall be capable of operating as specified herein at 500 feet above sea level with an average ambient air temperature of 110 degrees F.

1.06 QUALITY ASSURANCE:

- A. The supplier of the diesel-engine generator set shall be responsible for satisfactory total operation of the system and its certification. This supplier shall have had experience with three or more installations of systems of comparable size and complexity as regards to coordinating, engineering, testing and supervising. Each of these installations shall have been in successful operation for three or more years. With submittals, the CONTRACTOR shall submit the following:
 - 1. Submit a list of locations of similar installations utilizing similar equipment by the same manufacturer. Include in the listing of all names and addresses of owners of these installations.
- B. TESTING: To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
 - 1. Design Prototype Test: components of the emergency system, such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and reliability preproduction models, which will not be sold, shall be used for these tests. Upon request, the following certified test records shall be made available:
 - a. Maximum power (KW).
 - b. Maximum starting (KVA) at 15% instantaneous voltage dip.
 - c. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1-22.40 and 16.40.
 - d. Governor speed regulation under steady-state and transient conditions.
 - e. Voltage regulation and generator transient response.
 - f. Fuel consumption at no load, 1/4, 1/2, 3/4, and full load.
 - g. Harmonic analysis, voltage waveform deviation, and telephone influence

factor.

- h. Three-phase line-to-line short circuit test.
- i. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.
- j. Endurance testing.

C. Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

- 1. Single-step load pickup.
- 2. Transient and steady-state governing.
- 3. Safety shutdown device testing.
- 4. Voltage regulation.
- 5. Rated power.
- 6. Maximum power.

Upon request, arrangements to witness this test will be made or a certified test record will be sent prior to shipment.

D. Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

- 1. Fuel, lubricating oil, and antifreeze (liquid cooled models) shall be checked for conformity to the manufacturer's recommendations under the environmental conditions present and expected.
- 2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. This shall include: engine heaters, battery charger, generator strip heaters, etc.
- 3. Start-up under test mode to check for exhaust leaks, paths of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.

E. A one (1) year warranty for each generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

- B. Supplier: Authorized distributor of specified manufacturer with minimum five years documented experience and with service facilities within 200 miles of project.

1.08 APPLICABLE PUBLICATIONS: The following Specifications and standards, except as hereinafter modified, are incorporated herein by reference and from, a part of this Specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation of Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.

- A. National Fire Protection Association (NFPA):

No. 70 National Electrical Code (NEC)

- B. Underwriters Laboratories, Inc. (UL):

No. 508.....Electric Industrial Control Equipment

No. 891.....Dead-Front Electrical Switchboards

No. 50.....Cabinets and Boxes

No. 489.....Molded Case Circuit Breakers and Circuit Breaker Enclosures

- C. National Electrical manufacturers Association (NEMA):

ICS Industrial Control and Systems

IS 4.....Terminal Blocks for Industrial Control Equipment

II 2.....Electrical Indicating Instrument - Relay

MG 1 Motor and Generators

MG 2 Safety Standard for Construction and Guide for Selection, Installation
and Use of Electric Motors and Generators.

AB 1 Molded Case Circuit Breakers

PART 2 - PRODUCTS

2.01 DIESEL ENGINE-GENERATOR SET - GENERAL

- A. The engine generator system shall be in accordance with NFPA, UL, NEMA and ANSI, as herein specified and as shown on the Drawings.
- B. The CONTRACTOR shall provide and install at the new and existing well sites a complete and fully automatic, diesel engine-generator system.
- C. Published Rating:

Wastewater Treatment Plant Site:

Refer to Panelboard Schedules and Mechanical Equipment Schedules for load

information.

1. The rating shall be not less than 750 KW at 277/480 volts, 3-phase, 4-wire, 60 Hz, 0.80 power factor.
 - D. Assemble, connect and wire the equipment at the factory so that only the external connections need to be made at the construction site.
 - E. Thoroughly clean and paint the metal; surfaces at the factory with manufacturer's primer and standard finishes.
 - F. Coordinate the components of the system and their arrangements electrically and mechanically.
 - G. Connections between components of the system shall conform to the recommendations of the manufacturer of the diesel engine-generator set.
 - H. Couplings, shafts, and other moving parts shall be enclosed and guarded. Guards shall be metal, ruggedly constructed, rigidly fastened and readily removable for convenient servicing of the equipment without disassembling any pipes and fittings.
 - I. Protect the diesel engine and its water cooling system at all times against freezing weather conditions.
 - J. The engine generator system shall have the following features:
 1. Mounting shall be on a common, rigid, welded, structural steel base at the factory.
 2. The engine shall automatically start, accelerate to the specified RPM and deliver the specified KW/KVA output at 60 Hz after a single pole contact closes in a remote device in accordance with NFPA-70.
 3. The engine shall recover rapidly from instantaneous changes between no load and the specified KW/KVA rating, and the reverse changes of load, without damage.
 - K. Emergency Generator(s) shall be provided in a weatherproof enclosure, rated NEMA 3R. **Access Doors on the weather protective enclosure shall be hinged.**
 - L. Vibration isolators shall be provided between the engine-generator and heavy-duty steel base.
- 2.02 DIESEL ENGINE:

- A. The engine shall have the following features:

1. Engine shall be a full diesel, coupled directly to a generator. Engine shall have sufficient displacement and shall develop sufficient horsepower to meet the load starting and running requirements detailed in above paragraph 1.03 f of this specification. Two cycle engines are not acceptable.
2. The engine shall be equipped with the following:
 - a. Engine-driven or electric fuel transfer pump, fuel filters and electric solenoid fuel shut-off valve.
 - b. Isochronous governor capable of 0.5% Steady State frequency regulation.
 - c. 24 volt positive engagement solenoid shift-starting motor.
 - d. Automatic battery charging alternator with solid-state voltage regulation.
 - e. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, an oil drain.
 - f. Dry-type replaceable air cleaner elements.
- B. The naturally aspirated or turbocharged engine shall be fueled with No. 2 diesel. The engine shall be liquid cooled by a unit mounted radiator and shall be suitable for outdoor mounting, sized in accordance with the engine supplier's recommendation. This system shall properly cool the engine. It shall include an engine-driven fan, fan shroud, fan core guard, surge tank, and filler with pressure cap.

2.03 GENERATORS

- A. The alternators shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated for drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet NEMA standard for Class H and shall be insulated with epoxy varnish to fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 130°C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within +/-2% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volt-per-hertz operations. The regulator must be protected from the environment by conformal coating. The alternator shall be compatible with the Variable Frequency Drives to be installed at the Grit and Grease and Pumping Station site.
- B. The alternator excitation shall be of a permanent magnet exciter design.

- C. The generators shall be capable of sustaining at least 250% or rated current for at least 10 seconds under a three-phase symmetrical short-circuit by inherent design or by the addition of an optional current boost system.
- D. The generator set shall be furnished for the **Waste Water Treatment Plant Site** shall be provided with one (1) mounted main line circuit breaker that shall feed the Waste water treatment plant. The circuit breaker shall be service entrance rated, sized to carry the rated output current of the generator set on a continuous basis. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions. The electronic trip unit shall be adjustable. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.
- E. The generator furnished for the Waste Water Treatment Plant shall be capable of starting with a maximum voltage drop of 15% or less and maximum frequency drop of 10.0% with the following loads:

Wastewater Treatment Plant Site:

Refer to Panelboard Schedules and Mechanical Equipment Schedules for load information.

2.04 CONTROLLER

- A. Generator sets controllers shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set. The control shall be mounted on the generator set. The control shall be vibration isolated.
- B. The Controllers shall be provided with the following accessories:
 - 1. Common Failure Alarm Relay - remotely signals auxiliary fault, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole double throw relay with 10 amp contacts at 120 VAC.
 - 2. Run Relay - provides a three pole, double throw relay with 10 amp contacts at 120 VAC for indicating that the generator set is running.
- C. The controllers shall provide inherent alternator safeguard protection. The protective functions shall comply with the requirements of NFPA 70 Article 445.

2.05 FUEL OIL SYSTEM:

- A. The fuel oil system shall have the following features:

1. Injection pump(s) and nozzles shall be provided.
 2. Plungers shall be carefully lapped for precision fit and shall not require any packing.
 3. Filters or screens which require cleaning or replacement will not be permitted in the injection system assemblies.
 4. When recommended by the manufacturer, return surplus oil from the injectors to the main storage tank by gravity or a pump.
 5. Filter System:
 - a. Dual primary filters shall be located between the main fuel oil storage tank.
 - b. Secondary filters (engine mounted) shall be located so the oil will be thoroughly filtered before it reaches the injection system assemblies.
 - c. Filters shall be cleanable or replaceable type and shall entrap and remove water from oil as recommended by the engine manufacturer.
- B. Main Storage Tank: Provide a UL-Listed, double-wall, sub base fuel tank with the unit. The storage tank shall hold enough fuel to operate the engine-generator set at 75 % of full load for a period of 24 hours.
- C. Piping System:
1. The engine and main storage tank shall be piped as required.
 2. All piping shall be black steel, standard weight, Fed. Spec. WW-P-404 or WW-P-406. At connection points to the engine, install a section of stainless steel flexible piping.
- D. CONTRACTOR shall provide tanks fully fueled with diesel. CONTRACTOR shall refuel tanks to full capacity after certification test have been performed.

2.06 ACCESSORIES

- A. The following accessories shall be installed:
1. Block heater (liquid cooled models) of proper wattage and voltage, thermostatically controlled to maintain engine coolant at proper temperature to meet the start-up requirement of NFPA-99 Regulation. The heater voltage shall be 120 VAC.
 2. Overvoltage protection will shut down the unit after one second of 15% or more

overvoltage.

3. Battery cables, 12-volt batteries capable of delivering the minimum cold-cranking amps required at zero degrees Fahrenheit per SAE Standard I-537 shall be supplied dry, along with separate electrolyte, which will be added just prior to start-up.
4. Automatic float battery charger with constant voltage regulation, current limiting capability, cranking disconnect relay, temperature compensated for ambient from - 20 degrees Fahrenheit, voltmeter and ammeter, equipped for conduit installation. The battery charger shall be provided with an alarm feature that signals battery charger fault, via one single-pole double throw relay with 10 amp contacts at 120 VAC.
5. Gas proof, seamless, stainless steel, flexible exhaust connection, and engine exhaust silencer.
6. Weather protective enclosure for outdoor mounting, NEMA 3R. **Access Doors on the weather protective enclosure shall be hinged.**

2.07 OPERATION

- A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.
- B. The generator set shall complete a time delay start period as programmed into the control.
- C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
 1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.
 2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
 3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine

accelerates and the alternator builds to rated voltage.

- D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.
- E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
- F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Mounting:
 - 1. All connections between the engine-generator set and exterior systems (such as fuel lines and exhaust duct) shall be flexible.

3.02 SPARE PARTS: Furnish the following spare parts:

- A. For each engine-generator set:
 - 1. Three filters of each type required.
- B. For each battery charger:
 - 1. One complete set of fuses.
 - 2. One complete set of indicating lamps.

3.03 TECHNICAL SERVICES DURING INSTALLATION AND TEST:

- A. At the construction site, provide the services of a competent, factor-trained engineer or technician employed by the manufacturer of the diesel engine-generator set to technically supervise and participate during all of the adjustments and tests for the set and major auxiliaries. Adjustments and testing shall be certified by the manufacturer that the set is installed and operating in compliance with the specifications.
- B. When the complete auxiliary electrical power system has been installed and prior to the final inspection, test all components of the system in the presence of the ENGINEER for

proper operation of the individual components and the complete system and to eliminate electrical and mechanical defects.

3.04 INSTRUCTIONS AND FINAL INSPECTIONS:

- A. At the final inspection in the presence of the ENGINEER, demonstrate that the complete auxiliary electrical power system operates properly in every respect.
- B. Furnish the services of a competent, factory-trained engineer or technician for five, 4-hour periods for instructing Owner's personnel in operation and maintenance of the equipment, on the dates requested by the ENGINEER.

3.05 FACTORY TESTING

- A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Supplier is responsible to provide two weeks notice for testing.
- C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

3.06 INSTALLATION

- A. Equipment shall be installed by the CONTRACTOR in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The CONTRACTOR shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Equipment shall be installed on concrete pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- D. Equipment shall be initially started and operated by representatives of the manufacturer.
- E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

3.07 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by CONTRACTOR. The Engineer shall be notified in advance and shall have the option to witness the tests.
- B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test. Provide a resistive load bank and make temporary connections for full load test, if necessary.
- C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.08 DIESEL FUEL

- A. The generator set installed at the Waste Water Treatment Plant Site shall be provided with a full tank of Diesel Fuel and Fuel Stabilizer. Fuel and Fuel Stabilizer shall be type as recommended by Generator Manufacturer.

END OF SECTION

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Two-winding transformers.
- B. Related Requirements:
 - 1. Section 26 05 26 - Grounding.
 - 2. Section 26 05 29 - Supporting Devices.
 - 3. Section 26 05 33 - Conduits
 - 4. Section 26 05 53 - Identification for Electrical Systems.

1.2 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association:
 - 1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
 - 2. NEMA ST 20 - Dry Type Transformers for General Applications.
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

- A. Product Data: Submit outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- B. Test and Evaluation Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
- C. Source Quality Control Submittals: Indicate results of factory tests and inspections.
- D. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

- A. Record Documentation: Record actual locations of transformers.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

- A. Manufacturers:
 - 1. Cutler-Hammer
 - 2. Eaton Corporation
 - 3. General Electric Company
 - 4. Schneider Electric; Square D
- B. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as indicated on Drawings.
- C. Operation:
 - 1. Primary Voltage: 480 volts, 3 phase.
 - 2. Secondary Voltage: 240/120 volts, delta, 3 phase.
 - 3. Insulation system and average winding temperature rise for rated kVA as follows:
 - 4. 1-15 kVA: Class 185 with 115 degrees C rise.
 - 5. 16-500 kVA: Class 220 with 115 degrees C rise.
 - 6. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
 - 7. Winding Taps:
 - a. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
 - b. Transformers 15 kVA and Larger: NEMA ST 20.
 - 8. Sound Levels: NEMA ST 20.
 - 9. Basic Impulse Level: 10 kV.
 - 10. Mounting:
 - a. 1-15 kVA: Suitable for wall mounting.
 - b. 16-75 kVA: Suitable for floor mounting.
 - c. Larger than 75 kVA: Suitable for floor mounting.

D. Materials:

1. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.
2. Coil Conductors: Continuous copper windings with terminations brazed or welded.
3. Enclosure: NEMA ST 20, Type 1. Furnish lifting eyes or brackets.

E. Fabrication:

1. Isolate core and coil from enclosure using vibration-absorbing mounts.
2. Nameplate: Include transformer connection data.

2.2 SOURCE QUALITY CONTROL

- A. Production test each unit according to NEMA ST20.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify mounting supports are properly sized and located including concealed bracing in walls.

3.2 PREPARATION

- A. Provide concrete pads under provisions of Section 03 30 00.

3.3 DEMOLITION

- A. Disconnect and remove abandoned transformers.
- B. Maintain access and adequate ventilation to existing transformers and other installations remaining active and requiring access and ventilation. Modify installation or provide access panel or ventilation grilles.

3.4 INSTALLATION

- A. Set transformer plumb and level.
- B. Use flexible conduit 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- C. Support transformers in accordance with Section 26 05 29.
1. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer.
 2. Mount floor-mounted transformers on vibration isolating pads suitable for isolating transformer noise from building structure. Provide concrete housekeeping pad.

3. Mount trapeze-mounted transformers as indicated on Drawings.

D. Install grounding and bonding in accordance with Section 26 05 26.

3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.2.1.

3.6 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

3.7 CLEANING

A. Clean existing transformers to remain or to be reinstalled.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Distribution switchboards.
 - 2. Main circuit breaker.
 - 3. Distribution circuit breakers – 400 Ampere and Larger Frame Size.
 - 4. Distribution circuit breakers – Smaller than 400 Ampere Frame Size.
 - 5. Transient Voltage Suppression Device.
 - 6. Control Power.
 - 7. Control Wiring.
 - 8. Nameplates.
- B. Related Sections:
 - 1. Section 26 05 26 - Grounding.
 - 2. Section 26 05 73 - Overcurrent Protective Device Coordination Study.
 - 3. Section 26 35 53 - Voltage Regulators.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C12.1 - Code for Electricity Metering.
 - 2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.
- B. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
 - 2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 3. NEMA PB 2 - Deadfront Distribution Switchboards.
 - 4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- D. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

- E. Underwriters Laboratories Inc.:
 - 1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - 2. UL 891 - Dead-Front Switchboards.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.
- B. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.
- C. Test Reports: Indicate results of factory production and field tests.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.
- B. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in 42 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- B. Accept switchboards on site. Inspect for damage.
- C. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 SEQUENCING

- A. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 PRODUCTS

2.1 DISTRIBUTION SWITCHBOARDS

- A. Manufacturers:
 - 1. Square D Model “QED-2” or as accepted.
- B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.
- C. Service Conditions:
 - 1. Temperature: 86 degrees F.
- D. Device Mounting:
 - 1. Main Section: Individually mounted.
 - 2. Distribution Section: Group mounted.
- E. Phase Bus:
 - 1. Material: Plated copper, sized per UL 891.
 - 2. Connections: Bolted, accessible from front for maintenance.
 - 3. Insulation: Bus insulators and separations rated for 600V.
 - 4. Future Provisions: Fully equipped spaces for future devices with bussing and bus connections, insulated and braced for short circuit calculations. Furnish continuous current rating as indicated on Drawings. Make Full provisions for the addition of future switchboard sections; include all necessary hardware to accommodate splicing for future additions.
- F. Neutral Bus: Equivalent capacity and construction as phase bus bar.
- G. Ground Bus:
 - 1. Material: Copper, ¼ inch by 2 inch minimum size, sized per UL 891.

2. Connections: Bolted, accessible from front for maintenance. Provide bolt holes to accept NEMA two-hole compression lugs. Bond ground bus to each switchboard section.
 3. Future Provisions: Extend length of switchboard. Make full provisions for the addition of future switchboard sections; include all necessary hardware to accommodate splicing for future additions.
- H. Minimum Short Circuit Rating: 65,000 symmetrical amperes rms, fully rated.
- I. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on Drawings.
- J. Barriers: Provide insulated barrier between adjacent switchboard sections.
- K. Enclosure: Type 1 - General Purpose.
- L. Align sections at front and rear.
- M. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.
- N. Hinged Front Panels: Allow access to circuit breaker, metering, accessory and blank compartments.
- O. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.2 MAIN CIRCUIT BREAKER

- A. Manufacturers:
1. Square D Company or as accepted.
- B. Rating:
1. Ampacity: 1600 amperes continuous.
 2. Voltage: 480/277Y, three-phase-four-wire.
 3. Interrupting Rating: 65 kA symmetrical at 480 volts AC.
- C. Product Description: UL 489, molded-case circuit breaker with electronic sensing, timing, and tripping circuits with adjustable time and current settings:
1. Long time pickup and delay.
 2. Short time pickup and delay.
 3. Ground fault pickup and delay.

4. Instantaneous pickup and delay.

2.3 DISTRIBUTION CIRCUIT BREAKERS - 400 AMPERE AND LARGER FRAME SIZE

A. Manufacturers:

1. Square D Company “I-Line” or as accepted.

B. Rating: Frame and trip ratings and characteristics as shown on the Drawings and as specified herein.

C. Product Description: UL 489 molded-case circuit breaker with electronic sensing, timing, and tripping circuits with adjustable time and current settings:

1. Long time pickup and delay.
2. Short time pickup and delay.
3. Ground fault pickup and delay.
4. Instantaneous pickup and delay.

2.4 DISTRIBUTION CIRCUIT BREAKERS - LESS THAN 400 AMPERE FRAME SIZE

A. Manufacturers:

1. Square D Company “I-Line” or as accepted.

B. Rating: Frame and trip ratings and characteristics as shown on the Drawings and as specified herein.

C. Product Description: UL 489 molded-case thermal magnetic circuit breaker with field-adjustable trip setting.

2.5 TRANSIENT VOLTAGE SUPPRESSION DEVICE

A. Manufacturers:

1. Square D “I-Line” or as accepted.

B. Product Description: IEEE C62.41, integrally-mounted, solid-state, parallel-connected, transient voltage surge suppressor, selected to meet requirements for high exposure for service entrance facilities and to coordinate with system circuit voltage.

2.6 CONTROL POWER

- A. Control Circuits: 277 volt AC, supplied through main switchboard.
- B. Control-Power Fuse: Fuse for protection of control circuit.

2.7 CONTROL WIRING

- A. Use Type SIS flexible stranded 90 °C wire that is VW-1 flame test rated per UL 1581 for control and communications wiring.
- B. Secure wires in bundles using nylon ties; anchor bundles to the switchgear assembly using pre-punched wire lances.
- C. Terminate control and communications conductors on terminal blocks with suitable numbering strips; use crimp-on solderless lugs.
- D. Provide wire markers at each end of all control and communications wiring.

2.8 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- B. Letter Size: 3/16 inch high letters for identifying grouped equipment and loads.
- C. Minimum nameplate thickness: 1/8 inch.
- D. Installation: Provide nameplate for each device.

2.9 SOURCE QUALITY CONTROL

- A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surface is suitable for switchboard installation.

3.2 PREPARATION

- A. Provide Concrete Pad.

3.3 INSTALLATION

- A. Install in accordance with NEMA PB 2.1.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- C. Install fuses in each switch and coordinate sizes with connected load.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.
- E. Install breaker circuit directory.
- F. Ground and bond switchboards in accordance with Section 26 05 26.

3.4 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.5 ADJUSTING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections.
- C. Adjust circuit breaker trip and time delay settings to values shown in Coordination Study.
Refer to Section 26 05 73 - Overcurrent Protective Device Coordination Study.

3.6 CLEANING

- A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

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SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of panelboards and circuit breakers as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions.
- B. Section 26 05 26 - Grounding.
- C. Section 26 05 33 - Conduit.
- D. Section 26 05 73 - Overcurrent Protective Device Coordination Study.

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all panelboards and circuit breakers to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Panelboards shall meet or exceed applicable ASTM Specifications and shall conform to Underwriters Laboratories Standard UL-67, and NEMA Standard AB-1, latest revisions.
- B. Circuit breakers shall meet or exceed applicable ASTM Specifications and shall conform to Underwriters Laboratories Standard UL-489, and NEMA Standard AB-1, latest revisions.

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall be dead front construction with solderless pressure terminals.
- B. Main busses shall be of the capacity shown in the circuit schedules. Panelboards shall be supplied with full size neutral bus mounted on insulated supports and a ground bar with sufficient terminals for all grounding wires. All panelboard busses shall be copper.
- C. Panelboards shall be of the type specified or NEC required for their location and application and manufactured by General Electric, Square D, Cutler Hammer, or as accepted.
- D. All interior panelboards shall be NEMA 1 enclosure. All exterior panelboards shall be enclosed in a weatherproof NEMA 4X stainless steel enclosure, watertight and dust tight with gasketed door. Panelboard shall have a directory card holder on the inside of the door. The panelboard enclosure shall be U.L. approved.
- E. Integrated equipment short circuit ratings of panelboards shall be a minimum of 22,000 amperes RMS symmetrical for 208 volt panelboards and minimum 65,000 amperes RMS symmetrical for 480 volt panelboards.
- F. Panelboards utilized as service entrance equipment shall be approved for that purpose.
- G. Panelboards shall have main breaker, or main lug, bus size, voltage, phase, top or bottom feed, and flush or surface mounting, all as scheduled on the Drawings.
- H. Where designated on the panel schedule as "space", include all necessary bussing, device support and connections. Provide blank cover for each space.

2.02 CIRCUIT BREAKERS

- A. Circuit breakers shall be of the molded case bolt on type and shall be quick-make and quick-break in manual or automatic operation and shall be of the same manufacturer as the panelboard in which they are installed.
- B. Circuit breakers rated at 120/208 volts shall have a minimum short circuit rating of 22,000 amperes RMS symmetrical.
- C. Breakers shall be trip-free. Each breaker shall have trip indication independent of the ON or OFF positions.
- D. All breakers shall be UL listed and meet NEMA Standards Publication No. AB1-1969 and Federal Specification No. W-C-375a, and any amendments to the above where applicable.
- E. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees C.
- F. All two (2) and three (3) pole breakers shall be common trip.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Connect the phase wires of two and three wire home runs to breakers connected to separate phase busses of the panelboard and maintain approximately equal loads on each bus. Panelboard circuits shall be numbered in sequence vertically. All branch circuit neutral connections shall be identified by adhesive number tags to identify with their branch circuit phase conductors where neutral connections connect to the panel neutral bus.
- B. Home runs may be regrouped as required. However, in no case shall two ungrounded conductors in a circuit grouping be connected to the same ungrounded main in any panel.
- C. Locate panelboards so that present and future conduits can be conveniently connected.
- D. Mount panelboards so that maximum height of circuit breakers above finished floor shall not exceed 78 inches. For panelboards which are too high, mount panelboard so that the bottom of the cabinets will be not less than 6 inches above finished floor.
- E. Circuit numbers indicated on the Drawings are shown for the purpose of clarifying the grouping of outlets. The actual number assigned to the circuit in the panelboard shall suit the load balancings, the bussing, and branch circuiting to the panel.
- F. A typewritten schedule of circuits, shall be placed on the panel directory cards in the panelboard installed on this project prior to the final inspection.

END OF SECTION

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SECTION 26 27 26

WALL SWITCHES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of wall switches as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 19 - Wires and Cables
- C. Section 26 05 35 - Pull, Junction, and Outlet Boxes
- D. Section 26 27 28 - Plate Covers
- E. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all wall and toggle switches to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Toggle switches shall meet or exceed applicable ASTM Specifications and shall conform to Underwriters Laboratories Standard UL-20, and Federal Specification W-S-896E, latest revision.

PART 2 - PRODUCTS

2.01 TOGGLE SWITCHES

- A. Switches shall be AC quiet type, Leviton, Hubbell, P & S, Arrow-Hart, or as accepted. Circuit control contacts shall be silver-alloy; terminal screws and back-wiring wells shall accept up to size #10 AWG wire. Control shall be single-pole, double-pole, three-

way or four-way; standard or framed toggle. Toggles shall be brown or ivory; rating shall be 20 amperes, 120/277 volts alternating current, grounding type.

- B. The color of the toggle shall be ivory.

PART 3 - EXECUTION

3.01 GENERAL

- A. Wall switches shall be installed in outlet boxes mounted on the striker plate side of doors at heights above finished floor as specified in Section 16134.
- B. Wall switches shall be installed to assure ground continuity of grounded portions of the switch body.

END OF SECTION

SECTION 26 27 27

RECEPTACLES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing receptacles as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 35 - Pull, Junction, and Outlet Boxes
- C. Section 26 27 28 - Plate Covers
- D. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all receptacles to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Single and duplex receptacles shall meet or exceed all applicable ASTM specifications, shall be UL listed, and shall meet the requirements of Federal Specification W-C-596, latest revision.
- B. Ground fault interrupter receptacles shall meet or exceed applicable ASTM Specifications and shall comply with Underwriters Laboratories Standard UL-943, class A and shall be certified "Corrosion Resistant", enduring 500 hour ASTM B-117-73 Salt Spray (Fog) Test.

PART 2 - PRODUCTS

2.01 RECEPTACLES

- A. Single and Duplex receptacles shown on the plans shall be specification grade by Leviton, Hubbell, P & S, Arrow-Hart, or equal, straight blade 20 ampere, 2 pole, 3 wire grounding receptacles, NEMA 5-20R configuration, with self grounding feature.
- B. Weatherproof receptacles shall consist of a ground fault circuit interrupter duplex receptacle, as specified, mounted in a box with a gasketed, weatherproof, cast metal in-use cover plate. The in-use cover shall be permanently attached to the cover plate.

2.02 GROUND FAULT INTERRUPTER RECEPTACLES

- A. Ground Fault Circuit Interrupters shall be P & S GFCI Duplex Receptacle types having designer-type receptacle faces, made in conformance with NEMA WD-1-1.10. All models shall have nylon faces and bodies and shall be capable of being installed to afford feed-through GFCI protection to the entire branch circuit or portions thereof, as well as through their own receptacles. In the feed-through mode, all models shall be current-rated at 20A. GFCI duplex receptacles shall be ivory colored.

PART 3 - EXECUTION

3.01 GENERAL

- A. Installation of receptacles and plug-in strip receptacle units shall be in accordance with National Electrical Code.
- B. Receptacles shall be installed in locations as shown on the drawings and in outlet boxes located as specified in Section 26 05 35.
- C. The color of the receptacles installed on this project shall ivory.
- D. The equipment grounding terminal on all grounding type receptacles shall be bonded to the equipment grounding conductor of the circuit on which it is installed.
- E. Mount duplex receptacles with grounding pole at the bottom.

END OF SECTION

SECTION 26 27 28

PLATE COVERS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing wall plates for receptacles and wall switches as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 35 - Pull, Junction, and Outlet Boxes
- C. Section 26 27 26 - Wall Switches
- D. Section 26 27 27 - Receptacles

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all wall plates to be utilized on this project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Wall plates shall conform to all applicable NEMA and ANSI standards, be UL listed and shall meet Federal Specification W-P-455A, latest revision.

PART 2 - PRODUCTS

2.01 PLATE COVERS

- A. Wall plates shall be standard NEMA design so that products of different manufacturers will be interchangeable.

- B. Plates/covers for duplex and GFCI receptacles shall be a gasketed non-metallic weatherproof in-use cover over the receptacle opening. The cover plate shall be Carlon Catalog No. E98GFCN-CAR, or as accepted.
- C. Plates/covers for single toggle switch applications shall be Carlon Catalog No. E98TSCN-CAR, or as accepted.
- D. Plates/covers for two gang switch applications shall be Carlon Catalog No. E9GZSSN, or as accepted.

PART 3 - EXECUTION

3.01 GENERAL

- A. Wall plates and/or covers shall be installed on all switches and receptacles.
- B. All openings around outlet boxes shall be properly patched, repaired, or painted to ensure that cover plates conceal all rough openings.
- C. Blank plate covers shall be installed on all outlets, and on outlets with no device installed.
- D. For receptacles or switches mounted adjacent to each other, wall plates shall be common for each group of receptacles or switches.

END OF SECTION

SECTION 26 28 19

MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing disconnect switches and fuses as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions.
- B. Section 26 05 33 - Conduit.
- C. Section 26 05 19 - Wires and Cables.
- D. Section 26 05 26 - Grounding.
- E. Section 26 05 73 - Overcurrent Protective Device Coordination Study.

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all disconnect (safety) switches and fuses to be utilized on this project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Disconnect switches shall meet all applicable ASTM Specifications and shall conform to Underwriters Laboratories Standard UL-89, and NEMA standard KS-1.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. Disconnect switches installed on this project shall be NEMA General Duty. Disconnect switches shall be manufactured by General Electric, Square D, Gould/ITE, or Cutler Hammer, and shall have solid neutral lugs for each switch being installed in a circuit which includes a neutral conductor.

- B. Disconnect switches shall be of the fusible type as shown in schedule on drawings or where non-fusible switches are shown on the drawings for use as disconnects, shall be the non-fusible type.
- C. Disconnect switches shall have copper switch blades which are fully visible in the OFF position when the door is open and shall be rated as shown on the drawings.
- D. Switches shall have a quick-make and quick-break operating handle and mechanism which shall be an integral part of the box, not the cover. Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. Handle position shall indicate if switch in ON or OFF position. Switches shall be capable of being padlocked in the OPEN position.
- E. Disconnect switches shall have an arc chute for each pole.
- F. Switches installed out of doors shall be furnished in NEMA 3R (rainproof) enclosures. Rainproof covers shall be securable in the open position. Enclosures shall be of code gauge (UL 98) galvanized steel (NEMA 3R), gray baked enamel electro-deposited over cleaned phosphatized steel.

2.02 FUSES

- A. Fuses shall be installed in all fusible disconnect switches installed on this project.
- B. Fuses shall be of the ampere rating indicated on the drawings and shall be dual element, 250 volt, type FRN, Class K5, as manufactured by Bussman, Shawmut or as approved.

PART 3 - EXECUTION

3.01 GENERAL

- A. Disconnect switches shall be mounted as close as possible to the equipment being protected or isolated.
- B. Mount disconnect switches at an elevation of approximately 42" above finished floor or grade.
- C. Where required by the NEC, install a safety disconnect switch near and within sight of each motor, connected in the power circuit to each motor. Install all of the disconnect switches which are shown on the drawings and in the schedules whether or not they are required by the NEC.

END OF SECTION

SECTION 26 29 13

ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes manual, magnetic motor controllers, and Reduced Voltage Soft Start Controllers in individual enclosures.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
 - 3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
 - 4. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
 - 5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 19 - Wires and Cables.
- B. Section 26 05 26 - Grounding.
- C. Section 26 05 73 - Overcurrent Protective Device Coordination Study.

1.4 SUBMITTALS

- A. Product Data: Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- B. Test Reports: Indicate field test and inspection procedures and test results.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations and ratings of enclosed controllers.
- B. Operation and Maintenance Data: Submit Replacement parts list for controllers.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 FULL-VOLTAGE NON-REVERSING CONTROLLERS

- A. Manufacturers:
 - 1. Eaton Electrical
 - 2. General Electric Company
 - 3. Rockwell Automation
 - 4. Schneider Electric; Square D
 - 5. Siemens Industry
- B. Product Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- C. Control Voltage: 120 volts, 60 Hertz.
- D. Overload Relay: NEMA ICS 2; bimetal.
- E. Product Features:
 - 1. Auxiliary Contacts: NEMA ICS 2, 2 each normally open contacts in addition to seal-in contact.
 - 2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oiltight type.
 - 3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
 - 4. Pushbuttons: Recessed type.
 - 5. Indicating Lights: Transformer, LED type.
 - 6. Selector Switches: Rotary type.
 - 7. Relays: NEMA ICS 2,.
 - 8. Control Power Transformers: 120 volt secondary, Furnish fused secondary, and bond unfused leg of secondary to enclosure.
- F. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses. Obtain IEC Class 2 coordinated component protection.
- G. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R

2.2 SOLID STATE REDUCED VOLTAGE MOTOR CONTROLLERS

- A. Controllers shall meet applicable NEMA and UL requirements.
- B. Solid State Reduced Voltage Motor Controller shall be Allen-Bradley or as accepted.
- C. Solid State Reduced Voltage Motor Controllers: UL508; integrated, modular unit consisting of power SCRs, microprocessor controls, digital display, programming keypad, output auxiliary contacts, and external communications ports
 - 1. Rating: Severe duty, nonreversible.
 - 2. Power Structure: Modular design for easy replacement, with built in overload protection, integral heat sinks, and two SCRs for each phase.
 - 3. Control Structure: Digital microprocessor to control and supervise operation of motor controller with self-tuning power supply, logic control circuitry, SCR firing circuitry.
 - 4. Overload Protection: 3-phase current sensing acting as motor thermal protective device, selectable trip class.
- D. Operation:
 - 1. Starting: Voltage ramping.
 - 2. Stopping: Coast to stop.
 - 3. Provide SCR bypass for full voltage starting.
 - 4. Slow Speed: User adjustable starting and running current as percentage of full load current rating.
- E. Digital Display: Manufacturer's standard front mounted, LED type, indicating status of motor, controller, and fault conditions.
 - 1. Motor Indications: 3-phase current, 3-phase voltage, power, power usage, power factor, thermal capacity, and elapsed time.
 - 2. Controller Indications: Ready, starting, running, and stopping.
 - 3. Fault Indications: line fault, shorted SCR, power loss, over temperature, under load, overload, under voltage, over voltage, excessive starts, phase reversal, and jam.
- F. Programming Keypad: Manufacturer's standard front mounted for setting and adjusting the following controller functions.
 - 1. Full load amperes.
 - 2. Starting current limits.
 - 3. Acceleration ramp.
 - 4. Initial torque.
 - 5. Voltage boost.
 - 6. Starting mode.
 - 7. Starting time.
 - 8. Stopping mode.

- 9. Thermal overload trip class.
- G. Output Auxiliary Contacts: Provide contacts to signal the following operating conditions.
 - 1. Normal.
 - 2. Up to speed.
 - 3. Bypass.
 - 4. Alarm.
- H. Controller Remote Communications:
 - 1. Port: RJ45.
 - 2. Protocol: Ethernet/IP.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.
- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible switches.
- D. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- E. Install engraved plastic nameplates. Refer to Section 26 05 53 for product requirements and location.
- F. Neatly type label and place inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.2 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.16.1.

END OF SECTION

SECTION 26 29 23

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary to provide variable frequency drives in control panels as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 19 - Wires and Cables
- C. Section 26 05 26 - Grounding
- D. Section 25 31 03 - Influent Pump Station Control Panel
- E. Section 25 31 04 - Effluent Pump Station Control Panel

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on the variable frequency drive to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE PUBLICATIONS:

- A. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this Specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.

- 1. National Fire Protection Association (NFPA) Publication:

No. 70.....National Electrical Code (NEC)

2. National Electrical Manufacturers Association (NEMA) Publications:

- No. ICS-1 General Standards for Industrial Control and Systems
- No. ICS-2 Industrial Control Devices, Controllers and Assemblies
- No. ICS-4 Terminal Blocks for Industrial Control Equipment and
Systems
- No. ICS-6 Enclosures for Industrial Control and Systems

3. Underwriters Laboratories, Inc. (UL) Publications:

- UL 50 Cabinets and Enclosures For Electrical Equipment
- UL 508 Safety Standard For Industrial Control Equipment

1.05 WARRANTY

- A. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Allen Bradley – Power Flex 753 VFD, or as accepted.

2.02 VARIABLE FREQUENCY DRIVE UNIT

A. Features

1. Certifications

- a) Listed to UL508C and CAN/CSA-C22.2 No. 14-05.
- b) In conformity with EMC Directive (2004/108/EC) and Low Voltage Directive (2006/95/EC). Standards applied; EN 61800-3:2004, EN 61800-5-1:2007.
- c) Electric Power Research Institute. Certified compliant with standards SEMI F47 and IEC 61000-4-34.

2. Hardware

- a) Utilize diode bridge or SCR bridge on the input rectifier.
- b) Utilize DC bus inductor on all six-pulse VFDs only.
- c) Utilize switching logic power supply operating from the DC bus.
- d) Incorporate phase to phase and phase to ground MOV protection on the AC input line.
- e) Microprocessor based inverter logic shall be isolated from power circuits.

- f) Utilize latest generation IGBT inverter section.
- g) Battery receptacle for Lithium battery power to the Real Time Clock.
- h) Additional DPI port for handheld and remote HIM options.
- i) Dedicated Digital Input for hardware enable.
- j) Conformal coated printed circuit boards.
- k) Optional onboard 24V DC Auxiliary Control Power Supply.

3. Control Logic

- a) Ability to operate with motor disconnected.
- b) Provide a controlled shut down, when properly protected, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
- c) Provide multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, Fast Braking, and Current Limit Stop.
- d) Provide multiple acceleration and deceleration rates.
- e) Adjustable output frequency up to 650Hz.

4. DeviceLogix Control

- a) Ability to control outputs and manage status information locally within the VFD.
- b) Ability to function stand-alone or complimentary to supervisory control.
- c) Ability to speed reaction time by processing in the VFD.
- d) Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.
- e) Ability to read inputs/write outputs and exclusively control the VFD.
- f) Ability to provide an option for decision making if communication is lost with main controller.
- g) Ability to control other VFDs via a peer-to-peer EtherNet/IP network.
- h) Ability to write programs off-line.

5. Motor Control Modes

- a) Selectable Sensorless Vector, Flux Vector, V/Hz, and Adjustable Voltage Control modes selectable through programming.
- b) The drive shall be supplied with a Start-up and Auto-tune mode.
- c) The V/Hz mode shall be programmable for fan curve or full custom patterns.
- d) Capable of Open Loop V/Hz.

6. Current Limit

- a) Programmable current limit from 20 to 160% of rated output current.
- b) Current limit shall be active for all drive states: accelerating, constant speed and decelerating.

- c) The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.
7. Acceleration/Deceleration
- a) Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
 - b) A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.
8. Speed Profiles
- a) Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.
 - b) S Curve profiles shall be adjustable.
9. Adjustments
- a) A digital interface can be used for all set-up, operation and adjustment settings.
 - b) All adjustments shall be stored in nonvolatile memory (EEPROM).
 - c) No potentiometer adjustments shall be required.
 - d) EEPROM memory for factory default values shall be provided.
 - e) Software must be available for trending and diagnostics, as well as online and offline programming functionality.
10. Process PID Control
- a) The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
 - b) The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
 - c) Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
 - d) Protection shall be provided for a loss of feedback or reference signal.
11. Skip Frequencies
- a) Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.

- b) The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.

12. Fault Reset / Run

- a) The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
- b) The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.
- c) The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.

13. Run on Power Up

- a) A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.

14. Fault Memory

- a) The last 32 fault codes shall be stored and time stamped in a fault buffer.
- b) Information about the drive's condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
- c) A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
- d) The last 32 alarm codes shall be stored and time stamped for additional troubleshooting reference.

15. Overload Protection

- a) The drive shall provide internal class 10 adjustable overload protection.
- b) Overload protection shall be speed sensitive and adjustable.
- c) A viewable parameter shall store the overload usage.

16. Auto Economizer

- a) An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
- b) When the load increases, the drive shall automatically return to normal operation.

17. Terminal Blocks

- a) Separate terminal blocks shall be provided for control and power wiring.
- b) I/O terminal blocks shall be removable with wiring in place.

18. Flying Start

- a) The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed. This feature is disabled by default.

19. Inputs and Outputs

- a) The Input / Output option modules shall consist of both analog and digital I/O.
- b) No jumpers or switches shall be required to configure digital inputs and outputs.
- c) All digital input and output functions shall be fully programmable.
- d) The control terminal blocks shall be rated for 115V AC.
- e) Inputs shall be optically isolated from the drive control logic.
- f) The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
- g) The VFD shall be capable of supporting up to 7 analog inputs, 7 analog outputs, 21 digital inputs, 7 relay outputs, 7 transistor outputs, and 3 positive temperature coefficient (PTC) inputs.
- h) The Input / Output option modules shall have the following features:
 - i. Analog Inputs:
 - a. Quantity two (2) differentially isolated, $\pm 10\text{V}$ (bi-polar), 88k ohm input impedance, 11 bit plus sign.
 - b. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
 - ii. Analog Outputs:
 - a. Quantity two (2) $\pm 10\text{V}$ (bi-polar) / 11 bit & sign, 2 k Ω minimum load, 4- 20 mA, 11 bit plus sign, 400 Ω maximum load.
 - b. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
 - c. Programming shall be available to select either absolute or signed values of these parameters.

iii. Digital Inputs:

- a. Quantity of six (6) digital inputs rated 24V DC/115V AC.
- b. All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.

iv. Digital Outputs:

- a. At least one (1) relay output (N.O. or N.C.).
- b. For 240V AC or 24V DC, N.O. contact output ratings shall be 2 amp max., general purpose (inductive)/resistive. N.C. contact output ratings shall be 2 amp max., resistive only.
- c. Relays shall be programmable to multiple conditions including: Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
- d. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
- e. At least one (1) transistor output.
- f. For 24V DC, transistor output rating shall be 1 amp max, Resistive.

20. Reference Signals

- a) The drive shall be capable of using the following input reference signals:
 - i. Analog inputs
 - ii. Preset speeds
 - iii. Remote potentiometer
 - iv. Digital MOP
 - v. Human Interface Module
 - vi. Communication modules

21. Loss of Reference

- a) The drive shall be capable of sensing reference loss conditions.
- b) In the event of loss of the reference signal, the drive shall be user programmable to the following:
 - i. Fault the drive and coast to stop.
 - ii. Issue a minor fault - allows the drive to continue running while some types of faults are present.
 - iii. Alarm and maintain last reference.

- c) When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
 - i. Fault
 - ii. Stop
 - iii. Zero Data
 - iv. Hold Last State
 - v. Send Fault Configuration

22. Metering

- a) At a minimum, the following parameters shall be accessible through the Human Interface Module:
 - i. Output Current in Amps
 - ii. Output Voltage in Volts
 - iii. Output Power in kW
 - iv. Elapsed MWh
 - v. DC Bus Voltage
 - vi. Frequency
 - vii. Heatsink Temperature
 - viii. Last eight (32) faults
 - ix. Elapsed Run Time
 - x. IGBT Temperature

23. Faults

- a) At a minimum, the following faults shall be accessible through the Human Interface Module:
 - i. Power Loss
 - ii. Undervoltage
 - iii. Overvoltage
 - iv. Motor Overload
 - v. Heat Sink Over-temperature
 - vi. Maximum Retries
 - vii. Phase to Phase and Phase to Ground Faults

24. Predictive Diagnostics

- a) At a minimum, the following predictive diagnostic features shall be provided:
 - i. Relay Output Life Cycles based on load type and amps.

- ii. Hours of Fan Life based on load and ambient temperature.
- iii. Motor Bearing life based on expected hours of use.
- iv. Motor Lubrication schedule based on hours of use.
- v. Machine Bearing life based on expected hours of use.

25. Real-Time Clock

- a) Shall be capable of providing time stamped events.
- b) Shall have the ability to be set locally or via a remote controller.
- c) Shall provide the ability to be programmable for month, day, year and local time zones in HH:MM:SS.

F. Auxiliary Equipment:

1. Drive Input Line Reactor-Provide a drive input line reactor mounted within the drive system enclosure. The Line Reactor Impedance shall be as recommended by the drive manufacturer. The Line Reactor shall have an iron core, copper windings, Class H insulation class with a 115 °C rise over 50°C ambient and shall be rated for system voltage, ampacity and frequency.
2. Drive Load Reactor-Provide a drive separately enclosed (NEMA 1 Enclosure) output line reactor for mounting on top/above motor control center. The Load Reactor Impedance shall be as recommended by the drive manufacturer. The Load Reactor shall have an iron core, copper windings, Class H insulation class with a 115 °C rise over 50°C ambient and shall be rated for system voltage, ampacity and frequency.
3. Communications Card - Provide and install a Communication card on the variable frequency drive to provide MODBUS communications.
4. Auxiliary Relays-Provide relays for Drive Alarm, Drive Fault, Drive Run and System Status Fault. The relays shall have two (2) normally open and two (2) normally closed contacts rated for 115 VAC/30V DC, 5.0 amp resistive, 2.5 amp inductive.
5. Control Interface-Provide control terminals rated for 115 VAC. The control interface shall also provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable.
6. Hand/Off/Auto Selector Switch-Provide a “Hand/Off/Auto selector switch, mounted on the enclosure door. The “Hand/Off/Auto selector switch shall start the drive in the “Hand” mode and stop the drive in the “Off” mode. In the “Auto” mode the drive shall be started and stopped from a remote “Run” contact. In all modes, Auxiliary and Enable inputs to the drive control interface board must be present before the drive will start. When an HIM is present, the stop function shall

always be available to stop the drive regardless of the selected mode (“Hand” or “Auto”). The HIM will be nonfunctional (except for the display and programming) when the switch is in “Off” mode. The HIM shall stop the drive if the switch is in the “Auto” mode with remote start contact initiated. The Drive speed reference shall be controlled from the HIM, a separate door mounted potentiometer shall be provided, and shall be only active when the switch is placed in the “Hand” mode. The Drive speed reference shall be controlled by a remote 4-20 mA input when in “Auto” mode.

7. Pilot Lights-Provide LED pilot lights mounted on the enclosure door for indication of the following status: a) Run, b) Drive Fault, c) Control Power On, d) Motor Fault.
8. Motor Run Time Meter-Provide a digital, non-resettable, door mounted elapsed time meter. The meter shall be electrically interlocked with the Drive Run relay to indicate actual motor operating hours.

G. Additional Requirements:

1. The Variable Frequency Drive Manufacturer and/or their agents, shall provide certification to the CONTRACTOR and ENGINEER of the motor to drive compatibility.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The variable frequency drive shall be installed in accordance with the Drawings, the Specifications, and manufacturer's guidelines.

3.02 TECHNICAL SERVICES DURING INSTALLATION AND TEST:

- A. At the construction site, provide services of a competent, factory-trained engineer or technician to technically supervise and participate during all of the adjustments and test of the variable frequency drive.

3.03 VARIABLE FREQUENCY DRIVE SET-UP REQUIREMENTS

- A. The variable frequency drive shall be set-up with the following functions:
 1. Auto Reset/Run-For faults other than those caused by a loss of power or any other non-critical fault, the drive shall be programmed to automatically clear the fault and resume operation.
 2. Run on Power-Up-The VFD shall be programmed to allow for remote restart of

equipment after a power outage, faults due to power outages shall be remotely resettable. The VFD shall indicate a loss of power to the remote terminal unit. Upon indication of power restoration the remote terminal unit will attempt to clear any faults and issue a run command.

3.04 INSTRUCTIONS AND FINAL INSPECTIONS:

- A. Furnish the services of a competent, factory-trained engineer or technician for five, 4-hour periods for instructing the Owner's personnel in operation and maintenance of the equipment.

END OF SECTION

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SECTION 26 35 53

VOLTAGE REGULATORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Transient Voltage Surge Suppressors.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
 - 2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
 - 3. IEEE C62.45 - Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
 - 1. NEMA LS 1 - Low Voltage Surge Protection Devices.
- C. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 780 - Standard for the Installation of Lightning Protection Systems.
- D. Underwriters Laboratories Inc.:
 - 1. UL 1283 - Electromagnetic Interference Filters.
 - 2. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

- A. Product Data: Submit capacity, dimensions, weights, details, and wiring configuration.
- B. Test Reports:
 - 1. Indicate Let-Through voltage test data.
 - 2. Submit spectrum analysis of each unit.
 - 3. Submit test reports from nationally recognized independent testing laboratory verifying suppressors can survive published surge current rating.
- C. Manufacturer's Installation Instructions: Submit installation instructions and connection requirements.

- D. Manufacturer's Certificate: Certify transient voltage surge suppression device complies with UL 1449 Third Edition Surge Voltage Ratings.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of transient voltage surge suppressors.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, installation instructions, and maintenance and repair data.

1.5 QUALITY ASSURANCE

- A. List individual units under UL 1449 and UL 1283.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept equipment on site in factory packaging. Inspect for damage.
- B. Protect equipment from damage by providing temporary covers until construction is complete in adjacent space.

1.8 WARRANTY

- A. Furnish five year manufacturer's warranty for transient voltage surge suppressor part failure.

PART 2 PRODUCTS

2.1 TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

- A. Manufacturers:
 - 1. ABB France.
 - 2. Advanced Protection Technologies Inc. (APT).
 - 3. Eaton Corporation.
 - 4. Emerson Electric Co.
 - 5. GE Zenith Controls.
 - 6. LEA International; Protection Technology Group.
 - 7. Leviton Manufacturing Co., Inc.
 - 8. PowerLogics, Inc.

9. Schneider Electric Industries SAS.
10. Siemens Industry, Inc.
11. Surge Suppression, Inc.

B. Product Description: Surge protective devices for protection of AC electrical circuits.

C. Unit Operating Voltage: As indicated on Drawings.

D. Maximum Continuous Operating Voltage: Greater than 115 percent of nominal system operating voltage.

E. Construction:

1. Finish: Factory finish of baked enamel.
2. Balanced Suppression Platform: Equally distribute surge current to Metal Oxide Varistor (MOV) components to ensure equal stressing and maximum performance. Furnish surge suppression platform with equal impedance paths to each matched MOV.
3. Internal Connections: Hardwired with connections using low impedance conductors and compression fittings.
4. Safety and Diagnostic Monitoring: Equipped with standard overcurrent protection:
 - a. Continuous monitoring of fusing system.
 - b. Monitor individual MOV's (including neutral to ground). Capable of identifying open circuit failures not monitored by conventional fusing systems.
 - c. Monitor for overheating in each mode due to thermal runaway.
 - d. Furnish green and red solid state indicator light on each phase. Absence of green light and presence of red light indicates which phases have been damaged. Fault detection activates flashing trouble light. Units not capable of detecting open circuit damage, thermal conditions, and over current will not be accepted.
5. Labeling: Permanently affix UL 1449 suppression voltage ratings and CSA to unit.

F. Rating:

1. Electrical Noise Filter: Furnish each unit with high performance EMI/RFI noise rejection filter. Electric line noise attenuation no less than 45 dB at 100 kHz using MIL-STD-220A insertion loss test method.

G. Accessories:

1. Digital display transient event counter [**with manual reset**].
2. Local audible alarm.
3. Form C dry contacts one normally open (NO) and one normally closed (NC) for remote status monitoring.
4. Remote monitor panel with indicating lights and audible alarm for mounting in remote location.
5. Push-to-test feature.

- H. Surge Current Capacity: Total surge current (based on 8 x 20 microsecond waveform) device is capable of surviving is not less than:

Application	Min Surge Current Per Phase	Min Surge Current Per Mode *
Main Distribution Panel	250 kA	125 kA
*L-G, L-N and N-G (WYE system);		

- I. Protection Modes: For Wye configured system, furnish device with directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).
- J. Do not exceed the following for maximum UL 1449 suppression voltage ratings:

Modes	480Y/277
WYE - L-N; L-G; N-G	800 V

- K. ANSI/IEEE Catalog C3 Let Through Voltage: Based on ANSI/IEEE C62.41 and C62.45 recommended procedures for Catalog C3 surges (20 kV, 10kA) and not less than:

Modes	480Y/277
L-N	900 V

- L. ANSI/IEEE Cat. B3 Let Through Voltage: Based on ANSI/IEEE C62.41 and C62.45 recommended procedures for ANSI/IEEE Catalog B3 Ringwave (6 kV, 500 amps) not less than:

Modes	480Y/277
WYE - L-N; L-G; N-G	800 V
L-N	300 V

2.2 SOURCE QUALITY CONTROL AND TESTS

- A. Test units to specified surge ratings to ensure devices will achieve required life expectancy and reliability. Testing to full ratings also verifies internal construction quality of suppressors. Provide withstand testing for each mode and each phase basis.
- B. Perform actual Let-Through voltage test data in form of oscillograph results for ANSI/IEEE C62.41 Catalog C3 (20 kV, 10 kA), Catalog C1 (6 kV, 3 kA), and Catalog B3 (6 kv, 500 A at 100 kHz) tested in accordance with ANSI/IEEE C62.45.
- C. Perform spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying device noise attenuation exceeds 45 dB at 100 kHz.

- D. Perform test verifying suppressors can survive published surge current rating for each mode and each phase basis. Test wave based on ANSI/IEEE C62.41, 8x20 microsecond current wave.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify mounting area is ready for equipment.
- B. Verify circuit rough-ins are at correct location.

3.2 INSTALLATION

- A. Install in accordance with IEEE 1100.
- B. Install with maximum conductor length of 14 inches. Install suppressor with internal fusing.

END OF SECTION

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SECTION 26 36 00

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the automatic transfer switches at the Wastewater Treatment Plant site, as shown on the Drawings and as hereinafter specified.
- B. The automatic transfer switch shall have the features and meet the performance standards specified hereafter in this Section.
- C. Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the Drawings and as specified herein. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.
- D. Furnish an enclosure for the ATS that is for service entrance rated. It shall provide all of the proper disconnecting, protection, grounding and bonding required for service entrance equipment.
- E. **All automatic transfer switches furnished and installed on this project shall be of the same manufacturer.**
- F. The Automatic Transfer Switch manufacturer shall provide all information required by the ENGINEER or Manufacturer of the Electrical Distribution Equipment for the Arc Flash Analysis Study.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 26 - Grounding
- C. Section 26 05 29 - Supporting Devices
- D. Section 26 05 33 - Conduits
- E. Section 26 05 73 - Overcurrent Protective Device Coordination Study
- F. Section 26 21 13 - Emergency Generators

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on the automatic transfer switches to be furnished.
- C. Sufficient information, clearly presented, shall be submitted with the CONTRACTOR's bid to determine compliance with the Specifications.
- D. The specific item proposed, and its area of application shall be marked on the catalog cuts.
- E. A certified test report from an independent laboratory that a representative sample has passed the ANSI surge withstand test for transfer switches.
- F. Manuals
 - 1. Submit, simultaneously with the shop drawings, companion copies of complete operating and maintenance manuals including technical data sheets, wiring diagrams, and information of ordering replacement parts.
 - a. Identify terminals on wiring diagrams to facilitate installation, operation, and maintenance.
 - b. On wiring diagrams, indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
 - c. Provide a clear and concise description of the operation that gives, in detail, the information required to ensure proper operation of equipment.
 - d. Approvals will be based on complete submissions of manuals together with shop drawings.
 - 2. Deliver two (2) copies of a complete operating and maintenance manual for transfer switch furnished.
 - a. Update the manual to include any information necessitated by shop drawing approval.
 - b. Include complete "as installed" wiring and schematic diagrams which show all items of equipment and their interconnecting wiring.

- c. Show all terminal identification.
 - d. Include information for testing, repair, trouble shooting, assembly, disassembly, and recommended maintenance intervals.
 - e. Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
 - f. Furnish manuals in a loose-leaf binder or manufacturer's standard binder.
- 1.04 APPLICABLE STANDARDS: The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this Specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revision, supplements, and errata) on the date of Advertisement for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.
- A. UL 1008 - Standard for Automatic Transfer Switches
 - B. NFPA 70 - National Electrical Code
 - C. NFPA 110 - Emergency and Standby Power Systems
 - D. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - E. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
 - F. NEC Articles 700, 701, 702
 - G. International Standards Organization ISO 9001
 - H. UL 891 According to this UL standard the equipment shall be labeled: "Suitable for use only as service equipment."
 - I. UL 508 Industrial Control Equipment
- 1.05 ACCEPTABLE MANUFACTURERS
- A. Service Entrance Automatic transfer switches shall be manufactured by ASCO Power Technologies, or as accepted.

PART 2 - PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH

- A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.
- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- F. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.
- G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.02 MICROPROCESSOR CONTROLLER WITH MEMBRANE INTERFACE PANEL

- A. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

- B. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers.
- C. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - 1. ANSI C37.90A/IEEE 472 Voltage Surge Test
 - 2. NEMA ICS – 109.21 Impulse Withstand Test
 - 3. IEC801-2 Electrostatic discharge (ESD) immunity
 - 4. ENV50140 and IEC 801 – 3 Radiated electromagnetic field immunity
 - 5. IEC 801 – 4 Electrical fast transient (EFT) immunity
 - 6. ENV50142 Surge transient immunity
 - 7. ENV50141: Conducted radio-frequency field immunity
 - 8. EN55011: Group 1, Class A conducted and radiated emissions
 - 9. EN61000 –4 – 11 Voltage dips and interruptions immunity

2.03 ENCLOSURE

- A. The ATS shall be furnished in a NEMA type 3R Floor free standing enclosure unless otherwise shown on the plans.
- B. Controller shall be flush-mounted display with LED indicators for switch position and source availability. It shall also include test and time delay bypass switches.
- C. The complete assembly shall be degreased, and thoroughly cleaned through a five-stage aqueous process. The finish shall be ANSI-61, light gray, electrostatically-charged polyester powder paint over a phosphate coating, at a minimum of 2.0 mils in density. Finish shall be suitable for indoor and outdoor environments.
- D. The ATS connection between the normal disconnecting device and the ATS shall be made with the appropriate size bus. Bus shall be silver plated copper rated no less than 1200 amps per square inch.

- E. A pressure disconnect link shall be provided to disconnect the normal source neutral connection from the emergency and load neutral connections for 4-wire applications. A ground bus shall be provided for connection of the grounding conductor to the grounding electrode. A pressure disconnect link for the neutral to ground bonding jumper shall be provided to connect the normal neutral connection to the ground bus.
- F. Control wiring shall be rated for 600 volt, UL 1015. Wires shall be placed in wire duct or harnessed and shall be supported to prevent sagging or breakage from weight or vibration. All wiring to hinged doors shall be run through door terminal blocks or connection plugs.

2.04 RATINGS, MARKINGS AND TESTS:

A. Ratings:

- 1. The transfer switch to be shall be service entrance rated and shall be three-pole, three-phase, four-wire, 60 Hertz, 277/480 volts, rated at not less than 1,200 amperes. The transfer switch shall comprise of three switched poles. Fault withstand rating of the complete assembly shall be not less than 65,000 amps. The interrupting and closing rating shall meet or exceed the required withstand rating.
- 3. Transfer switches are to be rated for total system transfer on emergency systems.
- 4. Ratings shall be with non-welding of contacts during the performance of withstand and closing tests.

B. Markings:

- 1. Markings shall be in accordance with UL 891 and UL 1008.

2.05 DISCONNECTING AND OVERCURRENT PROTECTION DEVICE

- A. The automatic transfer switch normal connection shall be provided with a stationary mount, insulated 1,200 amp case circuit breaker with a solid-state trip unit set at 1,600 amp trip. The trip unit shall have adjustable long time, short time, instantaneous, and ground fault trip settings. The insulated case circuit breaker shall trip open when the ground fault setting is exceeded.

PART 3 OPERATION

3.01 VOLTAGE AND FREQUENCY SENSING

- A. The voltage of each phase of the normal source shall be monitored, with pickup adjustable to 95% of nominal and dropout adjustable from 70% to 90% of pickup setting.
- B. Single-phase voltage and frequency sensing of the emergency source shall be provided.

3.02 TIME DELAYS

- A. An adjustable time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.
- B. An adjustable time delay shall be provided on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency.
- C. An adjustable time delay shall be provided on retransfer to normal, adjustable to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- D. A 5-minute cool down time delay shall be provided on shutdown of engine generator.
- E. All adjustable time delays shall be field adjustable without the use of tools.

3.03 ADDITIONAL FEATURES

- A. A set of gold-flashed contacts rated 10 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- B. A push-button type test switch shall be provided to simulate a normal source failure.
- C. A push-button type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer to normal time delay whichever delay is active at the time the push-button is activated.
- D. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact, closed, when the ATS is connected to the emergency source.

- E. Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.
- F. Terminals shall be provided to indicate actual availability of the normal and emergency sources, as determined by the voltage sensing pickup and dropout settings for each source.
- G. Engine Exerciser - An engine generator exercising timer shall be provided, including a selector switch to select exercise with or without load transfer.
- H. Inphase Monitor - An Inphase monitor shall be inherently built into the controls. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.
- I. Selective Load Disconnect - A double throw contact shall be provided to operate after a time delay, adjustable to 20 seconds prior to transfer and reset 0 to 20 seconds after transfer. This contact can be used to selectively disconnect specific load(s) when the transfer switch is transferred. Output contacts shall be rated 6 amps at 28 VDC or 120 VAC.
- J. Programmable Engine Exerciser - A seven or fourteen day programmable engine exerciser with digital readout display. Shall include one form C contact for availability of normal and emergency. Include "with or without" load control switch for exerciser period. The exerciser shall be backed up by a permanent battery.
- K. **Strip Heater** - Provide a strip heater with thermostat for extremely cold areas to prevent condensation and freezing of this condensation. The strip heater shall be wired to the load terminals (does not require external power source).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with NEC, Manufacturer's instructions, and as shown on the Drawings.
- B. CONTRACTOR shall tighten accessible bus connections and mechanical fasteners to the manufacturer's torque requirements.
- C. CONTRACTOR shall adjust circuit breaker settings based upon field requirements.

- D. CONTRACTOR shall provide and install all required connecting lugs, properly sized for conductors installed on this project.
- E. CONTRACTOR shall perform all field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust settings in accordance with approved short circuit and protective device coordination study.

END OF SECTION

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SECTION 26 51 00

INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of lighting fixtures in and on the building.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 19 - Wires and Cables
- C. Section 26 05 29 - Supporting Devices
- D. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all luminaires and lighting fixtures to be utilized on this project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Lighting fixtures shall meet or exceed all applicable ANSI standards, and shall conform to Underwriters Laboratories Standard UL-57, latest revision.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

- A. Furnish and install all lighting fixtures as shown on the fixture schedule. Fixtures shall have the necessary studs, straps, fittings, etc., for a complete and safe installation.
- B. All fixtures shall be furnished with proper outlet boxes, hangers etc.; securely fastened to outlet boxes; furnished complete with lamps of proper size and type required or as specified; complete with supports, pendants, canopy extensions, etc.; equipped with

socket suspensions which prevent twisting of wiring when installing or removing lamps; wired with type AF or TF fixture wire; furnished with plaster frames and light tight gaskets when recessed as required; have specified finish.

PART 3 - EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall carefully examine the complete area as well as each individual room in which fixtures are to be installed for interference with piping, beams, ducts etc., and where any such interferences occur, shall provide approved fixtures of proper length, design and suspension to overcome such interferences.
- B. The finished appearance of the workmanship of all fixtures installed under this contract shall have the approval of the ENGINEER before final acceptance is made.

END OF SECTION

SECTION 26 56 00

SITE LIGHTING

PART 1 - GENERAL

1.01 SCOPE

- A. The Work under this Section consists of furnishing materials, equipment, labor, and services necessary for the installation of the outdoor luminaires as shown on the Drawings and as hereinafter specified.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 26 05 00 - General Electrical Provisions
- B. Section 26 05 26 - Grounding

1.03 SUBMITTALS

- A. Manufacturer's data shall be submitted in accordance with paragraph entitled SUBMITTALS in Section 26 05 00 of these Specifications.
- B. Submit data on all luminaires to be utilized on this Project.
- C. Sufficient information, clearly presented shall be included to determine compliance with Drawings and Specifications.
- D. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.04 APPLICABLE STANDARDS

- A. Stanchion mounted luminaires shall meet Underwriter's Laboratories Standards UL1572 and UL595 Marine. Luminaires shall have a NEMA 4X enclosure.

PART 2 - PRODUCTS

2.01 LUMINAIRES - GENERAL

- A. The luminaires installed on this Project shall be furnished, installed, and tested and be complete in every way for OWNER's beneficial use upon completion of the Project.
- B. All luminaires furnished and installed on this project shall be complete with ballasts and lamps.

2.02 WOOD POLE MOUNTED LUMINAIRES

- A. Provide southern yellow pine wood pole with height and class as indicated on drawings.
- B. Ballasts for wood pole mounted luminaires shall be rated for 277 volt input.
- C. Wood pole mounted luminaires shall be suitable for wet locations. Wood pole mounted luminaires shall be individually controlled by a photocell mounted in the lighting fixture.

2.03 PHOTOCELLS

- A. The wood pole mounted luminaires shall be individually controlled by a photocell mounted in the lighting fixture. The photocell shall provide control for automatic dusk to dawn lighting. The fixture mounted photocell shall switch the lighting fixture "on" at approximately one footcandle and switch the lighting fixture "off" at approximately 10 footcandles.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION - GENERAL

- A. Luminaires shown on the Drawings shall be mounted and leveled in all directions prior to tightening in place.
- B. All luminaires shall be installed in strict accordance with the manufacturer's recommendations.
- C. Damaged or marred luminaires will be replaced at the CONTRACTOR's expense.

3.02 WOOD POLE MOUNTED LUMINAIRE INSTALLATION

- A. Mount luminaire to wood pole with luminaire bracket as indicated on the plans. Use lag type screws sized per manufacturer's recommendations.

END OF SECTION

SECTION 27 13 43

COMMUNICATIONS SERVICES CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes optical fiber backbone cable and unshielded twisted pair horizontal cabling for SCADA System.
- B. Related Sections:
 - 1. Section 25 31 02 - SCADA System.

1.2 REFERENCES

- A. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
 - 1. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Telecommunications Industry Association/Electronic Industries Alliance:
 - 1. TIA/EIA 568 - Commercial Building Telecommunications Cabling Standard.
 - 2. TIA/EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
- D. Underwriters Laboratories, Inc.:
 - 1. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.

1.3 SYSTEM DESCRIPTION

- A. Service entrance from Telecommunications Utility Company.
- B. Service Entrance Pathway: Empty ducts and raceway from point of Telephone Utility connection at property line to building service.

- C. Backbone Pathway: Conform to TIA/EIA 569 using conduit as indicated on Drawings.
- D. Horizontal Pathway: Conform to TIA/EIA 569, using raceway as indicated on Drawings.
- E. Backbone Wiring: Complete from entrance equipment to each RTU and CTU using optical fiber backbone cables.
- F. Horizontal Wiring: Complete from entrance equipment to each outlet using unshielded horizontal cables.

1.4 SUBMITTALS

- A. Product Data: Submit catalog data for each termination device, cable, and outlet device.
- B. Test Reports: Indicate procedures and results for specified field testing and inspection.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations and sizes of pathways and outlets.

1.6 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Provide combustible electrical equipment exposed within plenums with peak rate of heat release not greater than 100 kW, peak optical density not greater than 0.5, and average optical density not greater than 0.15 when tested in accordance with UL 2043.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in installing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 TELEPHONE OUTLET JACKS

- A. Product Description: Conform to TIA/EIA 568 requirements for cable connectors for specific cable types.

2.2 OPTICAL FIBER BACKBONE CABLE

- A. Product Description: TIA/EIA 568, 62.5/125 um multimode optical fiber, 6 pair, plenum rated noncombustible cable.

2.3 UNSHIELDED HORIZONTAL CABLE

- A. Product Description: TIA/EIA 568, 100-ohm, unshielded twisted pair plenum rated noncombustible cable with 4 pairs, 22-24 AWG copper conductor. Category 6.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pathways in accordance with TIA/EIA 569.
- B. Install wire and cable in accordance with TIA/EIA 568.
- C. Install polyethylene pulling string in each empty telecommunications conduit.

3.2 FIELD QUALITY CONTROL

- A. Inspect and test optical fiber cables in accordance with NETA ATS, except Section 4. Perform inspections and tests listed in NETA ATS, Section 7.25.
- B. Inspect and test copper cables and terminations in accordance with TIA/EIA 568.

END OF SECTION

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DIVISION 31 – EARTHWORK

SECTION 31 1100

CLEARING AND GRUBBING

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PART 2 PRODUCTS (Not Applicable)

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3.1.2 Trees

3.1.3 Vegetation

3.1.4 Areas to be Cleared

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3.2 GRUBBING

3.2.1 General

3.2.2 Areas to be Grubbed

3.2.3 Filling of Holes

3.3 DISPOSAL OF DEBRIS

- End of Section Table of Contents -

DIVISION 31 – EARTHWORK

SECTION 31 1100

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

All clearing and grubbing work shall be completed in advance of excavation or embankment construction. If regrowth of vegetation or trees occurs after clearing and grubbing and before construction, CONTRACTOR will be required to clear and grub the area again prior to excavation or embankment construction, and no payment will be made for this additional clearing and grubbing.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

3.1.1 General

Clearing, unless otherwise specified, shall consist of the complete removal above the ground surface of all trees, stumps, down timber, snags, brush, vegetation, trash, and similar debris. Clearing shall be limited to the absolute minimum necessary for construction and shall extend to five feet outside the exterior lines of area to receive pavement, foundations and building areas. It is the intent of this Section that growth around the work area be preserved to the maximum extent practicable.

3.1.2 Trees

Trees shall be felled in such a manner as to avoid damage to trees to be left standing, to existing structures and installations and to those under construction, and with due regard for the safety of employees and others.

3.1.3 Vegetation

Vegetation to be removed shall consist of grass, vines, bushes, and weeds. Close-growing grass and other vegetation shall be removed from areas to receive semi-compacted or compacted fill or other surface material to provide a completely bare earth surface immediately prior to foundation preparation. Acceptance of the vegetation removal operation by PROFESSIONAL shall precede the initiation of foundation preparation in the area from which vegetation has been removed.

3.1.4 Areas to be Cleared

3.1.4.1 General

The entire area of the excavations, embankments, and disposal areas shall be cleared. Clearing shall be limited to the absolute minimum necessary for construction of the work plus five feet outside the exterior lines of areas to receive pavement and foundations. Care shall be taken by CONTRACTOR not to cut or injure any trees or grass which do not unreasonably interfere with the construction.

3.1.4.2 Disposal and Stockpile Areas

Areas for use as disposal areas and temporary stockpile areas shall be approved by PROFESSIONAL and shall be cleared to the extent necessary to accommodate the materials and to preclude contamination of the materials.

3.2 GRUBBING

3.2.1 General

Grubbing shall consist of the removal of all stumps, roots, buried logs, buried debris, and unsuitable materials as described in Section 31 2323.11 BACKFILL AND FILL, Paragraph 2.1.1.1.

3.2.2 Areas to be Grubbed

Grubbing shall be performed within the limits of the embankments, pavements, and all structures with the 5-foot strips contiguous thereto. All roots and other projections over 1-1/2 inches in diameter shall be removed to a depth of 1-foot

below the natural surface of the ground and to a depth of 3 feet below the subgrade for the foundation of the structures. The areas to be grubbed are those specific areas within the limits specified herein from which trees, stumps, down timber, and other projections have been removed.

3.2.3 Filling of Holes

All holes caused by grubbing operations shall be backfilled with suitable material in 12-inch layers to the elevation of the adjacent ground surface, and each layer compacted to a density at least equal to that of the adjoining undisturbed materials.

3.3 DISPOSAL OF DEBRIS

Cleared and grubbed material shall be removed from the project site and disposed of as CONTRACTOR may elect, provided such disposal is done in accordance with the Federal, State, and local regulations.

- End of Section -

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DIVISION 31 – EARTHWORK

SECTION 31 2316

EXCAVATION

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1.1 GENERAL REQUIREMENTS

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3.1.4.1 Structure

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3.2.1 Suitable Materials

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- End of Section Table of Contents -

DIVISION 31 – EARTHWORK

SECTION 31 2316

EXCAVATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Excavation consists of the removal of all materials of whatever nature encountered as necessary to construct the required work.

PART 2 PRODUCTS

2.1 CHARACTER OF MATERIALS

2.1.1 Borings have been made by the PROFESSIONAL to determine the character of materials to be removed. This report is provided for information and does NOT establish contract requirements unless noted. The results of these borings are shown in the GEOTECHNICAL INVESTIGATION AND ENGINEERING REPORT located in Exhibit A. Although the results of the above-mentioned explorations are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local minor variation in the subsurface materials such as logs, stumps, snags, and other debris are to be expected within the purview of the General Conditions article entitled Claims for concealed or Unknown Conditions.

PART 3 EXECUTION

3.1 EXCAVATION

3.1.1 Excavation

Excavation shall consist of the removal of material in preparing the foundations for the structures, water system piping, valves, wastewater piping, stormwater piping, utilities, and for removal of unsuitable foundation material as directed by PROFESSIONAL. All foundations shall be on solid undisturbed or properly compacted material. Where disturbed by CONTRACTOR's operations and

elsewhere as required, the excavated surfaces shall be moistened with water or dried if necessary and tamped or rolled with suitable tools or equipment for the purpose of thoroughly compacting them to form firm foundations upon or against which to place backfill, concrete, pipes, or surfacing items. Wherever unsuitable foundation material is encountered, the unsuitable material shall be removed and replaced with suitable material in accordance with Paragraph 3.1.2 Over-Excavation. Care shall be taken not to excavate below the depths indicated on the drawings unless otherwise directed by PROFESSIONAL. If at any point in the excavation, material is excavated beyond the excavation lines shown on the drawings; such over-excavation shall be filled and compacted as specified in Paragraph 3.1.2 Over-Excavation. All excavation and foundation preparation shall be performed in areas free of water.

3.1.2 Over-Excavation

Over-excavation will not be permitted except to remove unsuitable foundation material as directed by PROFESSIONAL. Wherever unsuitable foundation material is encountered, the unsuitable material shall be removed to the depth directed by PROFESSIONAL. Filling and compacting of authorized (required) over-excavation and of unauthorized over-excavation shall be as specified in Section 31 2323.11 BACKFILL AND FILL, Paragraph 3.1 FOUNDATION PREPARATION. Payment for authorized (required) over-excavation and for filling authorized (required) over-excavation shall be made in accordance with the applicable provisions of the General Conditions article entitled Changes in the Work; Claims. No payment will be made for unauthorized over-excavation or for filling unauthorized over-excavation.

3.1.3 Stockpiling from Required Excavations

Excavated material shall be stockpiled at locations approved by the PROFESSIONAL adjacent to the work until it is needed. No payment will be made for such stockpiling or for the reloading and hauling of this material to its final position in the embankment or disposal areas. CONTRACTOR shall stockpile the material within the right-of-way shown on the drawings and in such a manner as to provide surface drainage and so as not to interfere with the natural drainage of the area. The material stockpiled for later use shall be kept separate from the unsuitable materials placed in the stockpile area. Materials temporarily placed in the stockpile area shall have a maximum height of 10 feet, shall be placed to drain, and shall have side slopes no steeper than 1V on 3H. Excavation from the stockpiles shall be performed so as to maintain drainage at all times.

3.1.3.1 Drainage

All excavation, embankment construction, and backfilling shall be performed in a manner that will provide drainage at all times. CONTRACTOR shall control the earthwork in the vicinity of the structures so that the ground surface is properly ditched to prevent water from running into the excavated areas. Water which has accumulated in the excavated areas shall be removed within 48 hours after it has accumulated. If the accumulation is sanitary sewer, then it shall be placed in the sewer collection system for proper treatment. Accumulations from rainfall shall be placed in the storm sewer collection system. Soil which becomes soft as a result of improper drainage shall be removed and replaced with suitable material placed and compacted as specified for backfill in Section 31 2323.11 BACKFILL AND FILL, Paragraph 3.2 PLACEMENT AND COMPACTION OF BACKFILL. Such required over-excavation and backfill shall be at no additional cost to OWNER.

3.1.4 Tolerances

Excavation shall be to the lines, grades and sections indicated on the drawings, except as otherwise provided herein. The excavation shall be accurately constructed to within the following tolerances:

3.1.4.1 Structure

For surfaces on which concrete will be placed, the allowable vertical tolerance is 1/2 inch above line and grade and 2 inches below line and grade. Neither extreme of such tolerance may be continuous over an area greater than 200 square feet and abrupt changes from one extreme to the other will not be permitted.

3.1.4.2 Piping

For surfaces excavated for placement of piping, the allowable vertical tolerance is 1 inch above and below line and grade.

3.2 DISPOSITION OF MATERIALS

3.2.1 Suitable Materials

Excavated materials which are suitable for incorporation in the fill or backfill shall either be placed directly therein, or stockpiled at no additional cost to OWNER and subsequently used in the fill or backfill.

3.2.2 Unsuitable and/or Excess Materials

Materials from required excavation which are unsuitable for fill or backfill material and/or excess material shall be disposed of as directed by PROFESSIONAL. Stumps, logs, and other debris removed in the excavation process shall be disposed of as prescribed in Section 31 1100 CLEARING AND GRUBBING, Paragraph 3.3 DISPOSAL OF DEBRIS.

- End of Section -

EXHIBIT A

GEOTECHNICAL INVESTIGATION

AND

ENGINEERING REPORT

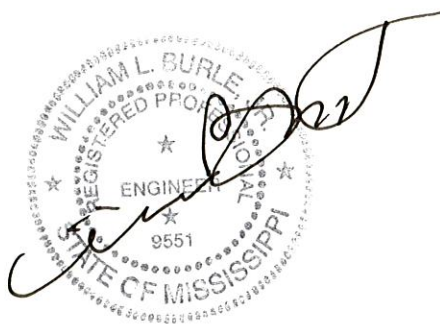
FOR

GS# 323-024

ARPA INFR. – WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTE
LEAKESVILLE, MISSISSIPPI

Submitted To:

Bureau of Buildings, Grounds and Real Property Management
501 North West Street, Suite 1401 B
Woolfork Building
Jackson, MS 39201



February 7, 2024



W.L.BURLE

ENGINEERS, P. A.

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February 7, 2024

Mr. Heith Newman
Bureau of Buildings, Grounds and Real Property Management
501 North West Street, Suite 1401B
Woolfork Building
Jackson, MS 39201

Re: Geotechnical Investigation and Engineering Report
GS# 323-024
ARPA Infr. – Waste Cent. Treatment
South Mississippi Correctional Institute
Leakesville, Mississippi

Dear Mr. Newman:

W. L. Burle Engineers, P.A. (BURLE) has completed the authorized geotechnical investigation and engineering report for the referenced project. This report contains the results of our findings, an engineering interpretation of these with respect to the available project characteristics and recommendations to aid in the design and construction of the wastewater treatment plant system for the proposed project.

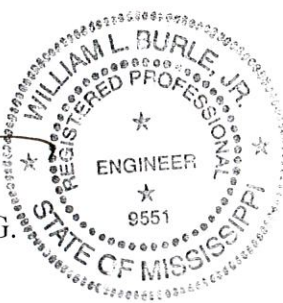
We appreciate having the opportunity to work with you during the site investigation phase of this project and look forward to assisting you during construction phase. If we can be of further assistance or should you have any questions regarding this report, please contact our office.

Sincerely,

W. L. BURLE ENGINEERS, P.A.

A handwritten signature in black ink, appearing to read "William L. Burle, Jr.", is written over the typed name.

William L. Burle, Jr., Ph.D., P.E., P.G.



WLB/lcl

pc: Mr. Darrell Martinek, P.E., BURLE

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FIGURES

Figure 1	Vicinity Map
Figure 2	Boring Location Site Map

APPENDICES

Appendix A	Test Boring Records

1.0 INTRODUCTION AND PURPOSE

The Bureau of Buildings, Grounds and Real Property Management (CLIENT) of Jackson, MS, retained W. L. Burle Engineers, P.A. (BURLE) to conduct a geotechnical investigation for a wastewater treatment plant (WWTP) project to be built at the South Mississippi Correctional Institute (SMCI) in Leakesville, MS.

The purpose of the geotechnical investigation is to:

- determine the general, on-site, sub-surface soil and groundwater conditions;
- evaluate the findings with respect to the proposed construction;
- identify potential problems which may develop during construction; and
- provide design criteria for the proposed project.

2.0 PROJECT CHARACTERISTICS

The project site is in Section 32, Township 3 North, Range 6 West, Leakesville, Greene County, MS. The site is on the SMCI grounds. The street address is 22689 MS Highway 63 North. It is referenced on Figure 1.

The project site is the existing WWTP for the SMCI facility. The WWTP is an activated sludge plant. The site is shown on Figure 2.

The proposed project is an upgrade to the existing WWTP. It will not only serve the future needs of the correctional facility but will also meet the more stringent effluent limitations referenced in their renewed NPDES permit. The existing sludge lagoons will be converted to an activated sludge process. The existing activated sludge treatment process will be maintained for back-up. Post-disinfection/de-chlorination/post-aeration processes will provide final treatment. The treated effluent will be directed to the existing outfall.

3.0 GEOLOGICAL SETTING

A study of the geological survey of Mississippi indicates that this site is in the Atlantic/Gulf Coastal Plain Province. The site is specifically in the East Gulf Coastal Section of the province. The surficial deposit is the Pascagoula/Hattiesburg formation and is of Miocene age. The formation consists of clay, sandy clay, sand and/or siltstone. The formation is a prolific aquifer. Given the difficulty in distinguishing between the formations and the common age of both, the Pascagoula/Hattiesburg formation is referred to as the Miocene Aquifer System. The thickness of the formation varies throughout the area.

4.0 FIELD AND LABORATORY METHODS

Seven (7) soil test borings, designated B-1 through B-7, were drilled at the boring locations shown in the appendices. The borings were drilled to depths ranging from 25 to 35 feet below ground surface (bgs) within the proposed project area. Actual boring locations used to investigate the project site were selected by BURLE. The boring locations were referenced in the field by GPS coordinates.

The borings were made with both truck-mounted and track-mounted drill rigs using the hollow-stem auger (HSA) drilling method. The Standard Penetration Test (STP) method (ASTM D-1586) was used to obtain disturbed soil samples. The recovered samples were visually classified (ASTM D-2487) in the field, logged and sealed in moisture proof containers.

Groundwater levels were monitored during the drilling operation. A temporary 1" PVC piezometer was installed in boring B-7 to accurately measure the depth to groundwater. All readings were recorded on the field boring logs. The piezometer and boreholes were properly abandoned upon completion of all field activities.

Preliminary test boring logs were developed on the job site by the drill foreman. At the completion of the field program, the samples were taken to the laboratory where they were again examined and classified, in accordance with the Unified Soil Classification System (USCS), by a soils technician and/or the project engineer; the field classifications were revised where necessary. The soil descriptions, USCS symbols and SPT values (N) are referenced on the Test Boring Logs.

In addition to the field investigation, supplementary laboratory analyses were performed to aid in the soil classification and to further define the pertinent physical properties of the foundation soils. Atterberg Limits and moisture content tests were performed on selected samples. Sieve analyses were performed on selected samples to aid in determining soil classification. All laboratory testing was conducted in accordance with appropriate ASTM standards. Results of the laboratory tests are referenced on the Test Boring Logs and/or in the appendices of this report.

5.0 SUBSURFACE FINDINGS

5.1 Site Geology

One (1) stratum of soil existed to the termination depths referenced on the boring logs.

The surficial stratum was a coarse-grained deposit consisting of a **sand** (SM, SM-SP, and/or SP). The following comments describe the deposit:

- The project site was covered with grass and/or pavement. With the exception of B-1, the surficial deposit was encountered beneath the grass/

pavement and extended to the boring termination depths in all of the borings.

- Field SPT N values ranged from 2 to 23; after adjusting these values for the automatic hammer's energy transfer coefficient (~ 1.51), the resulting N60 values indicated the soil's relative density ranged from very loose to dense.
- The soil's moisture contents ranged from 3 to 23%.
- A shallow lean clay lense (CL and/or CL-ML) was encountered in borings B-1, B-2 and B-5 within a vertical zone from the ground surface to ~ 15 feet bgs. The lense is described below:
 - The clay's LL ranged from 21 to 25 and its PI ranged from 4 to 8.
 - The soil's moisture content ranged from 13 to 31%. The soil was within either its solid or plastic state.
 - Field SPT N values ranged from 3 to 10; after converting these values to N60 values, the data indicated the soil's consistency ranged from firm to stiff.
- A deeper clay lense (CL) was encountered in boring B-1 within a vertical zone from ~ 20 to ~ 25 feet bgs. The lense is described below:
 - The clay's LL was 28 and its PI range was 9.
 - The soil's moisture content was 20%. The soil was within its plastic state.
 - The field SPT N value was 4; after converting this value to a N60 value, the data indicated the soil's consistency was firm.
- A shallow silt lense (ML) was encountered in borings B-4 and B-5 within a vertical zone from the ground surface to ~ 10 feet bgs. The lense is described below:
 - Field SPT N values ranged from 4 to 25; after converting these values to the N60 values, the data indicated the soil's consistency ranged from firm to hard.
 - The soil's moisture content ranged from 4 to 15%. The soil was in its solid state.

- A deeper silt lense (ML) was encountered in borings B-1 and B-2 within a vertical zone from ~15 to the boring termination depths of 25 feet bgs. The lense is described below:
 - Field SPT N values ranged from 6 to 7; after converting these values to N60 values, the data indicated the soil's consistency was stiff.
 - The soil's moisture content ranged from 18 to 21%. The soil was in its plastic state.
 - The silt's LL was 23 and its PI was 3.

5.2 Hydrogeology

The capillary fringe, when encountered, was encountered at depths ranging from ~20 to ~30 feet bgs. A temporary 1" diameter piezometer was installed in soil boring B-7; it was used to accurately measure the depth to the static groundwater potentiometric surface. Approximately 24 hours after the piezometer was installed, the depth- to- groundwater was measured to 22.05 feet bgs (~176' MSL).

Upon completion of all monitoring activities, the temporary piezometer and the boreholes were properly abandoned in accordance with MDEQ protocol.

6.0 DESIGN RECOMMENDATIONS

The following design recommendations are made based on the subsurface findings and the project characteristics:

6.1 Site Work

1. Clearing/Grubbing Activities:

The project site should be cleared/grubbed. The operation will remove the vegetation and organic-laden soils located within the proposed project area. The depth of excavation will vary. The horizontal limits of excavation should extend 5 feet outside the exterior lines of the project footprint.

The excavated material is believed to be unsuitable for use and should be disposed of off-site.

A geotechnical engineer should inspect the site to determine if the project area has been properly cleared/grubbed.

2. Excavation:

All excavations should be constructed in accordance with applicable United States Department of Labor, Occupational Safety and Health Administration (OSHA) regulations/guidelines. These guidelines are found in 29 Code of Federal Regulations (CFR) 1926. These regulations are strictly enforced by OSHA and, if not adhered to by the contractor, can not only result in worker injuries and/or fatalities, but also result in substantial penalties and fines levied by OSHA.

The burden of adhering to OSHA regulations falls solely on the contractor. The contractor is responsible for not only the design of the excavations but also their construction. The contractor will assign a “responsible person” as defined in 29 CFR 1926, to evaluate such excavations as part of the contractor’s health and safety plan. In no case should the contractor subject workers to excavations which do not comply with OSHA regulations/guidelines.

3. Engineered Fill Construction:

Upon completion of the clearing/grubbing and excavation activities, the cleared, sub-grade should be graded and compacted to 95% Standard Proctor Density (ASTM D-698). If unstable soil conditions (i.e. pumping) are encountered, the situation should be reviewed by a geotechnical engineer as noted in Section 6.4 of this report.

After the sub-grade has been properly prepared and if the site needs to be built up to grade, an engineered fill consisting of select fill material should be immediately constructed within the excavated area. The fill material should consist of imported, non-organic and debris-free silty clays (CL) or sandy clays (CL), having a PI within the range of 8 to 25 and a LL less than 35.

The fill should be placed in 8" loose lifts and compacted to 95% Standard Proctor density at moisture contents within 3% of optimum moisture. The lifts/benches should be level. The fill’s side slope should not be steeper than a 3(h) to 1(v) slope. The fill should be constructed in this manner until the site is brought to grade.

Testing services for both the subgrade and the compacted fill should be performed. The density and moisture content of the in-place fill material should be verified by testing at a frequency of one test per 2,500 square feet per six (6) inch compacted lift. Nuclear gauge (ASTM D-2922) or sand cone methods (ASTM D-1556) are approved testing methods for density verification.

6.2 Foundation System

Shallow foundation systems can support the anticipated structures. The site's allowable gross soil bearing capacity is 1,750 pounds per square foot (psf). The safety factor for this loading is 3.0. Differential settlement is anticipated to be 1.0 inch or less.

The following information is provided to assist in designing the foundation systems:

- Foundation Design – The foundation system should be designed by a structural engineer licensed in the State of Mississippi.
- Seismic Information – The Site Class for this project was obtained by interpreting the results of the soil borings and estimating the appropriate soil properties below the base of the borings to a depth of 100 feet as allowed by the International Building Code (IBC 2012). Based on this approach, the site class identification for the building site is Site Class D (IBC 2012 Section 1613).

6.3 Drainage

Adequate drainage should be provided to minimize any increase in the moisture content of the foundation soils. The drainage from the roof systems, pavement areas and/or yard should be directed away from the foundation systems to prevent the ponding of water around the structures.

6.4 Potential Construction Problems/Issues

1. Unstable Soil Conditions:

The potential always exists for unstable (i.e. pumping) soil conditions to be encountered during site preparation work. Undrained, saturated soils are typically the cause. Unless otherwise noted in this report, the problem is typically:

- localized or confined to an area, such as a ditch or low-lying area that is poorly drained;
- associated with an area that is affected by the groundwater situation or localized water/sewer leaks; and/or
- associated with an area that has conveyed/held water in the past.

If normal site work activities, such as discing and aeration, cannot dry the soil to a moisture level that will allow proper compaction and stabilization, the area should be inspected by a geotechnical engineer so that a remedial plan can be developed. Such a plan typically involves either:

- over excavation of the unstable soils and construction of an engineered fill to bridge the affected area; and/or
- installation of a geogrid material/aggregate mat over the affected area.

7.0 REPORT LIMITATIONS

The recommendations provided herein were developed from the information obtained from both the site reconnaissance and the test borings which depict subsurface conditions only at the specific locations and the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at the boring locations. The nature and extent of variations between the borings may not become evident until the course of construction. If variations are encountered, it will be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation phase and documenting the characteristics of these variations.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

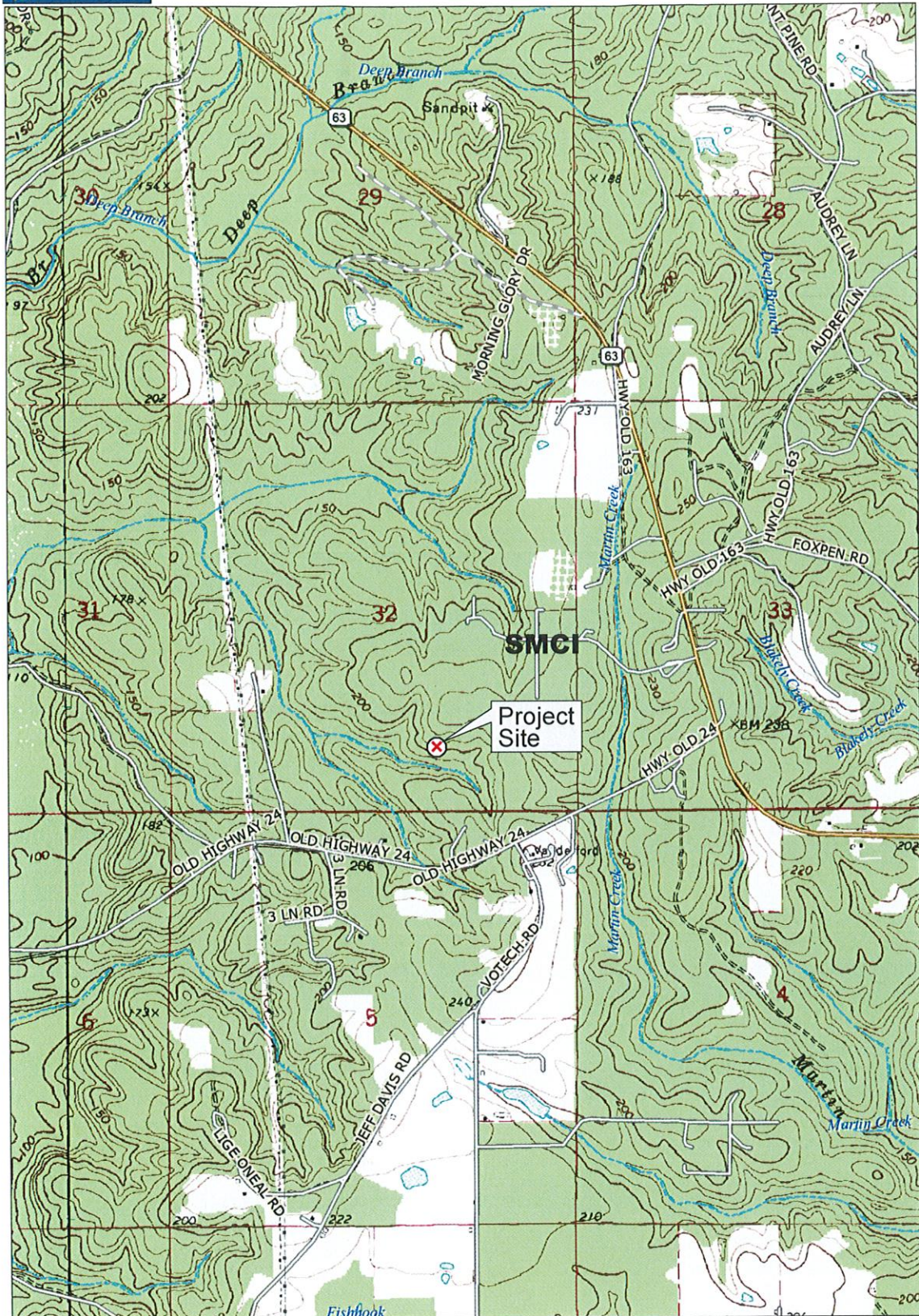
8.0 USER RELIANCE

This report was requested/authorized by CLIENT and was prepared for use by CLIENT and CLIENT's sub-consultants based on the CLIENT-approved scope of services, schedule and cost estimate. This report shall not be relied upon by and/or transferred to another party without the written consent of BURLE.

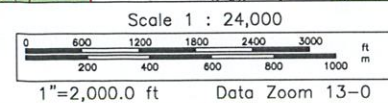
END OF REPORT

FIGURES

FIGURE 1
VICINITY MAP



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W. L. BURLE
ENGINEERS, P.A.
111 South Walnut Street
Greenville, MS 38701

FIGURE 1 VICINITY MAP

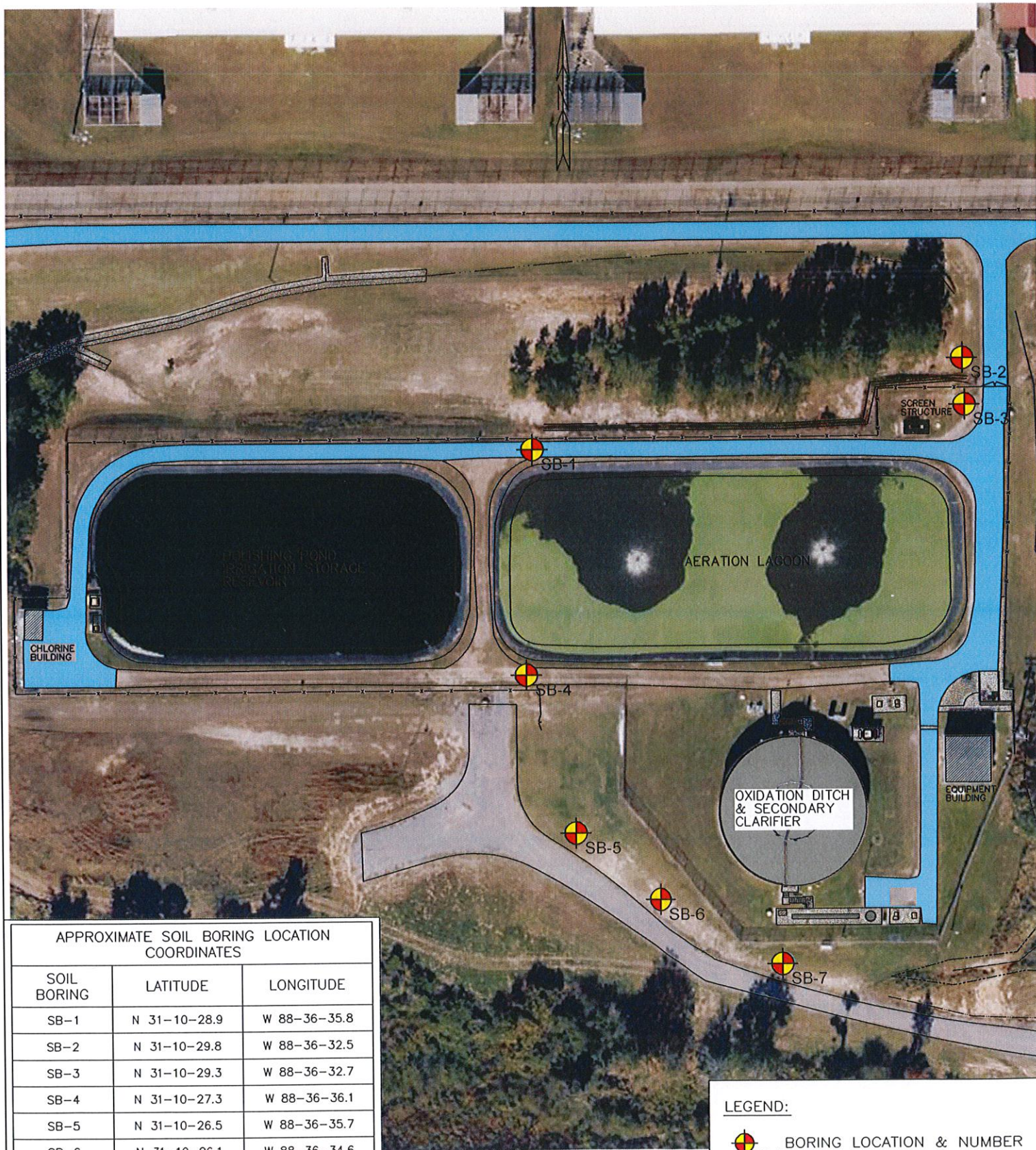
GEOTECHNICAL INVESTIGATION
GS#323-024
ARPA INFR.-WASTE CENT. TREATMENT
SOUTH MISSISSIPPI CORRECTIONAL INSTITUTE (SMCI)
LEAKESVILLE, MISSISSIPPI



QUADRANGLE LOCATION

Proj. No.	08194-4-0123
CAD File No.	GreeneCountyVicinity.Dwg
Drawn By: M.JJ	Dwg. No.
Chkd. By: WLB, JR.	1
Date: 12/21/2023	
Scale: 1"=2000'	

FIGURE 2
BORING LOCATION SITE MAP



APPROXIMATE SOIL BORING LOCATION
COORDINATES

SOIL BORING	LATITUDE	LONGITUDE
SB-1	N 31-10-28.9	W 88-36-35.8
SB-2	N 31-10-29.8	W 88-36-32.5
SB-3	N 31-10-29.3	W 88-36-32.7
SB-4	N 31-10-27.3	W 88-36-36.1
SB-5	N 31-10-26.5	W 88-36-35.7
SB-6	N 31-10-26.1	W 88-36-34.6
SB-7	N 31-10-25.6	W 88-36-34.1

LEGEND:



BORING LOCATION & NUMBER
SB-1

FIGURE 2
BORING LOCATION
SITE MAP



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SOUTH MISSISSIPPI CORRECTIONAL
INSTITUTE (SMCI)
LEAKESVILLE, MISSISSIPPI

Proj. No.
08194-4-0123

CAD File No.
GreeneCountySite.dwg

Drawn By: MJJ	Dwg. No.
Chkd. By: WLB, Jr.	2
Date: 02/07/2023	
Scale: NOT TO SCALE	

APPENDICES

APPENDIX A
TEST BORING RECORDS

TEST BORING RECORD

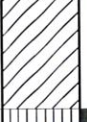
PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-30-24
 BORING NO.: 1 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 201' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	SP-SM			Asphalt Pavement			6				5" Thick
				Reddish Brown Silty Sand		21	11				10.4% Passing #200
				Reddish Brown Silty Sand		11	10				39.6% Passing #200
						9	12				19.3% Passing #200
5											26.3% Passing #200
	SM										
10						14	10				14.1% Passing #200
15				Tan and Brown Slightly Silty Sand Trace of Gravel		18	8				7.5% Passing #200
	SP-SM										
20				Tan and White Silty Clay		4	20	19	28	9	
	CL										
25				Tan and White Sandy Silt		7	21	20	23	3	
	ML										
30											
35											

DEPTH TO WATER: INITIAL 20' AFTER NR HOURS NR BORING TERMINATED AT 25 FT

TEST BORING RECORD

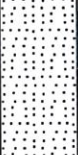
PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-30-24
 BORING NO.: 2 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 209' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	CL-ML			Reddish Brown Sandy Silty Clay		6	14				
						4	14				
				Reddish Brown Silty Clay		3	31				
5						5	23				
	CL										
10						4	18				
15	ML			Tan Clayee Sandy Silt		6	18				
20	SP-SM			Tan and Brown Slightly Silty Sand Trace of Gravel		19	7				
25	SM			Tan Silty Sand		11	8				
30											
35											

DEPTH TO WATER: INITIAL NE AFTER NA HOURS NA BORING TERMINATED AT 25 FT

TEST BORING RECORD

PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-30-24
 BORING NO.: 3 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 204' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	SM			Reddish Brown Silty Sand		6	13				45.4% Passing #200
	SP			Reddish Brown Gravelly Sand		7	10				4.4% Passing #200
	SM			Tan Silty Sand		5	9				15.7% Passing #200
5				Tan Slightly Silty Sand Race of Gravel		6	7				6.7% Passing #200
	SP-SM										
10				Tan Gravelly Sand		10	3				3.4% Passing #200
											
15	SP					13	3				3.0% Passing #200
											
20				Tan Slightly Silty Sand Trace of Gravel		19	5				7.5% Passing #200
	SP-SM										
25						17	5				9.5% Passing #200
											
30											
											
35											
											

DEPTH TO WATER: INITIAL NE AFTER NA HOURS NA BORING TERMINATED AT 25 FT

TEST BORING RECORD

PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-30-24
 BORING NO.: 4 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 200' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	ML			Reddish Brown Sandy Silt		25	9				
						21	8				
						9	7				
5						9	4				
10	SP-SM			Tan Slightly Silty Sand Trace of Gravel		6	5				
15	SM			Tan Silty Sand		16	4				
20						23	4				
25						9	18				
30											
35											

DEPTH TO WATER: INITIAL 25' AFTER NR HOURS NR BORING TERMINATED AT 25 FT

TEST BORING RECORD

PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-11-24
 BORING NO.: 5 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 199' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	ML			Reddish Brown Clayee Sandy Silt		7	13	15	18	3	
	CL-ML			Reddish Brown Sandy Silty Clay		3	14	17	21	4	
	ML			Reddish Brown Clayee Sandy Silt		4	15	17	20	3	
5				Reddish Brown Silty Clay		10	13	17	25	8	
	CL										
10				Tan Gravelly Sand		7	3				3.0% Passing #200
	SP										
15				Tan Gravelly Slightly Silty Sand		10	6				6.4% Passing #200
	SP-SM										
20				Tan Gravelly Sand		11	5				4.9% Passing #200
	SP										
25	SM			Tan Silty Sand		17	15				17.0% Passing #200
30											
35											

DEPTH TO WATER: INITIAL 25' AFTER NR HOURS NR BORING TERMINATED AT 25 FT

TEST BORING RECORD

PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-11-24
 BORING NO.: 6 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 198' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	SM			Reddish Brown Clayey Silty Sand		8	12				
						14	13				
				Reddish Brown Silty Sand		3	15				
5						2	17				
	SP-SM			Tan Slightly Silty Sand Trace of Gravel		6	7				
10											
	SM			Tan Silty Sand		7	5				
15											
						11	6				
20											
25						18	18				
30											
35											

DEPTH TO WATER: INITIAL 25' AFTER NR HOURS NR BORING TERMINATED AT 25 FT

TEST BORING RECORD

PROJECT: GS# 323-024, ARPA Infr.-Waste Cent. Treatment, SMCI, Leakesville, MS SHEET 1 OF 1
 CLIENT: BOB, Jackson, MS DATE: 1-10-24
 BORING NO.: 7 LOCATION: See Site Map PROJECT NO.: 08194-4-0123
 ELEVATION: 198' MSL DRILLING METHOD: 3.25 I.D. HSA DRILLER: G. Olivi

DEPTH (FT)	USCS	LEGEND	SAMPLE	DESCRIPTION	PID (PPM)	N Value	W	PL	LL	PI	REMARKS
0	SM			Reddish Brown Silty Sand		9	13				25.2% Passing #200
						8	18				15.4% Passing #200
	ML			Reddish Brown Sandy Silt		8	14	16	18	2	
5						5	15	17	18	1	
10	SM			Reddish Brown Silty Sand		4	14				34.3% Passing #200
15						7	9				26.7% Passing #200
20						18	11				16.6% Passing #200
25						13	15				27.7% Passing #200
30						12	20				40.7% Passing #200
35						5	23				17.4% Passing #200

DEPTH TO WATER: INITIAL 30' AFTER 24 HOURS 22.05' BORING TERMINATED AT 35 FT

KEY TO SYMBOLS

Symbol Description

Symbol Description

Strata symbols

	Paving
	Poorly graded sand with silt
	Silty sand
	Low plasticity clay
	Silt
	Silty low plasticity clay
	Poorly graded sand

Soil Samplers

	Rock core
	Standard penetration test

Misc. Symbols

	Water table during drilling
	Water table at boring completion

Notes:

NE	Not Encountered
NA	Not Applicable
NR	Not Recorded

1. Exploratory borings were drilled on 1-10-24, 1-11-24 and 1-30-24, using a 3.25-inch I.D. diameter hollow stem auger.
2. Water was encountered at the time of drilling and re-checked 24 hours later in Boring B-7.
3. Boring locations were referenced by GPS.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

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DIVISION 31 – EARTHWORK

SECTION 31 2319

DEWATERING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Dewatering

Dewatering is defined as the lowering of the ground water below the slopes and bottom of the excavated areas to ensure dry, firm working conditions and the reduction to safe levels of any hydrostatic uplift pressures in the foundation which is necessary to ensure the stability and integrity of the foundation. Dewatering also includes the removal of all surface water within the areas where work is required.

1.1.2 Dewatering System

Dewatering system is defined as the equipment and appurtenances necessary for and related to dewatering the area where work is required.

1.2 SUBMITTALS

Details of the proposed dewatering system shall be submitted.

1.3 GENERAL

The work consists of designing, furnishing, installing, and operating a system to dewater the excavation, excavation slopes, and foundation surfaces in areas where work is required, maintaining these areas free from water during construction operations, monitoring the ground water levels, and removing the system.

1.3.1 Dewatering Requirements

All permanent work under this contract except as otherwise specified shall be performed in areas free of water. The CONTRACTOR shall design, furnish, install, operate, and maintain such facilities necessary to accomplish the following:

- 1.3.1.1 Collect and dispose of all surface water in areas where work is required regardless of its source.
- 1.3.1.2 Control and dispose of all surface water around the periphery of the excavated areas to prevent such water from entering the excavation.
- 1.3.1.3 Lower and maintain the water table at least 1 foot below the bottom of the excavation and at least 1 foot below the side slopes.
- 1.3.1.4 Provide a system of dikes or ditches around the periphery of the excavation to route water away from the excavated areas.

1.3.2 Design Requirements

The dewatering system shall be designed using accepted professional methods of engineering design consistent with the best current practice. The CONTRACTOR shall perform necessary tests and/or analyses of the groundwater quality and soil environment at the site to satisfy himself that his system will provide the required results, that materials used in his system will not corrode or otherwise deteriorate to such an extent that the system will not perform satisfactorily during the life of the contract, and that adequate preventative and/or maintenance procedures are incorporated in his dewatering system design to prevent the clogging of the system due to the buildup of incrustation resulting from the deposition of dissolved minerals in the ground water and slime-forming organisms.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SYSTEM REQUIREMENTS

The dewatering system shall be of a type and capacity to accomplish the following requirements:

- 3.1.1 The system shall be of such capacity that it will lower and maintain the piezometric levels to an elevation at least 1 foot below all earth slopes and excavation surfaces lying within the areas where work is required. The system shall have sufficient capacity to accomplish this desired result allowing for normal variations in soil

properties and foundation conditions.

- 3.1.2 The water level shall be maintained continuously at or below the elevations specified above so that construction operations can be performed without interruption due to wet conditions.
- 3.1.3 No upward or vertical or lateral flow of ground water into the work area will be permitted at any time. The dewatering system shall be designed, constructed, and operated at all times so as to prevent movement and/or piping of the foundation, excavation slopes, and fill materials.
- 3.1.4 The system shall consist of wells, and/or well points, pumps, sumps, ditches, and necessary appurtenances capable of intercepting seepage before it exists on any interior surface or excavation face and shall provide control of surface water. The system shall be operated as required in Paragraph 3.1.2 above and shall be designed to control a rainfall intensity of 6 inches in 24 hours.

3.2 REVIEW OF SYSTEM DESIGN AND PERFORMANCE

The CONTRACTOR shall submit to the PROFESSIONAL details of his proposed dewatering facilities including the type of system, planned layout and sizes of wells and/or well points, (including screen diameter, lengths, and screen open areas) headers, (including all lengths requiring burial), collectors, ditches, sumps and pumps; (including number, type, location), proposed method of installation, and provisions for disposal of water from the dewatering system. This submittal shall include provisions for handling and disposal of surface water. This submittal shall also include the design capacity of each well and/or well-point segment at the design stage, and shall be submitted no later than 21 days prior to installation of the system. The PROFESSIONAL's review of the CONTRACTOR's proposed dewatering system will be only for the purpose of determining the acceptability of the general design concept and layout of the system.

If during the progress of the work the installed dewatering system proves inadequate to meet the requirements specified, the CONTRACTOR shall, at no additional cost to the OWNER, furnish, install, and operate such additional dewatering facilities and/or make such changes either in features of the system or the plan of operation as may be necessary to perform the required dewatering in a satisfactory manner.

3.3 OPERATION

The CONTRACTOR shall perform such dewatering and maintain the work areas in a dry

condition as long as is necessary for the work under this contract. Once an area is dewatered, it shall be maintained in a dewatered condition until all work in the area is completed.

3.4 MAINTENANCE AND SERVICING

The CONTRACTOR shall be responsible for the maintenance, servicing, and repairs of the entire dewatering system during the life of the contract.

3.5 REMOVAL

The dewatering facilities required to maintain a dry condition within the work areas shall be maintained until completion of the work. When the dewatering system is no longer required, all components of the system shall be completely removed. However, no dewatering facilities of any kind shall be removed without prior approval of the PROFESSIONAL. All wells, well-points, pumps, and appurtenances used in the dewatering system shall remain the property of the CONTRACTOR and shall be removed from the site of the work. All holes created by the dewatering system shall be plugged with cement grout in a manner approved by the PROFESSIONAL.

- End of Section -

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SECTION 31 2323.11

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2.1.1.1 Unsuitable Materials

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DIVISION 31 – EARTHWORK

SECTION 31 2323.11

BACKFILL AND FILL

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216	Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

PART 2 PRODUCTS

2.1 MATERIAL FOR BACKFILL AND FILL

2.1.1 General

Material for select backfill and fill shall be obtained from a source outside the right-of-way and shall be non-organic and debris-free silty clays (CL) or sandy clays (CL) having a plasticity index within the range of 8 to 25 and a liquid limit less than 35 as determined by ASTM D 2487. Except as otherwise required, the remaining backfill and fill shall be constructed of suitable materials and obtained from the required excavations. However, if a sufficient quantity of material is not obtained from the required excavations to construct the site to the required grade, select material as described in this Section shall be obtained to complete the site fill to the required grade. Backfill and fill shall be constructed of materials that are free of unsuitable and frozen materials as defined in Paragraph 2.1.1.1 Unsuitable Materials and Paragraph 2.1.1.2 Frozen Materials.

2.1.1.1 Unsuitable Materials

Material containing organic matter, sticks, branches, sod, humus, roots, and other debris shall be unsuitable for placement in any backfill or fill if the length of any of these items of debris is more than one foot, if the cross-sectional area of any of these items of debris is more than four square inches, if these items of debris are not uniformly distributed in the backfill or fill, or if any cubic yard of backfill or fill material contains more than one percent by volume of these items of debris.

2.1.1.2 Frozen Materials

Under no circumstances shall frozen soil, snow, or ice be placed in any backfill or fill.

2.1.2 Material Classification

Unless otherwise specified or shown on the drawings, materials classified by ASTM D 2487 as gravels (GW, GP, GM) and sands (SW, SP, SM) shall not be used unless suitably blended with less pervious material to the extent that the material is changed to a classification other than gravels and sands.

PART 3 EXECUTION

3.1 FOUNDATION PREPARATION

3.1.1 General

All unsuitable foundation material consisting of soft, wet, or organic material or debris within the area upon which backfill or fill is to be placed shall be removed to the depth directed by PROFESSIONAL before any backfill or fill materials are placed. Where material has been removed from below the established grades, backfill shall be placed to the required foundation grades in layers not to exceed 6 inches in thickness before compaction and compacted as specified for backfill in Paragraph 3.2 PLACEMENT AND COMPACTION OF BACKFILL. Where suitable foundation material exists, the top 8 inches of the ground surface shall be compacted to the same density requirements as overlying backfill or fill. Sloped ground surfaces steeper than 1V on 5H on which backfill or fill is to be placed shall be plowed, stepped, benched, or broken up as directed by PROFESSIONAL in such manner that the new material will bond with the existing surface. Prepared surfaces on which backfill or fill is to be placed shall be wetted or dried as may be necessary to obtain the required compaction.

3.1.2 Drainage

The foundation receiving backfill or fill and all partially completed backfill or fill shall be kept thoroughly drained. CONTRACTOR shall be solely responsible for any and all damages, claims for damage, and liability of any nature whatsoever related to drainage to areas outside the work areas.

3.2 PLACEMENT AND COMPACTION OF BACKFILL

3.2.1 General

The location, type, and extent of backfill is shown on the drawings. The materials shall be placed or spread in layers. The first layer shall be not more than 6 inches in thickness before compaction, and the succeeding layers shall be not more than 8 inches in thickness before compaction. Layers shall be constructed full out to the slope stakes and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. When the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the next layer is placed thereon. Backfill shall

not be placed in or under water. Unless otherwise directed by PROFESSIONAL, backfill shall not be placed against concrete less than 14 days after the date the concrete was placed. Backfill within two feet of a structure shall be placed in 6-inch layers and compacted with hand-operated power tampers or other equipment as approved by PROFESSIONAL. Compacted backfill adjacent to the structure shall be carried up simultaneously on both sides of the structure unless deviation from this procedure is approved by PROFESSIONAL. Backfill over concrete slabs or footings shall have the first two 6 inch layers compacted with hand-operated power tampers before machine equipment is allowed to operate over the area. Sloped ground surfaces steeper than 1V on 5H on which backfill is to be placed shall be plowed, stepped, benched, or broken up as directed by PROFESSIONAL in such a manner that the new material will bond with the existing surface.

3.2.2 Moisture Control

The moisture content after compaction shall be as uniform as practicable throughout any one layer of material and shall be within the limits of 3 percentage points above or below optimum moisture content. Material that is too wet shall be spread and permitted to dry, assisted by discing or harrowing, until the moisture content is reduced to an amount within the specified limits. When the material is too dry, CONTRACTOR shall add water to the material until the moisture content is increased to an amount within the specified limits. Discing may be required to uniformly distribute the moisture in the material. If it is impracticable to obtain the specified moisture content by wetting or drying the material in place prior to compaction, CONTRACTOR may need to pre-wet or pre-dry the material at the source of excavation. If the top or contact surface of a partial backfill section becomes too dry to permit a suitable bond between the surface and the additional backfill to be placed thereon, CONTRACTOR shall loosen the dried materials by scarifying or discing, add moisture and recompact this layer in accordance with the applicable requirements of Paragraph 3.2.3 Compaction. If the top or contact surface of a partial backfill section becomes too wet to permit a suitable bond between the surface and the additional backfill to be placed thereon, the wet material shall be scarified and permitted to dry to an acceptable moisture content. After the material has dried to an acceptable moisture content, it shall be recompact in accordance with the requirements of Paragraph 3.2.3 Compaction.

3.2.3 Compaction

Each layer of backfill material shall be compacted to at least 95 percent of maximum density as determined by ASTM D 698 prior to placement of the successive layer.

3.2.4 Stability

Stability of each layer must be evident during the compaction of each lift prior to placement of successive layer.

3.3 PLACEMENT AND COMPACTION OF FILL

3.3.1 Select Compacted Fill

3.3.1.1 General

The location and extent of select compacted fill is shown on the drawings. The select fill material shall be placed or spread in layers. The first layer shall be not more than 6 inches in thickness before compaction, and the succeeding layers shall be not more than 8 inches in thickness before compaction. Layers shall be constructed full out to the slope stakes and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. When the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the next layer is placed thereon. Fill shall not be placed in or under water.

3.3.1.2 Moisture Control

The moisture content after compaction shall be as uniform as practicable throughout any one layer of material and shall be within the limits of 3 percentage points above or below optimum moisture content. Material that is too wet shall be spread and permitted to dry, assisted by discing or harrowing, until the moisture content is reduced to an amount within the specified limits. When the material is too dry, CONTRACTOR shall add water to the material until the moisture content is increased to an amount within the specified limits. Discing may be required to uniformly distribute the moisture in the material. If it is impracticable to obtain the specified moisture content by wetting or drying the material in

place prior to compaction, CONTRACTOR may need to pre-wet or pre-dry the material at the source of excavation. If the top or contact surface of a partial backfill section becomes too dry to permit a suitable bond between the surface and the additional fill to be placed thereon, CONTRACTOR shall loosen the dried materials by scarifying or discing, add moisture and recompact this layer in accordance with the applicable requirements of Paragraph 3.3.1.3 Compaction. If the top or contact surface or a partial fill section becomes too wet to permit a suitable bond between the surface and the additional backfill to be placed thereon, the wet material shall be scarified and permitted to dry to an acceptable moisture content. After the material has dried to an acceptable moisture content, it shall be recompacted in accordance with the requirements of Paragraph 3.3.1.3 Compaction.

3.3.1.3 Compaction

Each layer of select compacted fill material shall be compacted to at least 95 percent of maximum density as determined by ASTM D 698 prior to placement of the successive layer.

3.3.1.4 Stability

Stability of each layer must be evident during the compaction of each lift prior to placement of successive layer.

3.4 TOLERANCES

All backfill and fill shall be constructed to the lines, grade and cross sections shown on the drawings. For semi-compacted fill at all points, a tolerance of 1/10 of 1 foot above the prescribed gross grade and cross section shown will be permitted in the final dressing provided that the area drains, there are no abrupt humps or depressions in the surfaces, and the side slopes are uniform.

3.5 TESTS

3.5.1 General

CONTRACTOR shall establish and maintain tests and inspections for backfill and fill embankment operations to assure compliance with contract requirements. PROFESSIONAL shall be notified of each test and given the opportunity to

witness each test. CONTRACTOR shall perform all control testing such as soil classification, control compaction curves, in-place density, and in-place moisture. Control testing shall be the responsibility of CONTRACTOR and shall be performed at no additional cost to OWNER. Testing shall be performed by an approved commercial testing laboratory. Test performance shall be pursued in such a manner that the results are obtained in the minimum time frame. The following tests are required to provide adequate quality control:

- 3.5.1.1 Soil Classification Test: Determination of soil classification shall be according to the ASTM D 2487. One determination will be required for each type of material from each source.
- 3.5.1.2 Control Compaction Curves: Control compaction curves shall be according to ASTM D 698. A control compaction curve will be required for each type of backfill and fill material from each source. These tests shall be used to determine the controlling optimum moisture content and maximum density and are subject to verification by PROFESSIONAL.
- 3.5.1.3 In-Place Density Tests: In-place density tests for backfill and fill materials shall be made in accordance with ASTM D 2922, and shall be made at a frequency to assure compliance with the contract requirements, but not less than one density test for each layer of material placed. If a layer contains more than 100 cubic yards, one test will be required for each 100 cubic yards or portion thereof in the layer. The location of the test shall be representative of the area being tested and/or as directed by PROFESSIONAL. The result of each in-place density test shall be furnished to PROFESSIONAL prior to placement of the subsequent layer in the area.
- 3.5.1.4 In-Place Moisture Content Tests: In-place moisture content tests shall be performed in accordance with ASTM D 3017. The frequency of in-place moisture content tests shall be the same as for in-place density tests.
- 3.5.1.5 In addition to the previously mentioned frequency of tests, additional tests will be required:
 - A. Where PROFESSIONAL has reason to doubt the adequacy of the compaction,

- B. Where special compaction procedures are being used, and
 - C. When backfill and fill materials change substantially.
- 3.5.1.6 PROFESSIONAL may direct additional testing if he determines that the specified frequency for testing is inadequate.
- 3.5.1.7 Areas not meeting the specified moisture and density requirements shall be retested after corrective measures have been applied.
- 3.5.1.8 As a control, PROFESSIONAL may perform assurance tests for optimum moisture content and maximum density for all materials. If values for optimum moisture and maximum density as determined by CONTRACTOR and as determined by PROFESSIONAL do not agree, the values determined by PROFESSIONAL shall be used. PROFESSIONAL may also perform in-place moisture control tests and in-place density tests to verify compliance with the contract.
- 3.5.1.9 Additional testing as directed by PROFESSIONAL will be performed at no additional cost to OWNER.

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DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 1216

ASPHALT PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1 Section includes:

1.2.1.1 Cold milling of existing hot-mix asphalt pavement;

1.2.1.2 Hot-mix asphalt patching;

1.2.1.3 Hot-mix asphalt paving;

1.2.1.4 Hot-mix asphalt paving overlay;

1.2.1.5 Asphalt surface treatments; and

1.2.1.6 Pavement-marking paint.

1.2.2 Related Sections:

1.2.2.1 SECTION 02 4100 DEMOLITION for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.

1.2.2.2 SECTION 31 2323.11 BACKFILL AND FILL for aggregate subbase and base courses and for aggregate pavement shoulders.

- 1.2.2.3 Mississippi Standard Specifications for Road and Bridge Construction, Mississippi Department of Transportation (MDOT), Jackson, MS 2017 Edition.

1.3 DEFINITION

Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 or MDOT Specification Division 400 for definitions of terms.

1.4 SUBMITTALS

1.4.1 Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

- 1.4.1.1 Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

- 1.4.1.2 Job-Mix Designs: For each job mix proposed for the Work.

1.4.2 Shop Drawings: Indicate pavement markings, land separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.4.3 Qualification Data: For qualified manufacturer and installer.

1.4.4 Material or product certificates from manufacturers, as described in this Section.

1.4.5 Material Certificates: For each paving material, from manufacturer.

1.4.6 Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer Qualifications

A paving mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

1.5.2 Testing Agency Qualifications

Qualified according to ASTM D 3666 for testing indicated.

1.5.3 Regulatory Requirements

Comply with materials, workmanship, specifications, and other applicable requirements of the Mississippi Department of Transportation (MDOT) for asphalt paving work. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5.4 Preinstallation Conference

Conduct conference at the project site.

1.5.4.1 Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

- A. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
- B. Review condition of subgrade and preparatory work.
- C. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
- D. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

1.6.2 Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- 1.7.1 Environmental Limitations shall meet the requirements specified in MDOT Specifications.
- 1.7.2 Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 degrees F (4.4 degrees C) for oil-based materials and 55 degrees F (12.8 degrees C) for water-based materials, and not exceeding 95 degrees F (35 degrees C).

PART 2 PRODUCTS

2.1 AGGREGATES

- 2.1.1 General: Use materials and gradations that have performed satisfactorily in previous installations.
- 2.1.2 Coarse Aggregate shall be as specified in MDOT Specification Section 703 – Aggregates.
- 2.1.3 Fine Aggregate shall be as specified in MDOT Specification Section 703 – Aggregates.
- 2.1.4 Mineral Filler shall be as specified in MDOT Specification Section 401 – Asphalt Pavement – General.

2.2 ASPHALT MATERIALS

- 2.2.1 Asphalt Binder shall be as specified in MDOT Specification Section 702 – Bituminous Materials.
- 2.2.2 Asphalt Cement shall be as specified in MDOT Specification Section 702 – Bituminous Materials.
- 2.2.3 Prime Coat shall be as specified in MDOT Specification Section 408 – Prime Coat.
- 2.2.4 Tack Coat shall be as specified in MDOT Specification Section 407 – Tack Coat.

2.2.5 Fog Seal: ASTM D 997 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

2.2.6 Water: Potable.

2.3 AUXILIARY MATERIALS

2.3.1 Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular liquid, or wettable powder form.

2.3.2 Sand shall be as specified in MDOT Specification Section 401 – Asphalt Pavement – General.

2.3.3 Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, mildew, and specifically designed for paving applications.

2.3.4 Joint Sealant: ASTM D 6690 or AASHTO M 324, Type I, Type II or Type III, hot-applied, single component, polymer-modified bituminous sealant.

2.3.5 Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N, Type F, Type S; colors complying with FS TT-P-1952.

2.3.6 Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.

2.3.6.1 Color: White, Yellow, or Blue, as indicated.

2.3.7 Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.

2.3.7.1 Color: White, Yellow, or Blue.

2.3.8 Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

2.3.8.1 Color: White, Yellow, or Blue.

2.3.9 Glass Beads: AASHTO M 247, Type I.

2.4 MIXES

2.4.1 Recycled Materials for HMA Mixes shall be as specified in MDOT Specification Section 401 – Asphalt Pavement – General.

2.4.2 Hot-Mix Asphalt shall be as specified in MDOT Specification Section 401 – Asphalt Pavement – General complying with the following requirements:

2.4.2.1 Provide mixes with a history of satisfactory performance in geographical area where Project is located.

2.4.2.2 Base Course: HMA ST 12.5 mm.

2.4.2.3 Surface Course: HMA ST 9.5 mm.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Verify that subgrade is dry and in suitable condition to being paving.

3.1.2 Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

3.1.2.1 Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first directions. Limit vehicle speed to 3 mph (5 km/h).

3.1.2.2 Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 20 tons (13.6 tonnes).

3.1.2.3 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by PROFESSIONAL, and replace with compacted backfill or fill as directed.

3.1.3 Proceed with paving only after unsatisfactory conditions have been corrected.

3.1.4 Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt

surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 COLD MILLING

Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

3.2.1 Mill to the depth specified on the construction plans.

3.2.2 Mill to uniform finished surface free of excessive gouges, grooves, and ridges.

3.2.3 Control rate of milling to prevent tearing of existing asphalt course.

3.2.4 Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.2.5 Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.

3.2.6 Transport milled hot-mix asphalt to asphalt recycling facility.

3.2.7 Do not allow milled materials to accumulate on-site.

3.2.8 Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

3.3.1 Hot-Mix Asphalt Pavement

Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact exiting unbound-aggregate base course to form new subgrade.

3.3.2 Portland Cement Concrete Pavement

Break cracked slabs and roll as required to reseat concrete pieces firmly.

3.3.2.1 Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.

3.3.2.2 Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompress exiting unbound-aggregate base course to form new subgrade.

3.3.3 Tack Coat

Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

3.3.3.1 Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

3.3.3.2 Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected areas.

3.3.4 Patching

Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3.5 Patching

Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

3.4.1 Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

3.4.1.1 Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

3.4.2 Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of ¼ inch (6 mm).

3.4.2.1 Clean cracks and joints in exiting hot-mix asphalt pavement.

3.4.2.2 Use emulsified-asphalt slurry to seal cracks and joints less than ¼ inch (6 mm) wide.

3.4.2.3 Use hot-applied joint sealant to seal cracks and joints more than ¼ inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

3.5.1 Surface preparation shall be performed as specified in MDOT Specification Section 403 – Asphalt Pavements.

3.6 HOT-MIX ASPHALT PLACING

3.6.1 Place hot mix asphalt as specified in MDOT Specification Section 403 – Asphalt Pavements. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

3.6.1.1 Place hot-mix asphalt base course in number of lifts and thicknesses indicated on plans.

3.6.1.2 Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

3.6.1.3 Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

3.6.2 Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; suitable hand tools to smooth surface.

3.7 JOINTS

Construct joints as specified in MDOT Specification Section 403 – Asphalt Pavements.

3.8 COMPACTION

Compact asphalt pavement as specified in MDOT Specification 403 – Asphalt Pavements.

3.8.1 General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers. Complete compaction before mix temperature cools to 185 degrees F (85 degrees C).

3.8.2 Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

3.8.3 Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

3.8.3.1 Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent nor greater than 100 percent.

3.8.3.2 Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

3.8.4 Finish Rolling: Finish roll paved surfaces to remove roller marks while hot mix asphalt is still warm.

3.8.5 Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

- 3.8.6 Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- 3.8.7 Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- 3.8.8 Erect barricades to protect paving form traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- 3.9.1 Pavement Thickness shall be as specified in MDOT Specification Section 403 – Asphalt Pavements.
- 3.9.2 Pavement Surface Smoothness shall be as specified in MDOT Specification Section 403 – Asphalt Pavements.

3.10 SURFACE TREATMENT

3.10.1 Fog Seals

Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

3.10.2 Slurry Seals

Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

3.10.2.1 Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.11 PAVEMENT MARKINGS

- 3.11.1 Do not apply pavement-marking paint until layout, colors, and placement have been verified with PROFESSIONAL.
- 3.11.2 Allow paving to age for 10 days before starting pavement marking.

3.11.3 Sweep and clean surface to eliminate loose material and dust.

3.11.4 Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.11.4.1 Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.12 FIELD QUALITY CONTROL

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

3.12.2 Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in MDOT Specification Section 403 – Asphalt Pavements.

3.12.3 Surface Smoothness: Finished surface of each hot-mix asphalt courses will be tested for compliance with smoothness tolerance.

3.12.4 In-place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

3.12.4.1 Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

3.12.4.2 In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

3.12.5 Replace and compact hot-mix asphalt where core tests were taken.

3.12.6 Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 DISPOSAL

Except for material indicated to be recycled, remove excavated material from Project site and legally dispose of them in an EPA-approved landfill. Do not allow milled materials to accumulate on-site.

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CRUSHED STONE SURFACING

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DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 1500

CRUSHED STONE SURFACING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this Section to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2001) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM D 698	(2021) Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216	(2017) Laboratory Determination of Water (Moisture) Content of Soil and Rock

ASTM D 4318	(2017) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 6938	(2017) In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.2 SUBMITTALS

Contractor shall submit gradation tests (ASTM C 136) and standard proctor results (ASTM D 698) to PROFESSIONAL for review/approval prior to construction.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Crushed Stone

Crushed stone material shall be from a source approved by PROFESSIONAL and shall meet the following gradation requirements:

U.S. Std. Square Mesh Sieve Designation	[No. 610] Percent by Weight Passing AASHTO T 27 Testing Method
1-1/2"	100
1"	90-100
3/4"	70-100
1/2"	62-90
3/8"	50-80
No. 4	40-65
No. 8	
No. 40	12-26
No. 200	5-12

For No. 610 stone, the fraction of material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 5. The coarse aggregate shall have a percentage of wear not to exceed 50 after 500 revolutions of testing by the Los Angeles Testing Machine in accordance with AASHTO T 96. If material from the source has previously met this wear test, it need not be retested.

PART 3 EXECUTION

3.1 SITE PREPARATION

The surfaces to receive crushed stone shall be prepared in accordance with the CONTRACT DOCUMENTS and verified by PROFESSIONAL before crushed stone placement begins.

3.2 MOISTURE CONTROL

The moisture content after compaction shall be as uniform as practicable throughout any one layer of material and shall be within the limits of 3 percentage points above or below optimum moisture content. Material that is too wet shall be spread and permitted to dry, until the moisture content is reduced to an amount within the specified limits. When the material is too dry, CONTRACTOR shall add water to the material until the moisture content is increased to an amount within the specified limits. Discing or other approved

method may be required to uniformly distribute the moisture in the material. If it is impracticable to obtain the specified moisture content by wetting or drying the material in place prior to compaction, CONTRACTOR may need to pre-wet or pre-dry the material at the source. If the top or contact surface of a partial section becomes too dry to permit a suitable bond between the surface and the additional layer to be placed thereon, CONTRACTOR shall loosen the dried materials by scarifying, discing, or other approved method, add moisture and recompact this layer in accordance with the applicable requirements of Paragraph 3.3 of this Section.

3.3 CRUSHED STONE PAVEMENT CONSTRUCTION

No. 610 crushed stone material shall be placed as shown on the drawings. The crushed stone shall not be placed on a wet surface. No. 610 crushed stone shall be compacted to at least 95% of the maximum density as determined by ASTM D 698 at a moisture content within 3 percentage points of the optimum moisture content and shall be dressed with a motor grader or similar equipment to present a uniform appearance and a smooth surface without sharp breaks or depressions which will collect or hold water.

3.4 TESTING

CONTRACTOR shall establish and maintain tests and inspections for crushed stone operations to assure compliance with contract requirements. PROFESSIONAL shall be notified of each test and given the opportunity to witness each test. CONTRACTOR shall perform all control testing such as material gradation, control compaction curves, and in-place density. Control testing shall be the responsibility of CONTRACTOR and shall be performed at no additional cost to OWNER. Testing shall be performed by an approved commercial testing laboratory or may be performed by CONTRACTOR subject to approval of PROFESSIONAL. Test performance shall be pursued in such a manner that the results are obtained in the minimum time frame. The following tests are required:

3.4.1 Gradation Tests

As a minimum, the crushed stone shall be tested once before beginning placement and once for each 500 cubic yards placed. After placement begins, samples for tests shall be taken from material that has been delivered to the job site.

3.4.2 Control Compaction Curves

Control compaction curves shall be according to ASTM D 698. A control compaction curve will be required for No. 610 from each source. These tests shall be used to determine the controlling maximum density and are subject to verification by PROFESSIONAL.

3.4.3 In-Place Density Tests

In-place density tests for crushed stone materials shall be made in accordance with ASTM D 6938, and shall be made at a frequency to assure compliance with the contract requirements. The location of the test shall be representative of the area being tested and/or as directed by PROFESSIONAL. A sufficient number of in-place density tests shall be performed to demonstrate to the satisfaction of PROFESSIONAL that the required density has been obtained. Additional testing as directed by PROFESSIONAL will be performed at no additional cost to OWNER.

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SECTION 32 3113

CHAIN LINK FENCES AND GATES

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DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 3113

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 121	Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 392	Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 780	Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 824	Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence
ASTM F 626	Fence Fittings
ASTM F 883	Padlocks
ASTM F 900	Industrial and Commercial Swing Gates
ASTM F 1043	Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework

1.2 SUBMITTALS

The Contractor shall submit product data that demonstrate that the chain link fence and all related items comply with the contract requirements.

PART 2 PRODUCTS

2.1 FENCE FABRIC

Fabric shall comply with ASTM A 392, zinc-coated steel wire with minimum coating weight of 2 ounces of zinc per square foot of coated surface. Fabric shall be made of 9-gauge wire woven in 2-inch mesh. Fabric height shall be 8 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.2 GATES

Gates shall comply with ASTM F 900. Gate shall be the type and swing shown. Gate frames shall conform to strength and coating requirements of ASTM F 1043 for Group IA, steel pipe, with external coating Type A. Nominal pipe size (NPS) shall be 1-1/2. Gate fabric shall be as specified for chain link fabric. Gate leaves more than 8 feet wide shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished as required for the operation of the gate. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate. Stops shall be provided for holding the gates in the open position.

2.3 POSTS

Posts shall comply with ASTM F 1043, Group IA, with external and internal coating Type A steel pipe. Sizes shall be as shown. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Gate post shall be for the gate type specified subject to the limitation specified in ASTM F 900.

2.4 BRACES AND RAILS

Braces and rails shall comply with ASTM F 1043, Group IA, steel pipe, size NPS 1-1/4 with external and internal coating Type A.

2.5 TENSION WIRE

Tension wire shall be Type II Class 2 coating, 7 gauge, in accordance with ASTM A 824.

2.6 BARBED WIRE

Barbed wire shall comply with ASTM A 121, zinc-coated, Class I, 12-1/2-gauge wire with 14 gauge 4-point barbs spaced no more than 5 inches apart.

2.7 ACCESSORIES

Accessories shall comply with ASTM F 626. Ferrous accessories shall be zinc or aluminum coated. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Tie wire for attaching fabric to rails, braces, and posts shall be 9-gauge aluminum wire. Miscellaneous hardware coatings shall conform to ASTM A 153 unless otherwise required.

A screening system consisting of vertical slats and a locking horizontal channel (tube slats/viper channel or approved equal) shall be installed in the chain link fabric. The screen shall be constructed of high-density polyethylene (HDPE) material. Color shall match existing UM fences.

2.8 CONCRETE

Concrete shall be as specified in Section 31 3000 CAST-IN-PLACE CONCRETE.

2.9 PADLOCK

Padlock shall conform to ASTM F 883, Type P01, size 1-3/4 inch. The padlock and two keys shall be furnished for each gate. The padlocks shall be keyed alike.

PART 3 EXECUTION

3.1 INSTALLATION

Fence shall be installed to the lines and grades indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.

3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed by the Professional. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 1-inch clearance between the bottom of the fabric and finish grade.

3.3 POSTS

Posts shall be set plumb and in alignment. Posts shall be set in concrete as shown on the drawings. Concrete shall be thoroughly consolidated around each post, shall be free of voids and shall be finished to form a dome. Concrete shall be allowed to cure for at least 72 hours prior to attachment of any item to the posts.

3.4 TOP RAIL

Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail.

3.5 TENSION WIRES

Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

3.6 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the posts that are farthest from the project site. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15-inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15-inch intervals and fastened to all rails and tension wires at approximately 24-inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 1 inch plus or minus ½ inch above the ground surface.

3.7 BARBED WIRE

Barbed wire supporting arms and barbed wire shall be installed as shown on the drawings and as recommended by the manufacturer. Supporting arms shall be anchored to the posts in a manner to prevent easy removal with hand tools. Supporting arms shall be installed so that they protrude away from the project site. Barbed wire shall be pulled taut and attached to the arms with clips or other means that will prevent easy removal.

3.8 GATES

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Padlocks shall be attached to gates or gate posts with chains. Hinge pins and hardware shall be welded or otherwise secured to prevent removal.

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DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 9219

EXISTING TURF MAINTENANCE AND NEW TURF ESTABLISHMENT

PART 1 GENERAL

1.1 AREAS REQUIRING EXISTING TURF MAINTENANCE

For the duration of the contract, the Contractor shall maintain existing turf as designated by the Professional within the project rights-of-way.

1.2 AREAS REQUIRING NEW TURF ESTABLISHMENT

Turf shall be established on all embankment fill constructed under this contract, soil areas exposed upon completion of demolition activities upon which embankment will not be constructed, 10 feet wide strips contiguous to the newly constructed embankment, and all areas where the existing turf is damaged by the Contractor.

1.3 COMMENCEMENT REQUIREMENTS

1.3.1 Existing Turf Maintenance

The Contractor shall begin existing turf maintenance not later than 15 days after receipt of Notice to Proceed.

1.3.2 New Turf Establishment

The Contractor shall begin new turf establishment as soon as practicable during the specified planting period.

1.4 MINIMUM SPECIFIED QUANTITIES AND PROCEDURES

All requirements identified as minimum requirements are fully compensated under the payment provisions of the contract. The Contractor may exceed minimum specified requirements in an effort to reduce establishment and/or maintenance periods and associated costs, at no additional cost to the Owner.

1.5 HERBICIDE USE

Herbicides that have been approved by the Professional may be used on areas requiring new turf establishment. The Contractor shall ensure that the herbicide use complies with all applicable local, state, and federal requirements.

1.6 SUBMITTALS

The results of the soil testing with recommended materials, quantities, and procedures for new turf establishment and product data for the seed, fertilizer, lime, and admixtures shall be submitted.

PART 2 PRODUCTS

2.1 FERTILIZER

Fertilizer shall be commercial grade, uniform in composition, free flowing, and suitable for the Contractor's application method. Fertilizer shall be delivered in bulk or in labeled containers and shall conform to current Mississippi requirements for commercial fertilizer. Each delivery of bulk fertilizer shall be accompanied with a certificate from the manufacturer including the name, type, guaranteed analysis, trademark, and warranty of the producer.

2.2 LIME

Lime shall be agricultural grade lime containing not less than 85 percent total carbonates. Lime shall be ground to such fineness that 25 percent will pass a No. 100 sieve and 100 percent will pass a No. 8 sieve.

2.3 MULCH

Mulch shall consist of Bermuda grass hay or wheat, rice or oat straw. Mulch shall be dry and free of Johnson grass or other noxious weeds and shall not be in an advanced state of decomposition.

2.4 BERMUDA GRASS

2.4.1 Selection Criteria

The Contractor shall select a common Bermuda grass cultivar that is known to spread rapidly and have sufficient winter hardiness for the region. Examples of acceptable cultivars are Greenfield, Guymon, or Pasto-Rica. Blends of common and improved varieties will be submitted to the Professional for approval. Hybrids shall not be used.

2.4.2 Bermuda Grass Seed

Bermuda grass seed shall be obtained from a licensed dealer and labeled in accordance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Labels are required for both bulk and bagged seed. Seed shall have a minimum 98 percent pure seed rate and 85 percent

germination rate by weight and shall contain no more than one percent weed seeds. Seed shall be furnished in sealed, standard containers. Seed which has become wet, moldy or otherwise damaged in transit or storage will not be acceptable.

2.5 WATER

Water that is used as an aid to establishing turf shall be of irrigation quality and free of injurious quantities of oil, acid, alkali, salt, and other impurities detrimental to plant growth.

PART 3 EXECUTION

3.1 EXISTING TURF MAINTENANCE

The Contractor shall mow existing turf and other areas designated by the Professional within the rights-of-way where new embankment is not required and where new embankment is required but has not been placed. These areas shall be kept mowed to a height between 3 and 6 inches above the earth surface during the life of the contract. Should the Contractor fail to maintain the existing turf as specified, the Owner may assume the responsibility and deduct the cost thereof from any payments due the Contractor.

3.2 NEW TURF ESTABLISHMENT

3.2.1 General

The Contractor shall be responsible for soil testing, vegetation removal, slope restoration, soil preparation, pre-planting fertilizing and liming, planting, mulching, replanting, post-planting fertilizing, mowing, additional fertilizing, restoring eroded areas, all work during required subsequent growing seasons, and establishment to the point of Bermuda grass coverage required in paragraph 3.2.18 Establishment. Should the Contractor fail to perform the specified requirements, the Owner may assume establishment responsibility and deduct the cost thereof from any payments due the Contractor.

3.2.2 Soil Testing

The Contractor shall obtain the services of an established soil testing entity to perform soil sampling, testing and analyses and prepare recommendations for materials and procedures to be used for new turf establishment. When practicable, soil testing shall be performed early enough to permit lime (if required) to be applied sufficiently in advance of planting so that the soil pH adjustment will occur before planting. However, planting shall not be delayed for this purpose. Soil samples shall

be taken from each type of material on which new turf will be established. Samples shall be tested and analyzed to determine pH and fertility conditions. The test results and recommendations shall be used to determine the quantities required for pre-planting lime and fertilizer applications. Lime recommendations shall consider probable time of application.

3.2.3 Advance Notification Requirements

During periods when no concurrent construction work is being performed, the Contractor shall notify the Professional a minimum of one day prior to performing any existing turf maintenance, new turf establishment, or new turf maintenance work when there has been a period of no work for 5 days or longer.

3.2.4 Vegetation Removal

Not less than 7 days or more than 14 days prior to beginning pre-planting slope restoration or soil preparation, mowing shall be performed to remove grasses, weeds and other vegetation from areas where new turf establishment is required. Mowing shall be performed to a height not to exceed 2 inches above the ground surface and the resulting clippings shall be removed from the job site.

3.2.5 Pre-planting Slope Restoration

After completion of the slope construction and immediately prior to soil preparation for planting, the Contractor shall restore eroded embankments. Eroded areas shall be restored to the required grades and slopes. Necessary repairs shall be made with suitable material placed and compacted as required for the original embankment in accordance with Section 31 2320 BACKFILL AND FILL.

3.2.6 Soil Preparation

After the areas to be seeded have been placed at the required grades and slopes, the soil shall be lightly raked. Irregularities in the surface shall be dressed to provide a smooth surface that is within the specified tolerance.

3.2.7 Pre-planting Lime Application

Lime shall be applied at the time and rate indicated by soil test recommendations and incorporated into the soil by discing, harrowing or other approved method.

3.2.8 Pre-planting Fertilizer Application

Immediately prior to planting, fertilizer shall be applied at the rate indicated by soil test recommendations and incorporated into the soil by discing, harrowing or other approved method.

3.2.9 Seeding

Seeding shall be in accordance with the following:

3.2.9.1 Alternative A

If seeding is done during the period of 1 March through 30 September, hulled seeds shall either be broadcast in two passes made at right angles at a rate of 30 pounds per acre, or drilled using row markers to a depth of $\frac{1}{2}$ inch at a rate of 15 pounds per acre. If broadcast, seed shall be covered by approximately $\frac{1}{4}$ inch of soil and firmed by rolling with one pass of a conventional tractor-drawn cultipacker or other approved device not exceeding 90 pounds for each foot of roller width. If seeding is performed with a seed drill equipped with rollers, additional rolling is not required.

3.2.9.2 Alternative B

If seeding is done during the period of 1 October through 28 February a total of 40 pounds of unhulled Bermuda grass and 60 pounds of Rye seed per acre shall either be broadcast in two passes made at right angles or drilled using row markers to a depth of $\frac{1}{2}$ inch at a rate of 20 pounds of unhulled Bermuda grass and 35 pounds of Rye per acre. If broadcast, seed shall be covered by approximately $\frac{1}{4}$ inch of soil and firmed by rolling with one pass of a conventional tractor-drawn cultipacker or other approved device not exceeding 80 pounds for each foot of roller width. If seeding is performed with a seed drill equipped with rollers, additional rolling is not required.

3.2.9.3 Mulching

Immediately after seeding mulch shall be applied uniformly on the soil surface at the rate of 1-1/2 tons per acre. Mulch shall be anchored into the soil with a mulch crimper. The mulch crimping equipment shall have straight, notched, dull blades no more than 10 inches apart and shall be equipped with scrapers. The mulching material shall be anchored at least one inch into

the soil. Anchoring the mulch shall be performed parallel to the embankment centerline. The mulch shall be applied by means of approved equipment suitable for such work.

3.2.10 Inspections and Reports

After initial planting, the Contractor shall inspect newly turfed areas at least once every two weeks during April through September period during the second planting season following installation. For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) of personnel making the inspection, inspection date, height of vegetation, observations and conclusions with photographic record, and maintenance performed. The report shall be furnished to the Professional within 48 hours of the inspection.

3.2.11 Replanting

Approximately one month after initial planting, the Contractor shall restore any eroded areas and perform soil preparation, fertilize, and replant all bare spots larger than 100 square feet in accordance with the requirements of paragraph 3.2.5 and paragraphs 3.2.9, at no additional cost to the Owner. When initial planting is performed in June, replanting operations shall be performed as soon as practicable during the next specified planting season, unless otherwise approved by the Engineer.

3.2.12 Post-planting Fertilizer Application

For those areas that do not require replanting, approximately one month after the initial planting, fertilizer shall be applied at the minimum rate of 60 pounds of nitrogen per acre. For areas planted after 31 May, post-planting fertilizer shall be the slow-release type.

3.2.13 New Turf Maintenance

The Contractor shall maintain each area receiving new turf until Bermuda grass on all areas to be turfed is established to the point of acceptance. During establishment and prior to acceptance, the Contractor shall restore any eroded areas or rutting damage to the completed slopes at no additional cost to the Owner. The Contractor shall also maintain each area receiving new turf by coordinating with the owner and/or owners grounds maintenance contractor to apply herbicides at appropriate times, and fertilizers at required times in Paragraph 3.2.15 Additional Fertilizer Requirements During First Growing Season and 3.2.16 Requirements During Subsequent Growing Season to ensure a dense, vigorous Bermudagrass turf covering the entire project area. Maintenance shall be

performed to a minimum distance of 10 feet beyond the toe of the new slope or 10 feet beyond the disturbed area, whichever is greatest.

3.2.14 Additional Fertilizer Requirements During First Growing Season

Beginning approximately 30 days after post-planting fertilizer application, the Contractor shall make additional fertilizer applications at approximately 30-day intervals through June. Minimum rates of 60 pounds of nitrogen and 40 pounds of potassium per acre shall be used. If the Contractor elects to apply higher rates of nitrogen, or to apply fertilizer during July or August to reduce establishment and/or maintenance periods, it shall be a slow-release type. If growth has not reached the required coverage by the end of August, the Contractor shall apply fertilizer in September at a rate of 80 pounds of potassium per acre.

3.2.15 Requirements During Subsequent Growing Season

For newly turfed areas, during required growing season(s) after installation, and prior to the date of acceptance of all new turf, as a minimum, the Contractor shall apply fertilizer during the months of April, May, and June at approximately 30 day intervals at minimum rates of 60 pounds of nitrogen and 40 pounds of potassium per acre, restore eroded areas in accordance with Paragraph 3.2.5 Pre-planting Slope Restoration, maintain in accordance with Paragraph 3.2.14 New Turf Maintenance, and replant areas that have insufficient Bermuda grass to achieve the required coverage within each subsequent growing season in accordance with Paragraph 3.2.12 Replanting, all at no additional cost to the Owner. If the Contractor elects to apply higher rates of nitrogen, or to apply fertilizer during July or August to reduce establishment and/or maintenance periods, it shall be the slow-release type. If growth has not reached the required coverage by the end of August, the Contractor shall apply fertilizer in September at a rate of 80 pounds of potassium per acre.

3.2.16 Coordination Meeting

Prior to April 1 of each required subsequent growing season, the Contractor shall meet with the Professional at the job site to identify bare spots, eroded areas and rutting damage and to discuss the Contractor's plan of operation for completing new turf establishment. The Contractor shall contact the Professional to mutually schedule this meeting.

3.2.17 Establishment

Turf will be considered to be established and completed when the areas to be turfed have produced Bermuda grass stems or runners which overlap adjacent Bermuda grass growth over a minimum of 85 percent of the

entire area as determined by the Professional by random sampling on a square yard basis and, when the areas to be turfed have no spots greater than 4 square feet that are void of Bermuda grass.

3.2.18 Inspection and Acceptance

Acceptance of the entire turfed area will be based on the Professional's visual inspection and determination of the required coverage. Acceptance will be based on coverage of Bermuda grass only. Dying or dead turf and eroded areas will not be accepted.

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DIVISION 33 – UTILITIES

SECTION 33 0500

FIBERGLASS MANHOLE AND PARSHALL FLUME

PART 1 GENERAL

1.1. SECTION INCLUDES

- 1.1.1 FRP Manhole
- 1.1.2 Flume

1.2. RELATED SECTIONS

1.3. REFERENCES

- 1.3.1. AASHTO H-20 – Axial Loading
- 1.3.2. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics
- 1.3.3. ASTM D 790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- 1.3.4. ASTM C581 – Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service
- 1.3.5. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- 1.3.6. ASTM D3753 - Glass-Fiber-Reinforced Polyester Manholes and Wetwells
- 1.3.7. ASTM D 1941-91(2001) – Standard Test Method for Open Channel Flow Measurement of Water with the Parshall Flume
- 1.3.8. ASTM D 2583 – Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- 1.3.9. ISO 9826-92 – Measurement of Liquid Flow in Open Channel – Parshall and SANIIRI Flumes
- 1.3.10. United States Department of the Interior, Bureau of Reclamation, Water Measurement Manual
- 1.3.11. Field Manual for Research in Agricultural Hydrology, Agriculture Handbook No. 224, United States Department of Agriculture

1.4. SUBMITTALS

- 1.4.1. Submit product data that demonstrates compliance with contract requirements.
- 1.4.2. Product Data: Test results of representative fiberglass reinforced plastic laminate.
- 1.4.3. Submit manufacturer's installation instructions for all products shall also be submitted.

1.5. SHOP DRAWINGS: SHOW

- 1.5.1. Critical dimensions, jointing and connections, fasteners and anchors.
- 1.5.2. Materials of construction.
- 1.5.3. Sizes, spacing, and location of structural members, connections, attachments, openings, and fasteners.

1.6. DELIVERY, STORAGE, AND HANDLING

- 1.6.1 Store products indoors or in weather protected area until installation. Protect from construction traffic and damage.

PART 2 PRODUCTS

2.1. MANUFACTURER

- 2.1.1. The product shall be manufactured by VIRTUAL POLYMER COMPOUNDS LLC, 10478 Ridge Road Medina NY 14103 or approved equal.
- 2.1.2. Warranty: Packaged Metering Manholes shall be warranted to be free of defects in workmanship and materials for as required by contract requirements.

2.2. MANHOLE

- 2.2.1. Manholes shall be watertight, corrosion resistant units consisting of: manhole barrel, top, confined space entry warning sign, coupling, flume with end adapters, end connections, base, and mounting flange.
- 2.2.2. Diameter:
 - A. 60-inch inside Diameter
- 2.2.3. Access:
 - A. FRP Dome Cover
 - a. Terminate 6 inches above finished grade.
- 2.2.4. Height:
 - A. The manhole height as indicated in the contract drawings.
- 2.2.5. Materials:
 - A. Fiberglass reinforced plastic.
 - B. Gloss inside surfaces, free of irregularities.
 - C. Wall thickness shall be sufficient to meet or exceed ASTM D3753.
 - D. Minimum 30% glass by weight.
 - E. Isophthalic polyester resin.
- 2.2.6. Interior:
 - A. Smooth, resin rich, corrosion resistant to minimize sludge build-up.

- B. Natural finish no added pigments to aid in the visual inspection of the manhole barrel laminate for resin odd-lotting and the inclusion of any voids, contaminants, etc.
- C. Free of exposed fibers, crazing, delamination, blisters larger than Ø1/2-inch and wrinkles with a depth of 1/8-inch or greater.
- D. Pigments or gel coating of the interior manhole surface violate ASTM D3753 and are not allowed for any reason.

2.2.7. Exterior:

- A. White 15-20 mil (cured) gel coat with U.V. inhibitors on all exterior surfaces.
- B. Patterned/rolled glass exterior surface with no exposed fibers, sharp projections, or blisters larger than Ø1/2-inch.

2.2.8. Coupling:

- 1. 2-inch FNPT fiberglass coupling for power, sampling, sensor, or other cabling laminated to the manhole barrel.

2.2.9. Ladder:

- A. Fiberglass ladder support brackets thru-bolted and laminated outside to the manhole barrel.
- B. Ladder rungs
 - a. Pultruded fiberglass 18-inches wide x 1-1/2-inches in diameter x 1/4-3/8-inch thick.
 - b. Reinforced with stainless steel hardware, secured by solid pultruded fiberglass.
 - c. Spaced no more than 12-inches on center.
 - d. Each rung shall have a non-slip surface.

2.2.10. Base:

- A. The manhole base shall be not less than 3/4-inch thick.

2.2.11. Mounting Flange:

- A. 4-inch (minimum) wide x 3/4-inch thick integrally molded around the circumference of the manhole barrel for anchoring the manhole to the concrete pad.

2.2.12. Properties:

Flexural Strength (ASTM D 790):	Hoop:	22,500 psi
Flexural Modulus (ASTM D 790):	Axial:	14,300 psi
Compressive Strength (ASTM D 695)	Hoop:	1,050,000 psi
Compressive Modulus (ASTM D 695):	Axial:	960,000 psi
Barcol Hardness (ASTM D 2583):		18,900 psi
Stiffness (ASTM D 2412):		1,400,000 psi
	Length(Ft):	35
	3.0 - 6.5	0.72 psi
	7.0 - 12.5	1.26 psi
	13.0 - 20.5	2.01 psi
	21.0 - 25.5	3.02 psi
	26.0 - 35.0	5.24 psi

2.3. PARSHALL FLUME

2.3.1. Flume Type: Provide flumes of the following types:

- a) Parshall Flume
- b) Size: 9 INCH.
- a) Flow range: 40.66 GPM – 3979 GPM

2.3.2. Construction:

- A. One-piece construction.

2.3.3. Materials:

- A. Fiberglass reinforced plastic.
- B. Gloss inside surfaces, free of irregularities.
- C. Minimum 3/16 inch wall thickness.
- D. Minimum 30% glass by weight.
- E. Isophthalic polyester resin.
- F. Removable pultruded fiberglass bracing at top of flume with 316 stainless steel hardware.
- G. 2 inch (minimum) top and end stiffening flanges.
- H. Anchor clips
- I. Molded-in stiffening ribs, maximum 12 inch center to center spacing.
- J. 20 mil Isophthalic U.V. resistant gel coat on all surfaces
 - b) BEIGE interior
 - c) WHITE exterior.

2.3.4. Properties:

Flexural Strength (ASTM D 790):	27,000 psi
Flexural Modulus (ASTM D 790):	1,000,000 psi
Tensile Strength (ASTM D 638):	1,000,000 psi
Compressive Strength (ASTM D 66):	22,000 psi
Barcol Hardness (ASTM D 2583):	40
Impact Strength (ASTM D 256):	9 ft-lbs/in
24-hour Water Absorption (ASTM D 570):	.13% max by weight
Allowable Defects (ASTM D 2563):	Level 1

2.4. OPTIONS (select all that apply)

2.4.1. Staff Gauge

- a) English Staff Gauge – Graduated in Feet, Tenths and Hundredths

2.4.2. 316SS Ultrasonic mounting bracket

- A. 316 Stainless Steel, Vertically Adjustable

PART 3 EXECUTION

3.1. EXAMINATION

- 3.1.1. Verify that the flume dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until condition deficiencies have been corrected.

3.2. INSTALLATION

The fiberglass manhole and parshall flume shall be installed in accordance with the Installation Manual furnished by the manufacturer. The fiberglass manhole, parshall flume and appurtenances shall be handled, stored, and installed in accordance with the fiberglass manufacturer's instructions.

3.3. ADJUST AND CLEAN

- 3.3.1. Clean surfaces in accordance with the manufacturer's instructions.
- 3.3.2. Remove trash and debris and leave the site in a clean condition.

- End of Section -

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DIVISION 33 – UTILITIES

SECTION 33 0519

DUCTILE IRON UTILITY PIPE

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DIVISION 33 – UTILITIES

SECTION 33 0519

DUCTILE-IRON UTILITY PIPE

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only:

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
AWWA C 105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C 111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C 115	American National Standard for Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
AWWA C 151	Ductile-Iron Pipe, Centrifugally Cast
AWWA C 153	Ductile-Iron Compact Fittings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 193	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A 746	Standard Specification for Ductile Iron Gravity Sewer Pipe

ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM E 96	Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM F 924	Standard Test Method for Resistance to Puncture of Cushioned Resilient Floor Coverings
ASTM G 95	Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-PA-2	Procedure for Determining Conformance to Dry Coating Thickness Requirements

1.2 SUBMITTALS

- 1.2.1 Product data that demonstrate that all piping and related items comply with the contract requirements shall be submitted.
- 1.2.2 Product data that demonstrate that all cathodic protection materials and related items comply with the contract requirements shall be submitted.
- 1.2.3 Product data that demonstrate that all coating materials and related items comply with the contract requirements shall be submitted.
- 1.2.4 Product data that demonstrate that polyethylene encasement and related items comply with the contract requirements.
- 1.2.5 Manufacturer's installation instructions shall be provided for each product.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE

Ductile iron pipe shall be Class 350 pipe conforming to AWWA C 151. Ductile iron fittings shall be Class 350 and conform to AWWA C 153.

2.2 GASKETS

Rubber gaskets shall conform to AWWA C 111.

2.3 MECHANICALLY RESTRAINED JOINTS

2.3.1 Mechanically restrained joints shall have boltless positive lock ring type joints as manufactured by American Pipe Lok-Ring, U.S. Pipe HP Lok or approved equal.

2.3.2 Insulating Sections: Where a metallic nonferrous pipe or appurtenance is connected to ferrous pipe or appurtenance, an insulating flange gasket kit shall be provided. Each insulating gasket shall have a pressure rating equal to or exceeding the connecting pipes.

2.4 LINING

2.4.1 Exterior of the ductile-iron pipe and fittings shall receive an asphaltic coating in accordance with AWWA C 115.

2.4.2 Interior of the ductile-iron pipe and fittings shall have an amine cured novalac epoxy containing a minimum of 20% by volume of ceramic quartz pigment. The lining shall be a minimum of 40 mils. nominal dry film thickness.

2.5 BOLTS AND NUTS FOR FLANGES

Stainless steel bolts and nuts shall be used for the installation of pipelines. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts and Grade 8M for nuts.

2.6 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall consist of a tube of at least 8 mils thickness. Plastic adhesive tape for polyethylene encasement shall be a minimum of 2 inches wide.

PART 3 EXECUTION

3.1 GENERAL

The general arrangement of the ductile iron sewer line shall be as shown on the drawings.

3.2 EXCAVATION

Excavation shall be performed in accordance with Section 31 23 16 EXCAVATION and as shown. The general arrangement of the sewer line shall be as shown on the drawings.

3.3 PIPE EMBEDMENT

3.3.1 General

Pipe embedment shall consist of placing backfill as specified. Backfill materials shall be classified in accordance with ASTM D 2487.

3.3.2 Embedment Material and Compaction

Backfill material placed below the top of the pipe is considered bedding material and shall classify as granular material. Bedding material thickness shall be equal to the full depth of the pipe diameter plus 4 inches with a tolerance of plus 1 inch. Compaction of bedding material is required. Bedding material shall be compacted in accordance with Paragraph 3.3.1 Select Compacted Fill and Paragraph 3.5 TESTS in Section 31 23 23.11 BACKFILL AND FILL. Backfill material placed above the top of the pipe shall classify as BACKFILL or FILL as defined in Paragraph 2.1 MATERIAL FOR BACKFILL AND FILL in Section 31 23 23.11 BACKFILL AND FILL. Backfill material placed above the top of the pipe shall be placed as required by Paragraph 3.2 PLACEMENT AND COMPACTION OF BACKFILL or Paragraph 3.3.1 Select Compacted Fill in Section 31 23 23.11 BACKFILL AND FILL. All testing shall be performed in accordance with Paragraph 3.5 TESTS in Section 31 23 23.11 BACKFILL AND FILL.

3.3.3 Bedding Material Placement

Bedding material shall be placed to provide uniform and adequate longitudinal support under the pipe. Blocking shall not be used to bring pipe to grade. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support.

3.3.4 Initial Backfill

Backfill which is immediately above the springline of the pipe shall be free from clods and debris which could damage the pipe.

3.4 PIPE INSTALLATION

3.4.1 General

The CONTRACTOR shall furnish and install all pipe, fittings, bolts, nuts, adapters, gaskets, jointing materials, and all other appurtenances as shown and as required to provide a complete and workable installation.

3.4.2 Handling

Pipe and fittings shall be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe or fittings for lifting, positioning, or laying.

3.4.3 Inspection

Each joint of pipe shall be inspected carefully before being placed in the trench. Inspect the interior and exterior protective coatings. Patch damaged coating areas in the field with material recommended by the protective coating manufacturer and in accordance with the coating manufacturer's written instructions. Any joint found to be cracked, or otherwise so damaged as to impair its usefulness, shall be plainly marked in such a manner that the marking cannot be removed. Damaged joints shall be removed from the site on the day they are discovered.

3.4.4 Cutting Pipe

The cutting of pipe for any reason shall be done in a neat and precise manner without damage to pipe or pipe lining. After cutting the pipe the CONTRACTOR shall follow the coating manufacturer's written procedures for sealing and repairing the interior and exterior coatings.

3.4.5 Installation

All sewer pipe shall be placed with bell end up-gradient. Each pipe shall be placed to line and grade as shown of the drawings. Care shall be taken that each spigot is

centered properly in the bell of the preceding pipe and properly seated. During installation of pipe, the CONTRACTOR shall insure that all pipe is cleaned of dirt, rocks, wood and other debris before placement. Under no circumstances shall pipe be laid in water, and no pipes shall be laid when trench conditions or weather are unsuitable for such work. At the end of each day's work, and when, for any reason, the pipe installation will be discontinued for an appreciable period, the end opens of pipeline shall be closed temporarily.

3.4.6 Restrained Joint Pipe

Restrained joints in pipe shall be constructed in accordance with the manufacturer's written instructions. The pipe shall have firm bearing along its full length, and bell holes shall be provided at each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell end or coupling.

3.4.7 Mechanical Joint Pipe

Mechanical joints in pipe shall be constructed in accordance with the manufacturer's written instructions and be utilized in all above grade pipe installations.

3.5 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be used for the installation of ductile iron pipe and fittings below grade. Exposure of polyethylene encasement material to sunlight shall be kept to a minimum. Polyethylene encasement shall be installed in accordance with AWWA C 105, Method A.

3.6 TESTING

3.6.1 Leakage Test of Gravity Piping System

All piping shall pass the leakage test as specified herein. The CONTRACTOR shall provide all material, equipment, supplies, labor, and all items incidental thereto to perform the leakage test as specified herein. The leakage test shall be performed in the presence of the PROFESSIONAL, and the CONTRACTOR shall provide the PROFESSIONAL a 24 hour minimum notice before beginning the testing procedure. Prior to testing a section of piping, the line shall be visually inspected to determine if any piping has collapsed or has been crushed. After flushing, the piping system shall be tested by performing a hydraulic exfiltration

leakage test with a minimum positive head of 2 feet for the duration of the test. The minimum time of the hydraulic exfiltration test is 24 hours. The leakage outward or inward (exfiltration or infiltration) shall not exceed 200 gallon per inch of pipe diameter per mile per day for the entire length of the pipe installed including couplings.

3.7 WARRANTY

The equipment covered by this Section of the specification shall be warranted against defective parts due to faulty material or workmanship for the manufacturer's standard warranty period in addition to the warranty required by the General Conditions of the Contract.

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DIVISION 33 – UTILITIES

SECTION 33 1100

WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The work covered by this Section consists of furnishing all labor, equipment, materials, and appurtenances and performing all operations associated with the construction of water lines including any labor, materials, equipment and apparatus, disinfection operations and testing not specifically mentioned herein or noted on the plan, but which are incidental and necessary to complete the specified work. The CONTRACTOR shall arrange his work so that existing facilities shall have an adequate supply of water at all times and shall not interrupt other utility services.

1.2 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
AWWA C 111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C 151	Ductile-Iron Pipe, Centrifugally Cast
AWWA C 153	Ductile-Iron Compact Fittings
AWWA C 219	Bolted, Sleeve Type Couplings for Plain-End Pipe
AWWA C 508	Swing-Check Valves for Waterworks Service

AWWA C 509	Resilient Seated Gate Valves for Water Supply Service
AWWA C 511	Standard for Reduced Pressure Principle Backflow Prevention Assembly
AWWA C550	Protective Interior Coatings for Valves and Hydrants
AWWA C 600	Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C 606	Standard for Grooved and Shouldered Joints
AWWA C 651	Disinfecting Water Mains
AWWA C 800	Underground Service Line Valves and Fittings
AWWA C 900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in., for Water Transmission and Distribution
AWWA C 901	Polyethylene (PE) Pressure Pipe and Tubing, ¾ in. Through 3 in. For Water Service

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 536	Standard Specification for Ductile Iron Castings
ASTM B 62	Standard Specification for Composition Bronze or Ounce Metal Casings
ASTM B75	Standard Specification for Seamless Copper Water Tube
ASTM B 88	Standard Specification for Seamless Copper Water Tube
ASTM B 584	Standard Specification for Copper Alloy Sand Castings for General Applications

ASTM D 2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM F 2014

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

NSF/ANSI 61 Drinking Water System Components – Health Effects

NSF/ANSI 372 Drinking Water System Components – Lead Content

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B 16 Standardization of Valves, Flanges, Fittings, and Gaskets

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1079 Performance Requirements for Dielectric Pipe Unions

PART 2 PRODUCTS

2.1 PVC PIPE

Polyvinyl chloride pipe and couplings 3 inches through 12 inches in diameter shall conform to AWWA C 900 and bear the National Sanitation Foundation seal for potable water.

2.1.1 Locator Station

2.1.1.1 Underground, Flush Mounted type.

- A. Tube minimum 15 inches long with minimum inside diameter of 2 ½ inches made of non-corrosive material, schedule 40 PVC, HDPE, or equal.
- B. Factory attached cast iron or high-impact plastic collar with ribs to prevent rotation when removing locking lid after locator station is set in concrete.

- C. Light blue cast iron or high-impact plastic locking lid that will withstand AASHTO H-20 traffic loads and ultra-violet rays.
- D. Mark locking lid to identify pipeline with a permanent identification such as P.S. Locator.
- E. Terminal block made of a high dielectric material which is made of phenolic resin, plastic, micarta, Lexan or Bakelite for each locator station.
 - 1. Terminal block furnished with two 3/16-inch threaded studs, nuts, and washers made of nickel-plated brass.
- F. Approved manufacturers:
 - 1. C.P. Test Service, Inc., Model Mini,
 - 2. Handly Industries, Model T2IS2, or
 - 3. Approved equal.
- G. Manhole mounted:
 - 1. Waterproof enclosure made from cast aluminum, galvanized steel, high-impact plastic, Lexan, Gyrlyn, or equal.
 - 2. Light blue schedule 40 PVC pipe or schedule 40 galvanized steel with an outside diameter of at least ¾-inch to mount enclosure.
 - 3. Use similar materials for pipe and enclosure to fasten enclosure onto pipe following manufacturer's instructions.
 - 4. Approved manufacturers:
 - a. Cott Manufacturing Company, Model Finklet or Finkplate, Two (2) leads,
 - b. Gerome Manufacturing Company, Inc., Model Testox Series 300, Two (2) leads, or
 - c. Approved equal.

2.1.2 Detection Wire

- 2.1.2.1 Detection wire shall be TW/THW, THWN, or HMWPE insulated copper, 10 gage or thicker wire.

2.2 DUCTILE IRON PIPE

Pipe shall be ductile iron, mechanical joint and conform to AWWA C 151. Rubber gaskets and bolted joints shall conform to AWWA C 111. The ductile iron pipe shall be designed for 350 psi working pressure and shall be ANSI thickness Class 50. All pipe shall have an inside lining of cement-mortar conforming to AWWA C 104. The exterior of the pipe shall be coated with an asphaltic coating approximately 1 mil thick.

2.3 DUCTILE IRON FITTINGS

Fittings for ductile-iron pipe 4 inch and larger in diameter shall conform AWWA C 153. Rubber gasket joints shall conform to AWWA C 111. Fittings shall have an asphaltic coating approximately 1 mil thick. The interior of the fittings shall have a mortar lining in accordance with AWWA C 104. All fittings shall have a working pressure of 350 psi.

2.4 MECHANICALLY RESTRAINED JOINTS

Mechanically restrained joints shall be EBAA MEGALUG® type mechanical joint restraints or approved equal.

2.5 COPPER PIPE AND FITTINGS

2.5.1 Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

2.5.2 Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

2.5.3 Cast-Copper, Spider-Joint Fittings: ASME B16.18, pressure fittings.

2.5.4 Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.5.5 Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

2.5.6 Copper Unions:

2.5.6.1 MSS SP-123.

2.5.6.2 Cast-copper-alloy, hexagonal stock body.

2.5.6.3 Ball-and-socket, metal-to-metal seating surface.

2.5.6.4 Solder-joint or threaded ends.

2.5.7 Copper Pressure-Seal-Joint Fittings:

2.5.7.1 Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.5.7.2 Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.5.8 Copper Push-on-Joint Fittings:

- 2.5.8.1 Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B16.22.
- 2.5.8.2 Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.5.9 Copper-Tube, Extruded-Tee Connections:

- 2.5.9.1 Tee formed in copper tube according to ASTM F 2014.

2.5.10 Appurtenances for Grooved-End Copper Tubing:

- 2.5.10.1 Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B584 bronze castings.
- 2.5.10.2 Mechanical Couplings for Grooved-End Copper Tubing:
 - A. Copper-Tube dimensions and design similar to AWWA C606.
 - B. Ferrous housing sections.
 - C. EPDM-rubber gaskets suitable for hot and cold water.
 - D. Bolts and nuts.
 - E. Minimum Pressure Rating: 300psig.

2.6 TRANSITION FITTINGS

2.6.1 General Requirements:

- 2.6.1.1 Same size as pipes to be joined.
- 2.6.1.2 Pressure rating at least equal to pipes to be joined.
- 2.6.1.3 End connections compatible with pipes to be joined.

2.6.2 Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.6.3 Sleeve-Type Transition Coupling: AWWA C219.

2.7 DIELECTRIC FITTINGS

- 2.7.1 General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2.7.2 Dielectric Unions:

- 2.7.2.1 Standard: ASSE 1079
- 2.7.2.2 Pressure Rating: 125 psig minimum at 180 degrees.
- 2.7.2.3 End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.7.3 Dielectric Flanges:

- 2.7.3.1 Standard: ASSE 1079
- 2.7.3.2 Factory-fabricated, bolted, companion-flange assembly.
- 2.7.3.3 Pressure Rating: 125 psig minimum at 180 deg F.
- 2.7.3.4 End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.7.4 Dielectric Nipples:

- 2.7.4.1 Standard: IAPMO PS 66
- 2.7.4.2 Electroplated steel nipple complying with ASTM F 1545.
- 2.7.4.3 Pressure Rating and Temperature: 300 psig at 225 deg F.
- 2.7.4.4 End Connections: male threaded or grooved.
- 2.7.4.5 Lining: Inert and noncorrosive, propylene.

2.8 VALVES

2.8.1 Ball Valves

All ball valves shall comply with NSF/ANSI 61 and NSF/ANSI 372 standards. Ball valves shall be Apollo Valve 70LF-100 Series or approved equal.

2.8.2 Gate Valves

Gate valves shall comply with AWWA C 515, shall be non-rising stem types and shall be M & H C 515 or Mueller A-2361 resilient wedge or approved equal. Valves shall be designed for working pressure of not less than 350 pounds per square inch. Valves shall have joints as required for the piping in which they are installed. Gate valves shall have a clear water-way equal to the full nominal diameter of the valve, and shall be opened by turning counter-clockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the

direction of opening. Each valve shall have the marker's initials, pressure rating, and year in which manufactured cast on the body. The CONTRACTOR shall furnish one T-Handle valve key for each valve.

2.8.3 Curb Stop Ball Valve

All valves shall conform to AWWA C 800. Valves shall be Ford Metering Company B11-XXX-NL curb stop ball valve or approved equal. Valves shall be designed for working pressure of not less than 300 pounds per square inch. Valves shall have joints as required for the piping in which they are installed. Ball valves shall have a clear water-way equal to the full nominal diameter of the valve, and shall be opened by turning counter-clockwise. The operating nut shall be operable by curb box rod. Each valve shall have the marker's initials, pressure rating, and year in which manufactured cast on the body. The CONTRACTOR shall furnish one T-Handle valve key for each valve.

2.8.4 Alarm/Check Valves

Alarm/check valves shall comply with AWWA C 508 and AWWA C 550 standards.

2.9 VALVE BOXES

Except where concrete valve boxes are indicated on the plans, valve boxes shall be of cast or ductile iron as manufactured by Mueller, Kennedy, M & H or approved equal. Covers shall be cast or ductile iron with a designation of "WATER" embossed on the topside and shall be of the screw down type. Valve boxes shall be the two-piece type, adjustable in length and suitable for installation in roadway surfaces. Stack pipe for valve box adjustment shall be Class 150 DR 18 manufactured in accordance with AWWA C 900 PVC or ductile iron pipe. Adjustment risers shall be cast iron and approved prior to use by the PROFESSIONAL. The CONTRACTOR shall furnish one cover wrench for each valve.

2.10 BACKFLOW PREVENTER

Required backflow preventer assemblies shall have bronze and/or ductile iron body with stainless steel 300 series internals, fasteners, and springs. All required backflow preventers shall be the size, type and current model of the existing device being replaced. Backflow preventer size 2 ½ inch diameter and greater shall be Zurn Model 375A reduced pressure backflow assembly or approved equal. Backflow preventer size 2-inch diameter and less

shall be Watts Series 009 reduced pressure backflow assembly or approved equal. All backflow preventers shall conform to AWWA C 511 standards.

2.11 INSERTION VALVE

Required insertion valves shall be resilient wedge insertion gate valves and shall meet or exceed all pertinent requirements of ANSI/AWWA C515-15 gate valve standard and shall be MUELLER® PERMASEAL™ H-2361 series, Garrison Insert Valve, or approved equal. Insertion valve shall be ANSI/NSF 61 & 372 certified for drinking water components. Valve shall have 316 stainless steel (SS) non-rising stem (NRS). The valve body, bonnet, stuffing box, and operating nut shall be made of ASTM A536 ductile iron. The (NRS) valve will be equipped with a 2-inch square operating nut attached with type 316 SS recessed bolt so as not to interfere with valve wrench operations. Any operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening. Valves shall have type 316 SS bolts and nuts for the stuffing box, bonnet, and body. Valves shall have joints as required for the piping in which they are installed. Each valve shall have the maker's initials, pressure rating, and year in which manufactured cast on the body. The CONTRACTOR shall furnish one T-Handle valve key for each valve. Installation equipment shall be the responsibility of the Contractor and insertion valves shall be installed in accordance with the manufacturer's guidelines and specifications.

PART 3 EXECUTION

3.1 GENERAL

The general arrangement of the water line shall be as shown on the drawings. Where a water line is in the vicinity of a sanitary sewer line, a minimum of 10 feet horizontal separation shall be maintained, and the bottom of the water line shall be at least 18 inches higher than the top of the sanitary sewer line or a non-potable water line unless otherwise shown on the drawings. Where a water line crosses over a sanitary sewer line or non-potable water line, the pipe segments shall be centered to provide maximum spacing of joints of both the water and sanitary sewer lines or non-potable water line, and the bottom of the water line shall be at least 18" higher than the top of the sanitary sewer line. Water lines crossing ditches and/or streams where less than 30 inches of cover is maintained shall be installed in accordance with the drawing shall either be ductile iron or polyethylene protected by a steel casing, and shall be adequately supported and anchored on both sides of the crossing.

3.2 EXCAVATION

Excavation shall be performed in accordance with Section 31 2316 EXCAVATION. Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and backfill. Trenches shall be excavated so that the water line will have a minimum of 36 inches of cover. Where necessary to prevent sliding and caving, banks may be cut back on slopes which shall not extend lower than 1 foot above the top of pipe. Water shall be removed in accordance with Section 31 2319 DEWATERING.

3.3 PIPE EMBEDMENT

3.3.1 General

Pipe embedment shall consist of placing backfill materials as specified. Backfill materials shall be classified in accordance with ASTM D 2487.

3.3.2 Embedment Material and Compaction

Backfill material placed below the spring line of the pipe is considered bedding material and shall classify as sand. Bedding material thickness shall be one half the pipe diameter plus 2 inches with a tolerance of plus or minus 1 inch. Compaction of bedding material is not required. Backfill material placed above the spring line of the pipe shall classify as clay or silt and shall be compacted in accordance with Paragraph 3.2 PLACEMENT AND COMPACTION OF BACKFILL and Paragraph 3.5 TESTS in Section 31 2323.11 BACKFILL AND FILL.

3.3.3 Bedding Material Placement

Bedding material shall be placed as shown on the drawings to provide uniform and adequate longitudinal support under the pipe. Blocking shall not be used to bring the pipe to grade. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support.

3.3.4 Initial Backfill

Initial structural backfill shall begin immediately above the springline of the pipe. The initial backfill shall be free from clods and debris which could damage the pipe.

3.4 INSTALLATION

3.4.1 Pipe and Accessories

Pipe and accessories shall be handled in such a manner as to ensure delivery to the site in sound, undamaged condition. Particular care shall be taken not to injure the pipe. No other pipe or material of any kind shall be placed inside of the pipe or fitting. Cuttings of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized by the PROFESSIONAL, cutting shall be done by means of an approved type of mechanical cutter. While suspended in the sling and before lowering in the trench, the pipe shall be inspected for defects. Defective, damaged or unsound pipe shall be rejected. Deflections from a straight line of grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe less than 14 inches in nominal diameter where D represents the nominal diameter of the pipe expressed in inches, between the center lines extended, of any two connecting pipes. If the alignment requires deflections in excess of these limitations, the CONTRACTOR shall provide special bends or a sufficient number of shorter lengths of pipe to provide singular deflections within the limit set forth, and as approved by the PROFESSIONAL.

3.4.1.1 Above-ground Piping

- A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls, and floors.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Provide access where valves and fittings are not accessible.
- G. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- H. Establish invert elevations, slopes for drainage to ¼ inch per foot 2 percent minimum. Maintain gradients.
- I. Slope piping and arrange systems to drain at low points.

- J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

3.4.2 Anchor and Braces

Thrust blocks shall be constructed as shown on the drawings at all tees, fire hydrants, dead ends, and bends in the water line of 22-1/2 degrees or more. Contractor shall provide blocking adequate to withstand full test pressure. Concrete blocking shall be poured against undisturbed earth. All concrete used for thrust blocking shall be commercial grade concrete. Pipes and/or pipe fittings shall be wrapped with two layers of polyethylene film where in contact with concrete. Stirrups shall be deformed galvanized cold rolled steel AASHTO M31 (ASTM A615), Grade 60, and shall be coated with coal tar epoxy after installation.

3.4.3 Valves

Valves shall be installed at the location shown on the drawings, in accordance with the latest standards of practice, and in accordance with manufacturer's guidelines.

3.4.4 Valve Box

Valve boxes shall be installed at the location shown on the drawings, in accordance with the latest standards of practice, and in accordance with manufacturer's guidelines.

3.4.5 Backflow Preventer Assembly

Backflow Preventer assemblies shall be installed at the location shown on the drawings, in accordance with the latest standards of practice, and in accordance with manufacturer's guidelines.

3.4.6 Mechanically Restrained Joints

Mechanically restrained joints shall be installed in accordance with the manufacturer's written specifications, guidelines, and/or installation instructions.

3.4.7 Locator Station

- 3.4.7.1 Provide locator stations, following Standard Details or Drawings, at each end of the pipe.

- 3.4.7.2 Flush mount underground locator: See Standard Details.
- 3.4.7.3 When HDPE pipe is connected to another type of pipe material, continue detector wire over the connecting pipe, so locator station is installed out of paved area.
- 3.4.7.4 In areas scheduled to be improved:
 - A. Identify and protect station locations immediately after installation;
 - B. Space three (3) stakes equally around the station;
 - C. Extend at least four (4) feet above existing grade; and
 - D. Flag with orange fluorescent wrap withing six (6) inches from top of stakes.

3.4.8 Detection Wire

- 3.4.8.1 Install detection wire without splices as shown on Standard Details.
- 3.4.8.2 Terminate detection wire inside locator box using proper sized crimp type connectors on wire ends.
- 3.4.8.3 Connect each wire to a terminal maintaining at least eighteen (18) inches slack in each wire for underground flush mounted locator stations.
- 3.4.8.4 Neatly coil slack wire in test station below terminal board.
- 3.4.8.5 Locate wires on top and along HDPE pipe.
- 3.4.8.6 Allow adequate slack and support to protect wires from damage during backfilling operations.
- 3.4.8.7 Test each detection wire for continuity after backfill is completed.
 - A. If test for continuity is negative, repair or replace at Professional's direction.
 - B. After continuity is verified, connect each detection wire to terminal block locator station.

3.5 JOINT CONSTRUCTION

- 3.5.1 Pipe End: Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- 3.5.2 Cleaning: Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- 3.5.3 Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fitting and valves as follows.
- 3.5.3.1 Apply appropriate tape or thread compound to external pipe threads.
 - 3.5.3.2 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- 3.5.4 Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze joint" chapter.
- 3.5.5 Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- 3.5.6 Pressure-Sealed Joints for Copper Tubing: Join Copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- 3.5.7 Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- 3.5.8 Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- 3.5.9 Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- 3.5.10 Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- 3.5.11 Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.6 TRANSITION FITTING INSTALLATION

3.6.1 General: Install transition couplings at joints of dissimilar piping.

3.6.2 Underground: Transition Fittings in Underground Domestic Water Piping:

3.6.2.1 Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.

3.6.2.2 Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.6.3 Aboveground: Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fitting or unions.

3.7 DIELECTRIC FITTING INSTALLATION

3.7.1 General: Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.7.2 Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.7.3 Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges or nipples.

3.8 INSPECTION AND TESTING OF WATER LINE

After the water pipe is laid, the joints completed, and the trench partially backfilled, leaving the joints exposed for examination, the newly laid piping and any valved section of piping shall, unless otherwise specified, be subjected to a hydrostatic leakage test in accordance with Section 4 of the AWWA C 600.

3.9 STERILIZATION OF COMPLETED LINE

Before being placed in service, the entire line shall be chlorinated. Chlorine may be applied by the following methods: 1) liquid chlorine gas-water mixture, 2) direct chlorine gas feed, or 3) calcium hypochlorite and water mixture. The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection and shall be injected through a corporation cock, or other connection insuring treatment of entire line. Water shall be fed slowly into new line with chlorine applied in amounts to product a dosage of 50 ppm. Water lines previously filled shall be treated to a concentrated dosage at intervals along the line and retained for a period of twenty-four (24) hours or as described in AWWA C 651. During the chlorination process, all valves and accessories shall be operated. After completion of the construction and disinfection of water distribution, the CONTRACTOR

shall arrange for at least one sample to be collected by the PROFESSIONAL from every dead-end line and every major looped line for bacteriological examination. Water being collected for testing shall not have a chlorine residual higher than is normally maintained in other parts of the distribution system. No chlorine shall be present which is a result of line disinfection. Less than 1 coliform bacteria per 100 mL and no confluent growth indication shall constitute a satisfactory sample when analyzed by the Mississippi Department of Health Laboratory or a laboratory certified by the Mississippi State Department of Health.

PART 4 OPERATING INSTRUCTIONS

The CONTRACTOR shall furnish detailed operating instructions for each piece of equipment supplied and installed in these specifications. Four copies of the spare parts list shall be neatly bound in a folder, indexed, labeled for each piece of equipment and provided to the PROFESSIONAL. The CONTRACTOR shall spend sufficient time with OWNER's representative to acquaint him with the complete operation of the entire system.

4.1 CLEAN-UP

Upon completion of the installation of the water supply lines, distribution systems and appurtenances, all debris and surplus materials resulting from the work shall be removed. CONTRACTOR shall replace or repair with like materials any or all curbs, sidewalks, streets, existing pipe lines, etc. which are disturbed or broken in the process of installing piping. Extreme care shall be taken to preserve all flowers, shrubs, trees, etc. All damage done to existing improvements by the CONTRACTOR shall be repaired to the satisfaction of the PROFESSIONAL. In case of curb, sidewalk, or gutter the entire section which has been damaged shall be reconstructed.

4.2 WARRANTY

The equipment covered by this Section of the specifications shall be warranted against defective parts due to faulty material or workmanship for the manufacturer's standard warranty period in addition to the warranty required by the General Conditions of the Contract.

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DIVISION 33 – UTILITIES

SECTION 33 3100

SANITARY SEWER PIPING

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only:

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 110	Ductile-Iron and Gray-Iron fittings, 3 inch through 48 inch for water and other liquids
AWWA C 151	Ductile-Iron Pipe, centrifugally cast in metal molds or sand-lined molds for water and other liquids
AWWA C 900	Polyvinyl Chloride (PVC) Pressure Pipe

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 746	Standard Specification for Ductile Iron Gravity Sewer Pipe
ASTM C 443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 476	Standard Specification for Grout for Masonry
ASTM C 478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 1173	Standard Specification for Flexible Transition Couplings for Underground Piping Systems

ASTM D 2241	Standard Specifications for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 3034	Standard Specifications for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 5926	Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 1417	Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air
UNI-B-5-89	Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Sewer Pipe
	CSA GROUP
CSA B 602	Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe

1.2 SUBMITTALS

- 1.2.1 Product data that demonstrate that all piping and related items comply with the contract requirements shall be submitted.

1.2.2 Manufacturer's installation instructions shall be provided for each product.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

2.1.1 Gravity Sewer Main

Gravity sewer main piping shall be either:

- 2.1.1.1 C-900 DR 18 (235 psi) Polyvinyl Chloride pipe and conform to AWWA C 900. All joints shall be of the bell and spigot type and conform to ASTM D 3139. Gaskets shall be in accordance with ASTM F 477; OR
- 2.1.1.2 SDR 26 Polyvinyl Chloride pipe and conform to ASTM D 3034. All joints shall be of the bell and spigot type and conform to ASTM D 3212. Gaskets shall be in accordance with ASTM F 477.

2.1.2 Gravity Sewer Service Lateral

Gravity sewer lateral piping shall be:

- 2.1.2.1 SDR 26 Polyvinyl Chloride pipe and conform to ASTM D 3034. All joints shall be of the bell and spigot type and conform to ASTM D 3212. Gaskets shall be in accordance with ASTM F 477.

2.1.3 Forcemain Piping

- 2.1.3.1 Forcemain piping shall conform to AWWA C900 and shall be green in color for pipes 4 inches in diameter and larger. Pipes less than 4 inches in diameter shall be schedule 80 PVC.

2.1.4 Locator Station

2.1.4.1 Underground, Flush Mounted type.

- A. Tube minimum 15 inches long with minimum inside diameter of 2 ½ inches made of non-corrosive material, schedule 40 PVC, HDPE, or equal.
- B. Factory attached cast iron or high-impact plastic collar with ribs to

prevent rotation when removing locking lid after locator station is set in concrete.

- C. Light blue cast iron or high-impact plastic locking lid that will withstand AASHTO H-20 traffic loads and ultra-violet rays.
- D. Mark locking lid to identify pipeline with a permanent identification such as P.S. Locator.
- E. Terminal block made of a high dielectric material which is made of phenolic resin, plastic, micarta, Lexan or Bakelite for each locator station.

- 1. Terminal block furnished with two 3/16-inch threaded studs, nuts, and washers made of nickel-plated brass.

F. Approved manufacturers:

- 1. C.P. Test Service, Inc., Model Mini,
 - 2. Handly Industries, Model T2IS2, or
 - 3. Approved equal.

G. Manhole mounted:

- 1. Waterproof enclosure made from cast aluminum, galvanized steel, high-impact plastic, Lexan, Gyrlyn, or equal.
 - 2. Light blue schedule 40 PVC pipe or schedule 40 galvanized steel with an outside diameter of at least ¾-inch to mount enclosure.
 - 3. Use similar materials for pipe and enclosure to fasten enclosure onto pipe following manufacturer's instructions.
 - 4. Approved manufacturers:
 - a. Cott Manufacturing Company, Model Finklet or Finkplate, Two (2) leads,
 - b. Gerome Manufacturing Company, Inc., Model Testox Series 300, Two (2) leads, or
 - c. Approved equal.

2.1.5 Detection Wire

- 2.1.5.1 Detection wire shall be TW/THW, THWN, or HMWPE insulated copper, 10 gage or thicker wire.

2.2 COUPLINGS

Flexible transition couplings shall meet ASTM C 1173, ASTM D 5926 and CSA B 602. Hose clamps constructed of series 300 premium grade stainless steel, including housing and screw shall be used to install couplings. The couplings shall be designed and properly sized for the pipe materials found on the project.

2.3 MANHOLES

Manholes shall consist of standard precast sections as shown on the drawings and shall comply with ASTM C 478. Manhole sections shall be factory coated with 20 mil thickness coal tar epoxy inside and outside. Manhole steps shall be copolymer polypropylene plastic with ½" grade 60 steel reinforcement and shall comply with ASTM C 478.

2.3.1 Joints

Manhole joints shall be watertight and shall be sealed with rubber gaskets, complying with ASTM C 443. After the joints are sealed, the joints shall be grouted inside and outside the manhole with a non-shrink grout. Grout shall be applied in accordance with manufacturer's recommendations.

2.3.2 Waterstops

Manhole waterstops shall be provided at pipe entering manhole. After waterstops are installed, the void inside and outside the manhole shall be grouted with grout as specified in Paragraph 2.3.3 below. CONTRACTOR shall submit manufacturer's data on waterstop for PROFESSIONAL's approval before installing manholes.

2.3.3 Grout

Grout at manhole shall be either non-shrink grout or grout that complies with ASTM C 476.

2.3.4 Frame and Cover

Manhole frames and covers shall consist of gasket and bolted watertight lid. Lid shall be stamped "SEWER". The manhole frame shall be secured with non-shrink grout as shown on the drawings.

2.3.5 Influent Piping

Influent piping where the difference in elevation of the influent invert and the manhole invert is GREATER than 24 inches shall require a drop pipe connection. The drop pipe connection shall be installed in accordance with the construction plans and/or any governing regulations. Any influent piping where the difference in elevation of the influent invert and the manhole invert is LESS than 24 inches shall be filleted to prevent solids deposition.

PART 3 EXECUTION

3.1 GENERAL

The general arrangement of the sewer line shall be as shown on the Project Drawings.

3.2 SEWER FLOW CONTROL

The sewer flow shall be restricted from the work areas by one of the following methods: the operation of pump station (both upstream and/or downstream) controls by OWNER or by CONTRACTOR with prior permission from OWNER; plugging the flow; or by bypassing of the flow around the sewer line, pump station, or force main to be worked via pumping methods. The hydraulics of the sewer system upstream of the sewer line, pump station, or force main to be worked shall be considered when choosing a sewer flow control method. Sewer flow control work (excluding bypass pumping) will not have a separate pay item and shall be absorbed in the price of related items.

When flow in a sewer line is plugged or bypassed, sufficient precautions shall be taken to protect against surcharging that may result in discharges of flows from the sewer system, including flooding or damage to public or private property. Liability for any such damage that occurs as a result of CONTRACTOR's activities, including flow control operations, is to be solely the responsibility of CONTRACTOR, at no additional cost to OWNER. CONTRACTOR shall be responsible for any and all reporting to regulatory agencies of any sanitary sewer overflows or for the discharge of sanitary sewage to or below grade as part of the bypass pumping as determined by PROFESSIONAL and/or OWNER. Any and all fines from any and all government agencies for the discharge of sanitary sewage to or below grade as part of bypass pumping shall be solely the responsibility of CONTRACTOR.

3.2.1 Plugging

When plugging a sewer line, a temporary sewer line plug shall be inserted into the line upstream of the section to be worked. The plug assembly shall be designed such that all, or any, portion of the sewage, within the plugged sewer line, can be released at varying rates. After the work has been completed, the flow in plugged sewer lines shall be slowly released to avoid damage to the sewer system or private property. Line plugging will not have a separate pay item and shall be absorbed in the price of other items. Plugging of a sewer line requires the direct permission of PROFESSIONAL.

3.2.2 Bypassing Flow via Pump

When bypassing flow around a sewer line or other parts of the sewer collection system, via the use of pumping equipment, is necessary, CONTRACTOR shall supply the labor, supervision, tools and equipment, including plugs, fuel, pumps, and hoses, necessary to divert the flow of sewage around the sewer line in which work is to be performed. The bypass system shall be of sufficient capacity to bypass wet weather flows that, in this case, shall be defined as the design capacity of the pipe or as indicated on the drawings. The bypass system shall be constructed in a manner to prevent leakage during pumping operations. CONTRACTOR will be responsible for assembly, operation, and dismantling of the bypass pumping system, as well as any measures needed to protect the equipment and the public. Bypass pumping shall only be permitted when plugging of the sewer flow is impractical or likely to cause sewer backups and surcharging. When pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum. Bypass pumping shall be the responsibility of CONTRACTOR. Each work area has its own separate lump sum pay item for bypass pumping. Bypass pumping will be paid per manhole-to-manhole line segment being repaired or replaced, and the need for bypass pumping shall be approved by PROFESSIONAL prior to CONTRACTOR installation.

3.3 EXCAVATION

Excavation shall be performed in accordance with Section 31 23 16 EXCAVATION and as shown. The general arrangement of the sewer line shall be as shown on the drawings.

3.4 PIPE EMBEDMENT

3.4.1 General

Pipe embedment shall consist of placing crushed stone as specified. Backfill materials shall be classified in accordance with ASTM D 2487.

3.4.2 Embedment Material and Compaction

Backfill material placed below the springline of the pipe is considered bedding material and shall classify as gravel or sand. Bedding material thickness shall be one-half the pipe diameter plus two (2) inches with a tolerance of plus or minus one (1) inch. The bedding material shall be placed atop an eight (8) inch thick layer of crushed #57 stone wrapped with geotextile fabric, as shown on Project Drawings. Bedding material shall be compacted until movement of the material is not observed. Compaction testing of the bedding material is not required. Backfill material placed above the springline of the pipe shall classify as clay or silt and shall be compacted in accordance with Paragraph 3.2 PLACEMENT AND COMPACTION OF BACKFILL and Paragraph 3.5 TESTS in Section 31 23 23.11 BACKFILL AND FILL.

3.4.3 Bedding Material Placement

Bedding material shall be placed to provide uniform and adequate longitudinal support under the pipe. Blocking shall not be used to bring pipe to grade. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support.

3.4.4 Initial Backfill

Backfill which is immediately above the springline of the pipe shall be free from clods and debris which could damage the pipe.

3.5 PIPE INSTALLATION

3.5.1 General

Each joint of pipe shall be inspected carefully before being placed in the trench. Any joint found to be cracked, or otherwise so damaged as to impair its usefulness, shall be plainly marked in such a manner that the marking cannot be removed.

Damaged joints shall be removed from the site on the day they are discovered. All sewer pipe shall be placed with bell end up-gradient. Each pipe shall be placed to line and grade as shown on the drawings. Care shall be taken that each spigot is centered properly in the bell of the preceding pipe and properly seated. During installation of pipe, the CONTRACTOR shall insure that all pipe is cleaned of dirt, rocks, wood and other debris before placement. At the end of each day's work, and when, for any reason, the pipe installation will be discontinued for an appreciable period, the open end(s) of the pipeline shall be closed temporarily.

3.5.2 Cutting Pipe

The cutting of pipe for any reason shall be done in a neat and precise manner without damage to pipe or pipe lining.

3.5.3 Procedures

Pipe shall be lowered carefully into the trench in such a manner that spigot and bell will not be contaminated. Spigot and bell shall be checked for cleanliness immediately before insertion of spigot into bell. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipes shall be laid when trench conditions or weather are unsuitable for such work. Full responsibility for the diversion of drainage and control of water in the trenches during construction shall be borne by the CONTRACTOR.

3.5.4 Bell and Spigot Pipe

The spigot and bell shall be cleaned and lubricated as recommended by the manufacturer. No deviation from recommended lubricant will be allowed without approval by the PROFESSIONAL. Following the initial insertion of the spigot into the bell, the bell end of the added pipe shall be moved sideways or up a distance of approximately 8" to move the spigot end slightly away from the shoulder of the connecting bell, thus providing for expansion and flexibility in the completed line. The added joint of pipe then shall be placed in true alignment at plan grade utilizing a pipe-laying laser or lamping.

3.5.5 Mechanical Joint Pipe

Mechanical joints in pipe shall be constructed in accordance with the manufacturer's recommendations.

3.5.6 Flexible Transition Coupling

Flexible transition couplings shall be installed in accordance with manufacturer's recommendations, ASTM C 1173, and ASTM D 5926.

3.5.7 Conflicting Utilities

Where water mains are encountered that are within 18 inches vertically, measured from the outside of the sewer main and the outside of the water main, whether above or below the sewer main, offsets will be installed on the water main. Water mains are defined as water lines 2 inches or larger serving more than one customer. Offsets will be installed to place the water line above the sewer a minimum of 18 inches, measured from the outside of the sewer main and the outside of the water main. Offset fittings will be located at least one-half full pipe length away from the sewer crossing. At no time will an offset be installed that results in the water main crossing below the sewer. Where parallel water mains are encountered that are within 10 feet horizontally, measured from outside of the sewer main and the outside of the water main, whether above or below the sewer main, offsets will be installed on the water main to place it outside of the 10 feet buffer area. In such cases where it is not feasible to relocate the water main, supporting data may be submitted to the Mississippi Department of Environmental Quality (MDEQ) for exception. In such cases where approved, offsets will be installed along the water main to allow for an 18 inch vertical separation above the sewer main, measured from the bottom of the water main to the top of the sewer main. Where Natural Gas, telecommunications, or electrical utilities are encountered that conflict with or prevent the replacement of sewers required in this contract, the PROFESSIONAL will be notified immediately.

3.5.8 Locator Station

- 3.5.8.1 Provide locator stations, following Standard Details or Drawings, at each end of the HDPE pipe.
- 3.5.8.2 Flush mount underground locator: See Standard Details.
- 3.5.8.3 When HDPE pipe is connected to another type of pipe material, continue detector wire over the connecting pipe, so locator station is installed out of paved area.
- 3.5.8.4 In areas scheduled to be improved:

- A. Identify and protect station locations immediately after installation;

- B. Space three (3) stakes equally around the station;
- C. Extend at least four (4) feet above existing grade; and
- D. Flag with orange fluorescent wrap withing six (6) inches from top of stakes.

3.5.9 Detection Wire

- 3.5.9.1 Install detection wire without splices as shown on Standard Details.
- 3.5.9.2 Terminate detection wire inside locator box using proper sized crimp type connectors on wire ends.
- 3.5.9.3 Connect each wire to a terminal maintaining at least eighteen (18) inches slack in each wire for underground flush mounted locator stations.
- 3.5.9.4 Neatly coil slack wire in test station below terminal board.
- 3.5.9.5 Locate wires on top and along HDPE pipe.
- 3.5.9.6 Allow adequate slack and support to protect wires from damage during backfilling operations.
- 3.5.9.7 Test each detection wire for continuity after backfill is completed.
 - A. If test for continuity is negative, repair or replace at Professional's direction.
 - B. After continuity is verified, connect each detection wire to terminal block locator station.

3.6 MANHOLE CONSTRUCTION

3.6.1 Basic Assembly

Assemble each manhole with one or more straight vertical wall section(s) and one top taper section, to provide the required manhole depth. Seal all joints between precast sections as specified in this Section, plug all lifting holes with non-shrinking mortar after laying sections, and seal around all pipe entrances with non-shrinking mortar, all to provide strictly watertight construction. **DO NOT USE MORTAR TO SEAL PRECAST SECTION JOINTS.** Provide 24" inside diameter precast concrete, or cast-in-place concrete spacer rings between rim and precast taper section, as required to set rim at proper elevation. Securely grout spacers and rim to manhole structure with masonry mortar. Each finished manhole shall have permanently embedded-in manhole steps on 16" vertical centers. Protect and maintain each manhole until the project is accepted.

3.6.2 Manhole Tops

- 3.6.2.1 In streets, roads, highways, and other paved areas: flush with finished paving grade.
- 3.6.2.2 Undeveloped areas, such as fields, woods, etc.: 18" above ground.
- 3.6.2.3 Grass developed areas: 2" above grade finished grade.

3.7 TESTING

3.7.1 Alignment Testing

Sewer mainlines with diameter of 24-inches or less shall be laid with straight alignment between manholes. Either a laser beam or lamping shall be used to check pipe alignment.

3.7.2 Leakage Test of Gravity Piping System

All piping shall pass the leakage test as specified herein. The leakage test shall be performed in the presence of the PROFESSIONAL, and the CONTRACTOR shall provide the PROFESSIONAL a 24-hour minimum notice before beginning the testing procedure. Prior to testing a section of piping, the line shall be visually inspected to determine if any piping has collapsed or has been crushed. After flushing, the piping system shall be tested as specified by ASTM F 1417.

3.7.3 Deflection Testing

Deflection testing shall be performed on all PVC gravity sewer piping. The deflection test shall be performed after the final backfill has been compacted and in place at least 30 days. A maximum of five percent (5%) deflection is allowable. CONTRACTOR shall perform a mandrel deflection test as follows:

- 3.7.3.1 The mandrel outside diameter shall be equal to the minimum pipe inside diameter, less an allowance for the maximum five percent deflection.
- 3.7.3.2 Completely flush the pipe making sure the pipe is clean of any mud or trash that will hinder the passage of the mandrel.
- 3.7.3.3 During the final flushing of the pipe, attach a rope to a floating block or ball and float the rope and block or ball through the line.
- 3.7.3.4 After the rope is threaded through the pipe, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
- 3.7.3.5 Connect a second rope to the back of the mandrel so that the mandrel can be retrieved if a blockage is encountered.
- 3.7.3.6 Remove all the slack in the pull rope by gently pulling the rope at the far

manhole or cleanout. After the slack has been removed, place a tape marker on the rope close to the pipe where the mandrel will exit. If the mandrel encounters blockage, the marker will provide a means of measuring the traveled distance of the mandrel so that the restricted area can be located.

- 3.7.3.7 Draw the mandrel through the sewer. The mandrel shall be pulled manually without the use of winches or any mechanical device.

An increasing resistance to pull is an indication of excessive deflection. If this occurs, measure the distance from the beginning marker on the rope to the entry point, locate the section of piping where increased resistance occurred, and replace the pipe if visual examination reveals damage.

3.7.4 Retest of Deflection Testing

Resistance to pull may be caused by not properly flushing or cleaning the pipe prior to testing. The following actions shall be taken prior to excavating and replacing the section of piping:

- 3.7.4.1 Remove mandrel and reflush with water, or
- 3.7.4.2 Preferably remove mandrel and pull a rubber sewer cleaning ball through the pipe with water and clear any mud or debris that did not flush during initial cleaning. The mandrel outside diameter shall be equal to the minimum pipe inside diameter less an allowance for the maximum five percent deflection.

The test equipment used shall be approved by PROFESSIONAL at the beginning of the testing. PROFESSIONAL may at any time require a calibration check of the instrumentation used.

3.7.5 Testing Order of Work

Tests for mainline pipe installed as part of Contract shall be performed in the following order: 1) Alignment Test; 2) Deflection Test; 3) Leakage Test; and 4) Post-Installation CCTV video. CONTRACTOR shall not perform any test out of order and shall not perform a second testing method until PROFESSIONAL confirms passing of preceding test.

3.8 WARRANTY

The equipment covered by this Section of the specification shall be warranted against defective parts due to faulty material or workmanship for the manufacturer's standard warranty period in addition to the warranty required by the General Conditions of the Contract.

3.9 COMPENSATION

Progress Payments for items for which field work has been completed but no deliverables have been submitted to or approved by PROFESSIONAL shall not exceed 50% of the unit price submitted in the Bid Proposal. Final payment shall not be made until all deliverables are submitted and approved acceptable by PROFESSIONAL.

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SECTION 33 4000

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DIVISION 33 – UTILITIES

SECTION 33 4000

STORMWATER UTILITIES

PART 1 GENERAL

1.1 REFERENCES

The current edition of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM B 209	Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
ASTM C 443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM D 6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM F 667	Standard Specification for 3 through 24 In. Corrugated Polyethylene Pipe and Fittings
ASTM F 1336	Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings
ASTM F 2306	Standard Specification for 12 In. to 60 In. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Non-Pressure Gravity-Flow Storm Sewer and Subsurface Drainage Applications

1.2 SUBMITTALS

The CONTRACTOR shall submit product data that demonstrate that the piping and accessories comply with the contract requirements. Manufacturer's installation instructions for all products shall also be submitted.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Reinforced Concrete Pipe

Reinforced concrete pipe shall be manufactured in accordance with ASTM C 76, Class III. Reinforced concrete pipe gaskets shall be in accordance with ASTM C 443.

2.1.2 Corrugated Polyethylene (PE) Tubing and Fittings

Corrugated polyethylene (PE) tubing and fittings shall be Advanced Drainage System, Inc. (ADS) N-12, dual walled, water tight joint pipe as basis of design or approved equal. Corrugated PE tubing and fittings shall be in accordance with ASTM D 3350, ASTM F 667, and ASTM F 2306.

2.1.3 Engineered Surface Drainage Products as Basis of Design, or Equal

PVC and concrete surface drainage inlets shall be the road and highway type, trench drain, inline drain, domed inlet or curb inlet type as indicated on the drawings and referenced within the contract specifications. The ductile iron frame and grate for each of these structures are to be considered an integral part of the surface drainage inlet, shall be bolted or lockable type covers and/or grate and shall be furnished by the same manufacturer.

The road and highway structures and curb inlets required for this contract shall be cast-in-place, prefabricated concrete, and/or manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration.

For PVC manufactured drainage structures, the drainage pipe connection stubs shall conform to ASTM D 3212. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described in ASTM D 3034 and ASTM F 1336.

The grate and frame for all sidewalk, road and highway structures and curb inlets shall be ductile iron and shall be made specifically for each basin so as to provide a bottom flange that closely matches the dimensions of the basin body opening. The grate and frame shall have bolted/lockable mechanical mechanisms and shall be capable of supporting H-25-wheel loading for heavy-duty traffic.

PART 3 EXECUTION

3.1 GENERAL

The CONTRACTOR shall verify all measurements and shall take all field measurements necessary before installation.

3.2 INSTALLATION

3.2.1 Reinforced Concrete Pipe

When delivered to the job site, the pipe shall be unloaded from the truck in a manner that will ensure no damage to the pipe. The pipe shall be unloaded by use

of hoist, skids, snubbing ropes, or other approved methods. Under no circumstances shall the pipe be dropped or roll freely. Lifting of the pipe shall be done by use of slings or lifting lugs attached to the pipe. The use of hooks attached to the ends of the pipe will not be allowed.

3.2.2 Corrugated Profile-Wall PE Pipe

When delivered to the job site, the pipe shall be unloaded from the truck in a manner that will ensure no damage to the pipe. The pipe shall be unloaded by hand or equipment. Under no circumstances shall the pipe be dropped or rolled freely. Additionally, tie down straps or bands should not be removed until the pipe has been secured, to prevent rolling or dropping the pipe. Handling should be accomplished by hand, lifting tongs, or nylon slings. When using slings, two pick points shall be used.

3.2.3 Engineered Surface Drainage Products

The specified PVC and concrete road and highway structures and curb inlets shall be installed in accordance with the manufacture and in accordance with the Contract Documents. The backfill material shall be crushed stone or other granular material meeting the requirements of Class 1 or 2 material as defined in ASTM D 2321. The road and highway structures and curb inlets shall be bedded and backfilled uniformly in accordance with ASTM D 2321. A concrete ring will be poured under the frame and grate as shown on the drawings. The road and highway structures and curb inlets bodies will be cut at the time of final grade so as to maintain a one piece, leak proof structure. Brick, stone, or concrete blocks shall not be used to set the frame and grate to the final grade height.

3.3 PIPE TRENCH EXCAVATION

The pipe trench excavation and disposition of excavated materials shall be in accordance with Section 31 2316 EXCAVATION, Paragraph 3.1 EXCAVATION. The surfaces upon which pipe is to be placed shall be accurately finished to the lines and grades required. Where dimensions of pipe trenches are not shown on the drawings, the bottom width shall be not less than 2 feet greater than the outside span dimension of the pipe.

3.4 PLACING OF PIPES

3.4.1 Reinforced Concrete Pipe

Reinforced concrete pipe shall be laid with spigot ends of pipe pointing in the direction of flow. The pipe shall be placed with the pipe invert coinciding with the specified grade lines. Proper facilities shall be provided for lowering the pipe into the trench. Each joint shall be wrapped in a geotextile fabric.

3.4.2 Corrugated Polyethylene (PE) Tubing and Fittings

Corrugated polyethylene (PE) tubing and fittings shall be installed in accordance with ASTM D 2321 and the manufacturer's installation guidelines and to the specified grade lines.

3.5 BACKFILL FOR REINFORCED CONCRETE PIPES

3.5.1 General

Material placed within 2 feet of the pipe shall be hand compacted. The material to be hand compacted shall be placed in layers not exceeding four inches in thickness and shall be compacted by application of a motor driven hand tamper or other approved hand compaction equipment over the fill in such a manner that every point of the surface of each layer of fill will be compacted by the hand tamper. The pipe conduit shall be held securely in place at all times while tamping is being performed to ensure proper bond between the pipe and the ground. Compaction of material that is not within 2 feet of the pipe shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the type of material being compacted. No fill shall be placed against slopes steeper than one horizontal to one vertical unless approved.

3.5.2 Compaction

After the pipes have been placed and approved, material shall be placed and compacted as specified for backfill in Section 31 2323.11 BACKFILL AND FILL, Paragraph 3.3 PLACEMENT AND COMPACTION OF FILL. Field density shall be determined in accordance with ASTM D 6938 on each lift placed.

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DIVISION 40 – PROCESS INTERGRATION

SECTION 40 9123.33

FLOW METERING

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DIVISION 40 – PROCESS INTERGRATION

SECTION 40 9123.33

FLOW METERING

PART 1 SCOPE OF WORK

- 1.1. Furnishing all materials, equipment and labor to perform the work indicated on the drawings, specified herein and required to complete the work.
- 1.2. Furnish and Install:
 - 1.2.1. Ultrasonic Flow Meter
 - 1.2.2. Internal 4-20mA Output 2 independent channels
 - 1.2.3. Large sunshade.
 - 1.2.4. Owner's Manual (2)
 - 1.2.5. Owner's Manual in pdf format

PART 2 GENERAL

- 2.1. The flow meter shall be self-contained, environmentally sealed designed to continuously measure wastewater flow at the location designated on the construction drawings.
- 2.2. The flow meter shall utilize a downward looking ultrasonic sensor for level measurement by means of non-contact, ultrasonic technology while suspended above the liquid and calculate flow based on the proper weir discharge equation.
- 2.3. Any ancillary items necessary to make the monitor fully functional shall be included as a requirement although such items may not be specifically called out in these specifications.

PART 3 FLOW MONITOR

- 3.1. The flow meter shall an open channel flow meter shall be a Signature Ultrasonic by Teledyne ISCO of Lincoln, Nebraska USA or approved equal.
- 3.2. The flow meter shall include internal data storage capable of holding 12 months, minimum, of daily reports.
- 3.3. The flow meter shall be capable of interfacing with a wastewater sampler.

- 3.4. The flow meter shall have 4-20mA output capability with two (2) independent channels.
- 3.5. The flow meter shall have Modbus input and output capability. Input for interfacing with other sensors and output for interfacing with SCADA and other logging systems.

PART 4 DESCRIPTION

4.1 Flow Meter Construction

- 4.1.1. The flow meter electronics and connections will be housed in a NEMA4X/IP66, lockable enclosure suitable for conduit connection.
- 4.1.2. Basic construction shall consist of a two-piece electronics enclosure, front panel, and door.
- 4.1.3. The enclosure door will have a clear polycarbonate window for viewing the LCD, optional mechanical totalizer, and LED indicator without opening the door.
- 4.1.4. The flow meter shall include a stainless steel bracket for wall mounting, and shall also be suitable for mounting on a rack or inside a console enclosure.
- 4.1.5. Operating and storage temperature shall be -4 to 140°F.
- 4.1.6. The flow meter's primary user interface shall include a tactile keypad with audible feedback, and 4-inch, 320x240, backlit liquid crystal display with graphing functionality.
- 4.1.7. The flow meter will have a two-color LED indicator next to the display to indicate activated alarms/events.
- 4.1.8. The flow meter's internal mains power supply will operate on 100VAC, 50/60Hz line power.
 - A. Flow Meter Functionality
 - 1. Communication and User Interface
 - a. Primary programming will be directly through the tactile keypad and programming menus on the front panel of the flow meter.
 - b. The programming steps should allow the backlight of the display and the display of the flow meter to turn off.
 - c. Direct serial connection to a computer or USB flash drive will be through a micro A/B USB port located on the front panel of the flow meter.
 - i. Data shall be exported from the flow meter in .ddp or .csv format to a USB flash drive.
 - ii. Verifiable text reports shall be exported from the flow meter to a USB flash drive.
 - iii. The flow meter shall include an adaptor for connecting a USB flash drive.

- iv. The flow meter shall optionally include a compatible adaptor cable for connecting to the USB port on a computer.

4.2 Data Storage

- 4.2.1 The flow meter will store recorded data and program settings on a recoverable, flash-based, secure, non-volatile digital memory card with standard 8M capacity (180 days with 5 parameters logged at 1-minute intervals and reports at 24-hour intervals).
- 4.2.2 The program memory shall be capable of being updated via the USB port on the flow meter without opening the enclosure.
- 4.2.3 The flow meter shall transmit data and program settings to a SCADA system and provide instantaneous flow data to the UV disinfection system.

PART 5 LEVEL-TO-FLOW CALCULATION

- 5.1. Measured liquid level readings shall be converted into corresponding flow rate readings using internal conversion algorithms. The flow meter shall contain conversions for V-notch, rectangular and Cipolletti weirs, and Parshall, Palmer-Bowlus, trapezoidal, and H flumes.
- 5.2. Field Service
 - 5.2.1. Meter arrangement shall include one day of field service by the local, factory-trained representative; to see that the meter has been properly physically installed; perform site specific programming and level calibration. Technician shall provide a dated calibration sticker and certificate of proper operation.
 - 5.2.2. A second site visit shall be conducted when the owner is ready for operator training. During the training visit, the meter will again be checked and tested for accuracy, stickered and certified.

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SECTION 46 0085

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DIVISION 46 – INDUSTRY SPECIFIC EQUIPMENT

SECTION 46 0085

GEOMEMBRANE LAGOON LINER

PART 1 GENERAL

1.1 SUMMARY

This section includes the technical requirements for the fabrication and installation of a geomembrane liner. All materials shall meet or exceed the requirements of this specification, and all work shall be performed in accordance with the procedures provided in these project specifications. The work covered by these specifications consists of installing a Reinforced Polypropylene (RPP) geomembrane, in the areas shown on the project drawings. All work shall be done in strict accordance with the project drawings, these specifications and the fabricator's approved shop drawings. Sufficient material shall be furnished to cover all areas as shown on the drawings including seam areas, anchor trenches and appurtenances as required. The CONTRACTOR shall allow for any anticipated or planned shrinkage or wrinkles in the field panels, installing the membrane free of stress or tension.

1.2 QUALITY ASSURANCE

The CONTRACTOR shall be experienced in the installation of similar geomembrane pond liners. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

1.3 SUBMITTALS

The liner supplier shall furnish a submittal package to the PROFESSIONAL for approval. The RPP roll goods shall be factory fabricated into large panels whenever possible. The CONTRACTOR shall furnish a proposed geomembrane panel layout to be approved in writing by the PROFESSIONAL prior to material shipment. The drawings shall show: direction of factory seams, size of panels, location of field seams, consistent with the requirements of the project drawing. These details shall include the recommended termination details of the geomembrane. Except for special requirements due to configuration and/or terminating the geomembrane, maximum use of large size panels shall be made to reduce field seaming to a minimum.

1.4 REFERENCES

The American Society of Testing and Materials (ASTM) publications listed below form a part of the specification to the extent referenced.

ASTM D751 & D751A	Standard Test Methods for Coated Fabrics
ASTM D7749	Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Grab Tensile Method
EPA/530/SW-91/051	Inspection Techniques for the Fabrication of Geomembrane Field Seams
ASTM D4437	Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes
ASTM D1777	Standard Test method Thickness of Textile Materials
ASTM D7004	Standard Test Method for Grab Tensile Properties of Geomembranes
ASTM D7003	Standard Test Method for Strip Tensile Properties of Geomembranes
ASTM D5884	Standard Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes
ASTM D5994	Standard Test Method for Measuring Core Thickness of Textured Geomembranes
ASTM D4833	Index Test for Measuring the Puncture Resistance of Geomembranes
ASTM D7747	Standard Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes
ASTM D413	Standard Test Method for Rubber Property- Adhesion to Flexible Substrate
ASTM G154	Standard Practice for Accelerated Ageing of Non-Metallic Materials Using Fluorescent Ultraviolet Lamps.

PART 2 PRODUCTS**2.1 GEOMEMBRANE**

The geomembrane material shall be scrim RPP. Thickness shall be minimum of 45-mils total fabric thickness as determined by ASTM D1777. Material type shall be suitable for the intended application. The geomembrane shall be manufactured by the extrusion / calendaring process, consisting of first quality ingredients, suitably compounded with sufficient additives to ensure long-term durability. The finished membrane shall be uniform in color, thickness, size and surface texture. The finished membrane shall consist of two (2) plies of Polypropylene laminated on each side of the single (1) ply of reinforcing scrim. The scrim shall be fully encapsulated with the encapsulation extending a minimum of 1/8" beyond the scrim edges. Exposed fabric along the length of the roll stock shall not be permitted.

The finished membrane shall meet or exceed the "physical properties" values as shown in the Product Specifications below:

Weight	22 ounces/square yard minimum
Thickness	45 Mil (+/- 10%)
Tensile Strength	Machine Direction: 655 lbs.
Tensile Strength	Transverse Directions: 880 lbs.
Tear Strength	Machine Direction: 105 lbs.
Tear Strength	Transverse Direction: 110 lbs.
Puncture Resistance	365 lbs.
Low Temperature Cold Crack:	-84 degrees Fahrenheit
Seam Strength (Sear)	Minimum >80% of strip tensile value direction perp. to seam
Seam Strength (Peel)	Minimum 27 lbs-inch
UV Resistance	>90% Strength Retained After 2,000 hours

2.2 PIPE BOOT

Pipe boots to be manufactured of RPP sized for the outside diameter of the pipe being wrapped, at the angle of the levee embankment intersecting the pipe. The properties of the pipe boot shall be the same as the geomembrane liner in Section 2.1 above.

2.3 BATTEN BAR

The batten bar shall be fabricated from 1-1/4" by 1/4" type 304 stainless steel bar stock. There shall be 1/4" bolt holes drilled 6 inches on center along the entire length of the bar. Holes at the end of the bar shall be no more than 3 inches from the end of the bar.

PART 3 EXECUTION

3.1 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

Each factory-fabricated panel shall be rolled and/or accordion-folded and placed onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each panel shall be given prominent and unique identifying markings indicating the proper direction of unrolling and/or unfolding to facilitate layout and position in the field. The panels shall be suitably packaged, enclosed and protected to prevent damage during shipment and each package shall be prominently marked in the same fashion as the panels within. Until needed, packaged factory fabricated panels shall be stored in their original unopened containers in a dry area, and protected from the direct heat of the sun, where possible. Pallets should not be stacked.

3.2 FACTORY FABRICATION

The Fabricator shall be an experienced firm customarily engaged in factory-fabricating individual widths of scrim-reinforced geomembrane roll stock into large panels. The fabricator shall have experience in fabricating a minimum of 1,000,000 square feet of geomembrane by thermal fusion methods. Prior to factory seaming, all roll goods shall be inspected. All factory seams shall be made by thermal fusion methods. All factory seams shall have a minimum scrim-to-scrim overlap of one and one-half inches (1 1/2") when fabricated. Fabricated seams found to have less than the specified minimum overlap shall be repaired by adding an overlap or cap strip that provides the minimum specified overlap or it will be rejected. All seams shall be made so that the thermal fusion bond extends fully along the width of the sheet so that no loose edges are present. All specified pipe boots shall be factory fabricated of scrim RPP with provisions for a minimum overlap of the liner of 6" to provide for field thermal fusion bonding per Section 3.4.3.4. below.

3.3 INSPECTION AND TESTING OF FACTORY SEAMS

All sheets and seams shall be 100% visually inspected during fabrication. No defective seams or exposed scrim will be allowed. All exposed scrim edges shall be sealed with an approved RPP edge caulk, capped with a strip of RPP or extrusion welded. All indicated repairs shall be made by the geomembrane manufacturer before the panels are packaged for shipment. In addition to visual inspection, a 48-inch (1.2m) weld sample (Trial Weld) shall be made with each factory seam welding unit used in this work at the beginning of every work shift and every four hours of production thereafter. Sample shall be taken from a seam specifically made for quality testing and not taken from the fabricated panel itself. Test specimens shall be cut at quarter points from each 48-inch seam sample (a total of three places) and tested for seam strength and peel

adhesion. The seam shear strength shall be tested in accordance with ASTM D7749 (Grab Method). The peel adhesion shall be tested in accordance with ASTM D6392. A log shall be maintained showing the date, time, panel number and test results. Failure of the material and/or seams to meet all the requirements of these specifications may be cause for rejection of the material and/or seams as appropriate. The CONTRACTOR shall provide the test results to the OWNER or PROFESSIONAL as a formal submittal prior to installation.

3.3.1 Certification and Test Reports

Prior to installation of the RPP panels, the CONTRACTOR shall provide the PROFESSIONAL with the following certification and all test reports:

- 3.3.1.1. Written certification that the material meets the material property requirements in the Product Specification.
- 3.3.1.2. Written certification that factory seams were inspected and tested in accordance with specifications.

3.4 INSTALLATION AND SEAMING

3.4.1 Subgrade Preparation (New Excavation)

- 3.4.1.1. The surfaces on which the lining is to be placed shall be maintained in a firm, clean, dry and smooth condition during the lining installation. All surfaces shall be compacted and smooth graded with anchor trenches provided as required and detailed. All surfaces to be lined shall be free of rocks, roots, gravel, grade stakes or debris that may puncture the geomembrane. The subgrade shall be compacted to a minimum of 95% of the dry density (as determined by ASTM D398 Standard Proctor Method). Geotextiles may be used as a cushioning agent. All vegetation, if present, shall be removed and if required by the PROFESSIONAL, a soil sterilant applied. The soil sterilant shall be selected for the geographical area and native grasses and growth.
- 3.4.1.2. If groundwater is encountered within 12 inches of the surface to be lined, the CONTRACTOR shall dewater the area prior to and during installation of the liner.
- 3.4.1.3. Immediately prior to the installation of the geomembrane, the PROFESSIONAL and CONTRACTOR shall perform a complete and detailed inspection of the embankments to determine acceptance of the finished subgrade and elevations. The CONTRACTOR shall correct any erosion or other damage to the base material that has occurred since placement.

3.4.2 Geomembrane Installation

- 3.4.2.1. The geomembrane shall be placed over the prepared surfaces in such a manner as to ensure minimum handling and in accordance with the approved shop drawings. The lining shall be sealed to all concrete structures and other openings in accordance with details shown on the plans and shop drawings. The geomembrane shall be closely fitted and sealed around all inlets, outlets and other projections through the lining, using prefabricated fittings where possible. Shop drawings or product information of which shall be submitted by the CONTRACTOR. Liner sheets, damaged from any cause, shall be repaired or covered with additional sheeting.
- 3.4.2.2. Only those sheets of lining material that can be anchored and seamed together on the same day shall be unpackaged and placed into position. If high wind is present, the lining installation should begin on the leeward, or downwind end of the project and proceed toward the windward, or upwind end of the project. The windward edge of the liner shall be secured at all times with sandbags sufficient to hold it down during high winds. The windward edges of the liner material left exposed at the end of a day's work shall be anchored with sufficient sandbags to prevent damage or displacement due to wind.
- 3.4.2.3. Materials, equipment or other items shall not be dragged across the geomembrane surface or be allowed to slide down slopes on the lining. All parties walking or working on the liner shall wear soft-sole shoes. No smoking shall be permitted on the liner.

3.4.3 Field Seams

- 3.4.3.1. Lap joints shall be used to seal factory fabricated sheets together in the field. The lap joint shall be formed by lapping the edges of the sheets four (4) to six (6) inches. The contact surfaces of the sheets shall be wiped clean of all dirt, moisture, and other foreign matter. A minimum of one and one half inch (1 ½") bond shall apply to all liner field seams.
- 3.4.3.2. Avoid fish mouths, wrinkles, folds or pleats in the same area. Where fish mouths do occur, they should be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any necessary repairs to the RPP geomembrane shall be done using an additional piece of the specified RPP sheeting applied as stated in this specification. All patching material shall have rounded edges.

- 3.4.3.3. Cleanup within the lining compound shall be an ongoing responsibility of the CONTRACTOR. Particular care should be taken to ensure that no stones, scrap material, trash, tools or other unwanted items are trapped beneath the geomembrane liner.
- 3.4.3.4. All field seams shall be made utilizing hot air or hot wedge welding techniques as outlined in appropriate sections of the EPA Technical Guidance Document: "Inspection Techniques for the Fabrication of Geomembrane Field Seams." All relevant information shall be recorded on a Destructive Failure Report or equivalent.

3.4.4 Cold Weather Seaming

- 3.4.4.1. Seams shall be welded only when ambient temperature is above 32°F and below 104°F as measured six inches above the geomembrane surface.
- 3.4.4.2. The surface temperature of the geomembrane must be 40°F (i.e. sunshine required in cold weather to raise geomembrane surface temperature 8 degrees).
- 3.4.4.3. For temperatures below 32°F or above 104°F, no welding will be allowed. Items to consider:

- Liner Temperature (surface contact thermometer)
 - Ambient Temperature (6" above liner)
 - Wedge Temperature during Welding
 - Wedge Welder Speed
 - Temperature Set Point of Wedge Welder

- 3.4.4.4. The wedge temperature during welding must be observed and recorded. After starting a seam the temperature is observed and recorded every 20 feet for the first 60 feet or until the wedge temperature appears to have stabilized. After the temperature has stabilized the wedge temperature is observed and recorded every 15 minutes. No welding can take place when it is snowing, sleeting, or raining. Snow, ice, and water must be removed from the surface of the liner prior to welding.

3.4.5 Inspection and Testing of Field Seams

- 3.4.5.1. Upon completion of the liner installation, all seams shall be visually inspected for compliance with these specifications. In addition to visual inspection, all field seams shall be checked using (a) mechanical point stressing with a dulled cotter pin puller or

equivalent or (b) an air lance nozzle directed at the seam to detect any unbonded areas (see ASTM D 4437).

- 3.4.5.2. All field seams shall be tightly bonded on completion of the work. Any geomembrane surface showing injury due to scuffing, penetration by foreign objects, or distress from other causes shall be replaced or repaired. All exposed scrim edges shall be sealed with an extrusion weld or capped with a strip of RPP lining material.
- 3.4.5.3. Any repairs made to the liner shall be made with lining material. For the best welding performance, the repair should be made with newly manufactured material. Patches shall be cut with rounded corners and shall extend a minimum of four (4) inches in each direction from the damaged area. The entire surface of the patch shall be bonded to the RPP lining material. If reinforced patches are used, the cut edges of the patch should be coated with an approved sealant or sealed with an extrusion weld.
- 3.4.5.4. Destructive test seams are to be made by each seaming crew, at the beginning of the seaming process and every four (4) hours thereafter, or every time equipment is changed. Test seams shall be made under the same surface and environmental conditions as the production welds (i.e., in contact with geomembrane subsurface and similar ambient temperature). These seams are to be made of like materials provided for the purpose of testing and not cut from the seamed panels. Each seaming crew and the materials they are using must be traceable and identifiable to their test seams. The samples shall be numbered, dated and identified as to the personnel making the seam, and location made by appropriate notes on a print of the panel layout for the project. The completed field seam sample shall measure not less than 14 inches in width and 24 inches in length.
- 3.4.5.5. The field test seams are to be tested for seam strength and peel adhesion using equipment suitable for this purpose. The seam shear strength shall be tested in accordance with ASTM D7749 (Grab Method). The peel adhesion shall be tested in accordance with ASTM D6392. The CONTRACTOR shall provide a punch press or other suitable means for the on-site preparation of specimens for testing. The CONTRACTOR shall provide a tensiometer for on-site shear and peel testing of geomembrane seams. The tensiometer shall be in good working order, built to ASTM specifications, and accompanied by evidence of recent calibration within the last four (4) weeks.
- 3.4.5.6. If a test seam fails to meet the field seam design specification, then the CONTRACTOR shall make additional test seam samples, using

the same tools, equipment, environmental conditions and seaming materials and retested.

3.4.6 Warranty

The CONTRACTOR shall confirm in writing, that the furnished material will be free of defects in materials and workmanship at the time of sale, and against deterioration due to the effects of ozone, ultraviolet and other normal weathering on a pro-rata basis for 20 years from the date of completed installation. The CONTRACTOR shall furnish a sample warranty to PROFESSIONAL for review and approval prior to shipment.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 2088

VERTICAL LIFT GATES

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1 The Contractor shall provide all labor, materials, equipment, and incidentals required to furnish and install slide gates, operating stems, and operating floor stands, complete and operational with all necessary accessories as shown in the Contract Documents and as required for complete operation.
- 1.1.2 The Contractor shall obtain all equipment specified in this Section from one manufacturer to ensure proper coordination and functionality. The manufacturer shall have responsibility for performance and compatibility of the entire system.
- 1.1.3 The Contract Documents are for purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily show all components required to interface with the equipment. The Contractor shall provide all parts, equipment, and devices necessary to meet the functional requirements of the system.

1.2 REFERENCES

- 1.2.1 Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
 - 1.2.1.1 American Water Works Association (AWWA C561 Fabricated Stainless Steel Slide Gates)
 - 1.2.1.2 American National Standards Institute (ANSI)
 - 1.2.1.3 American Society for Testing and Materials (ASTM)

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements:

- 1.3.1.1 The slide gates shall be manufactured in accordance with the latest version of AWWA C561 and shall be constructed of stainless steel (ASTM 304L or 316L).

- 1.3.1.2 Safety factors shall be used in the design of all equipment. Gate, frame, and yoke design shall be such that the flexural stress does not exceed 18,750 psi or that the minimum safety factor is 5-to-1 based on the ultimate strength of the material used.

1.4 SUBMITTALS

- 1.4.1 For Approval: Submit the following shop drawings for approval:

- 1.4.1.1 Manufacturer's information and product data showing dimensions, materials of construction, and weight of all major items of equipment.
- 1.4.1.2 Installation diagrams showing location, arrangement, and size of all fasteners required for the equipment.
- 1.4.1.3 Setting drawings, templates, and instructions for installation of frames, thimbles, etc.
- 1.4.1.4 Certification that all components were designed based upon the information shown in the Contract Documents.

- 1.4.2 Upon completion of installation, submit three (3) copies of the Operation and Maintenance Manual for this equipment. A final copy of this manual shall be approved by the Engineer prior to distribution and as a minimum shall contain the following:

- 1.4.2.1 Operational and maintenance manuals shall include all approved shop drawings associated with this Section, complete instructions for installation, and parts list for all components.
- 1.4.2.2 Include a list and frequency of specific maintenance activities.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- 2.1.1 Provide slide gates as manufactured by the following:

- 2.1.1.1 Hydro Gate.
- 2.1.1.2 Approved equal.

2.2 EQUIPMENT MATERIALS

- 2.2.1 All slide gates shown on the plans and listed in the specifications shall conform in all respects to the latest version of AWWA C561, with the noted

changes and additions: Materials used in construction of slide gates and appurtenances will be best suited for the application and will conform to the following specifications:

- 2.2.1.1 Frame, Slide, Yoke, and Reinforcing: Stainless Steel, ASTM A240/A240M, Type 304L, or ASTM A240/A240M, Type 316L
- 2.2.1.2 Stainless Steel for stems: ASTM A-276, Type 304.
- 2.2.1.3 Stainless Steel for fasteners: F-593/F-594, Alloy Group 1, 2 (SS304, SS316)
- 2.2.1.4 Invert seals and compression load pad: Neoprene, ASTM D2000, 60 Durometer, with a stainless steel ASTM A276, Type 304L, or Type 316L retainer bar.
- 2.2.1.5 Side Seal: Ultra High Molecular Weight (UHMW) Polymer, ASTM D4040
- 2.2.1.6 Top Wedges: Type 316 Stainless Steel ASTM A351-CF8M
- 2.2.2 Gate frame shall be flange back, embedded, or channel mount as shown on the drawings. Spigot-back frames are not acceptable. The frame shall be an integral unit of brake form and structural shapes, rigidly assembled to form the waterway openings. Holes shall be provided for mounting on anchor bolts. The head channels shall be welded or bolted to the gate frame. The channels are to be sufficiently spaced to allow removal of the gate slide. The primary slot of the frame extrusion shall contain polymer guide liner retained in grooves, to prevent metal-to-metal contact between slide and frame.
- 2.2.3 Gate slide shall conform to the safety factors specified, but shall, in no case, be less than ¼-in. thickness. Deflection under full head shall be limited to 1/720 of the span. The stem connector clips or stem block pocket shall be welded to the slide. Gates over 24” wide shall have adjustable top wedges in order to prevent deflection in the slide resulting from over closure.
- 2.2.4 Flush Bottom: Slide gates shall incorporate a flush-bottom seal that is mechanically fastened to the bottom frame invert member. Seals attached to the slide or “press fit seals” are not acceptable.
- 2.2.5 Side Seals shall be UHMW. Seals shall be securely fastened to the frame with formed stainless steel retainers and shall be replaceable and adjustable without removing the gate from the installed position. A compression load pad shall be set behind the UHMW seal to allow for a self-adjusting seal system. The face of the UHMW guide that is in contact with the cover bar shall have a

machined or extruded groove, in order to create a raised surface on each side, to allow for secondary adjustment of the seal clamp force.

- 2.2.6 The operating stem shall be of a size to safely withstand, without buckling or permanent distortion, the stresses induced by normal operating forces. In addition, the stem shall be designed to transmit in compression at least 2 times the rated output of the floor stand or bench stand with a 40-pound effort on the crank or handwheel. The threaded portion of the stem shall have cold rolled threads of the double lead Acme type with a minimum surface finish of 24 micro-inches. Cut threads shall not be acceptable. Stainless Steel couplings, threaded and keyed to the stems, shall join stems of more than one section. All threaded and keyed couplings of the same size will be interchangeable. Manually operated, rising stem type gates will be provided with an adjustable stop collar on the stem to prevent over-opening of the gate.
- 2.2.7 On slide gates where the width is greater than twice the height a tandem stem arrangement shall be used.
- 2.2.8 Stem guides will be split collar bronze type, mounted on cast iron brackets to allow for installation after the stem is placed. They will be adjustable in two directions and will be spaced at sufficient intervals to adequately support the stem. Stem guide spacing will not exceed an L/r ratio of 200.
- 2.2.9 Gate lifts shall be geared crank type. Cranks shall be removable and shall fit on an AWWA 2" square nut. Lifts shall operate the gate with a maximum pull of 40 lb. on the handwheel or crank. Crank shall be located approximately 36 in. above grating or walkway. All lifts shall have thrust bearings, bronze lift nuts, and an aluminum stop nut to limit the downward travel of the stem and slide. All geared lifts shall have cast or ductile iron housings and pedestals. All lifts shall be rising stem type. Stem covers made of clear butyrate shall be furnished for all lifts. Lifts shall be grease lubricated and regreasable through grease zerks. Oil bath lifts are not acceptable.
- 2.2.10 A clear, polycarbonate plastic stem cover and indicator shall be provided on each slide gate operator. Stem indication shall be provided to denote gate level at quarter, half, three-quarter, and full open. A cast aluminum adaptor shall be used to mount the cover to the lift. The covers shall be capped, vented, and of sufficient length to allow full travel of the gate.

PART 3 EXECUTION

3.1 INSTALLATION

The slide gate equipment and appurtenances shall be installed in accordance with the Installation Manual furnished by the gate manufacturer. The slide gate equipment

and appurtenances shall be handled, stored, and installed in accordance with the gate manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

3.2.1 Field testing shall be performed after installation of the equipment. The field testing shall demonstrate the following:

3.2.1.1 The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.

3.2.1.2 The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.

3.2.1.3 The equipment has been aligned.

3.2.1.4 There are no mechanical defects in any of the parts.

3.2.1.5 The slide gates shall undergo a leakage test following installation. The leakage test shall be in accordance with the latest version of AWWA C561.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 2113

COARSE MECHANICALLY CLEANED BAR SCREENS

PART 1 GENERAL

1.1. SUMMARY

- 1.1.1. This section includes: Requirements for furnishing two (2) mechanically-cleaned, multi-rake coarse bar screen unit and associated controls. Equipment shall be installed as shown on the plans, as specified herein, as recommended by the supplier and in compliance with all local, state and federal codes and regulations.
- 1.1.2. Each multi-rake screen shall be complete with side frames; bar rack; rake blades; scraper assembly; dead plate; discharge chute; drive chains; sprockets and bearings; drive motor; gear reducer; anchor bolts; controls and all accessories required for a complete, operating installation.

1.2. MANUFACTURER

- 1.2.1. The equipment supplier shall be SAVÉCO North America, Inc. or approved equal.
- 1.2.2. The entire bar screen shall be designed, coordinated and supplied by one manufacturer. The unit shall be supplied in one piece requiring no field assembly. The bar screen manufacturer shall take sole responsibility for the screen supplied.

1.3. REFERENCES

- 1.3.1. AISI (American Iron and Steel Institute)
- 1.3.2. ABMA (American Bearing Manufacturers Association)
- 1.3.3. AGMA (American Gear Manufacturers Association)
- 1.3.4. NEMA (National Electrical Manufacturer's Association)
- 1.3.5. NFPA (National Fire Protection Association)
- 1.3.6. ASTM (American Society for Testing and Materials)
- 1.3.7. WSC (American Welding Society Code)
- 1.3.8. ASME (American Society of Mechanical Engineers)
- 1.3.9. NEC (National Electrical Code)
- 1.3.10. UL (Underwriters Laboratory Standards)

1.4. EXPERIENCE

- 1.4.1. In order to establish a quality standard for the manufacture and production of the equipment, all manufacturers shall meet the requirements listed in this section.

1.4.2. Manufacturers shall have a minimum ten (10) year history of engineering and fabricating multi-rake screens. Documentation of at least fifty (50) installations having been installed for a minimum of five (5) years shall be provided.

1.4.3. The minimum acceptable standards for the equipment shall conform to the project contract documents as outlined in the respective sections of the specifications and drawings.

1.5. SUBMITTALS

1.5.1. Technical information:

- A. Manufacturer's layout drawing and electrical schematic drawings.
- B. Motor performance data and features.
- C. Gear reducer data including service factor, efficiency, torque rating and materials of construction.

1.5.2. Equipment information:

- A. Installation Reference List
- B. Brochures and other descriptive literature
- C. Ancillary item data sheets
- D. Manufacturer's Warranty

1.5.3. Operation & Maintenance Manuals

- A. Equipment Operating instructions
- B. Equipment weights and lifting instructions
- C. Installation instructions
- D. Maintenance schedules
- E. Recommended lubricants
- F. Recommended spare parts including wear items
- G. Long-term and short-term storage instructions

PART 2 PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

2.1.1. Flo-MultiRake Coarse Bar Screen, Model GVB 600 shall be as supplied by SAVÉCO North America, Inc. or approved equal.

2.2. QUALITY ASSURANCE

2.2.1. The Flo-MultiRake Coarse Bar Screen will be fully assembled and shop tested to confirm fit and function of the screen. A certificate of the shop run test shall be supplied with the shipping documents.

- 2.2.2. The Flo-MultiRake Coarse Bar Screen will be shipped to the site fully assembled. Some ancillary components may be removed to prevent damage during shipment.

2.3. PERFORMANCE REQUIREMENTS

Conditions	Unit
Number of screens	Two (2)
Influent Type	Municipal Wastewater
Maximum Influent TSS (mg/L)	500
Peak flow per screen (mgd)	3.1
Downstream Water Level at peak flow (in)	21.6
Max Headloss at peak flow with 30% blinding (in)	12.3
Bar Spacing (inch/mm)	1/2 inch (12 mm)
Channel width (in)	24.0
Channel depth (ft)	As Shown on Drawings
Screenings discharge height from top of channel (ft)	As Shown on Drawings
Screen Installation Angle (75°-90°)	75

2.4. UTILITY REQUIREMENTS/ENVIRONMENTAL CONDITIONS

Conditions	Unit
Power Supply (V/P/Hz)	480/3/60
Screen Installation Location (indoor/outdoor)	Outdoor
Screen NFPA Classification Requirement	TBD
Control Panel Location (indoor/outdoor)	Outdoor
Control Panel NFPA Classification Requirement	Non-hazardous

2.5. DESIGN REQUIREMENTS

2.5.1. General

- A. An in-channel mechanically cleaned coarse, multi-rake bar screen shall be provided designed to handle the maximum flow.
- B. The screen shall be designed and built to withstand maximum possible static hydraulic forces exerted by the liquid to the screen. All structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening operations. All components of the screen shall be 304 stainless steel construction unless otherwise noted.
- C. The screen shall be designed to be pulled out of the channel. Removal of the screen from the channel shall not require personnel to enter the channel. There shall be no need to remove the anchor bolts that attach the supporting brackets to the channel structure

- D. The screen shall be fully enclosed above channel level with bolted front, rear and top covers.

2.5.2. Screen Frame

- A. The screen frame shall consist of 18" x 3" U-profile side frames constructed of with a minimum thickness of 4 mm (.157").
- B. The screen frame shall have support beams consisting of 2" x 4" U-profile channel with a minimum thickness of 4 mm (.157").
- C. A base plate with a minimum thickness of 5 mm (.196") shall be welded to the side frames at the base of the screen.
- D. Chain guides shall be welded to the screen frame for the entire length of the chain travel. Chain guide shall be constructed of 2" x 2" L-profile with a minimum thickness of 5 mm (.196").
- E. The screen frame shall be rigidly anchored to the top of the channel with reinforced L-brackets and anchor bolts of M12 Grade 304 stainless steel furnished by the manufacturer.

2.5.3. Bar Rack

- A. The bar rack shall be supported from the framework and bolted to the screen frame.
- B. A clear opening size of 1/2 inch (12 mm) between each bar in the bar rack shall be provided. There shall be no space wider than the opening between the bars which would permit passage of larger solids through the bars.
- C. The bars shall be fastened to a dead plate 3 mm thick from type 304 stainless steel that extends to the point of discharge. The dead plate shall be flat such that a close tolerance between the raking tines and the plate can be maintained during the cleaning cycle. The backside of the dead plate shall be constructed to guarantee a uniform space between the rake bar and the dead plate leading to the discharge chute without interruption.
- D. The bar rack shall consist of continuous bars with rectangular cross section 8 mm (.315") x 40 mm (1.57").

2.5.4. Raking Mechanism

- A. The bar rack shall be cleaned by a minimum of four (4) cleaning rakes. The cleaning rakes shall engage the bar rack from the upstream side and travel from the bottom of the channel up along the bar rack to discharge.

- B. The raking mechanism shall be designed to be manually reversed to dislodge objects not being removed by the normal raking cycle. The manual reverse shall be initiated at the control panel.
- C. The rakes shall be of a single piece, reinforced welded design with a top plate of 5 mm, a structural cross plate of 15 mm and rake fingers of 5 mm. Rake fingers to be reinforced by a 5 mm gusset plate. The rakes shall have a precision laser cut tooth profile. Plasma cut rakes or cast rakes will not be accepted.
- D. Each rake shall be affixed to the roller chains.
- E. Drive chains for the raking mechanism shall be roller type chains and have links and rollers constructed of stainless steel. Units which utilize non-metallic chain components shall not be accepted.
- F. Drive chains shall have a minimum pitch of 50 mm (2") with a minimum breaking strength of 45,000N (10,116 lb.f).
- G. Drive chains and chain guides shall be replaceable without requiring removal of the screen from the channel.

2.5.5. Drive Mechanism

- A. The drive mechanism shall consist of a solid upper drive shaft with two (2) drive sprockets.
- B. The drive shaft shall be machined from a single piece of stainless steel and have a minimum diameter of 60 mm (2.375"). The ends shall be finish machined to accommodate the keyed gearbox connection and roller bearings. Drive shafts constructed of tubular material with welded journal ends shall not be accepted.
- C. The drive shaft shall be supported on either end by grease lubricated bearing assemblies mounted to adjustable plates allowing for chain tension adjustment.
- D. Upper drive sprockets shall be constructed of stainless steel with a minimum diameter of 305 mm (12"), 50 mm (2") pitch, and 13 mm (.5") tooth width.
- E. The unit shall utilize lower chain return guides in order to maintain proper rake alignment and maintain proper engagement of the rake assemblies with the bar rack.
- F. Lower chain return guide shall have a minimum thickness of 10 mm (.375").

2.5.6. Scraper Assembly

- A. Screenings shall be positively cleaned from the rakes via a mechanical scraper assembly and deposited into the discharge chute.
- B. Scraper pivot arms shall be constructed of 50 mm (2") square tubing with a minimum wall thickness of 3 mm (1/8"). Scraper blade shall be constructed of 60 mm (2 1/2") L-profile stainless steel with a minimum thickness of 6 mm (1/4").
- C. Scraper assembly shall be designed to travel on a controlled motion path allowing the scraper to return to the home position by gravity between cleaning cycles.
- D. Scraper assembly shall be bearing mounted and incorporate a radial return guide and rubber shock dampening devices in order to minimize wear and vibration.
- E. The design of the scraper assembly shall allow the unit to operate in reverse.

2.5.7. Drive Unit

- A. Gear reducer shall be a helical gear type as manufactured by NORD or approved equal. A cast iron frame; design in accordance with AGMA recommendations for Class I service shall be provided.
- B. Gear reducer shall be driven by a 0.75 HP, 230/460v, 3ph, 60hz, TEFC motor.
- C. Motor/reducer assembly shall be directly connected to the drive shaft via the reducer's hollow drive shaft.
- D. The gearbox shall be mounted using a spring-loaded electromechanical torque limiting device which allows the gearbox to counter-rotate in order to reduce shock loading of the system. Units with a rigid mount for the gearbox shall not be accepted.
- E. Positive overload protection shall be initiated at the control panel by excessive motor current.
- F. Chain drives, belt drives, and hydraulic drives will not be accepted.

2.6. ELECTRICAL CONTROLS AND DEVICES

- 2.6.1. In addition to the drive motor, the equipment supplier shall furnish all electrical items specifically called for in this specification section. The contractor shall supply all other electrical items, and interconnecting wiring of proper size, including all conduit and supports required to place the equipment into service.

- A. Control Panel: NEMA 4X type 304 stainless steel pad mount main control panel suitable for 480/3/60 electrical supply. Control panel shall contain the following control devices for operation of the coarse bar screen:
 - 1. Main disconnect with through door interlock handle.
 - 2. Control transformer 480/120.
 - 3. Branch circuit protection.
 - 4. Screen drive motor starter (IEC) – reversing, with overload.
 - 5. Emergency stop pushbutton.
 - 6. Hand-Off-Auto selector switch for motor.
 - 7. Forward-Off-Reverse switch – spring return from REV to Off.
 - 8. Load monitor for screen motor overtorque/overload protection.
 - 9. Hour meter for each motor.
 - 10. Control power on, run and fault indicating lights.
 - 11. Alarm reset pushbutton.
 - 12. Programmable relay to control screen control logic functions.
 - 13. Run and alarm auxiliary contacts for use by the customer.
 - 14. Panel heater with thermostat (as required).
 - 15. Barrier relay for float level switches.
 - 16. UL Label.
- B. Local Emergency Stop: Provide a local emergency stop push button in a NEMA 4X polycarbonate enclosure.
- C. Float Switches: Two (2) mercury free type float switches of chemical resistant polypropylene construction for start level and high-level sensing. The floats shall have integral 20 foot cable and be supplied with mounting brackets constructed from type 304 stainless steel. Each float/bracket requires a suitable length of 1” pipe supplied by the contractor to suspend the float in the channel.

2.7. OPERATION, MONITORING, AND CONTROL

- 2.7.1. Screen Hand Operation: Screen to run continuously.
- 2.7.2. Screen Automatic Operation: Screen to cycle based on the level sensor or repeat cycle timer. Provide provisions to prevent excessive starting and stopping of the unit. Cycle timer shall be reset after each run initiated by the level sensor.
- 2.7.3. Fault Conditions:
 - A. Momentary motor over current shall trip the current monitor, stop the drive motor, and illuminate the alarm indicating light. Reset shall be manual on the outside of the control panel.
 - B. Excessive motor current shall trip the starter overload relays, stop the drive motor, and illuminate the alarm indicating light. Overload relays shall be reset manually on the inside of the control panel.

PART 3 - EXECUTION

3.1. PREPARATION

3.1.1. The mounting points of the channel shall be level and parallel and of proper size.

3.1.2. Contractor shall verify all dimension in the field to ensure compliance of equipment dimensions with the drawings.

3.2. INSTALLATION

3.2.1. All equipment shall be installed in accordance with the manufacturers written installation instructions.

3.3. START UP/TRAINING/FIELD QUALITY CONTROL

3.3.1. The initial start-up of the equipment shall be performed by an authorized representative of the equipment manufacturer. The authorized representative will verify the proper operation and installation and provide training to the equipment operators. Onsite training shall include how to remove the equipment from the channel, change bearings, and other wear items. The representative shall be on site a minimum of eight (8) hours for training.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 2153

PERFORATED PLATE SCREEN

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1 This Section includes: Requirements for furnishing two (2) fine screens with perforated filter panels and associated controls. Equipment shall be installed as indicated in the contract drawings, as specified herein, as recommended by the supplier and in compliance with all local, state and federal codes and regulations.
- 1.1.2 The fine screen shall be furnished with perforated filter panels, drive chain, sprockets and bearings, rotating self-adjusting cleaner brush, deflector roller, spray water system, drive motors, gear reducers, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.

1.2 REFERENCES

The Perforated Plate Screen shall, as applicable meet the requirements of the following industry standards:

- 1.3.1 AISI (American Iron and Steel Institute)
- 1.3.2 ANSI (American National Standards Institute)
- 1.3.3 ABMA (American Bearing Manufacturers Association)
- 1.3.4 AGMA (American Gear Manufacturers Association)
- 1.3.5 NEMA (National Electrical Manufacturer's Association)
- 1.3.6 NFPA (National Fire Protection Association)
- 1.3.7 ASTM (American Society for Testing and Materials)
- 1.3.8 WSC (American Welding Society Code)
- 1.3.9 ASME (American Society of Mechanical Engineers)
- 1.3.10 NEC (National Electrical Code)
- 1.3.11 UL (Underwriters Laboratory Standards)

1.3 EXPERIENCE

- 1.3.1 In order to establish a quality standard for the manufacture and production of the equipment, all manufacturers shall meet the requirements listed in this section.

- 1.3.2 Manufacturer shall have a minimum of ten years of experience in producing substantially similar equipment and shall be able to show evidence of at least fifty (50) installations in satisfactory operation for at least five years.
- 1.3.3 The minimum acceptable standards for the equipment shall conform to the project contract documents as outlined in the respective sections of the specifications and drawings.

1.4 SUBMITTALS

The manufacturer shall furnish electronic submittals in pdf format. The following information shall be submitted to the Engineer to establish compliance with this specification. Submittals shall include the following:

- 1.4.1 Certified general arrangement drawings showing all important details including materials of construction, dimensions, loads on supporting structures, and anchor bolt locations.
- 1.4.2 A list of all deviations from drawings and specifications.
- 1.4.3 Descriptive literature, bulletins and/or catalogs of the equipment.
- 1.4.4 Complete data on motors and gear reducers.
- 1.4.5 Wiring diagrams and electrical schematics for all control equipment to be furnished.
- 1.4.6 Describe the automatic adjusting cleaner brush.
- 1.4.7 Describe method of checking and adjusting drive chain tension.
- 1.4.8 Provide details of the area at the bottom of the screen to show how the screen will pick up large objects off the channel floor.
- 1.4.9 Provide details of the bottom of the screen that shows the method employed to prevent buildup of grit and small stones beneath the screen and to prevent wear on the screen elements.
- 1.4.10 Provide detailed operations and maintenance instructions to maintain the screen at the design SCR, including, lubricating, adjusting and/or replacing perforated panels, chains, bearings, shafts, wear surfaces, rotating brushes, motors, gear-drives, solenoid actuated water valves, proximity switches, etc.
- 1.4.11 Provide detailed instructions for start-up and shut-down of the screen and attached accessories, including normal and emergency scenarios.
- 1.4.12 Provide detailed troubleshooting instructions and recommendations for multiple mechanical and control related scenarios.
- 1.4.13 Provide independent certified test data confirming screen Screenings Capture Ratio (SCR) value with perforated panels of the same size as specified herewith. Testing shall confirm the percentage of all material captured by the screen as documented by the National screen evaluation facility at Chester Lee Street in England by TRPM and Northumbrian Water. The documented report of the test which shows the result of screenings capture rate (SCR) must be provided with submittals.

1.5 WARRANTY

- 1.5.1 Equipment to be covered against manufacturing defects in materials and workmanship during normal use and service for a period of one (1) year from date of startup. Items specifically not covered by the warranty are consumable wear parts as identified in the O&M manual.
- 1.5.2 The screen shall be unconditionally guaranteed to meet or exceed design criteria detailed in Part 2 of this specification.
- 1.5.3 Lower bearing/bottom revolving guide disk with incorporated bearing shall be guaranteed for five (5) years.

PART 2 PRODUCTS

2.1 QUALITY ASSURANCE

- 2.1.1 Equipment manufacturer shall be ISO 9001 certified.
- 2.1.2 The Perforated Filter Screen will be fully assembled and run to confirm fit and function of the screen. A certificate of the shop run test shall be supplied with the shipping documents.
- 2.1.3 The Perforated Filter Screen will be shipped to the site fully assembled or in sub-assemblies. Some ancillary components may be removed to prevent damage during shipment.
- 2.1.4 Shop Surface Preparation/Coating: All weldments shall be cleaned and passivated using a full dip passivation process to remove weld spatter, slag and discoloration. Bearings, electrical devices, drive and wiper chains and sprockets, motor and gear reducer shall be provided with the manufacturer's standard coating system. Screen weldments not full dipped passivated, using spray on cleaning solutions, passivating welds only or bead blasting shall not be allowed.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Perforated Filter Screens

- 2.2.1.1 Solids will collect on a continuous belt of perforated filter panels perpendicular to the flow, elevating solids to the discharge point. The perforated filter panels shall be cleaned by means of an automatic adjusting rotating cleaner brush. Screens that do not have an automatic adjusting rotating cleaner brush shall not be allowed.
- 2.2.1.2 The perforated filter panels shall be driven by drive sprockets secured to the main drive shaft.
- 2.2.1.3 Perforated plate screens shall be designed in accordance with the following performance and configuration requirements:

Conditions	Unit
Number of screens	Two (2)
Influent Type	Municipal Wastewater
Peak flow per screen (MGD)	3.1
Downstream Liquid Level at Peak Flow (in)	17.2
Headloss at Peak Flow @ 30% Blinding (in)	5.0
Screen Panel Perforation Diameter (mm)	6
Channel Width (ft)	2.0
Channel Depth (ft)	4.0
Screen angle from horizontal (lower section)	30 degrees
Screen angle from horizontal (upper section)	75 degrees
Screenings discharge height from top of channel (ft)	3.75
Minimum Screenings Capture Ratio (SCR)	85%

2.2.1.4 The minimum screening capture rate for 6 mm perforation must be 85% this result must be confirmed by the National screen evaluation facility at Chester Lee Street in England by TRPM and Northumbrian Water. The documented report of the test which shows the result of screenings capture rate (SCR) must be provided with submittals.

2.3 UTILITY REQUIREMENTS/ENVIRONMENTAL CONDITIONS

Conditions	Unit
Spray water flow and pressure:	16 gpm at 45 psi
Power Supply (V/P/Hz)	480/3/60
Screen Installation Location (indoor/outdoor)	Outdoor
Screen NFPA Classification Requirement	Class I, Div. 2
Control Panel Location (indoor/outdoor)	Outdoor
Control Panel NFPA Classification Requirement	Non-hazardous

2.4 MATERIALS OF CONSTRUCTION

All moving wetted parts, all wetted parts on which moving parts ride, all filter belt components under guiding, bearing, or driving loads shall be 304 stainless steel, wear resistant heat treated, high tensile, wear resistant steel, or UHMW-PE as noted below:

- 2.4.1 The frame shall be minimum 4 mm thick type 304 stainless steel.
- 2.4.2 The discharge chute, and all covers shall be type 304 stainless steel.
- 2.4.3 The screen and brush drive shafts shall be type 304 stainless steel.
- 2.4.4 The rotating deflector shall be from type 304 stainless steel.
- 2.4.5 The lower sprocket stub shafts shall be from type 316 stainless steel.
- 2.4.6 The upper and lower sprockets shall be type 304 stainless steel with only the wear area hardened.
- 2.4.7 The middle guide transitioning the filter panels from 30 degrees to 75 degrees is a non-revolving guide from UHMW-PE.

- 2.4.8 The screening elements shall be one piece curved from type 304 stainless steel and will not require upstream protection using coarse bar screens. Screens that require upstream protection shall not be permitted.
- 2.4.9 The heavy-duty roller chain will be from type 304 stainless steel with PA6 rollers.
- 2.4.10 The side and bottom seals shall be replaceable contoured UHMW-PE with 304 stainless steel fasteners.
- 2.4.11 The bottom seal between the lower end of the screen frame and the width of the filter panels shall be from Buna-N rubber and shall include a triple layer polyester brush with a 304L stainless steel adjustable holder.
- 2.4.12 The screening element support rails shall be 304 stainless steel with UHMW-PE wear surface or equivalent.
- 2.4.13 Spray bars from shall be 304 stainless steel.
- 2.4.14 All fasteners shall be 304 stainless steel.

All other appurtenances shall be of manufacturer's standard coated material.

2.5 EQUIPMENT DESIGN FEATURES

2.5.1 General

- 2.5.1.1 The screen shall be designed to provide maximum solids filtration and thus maximize capture of debris and minimize rate of head loss increase through the screen. This shall be achieved by means of one piece perforated curved filter elements. The maximum perforated opening shall be 6 mm. The screen will be operated intermittently by means of differential head measurement.
- 2.5.1.2 The screen shall be mounted by fastening to a mounting plate that spans the influent and mixed liquor channels which is then fastened to the channel walls. The screen mounting system shall be constructed of 304 stainless steel and completed as required to function in accordance with the specification. Routine service, repair or replacement of damaged parts, shall be possible with the screen in the channel.
- 2.5.1.3 Unit shall be designed so that maintenance of the drive mechanism can be accomplished at operating floor level. Screen elements shall be capable of removal at the operating level without taking the screens out of the channel or effecting the continuous or intermittent rotation of the screen.
- 2.5.1.4 The screen shall be factory assembled and tested prior to delivery and shall be delivered to the site fully assembled (other than the motor/reducer unit, discharge chute, and support legs). It shall be capable of being set in place and field erected by the contractor with minimal field assembly.
- 2.5.1.5 The influent screening system shall include a perforated plate screen and a washer/compactor system. The perforated plate screen shall be a self-

contained screening system used to capture and transport wastewater debris to the washer/compactor system.

2.5.1.6 Influent screening system shall be designed for continuous and intermittent operation. The perforated plate screens shall be installed in the channel as shown on the Contract Drawings.

2.5.1.7 All components shall be designed and constructed for all stresses that may occur during manufacturing, transportation, erection, and operation.

2.5.2 Filter Screen

2.5.2.1 The on-piece curved screening elements shall be nominal 1/8" thick and fixed by four fasteners to the heavy duty roller chain drive links which shall ride on minimum 0.2-inch thick 304 stainless steel supports located on the upstream and downstream sides of the screen. Chain shall have an minimum average ultimate design strength of 20,200 lbf (90kN). On every tenth screen panel a set of static, non-engaging 'finger' type lifters shall be attached to the lower edge of the panel, designed specifically to lift spherical and large size solids (stones, square lumber cans, bottles, rag clumps, etc.) from the bottom of the channel. Screens that use lifting ledge on top of the panel thereby preventing the removal of solids from the bottom of the channel floor will not be permitted. Screens which do not support the drive chains on the downstream side will not be approved.

2.5.2.2 A submerged stainless steel plate shall be provided at the base of the screen. The base of the screen shall be fitted with a rubber seal 10mm thick directly followed by a polyester brush along the full length of the filter panel to prevent ingress of stones and grit and to prevent solids bypass.

2.5.2.3 Two (2) upper sprockets from 3/4-inch thick type 304 stainless steel. Upper sprockets shall be split to allow removal without having to remove the drive shaft.

2.5.2.4 Two (2) revolving 3/4-inch thick lower guides. Lower revolving guide bearings shall be slide bushing from bronze with a 316 stainless steel minimum 3 inch diameter stub shaft. Complete unit sealed with stainless steel cover, O-rings and v-rings seals. Grease line from stainless steel brought to operating level. Ball or roller bearings or slide bushings made of plastic or ceramic shall not be accepted as a lower sprocket bearing.

2.5.2.5 The middle guide shall be stationary between the 30 and 75-degree transition section. The use of rotating sprockets/guides in this area shall not be allowed.

- 2.5.2.6 To prevent deflection, the one-piece filter elements shall have a minimum thickness of 1/8" (nominal) and shall be made of curved stainless steel. This is required to ensure structural integrity and smooth operation. Engaging tines, fingers or engaging elements, which can bind or jam, will not be acceptable. Filter panels that are not curved shall not be acceptable. Filter panels with a flat face inclined and a horizontal ledge shall not be allowed.
- 2.5.2.7 The screening elements are to be of the engineered curved shaped so that they can be cleaned with optimum efficiency with an automatic adjusting rotating cleaner brush. The rotation direction of the brush drive must be in the opposite direction of the chain drive.
- 2.5.2.8 The rotating cleaner brush shall be nylon and have a minimum diameter of 450 mm and be self-adjusting with no manual or motorized adjuster mechanism. The motorized cleaner brush will automatically adjust as the brush wears during use. The automatic adjustment will maintain consistent cleaning efficiency at a Screenings Capture Ratio(SCR) value of 85%. The distance between the cleaner brush and filter panels will be automatically controlled to ensure the distribution and magnitude of pressure is equal across the entire filter panel surface. Systems that use gas springs or struts to adjust brush shall not be permitted. Screens with rotating cleaner brushes requiring manual adjustment or adjustment with gas cylinders or a motor shall not be permitted.
- 2.5.2.9 The lifting fingers are located on each tenth filter plate. The lifting fingers must be located on the lower area of the filter element. Systems where these fingers are near the middle or top of the element are not permitted. They will be designed to remove spherical solids from the bottom of the channel, which may otherwise roll back off the screen face and accumulate thus creating a wear problem as the screen elements are moving thru the solids as they ascend on the upstream side of the screen.
- 2.5.2.10 The screening elements must be sealed against the chain by means of special knuckle joint side plates attached to each perforated plate filter element. Maximum gaps between the screen panels and side frame is 1 mm. These side plates must be made of stainless steel. Simple brush systems are not permitted. This is to ensure that small items are not floated past the sides of the screening elements.
- 2.5.2.11 A rotating deflector consisting of a 304 stainless steel tube roller wiper fabricated from 3.5 inches O.D. complete with 1.75 inches diameter stainless drive steel shafts at each end supported by two-hole flange bearings and auxiliary driven by screen drive unit. The roller wiper shall turn at max 20 rpm and function to seal the gap between the filter panels and discharge chute and to direct the heavier solids removed from the

screen by the revolving brush cleaner into the screenings wash press inlet hopper. The rotating deflector prevents bypassing of solids into the downstream channel. Screens supplied with a brush scraper and/or a static deflector that is not self-cleaning shall not be permitted.

2.5.3 Filter Screen Panels

- 2.5.3.1 The screen filtration belt shall be provided with one piece perforated curved elements, which limits the maximum opening in any direction to the perforated opening size detailed in Paragraph 2.2.1.3-Screen Panel Perforation Diameter. This restricted opening profile prevents long thin materials from passing through the openings. Filter panels that are not curved shall not be acceptable. Filter panels with a flat face inclined and a horizontal ledge shall not be allowed.
- 2.5.3.2 No cleaning devices which cause trash to be pushed or dropped into the interior of the filtration belt will not be allowed.
- 2.5.3.3 The individual screening elements must not exert stresses on one another and the load transmission must be exclusively via chains. Systems which involve connecting the screen elements together with other or additional attachments are therefore not permissible because of stressing. Furthermore, the elements must not be able to overlap one another, which would create spaces in which material could collect.
- 2.5.3.4 Due to the risk of high differential levels on the screen, in the event of a power failure, excess solids load condition, mechanical breakdown etc. the screen shall be designed to withstand a maximum differential head of 4.0 ft. measured from the upstream water level to the downstream water level.
- 2.5.3.5 The horizontal space between each adjoining screen panels will not exceed 1 mm +/- 10% at any point between any adjacent panels.
- 2.5.3.6 To control the buildup of biological slimes behind the screen panels, a 1-inch diameter internal spray water wash spray bar shall be provided, manufactured from stainless steel with PVDF spray nozzles. The spray bar will be attached in the internal space between the rotating screen panels and the spray water will be directed to wash each screen panel as the panel moves past the spray nozzles. The spray bar will supply approximately 9 gpm per ft. width of screen panel at a pressure of 40 - 45 psi. The spray orifices will be non-plugging and suitable for use with treated effluent water. A minimum 1" NPT connection will be located on one side of the screen frame above the operating floor level and the water supply connection will include an inline strainer, manual operated ball valve, and solenoid valve suitable for attaching to the 1" NPT connection.

Systems that require spray bars to assist with removing screenings from the filter panels shall not be allowed. The nozzle system for cleaning the belt must be located after the cleaning by the brush. Systems with a spray bar prior to the brush are not permitted.

2.5.4 Chain and Sprockets

- 2.5.4.1 The filter panel drive chains shall be equal in pitch to the upper and lower drive sprockets.
- 2.5.4.2 The chain for the perforated filter panels shall be roller type chain and be from material as per Paragraph 2.2.4.9. Chain shall have a minimum design operating force of 20,200 lb-f. Chain shall not require lubrication.
- 2.5.4.3 Each screen shall be provided with two identical drive sprockets from material as per Paragraph 2.4.6. Sprocket pitch and width shall match the roller chain. The sprockets shall be mounted on a drive shaft from material as per Paragraph 2.4.3 mounted between grease-able bearings mounted on the external side of the frame.
- 2.5.4.4 Each screen shall be provided with a middle transition guide from material as per Paragraph 2.4.7. This guide shall be located on the tension side between the 30 and 75-degree transition section.
- 2.5.4.5 Chain drive shaft bearings shall be four-hole flange mounted to a stainless steel plate. The bearings shall be grease lubricated. Chain tension adjustment is achieved via the take up screws attached to the flanged mounting plate. The take up screw shall be an acme thread type from type 18-8 stainless steel. The bearing casing shall be made of paint coated cast iron. Units using a threaded rod shall not be allowed.
- 2.5.4.6 Chain guides shall be secured to the screen frame for the full height of travel. A guide track shall also be located at the bottom of screen to allow the chain to travel from a downward to an upward direction. The chain guides shall accurately guide the chain and filter panels. The chain guide tracks shall from stainless steel.

2.5.5 Screen Drive Mechanism

- 2.5.5.1 Motor: 1.5 HP 1760 rpm TEFC (Class I, Division 2) gear-drive inverter duty motor suitable for 460/3/60 electrical supply.
- 2.5.5.2 Gear Reducer:
 - 2.5.5.2.1 Helical Worm type from SEW.
 - 2.5.5.2.2 Hollow, shaft type.
 - 2.5.5.2.3 Anti-friction bearings.

- 2.5.5.2.4 AGMA I rating.
 - 2.5.5.2.4.1 All drive components shall be designed to operate the screen continuously under a calculated load resulting from the differential water level between the upstream and downstream sides of the screen.
 - 2.5.5.2.4.2 Minimum filter panel speed shall be 13 fpm.

2.5.6 Screen Travel Speed:

- 2.5.6.1 Each screen shall have a travel speed that will quickly remove debris from the channel, and quickly return clean screen panels into the channel for further debris removal:
- 2.5.6.2 High travel speeds are critical for efficient debris removal as well as to limit the head loss across the screen since the percent blinding increases in direct proportion to the time the panel is exposed to the wastewater flow in the channel.
- 2.5.6.3 Screens shall have a VFD drive capable of continuously operating at Peak Flow throughput up to a maximum screen travel speed of 23 feet per minute (FPM).

2.5.7 Brush Drive Mechanism

- 2.5.7.1 Motor: 2.0 HP 1760 rpm TEFC (Class I, Division 2) geared motor suitable for 460/3/60 electrical supply.
- 2.5.7.2 Gear Reducer:
 - 2.5.7.2.1 Helical Worm type from SEW.
 - 2.5.7.2.2 Hollow, shaft type.
 - 2.5.7.2.3 Anti-friction bearings.
 - 2.5.7.2.4 AGMA I rating.

2.5.8 Rotating Deflector Drive Mechanism:

Auxiliary driven from Screen drive. Screens that require a third motor for the rotary deflector shall not be allowed.

2.5.9 Discharge Chute/Hood:

- 2.5.9.1 A discharge chute/hood shall be provided that fully encloses the discharge section of the screen. The upper section of the discharge chute/hood shall be hinged to allow complete access the screen cleaner brush. The hinged hood shall be secured with quick closing clamps and supplied with two (2) gas cylinders from stainless steel to aid opening and closing.

- 2.5.9.2 Discharge chute shall be from type 304 stainless steel.
- 2.5.9.3 Each screen discharge chute/hood shall direct screenings directly to the compactor or other device. Outlet shall extend down to the inlet of the compactor and shall be designed to match the screenings compactor inlet hopper with no water leaking or screenings dropping to the floor.

2.5.10 Frame Enclosures / Covers

- 2.5.10.1 The screen shall be provided with easily removable, sufficiently stiffened covers made of 18 gauge 304 stainless steel plates with edges on all sides.
- 2.5.10.2 Covers shall be provided on the upstream and downstream portion of the screen above the operating floor.
- 2.5.10.3 Covers shall be secured in place using quarter turn tool operated stainless steel cam latches.

2.6 ELECTRICAL CONTROLS AND DEVICES

- 2.6.1 Control Panel: 480-volt primary control panel shall be provided with a type 304, stainless steel, NEMA 4X enclosure. Panel shall be suitable for mounting on universal struts with the following electrical components to provide proper operation of the equipment.
 - 2.6.1.1 Main disconnect with through door interlock handle.
 - 2.6.1.2 Step down control transformer.
 - 2.6.1.3 Branch circuit protection.
 - 2.6.1.4 Screen drive motor VFD.
 - 2.6.1.5 Brush motor starter (IEC) with overloads.
 - 2.6.1.6 Emergency stop pushbutton.
 - 2.6.1.7 Hand-Off-Auto selector switches for screen and brush drive.
 - 2.6.1.8 Fast-Off-Slow switch for each screen drive motor.
 - 2.6.1.9 Open – Close – Auto switch for screen wash water solenoid valve.
 - 2.6.1.10 Hour meter for each motor.
 - 2.6.1.11 Control power on, run and fault indicating lights.
 - 2.6.1.12 Alarm reset pushbutton.
 - 2.6.1.13 Programmable relay to control screen control logic functions.
 - 2.6.1.14 Run and alarm auxiliary contacts for use by the customer.
 - 2.6.1.15 UL label.
 - 2.6.1.16 Hydraulic Power Pack Hand-Off-Auto selector switch.
 - 2.6.1.17 Screen Raise/Lower pushbutton.
 - 2.6.1.18 Low oil fault light for hydraulic power pack.
 - 2.6.1.19 High oil temperature for hydraulic power pack.
 - 2.6.1.20 Local Emergency Stop Pushbutton: A local emergency stop pushbutton station will be provided in a NEMA 4X (Class I, Division 2) enclosure for field mounting at the screen unit.

2.6.1.20 Motor Cut-out Switch: One (1) safety microswitch will be provided, suitable for the area classification and mounted to the hinged hood.

2.6.1.21 Solenoid Valve: One (1) solenoid valve shall be provided to control flow to the spray wash assembly. The brass body valve shall be 120 Volt, single phase, 60 Hz with a NEMA 4X (Class I, Division 2) housing.

2.6.2 Ultrasonic level sensor

Ultrasonic Differential Level Controller and Sensors – One (1) Pulsar Ultra-5 ultrasonic controller with one (1) upstream sensor and one (1) downstream sensor for screen start. The controller shall have 5 internal relays. Each sensor shall have a range of 1-20 ft and be supplied with a 33 ft integral cable and shall be suitable for installation in a Class I Division 1, Group D hazardous area, with stainless steel mounting bracket.

2.7 OPERATION, MONITORING, AND CONTROL

2.7.1 Screen and Brush Hand Operation: In HAND position the operator shall be able to run the screen or brush assembly by selecting the respective HOA selector switch. Turning the screen selector switch to Off will stop the unit. Screen drive motor is interlocked with the brush motor. Brush motor must be on if the screen is in operation.

2.7.2 Screen Automatic Operation: When the Screen and Brush are in AUTO position the screen shall be controlled by the water level sensors. Screen operation shall be started when the water level sensors monitor a certain water level difference, when the sensor senses high upstream water level, high differential, or when a certain time has passed since the last operation of the screen. When the upstream water level reaches its high level setting or when the high differential setpoint is reached, the Screen will run in high speed. When both the high level and high differential drop below their setpoints, the screen will decrease to low speed after the high speed off delay timer has expired. Screen operation shall be stopped with an adjustable delay time after the water difference is below a certain value and after the sensor reads the correct water level, or after a certain run time has expired (if operation was started by timer).

2.7.3 Wash water solenoid valve Operation: In HAND position the wash water solenoid valve will open. In the CLOSE position the wash water solenoid valve will close.

2.7.4 Wash Water Automatic Operation. The wash water solenoid valve will open and close via a repeat cycle timer whenever the screen is in operation.

2.7.5 Fault Conditions:

2.7.5.1 Excessive motor power will trip the starter overload relays, immediately stop the drive or brush motor, and illuminate the alarm indicating light.

This fault must be reset by depressing the associated motor starter overload reset internal to the control panel.

- 2.7.5.2 Momentary drive high torque will trip the screen motor load monitor, immediately stopping the screen drive motor, and illuminate the alarm indicating light. Pushing the reset pushbutton will reset this fault.

2.8 ANCHORAGE AND FASTENERS

- 2.8.1 Anchor Bolts: All anchor bolts shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The contractor shall furnish all anchor bolts, nuts, and washers required for installation of the equipment.

- 2.8.2 Fasteners: All fasteners shall be type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2.9 HYDRAULIC LIFT SYSTEM

2.9.1 Screen Bypass System

- 2.9.1.1 Raise screen to allow flow to bypass underneath the screen by using two (2) hydraulic cylinders.

- 2.9.1.2 Screen position monitored with two (2) proximity sensors suitable for installation in a Class 1, Division 1, Group D area.

- 2.9.1.3 Hydraulic power pack mounted to include a 5-gallon stainless steel oil reservoir, automatic directional valve, relief valve, pressure gauge, oil filter, low oil float, high oil temp switch, high pressure fittings & manifold, hydraulic hose, 5HP TEFC-XP motor suitable for 230/460 power supply.

- 2.9.1.4 Unit suitable for mounting in a Class 1, Division 1, Group D area.

2.10 SPARE PARTS

The following spare parts shall be included and supplied together with the equipment:

- a. 12 - perforated plate assemblies
- b. 4 - rotating brushes
- c. 4 - proximity switches
- d. 4 - lower bearing assemblies
- e. 2 - lifting tines

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 The installed equipment mounts shall be level both parallel and perpendicular to the channel walls, and at an equal elevation across the channel. Mounts shall be manufactured of 304 stainless steel to the design specified.

3.1.2 Contractor shall verify all dimensions in the field PRIOR to ordering equipment.

3.2 LIFTING AND MOVING EQUIPMENT

Contractor shall take all necessary precautions while lifting and moving equipment during unloading, storage, and installation to eliminate potential damage. A crane of sufficient capacity must be on site for unloading the equipment from the truck and placing in the channel for installation.

3.3 INSTALLATION

The installation is the responsibility of the Contractor. Complete installation procedures shall be provided by the manufacturer and included in the O&M manual shipped with the unit.

3.4 STARTUP/TRAINING/FIELD QUALITY CONTROL

The initial start-up of equipment will be performed by an authorized manufacturer's representative. The representative will verify the proper operation and installation and provide training to the equipment operators. Minimum of two (2) full 8-hour days on site for training.

3.5 ADJUSTING AND CLEANING

Information on minor periodic adjustments and cleaning shall be included in the O&M Manual.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 2173

SCREENINGS WASHER

PART 1 GENERAL

1.1 SCOPE OF WORK

- 1.1.1 This section includes: Requirements for furnishing four (4) screenings wash press and associated controls. Equipment shall be installed as indicated on the contract drawings and as specified herein, as recommended by the supplier and in compliance with all federal, state, and local codes and regulations.
- 1.1.2 Each screenings wash press will consist of a flange mounted gearmotor, spiral with separate thrust bearing, wash water spray system, stainless steel trough, wash zone, press zone, discharge piping, electrical controls, and all other appurtenances required or shown on the drawings.

1.2 MANUFACTURER

The screenings wash press equipment specified in this section shall be the SAVÉCO® North America, Inc. FSM Screw Wash Press Model SPW 350-1300, or the Huber WAP® Screenings Wash Press, or approved equal.

1.3 REFERENCES

The Screw Wash Press shall, as applicable meet the requirements of the following industry standards:

- 1.3.1 AISI (American Iron and Steel Institute)
- 1.3.2 ANSI (American National Standards Institute)
- 1.3.3 ABMA (American Bearing Manufacturers Association)
- 1.3.4 AGMA (American Gear Manufacturers Association)
- 1.3.5 NEMA (National Electrical Manufacturer's Association)
- 1.3.6 NFPA (National Fire Protection Association)
- 1.3.7 ASTM (American Society for Testing and Materials)
- 1.3.8 WSC (American Welding Society Code)
- 1.3.9 ASME (American Society of Mechanical Engineers)
- 1.3.10 NEC (National Electrical Code)
- 1.3.11 UL (Underwriters Laboratory Standards)

1.4 EXPERIENCE

- 1.4.1 In order to establish a quality standard for the manufacture and production of the equipment, all manufacturers shall meet the requirements listed in this section.
- 1.4.2 Manufacturers shall have a minimum twenty-five (25) years history of engineering and fabricating screenings wash presses. Documentation of a minimum ten (10) installations having been installed for a minimum of five (5) years shall be provided.
- 1.4.3 The minimum acceptable standards for the equipment shall conform to the project contract documents as outlined in the respective sections of the specifications and drawings.

1.5 SUBMITTALS

The Manufacturer shall furnish five (5) sets of bound submittals in addition to one electronic version on USB drive. The following will be submitted to the Professional to establish compliance with this specification. The submittals shall include:

- 1.5.1 Certified general arrangement drawings showing all important details including materials of construction, dimensions, loads on supporting structures, and anchor bolt locations.
- 1.5.2 A list of all deviations from drawings and specifications.
- 1.5.3 Descriptive literature, bulletins and/or catalogs of the equipment.
- 1.5.4 Complete data on motors and gear reducers.
- 1.5.5 Wiring diagrams and electrical schematics for all control equipment to be furnished.

1.6 WARRANTY

All equipment to be covered against manufacturing defects in materials and workmanship during normal use and service for a period of one (1) year from date of startup. Items specifically not covered by the warranty shall be identified by the Manufacturer.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The following manufacturers are named to establish a standard of quality necessary for the project:

- 2.1.1 SAVÉCO North America, Inc. – FSM Screw Wash Press Model SPW 350
- 2.1.2 HUBER Technology, Inc. – WAP Screenings Washer

2.2 QUALITY ASSURANCE

2.2.1 Equipment manufacturer shall be ISO 9001 certified.

2.2.2 The Screen Wash Press will be fully assembled and run tested to confirm fit and function of the wash press. A certificate of the shop run test shall be supplied with the shipping documents.

2.2.3 The Screen Wash Press will be shipped to the site fully assembled, if possible, and dependent upon the height of the wash press. Some ancillary components may be removed in order to prevent damage during shipment.

2.3 PERFORMANCE REQUIREMENTS

Conditions	Unit
Number of Wash Presses	Four (4)
Influent Type	Municipal Screenings
	Wet screenings with an approximate dry weight of not less than 8 - 10% solids.
Inlet Solids Capacity (CFH)	70
Inlet Length	700 mm (27.6 inches)
Volume Reduction	60 – 85%
Weight Reduction	60 – 85%
Discharged Material Dry Solids	>40%
Washed Screenings Fecal Reduction	90% (<20 mg/g BOD5)

2.4 UTILITY REQUIREMENTS/ENVIRONMENTAL CONDITIONS

Requirements/Locations	Unit
Spray Wash Water	11 gpm @ 20-40 psi
Motor HP	3.0
Power Supply (V/P/Hz)	480/3/60
Wash Press Installation Location (indoor/outdoor)	Outdoors
Wash Press NFPA Classification Requirement	Class I, Div. 2
Control Panel Location (indoor/outdoor)	Outdoors
Control Panel NFPA Classification Requirement	Non-hazardous

2.5 DESIGN REQUIREMENTS

2.5.1 General

2.5.1.1 The shafted screw type screenings wash press shall be a complete assembly consisting of an inlet hopper between the filter screen and wash press. The shafted screw wash press shall be designed to receive and wash screenings, then reduce the volume and water content by means of a pressing zone. The

unit's washing and compacting performance will be as documented in Paragraph 2.3. After the compacting and dewatering process, the screenings shall be conveyed through the discharge tube to the waste container.

2.5.1.2 Screenings washers that use impellers and/or grinders to tear and shred fibrous screenings at the inlet to the compactor and therefore increase the amount of inert material returned to the plant shall not be allowed.

2.5.1.3 Refer to and comply with the performance requirements list in Paragraph 2.3.

2.5.1.4 The screw wash press shall be designed and built to withstand maximum possible forces exerted. All structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screw wash press operations. All components of the screw wash press shall be made of type 304 stainless steel except the shaft screw which shall be from high strength steel with Hardox™ 400 flights throughout. Bearings, electrical devices, sprockets, motor and gear reducer shall be of the manufacturer's standard materials.

2.5.1.5 Shop Surface Preparation/Coating: All weldments shall be cleaned and passivated using a full dip passivation process to remove weld spatter, slag and discoloration. Bearings, electrical devices, drive and wiper chains and sprockets, motor and gear reducer shall be provided with the manufacturer's standard coating system. Screen weldments not full dipped passivated, using spray on cleaning solutions, passivating welds only or bead blasting shall not be allowed.

2.5.1.6 The screw wash press shall discharge dewatered screenings capable of passing the EPA Paint Filter Test as described in method 9095 of the EPA publication SW-486.

2.5.2 Screw Housing

2.5.2.1 The screw housing shall be constructed from 8mm (0.31 inch) thick type 304 stainless steel. The screw housing shall have support beams with U-profile, thickness of 5mm on each side. The screw housing shall be designed to support all required loads.

2.5.2.2 The interior of the screw housing shall incorporate with minimum of six (6) anti-rotation wear bars each fabricated from high strength alloy steel and plated with hard-faced material with minimum Brinell Hardness of 400.

2.5.2.3 The bottom of the housing shall be provided with perforated drainage sections. Perforations shall be countersunk with maximum 6 mm in diameter. Units supplied with slotted or wedgewire drainage or compaction

sections shall not be allowed. Perforations not countersunk shall not be allowed.

2.5.2.4 An inlet area length as specified in Paragraph 2.3, will receive incoming materials. A hopper constructed from type 304 stainless steel shall be provided by the manufacturer to direct solids to the inlet area of the screenings washer.

2.5.3 Shafted Screw

2.5.3.1 The screw will be constructed of high strength low alloy carbon steel and Hardox® 400 flights (minimum 400 Brinell), prime coated for protection during shipment. Screw OD shall be 350 mm (13.8 inches) with 12 mm (0.47 inch) thick flights welded to a minimum 114 mm (4.5 inch) diameter shaft. The final flight of the screw shall be supplied dual thickness 24 mm (0.94 inch) for increased wear life. Screws that do not have the final flight from dual thickness (24 mm) and all flights from Hardox® 400 will not be allowed.

2.5.3.2 A replaceable nylon brush reinforced with a stainless steel backer shall be attached to the screw flights in the drainage area with stainless steel clips and hardware. To reduce wear on the brush the design shall be such that the screw shall not be allowed to rest in the press housing. The screw shall be fully supported and cantilevered off the thrust bearing.

2.5.4 Thrust Bearing

2.5.4.1 An independent thrust bearing housing shall be flange mounted to the drive and flange mounted to the press body. The independent thrust bearing assembly shall be protected from the environment and located in a separately sealed area located inside the press body. The flange portion of the thrust bearing shall have a grease fitting centrally located for ease of maintenance.

2.5.4.2 The thrust bearing shall fully support the screw and handle the load created during compaction and reversal of the screw. The thrust bearing shall utilize a dual bearing assembly; a SKF tapered roller bearing and a SKF thrust bearing complete with double lip grease seals and O-rings. The mounting flange shall have an O-ring seal mounted in a machined groove to seal the housing against the press body. Designs that utilize the thrust bearing inside the gear reducer housing will not be acceptable.

2.5.5 Drain Pan

2.5.5.1 A drain pan shall be mounted to the bottom of the screw housing along the full length of the housing. The pan shall be sloped to the drain and it shall

be provided with a flushing water connection. Drain connection shall be minimum 6 inch plain ended pipe. Flush connection shall be minimum 1 inch NPT connection.

2.5.5.2 The pan shall be secured in place with hardware and allow for easy removal. Drain pan shall be constructed of minimum 14-gauge 304 stainless steel.

2.5.6 Wash Water Manifold

2.5.6.1 The screenings washer shall be provided with a minimum of two (2) separate connections for injecting wash water into the screenings.

2.5.6.2 Wash water spray nozzles shall be capable of utilizing the screened plant effluent without clogging or fouling.

2.5.6.3 The wash zone shall include a spray wash system to wash organic residue from the screenings. The wash zone spray will consist of one (1) spray header with two (2) wash water injection points at 3 o'clock and 9 o'clock, two (2) brass spray nozzles, two (2) PRV's, one (1) ball valve and one (1) solenoid valve. The system will have an output of 11 gpm at 20-40 psi. The spray connection will be 1 inch NPT.

2.5.7 Inlet Hopper

2.5.7.1 The inlet hopper shall be designed to accept discharge screenings from the filter screen discharge chute. The hopper shall directly interface with the filter screen discharge with no solids or water bypass.

2.5.7.2 The inlet hopper shall be fabricated from minimum 12-gauge type 304 stainless steel.

2.5.8 Discharge Pipe

2.5.8.1 The discharge pipe shall be flanged and mounted to the press body by a minimum 12.5 inch diameter flange.

2.5.8.2 The discharge pipe shall be designed to transport the washed, dewatered, and compacted screenings to the discharge point without plugging.

2.5.8.3 The diameter of the discharge pipe shall increase in size to ease the transportation of the screenings.

2.5.8.4 For increased washing and compaction performance the discharge pipe will include a manually controlled back pressure device. The back pressure is manually generated by a stainless steel plate positioned by operating personnel. Access to the back pressure device is through a stainless steel

access box fitted with a bolt in place hatch with handle. The access box is integral to the discharge pipe. Material of construction 304 stainless steel.

2.5.8.5 The discharge pipe elbow shall be fabricated from minimum 11-gauge type 304 stainless steel.

2.5.8.6 The discharge piping following the elbow shall be fabricated from minimum 12-gauge type 304 stainless steel.

2.5.9 Drive Assembly

2.5.9.1 The gear reducer shall be a flanged mounted directly to the thrust bearing housing and the compactor frame. Gear reducer shall be a helical gear type with hollow input shaft. The unit will be provided with a cast iron frame and be designed in accordance with AGMA recommendations for Class I service based on the horsepower required to operate the wash press. Units that do not bolt the gear reducer directly to the unit's frame will not be allowed.

2.5.9.2 The motor shall be TEFC (Class I, Division 2), 3.0 HP, 460 Volt, 3 phase, 60 Hz. The motor shall be NEMA design code B and be direct coupled to the reducer.

2.5.9.3 Chain drives, belt drives, and hydraulic drives will not be accepted.

2.6 ELECTRICAL CONTROLS AND DEVICES

2.6.1 In addition to the drive motor, the equipment supplier shall furnish all electrical items specifically called for in this specification section. The contractor shall supply all other electrical items, and interconnecting wiring of proper size, including all conduit and supports required to place the equipment into service.

2.6.1.1 The following components will be included in the associated screen panel to provide proper operation of the equipment:

2.6.1.1.1 Branch circuit protection.

2.6.1.1.2 Compactor motor starter (IEC) with overloads.

2.6.1.1.3 Hand-Off-Auto selector switches for the screw drive, and screenings spray wash water.

2.6.1.1.4 Motor load monitor for overload and over torque protection.

2.6.1.1.5 Hour meter for motor.

2.6.1.1.6 Run and fault indicating lights.

2.6.1.1.7 Run and alarm auxiliary contacts for use by the customer.

2.6.1.1.8 SCADA control terminal.

2.6.2 Solenoid Valve: One (1) solenoid valve shall be provided to control flow to the spray wash assembly. The brass body valve shall be 120 Volt, single phase, 60 Hz with a NEMA 4X (Class I, Division 2) housing.

2.7 OPERATION, MONITORING, AND CONTROL

2.7.1 Sequence of Operation

2.7.1.1 HAND OPERATION: When HAND mode is selected, the spiral will run continuously. When spray wash HAND mode is selected, the spray wash will run continuously.

2.7.1.2 INTERMITTENT AUTOMATIC OPERATION: The control panel will be equipped to control the wash cycle and screw movement. The wash cycle and the screw movement will be controlled independently through the use of timers and counters. The drive motor and spray wash will be controlled automatically when the selector switches are placed in the Auto position.

2.7.1.2.1 The press motor starts after an adjustable accumulated run time from the interlocked feeding equipment.

2.7.1.2.2 The wash water solenoid is open whenever the screw is in operation.

2.7.1.2.3 The washing solenoid closes and the press motor runs for an adjustable length of time, typically set at 30 seconds, to dewater and discharge the screenings.

2.7.1.3 EMERGENCY STOP: The unit can be deactivated at any time by pressing either the control panel mounted or unit mounted Emergency Stop push buttons.

2.7.1.4 FAULT CONDITIONS: Motor overload, high motor torque, or high motor current conditions will stop the motor and illuminate the fault light.

2.8 ANCHORAGE AND FASTENERS

2.8.1 Anchor Bolts: All anchor bolts shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment.

2.8.2 Fasteners: All fasteners shall be type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2.9 SPARE PARTS

Contractor shall supply the following spare parts for the washer compactor at the time of project acceptance by the OWNER:

16-replacement nylon brush assemblies

16-thrust bearings
48-spray nozzles
Any other spare parts as recommended by the manufacturer for units utilized in similar applications.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 The mounting points TOC shall be level and parallel and of proper size.

3.1.2 Contractor shall verify all dimension in the field to ensure compliance of equipment dimensions with the drawings.

3.2 INSTALLATION

The installation is the responsibility of the Contractor. Complete installation procedures are included in the O&M manual shipped with the unit.

3.3 START UP/TRAINING/FIELD QUALITY CONTROL

The initial start-up of equipment will be performed by manufacturers authorized representative. The representative will verify the proper operation and installation and provide training to the equipment operators which shall be included with the screen start-up and training.

3.01 ADJUSTING AND CLEANING

Information on minor periodic adjustments and cleaning is contained in the Operating and Maintenance Manual.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 3072

ROTARY POSITIVE DISPLACEMENT BLOWERS

PART 1 GENERAL

1.1 SCOPE OF WORK

- 1.1.1 Furnish all labor, materials, equipment, and incidentals required and install complete, ready for operation and field-test THREE (3) new rotary positive displacement blowers and appurtenances, as shown on the Drawings and as specified herein.
- 1.1.2 The entire blower package and its components shall comply with all applicable safety and environmental regulations.

1.2 RELATED WORK

- 1.2.1 Valves, except as otherwise specified herein, are included in Division 33.
- 1.2.2 Instrumentation work, except as otherwise specified herein, is included in Division 26.
- 1.2.3 Electrical work, except as otherwise specified herein, is included in Division 26.

1.3 SUBMITTALS

- 1.3.1 Submit in accordance with the General Conditions, copies of all materials required to establish compliance with this Section. Submittals shall include at least the following information:
 - 1.3.1.1 Certified general arrangement drawings showing materials, details of construction, dimensions, and connections.
 - 1.3.1.2 Complete Blower Performance Data including:
 - a. RPM
 - b. Capacity – scfm and icfm
 - c. Discharge pressure
 - d. dB(A) noise pressure level
 - e. Maximum gear tip speed and rotor tip speed (fpm)
 - f. HP required at rated capacity and pressure
 - g. Rated maximum pressure rise of blowers
 - 1.3.1.3 List of recommended spare parts broken down into on hand parts and long term for 2 years operation and 3 to 5 years operation.
 - 1.3.1.4 Descriptive Brochures
 - 1.3.1.5 Performance Curves
 - 1.3.1.6 Motor Data
 - 1.3.1.7 Valves

- 1.3.1.8 ISO-1217 Performance Test Results
- 1.3.1.9 Declaration of Conformity, per Machinery Directive 2006/42/EC, Annex II, No.1 A.
- 1.3.2 Complete blower package operating and maintenance instructions professionally published, hard copy and electronic copy, shall be furnished for all equipment included under these specifications in accordance with the General Conditions.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

- 1.4.1.1 Package shall be Aerzen Generation 5 Delta Blower Model GM 50L or approved equal.
- 1.4.1.2 The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings.
- 1.4.1.3 The blower(s) shall be covered by a warranty for 24 months from date of commissioning, or a maximum of 30 months from date of shipment.
- 1.4.1.4 The performance data and manufacturing methods shall achieve a Declaration of Conformity, per Machinery Directive 2006/42/EC, Annex II, No.1 A.

1.5 BLOWER PERFORMANCE CRITERIA

- 1.5.1 Quantity of Machines 3
- 1.5.2 Design Inlet Temperature 100 °F
- 1.5.3 Site Elevation 450 feet above sea level
- 1.5.4 Design Inlet Pressure 14.46 psia
- 1.5.5 Design Relative Humidity (%) 80 %
- 1.5.6 Design Flow 1,279 / 1,443 scfm/icfm per machine
- 1.5.7 Design Discharge Pressure 5.2 psig
- 1.5.8 Maximum Blower Speed 2,850 RPM @ 75% of maximum
- 1.5.9 Brake Horsepower (Max) 44.4 bHp
- 1.5.10 Motor Size (Max) 60 Hp
- 1.5.11 Free Field Noise Guarantee 73 dB(A) at 1 meter (at design point)
 - (1) Package BHP to include pressure loss through a clean inlet filter / silencer, pressure loss of the exhaust silencer and check valve.
 - (2) Package Performance shall be guaranteed to ISO 1217 with a tolerance is +/- 5% on volume flow and +/- 5% on package horsepower.
 - (3) Sound data shall be from an ISO 2151 method of measurement, in an ISO 3745 qualified test facility. Sound data shall be compliant with a Declaration of Conformity assessment standard.

1.6 DELIVERY, STORAGE AND HANDLING

- 1.6.1 All equipment shall be completely factory assembled, skid mounted, crated, and delivered to protect against damage during shipment.

- 1.6.2 All exposed flanges shall be covered and sealed with shrink-wrap to prevent the entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- 1.6.3 All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

1.7 MAINTENANCE

1.7.1 Spare Parts

1.7.1.1 Furnish the following spare parts for each blower package specified:

- a. Complete set of matched V-belts
- b. One filter element

1.7.1.2 Spare parts shall be properly bound and labeled for easy identification without opening the packaging.

PART 2 PRODUCTS

2.1 GENERAL

2.1.1 Blower packages shall be designed to minimize the life-cycle costs and maximize plant reliability. The design and the selection of the components shall be based on a minimum useful life of 15 years and a Mean Time Between Overhauls of 5 years of continuous operation.

2.1.2 No special foundations shall be required. The blower packages will be installed directly on a concrete slab without grouting the base frame. There shall only be 4 easily accessible anchor points.

2.1.3 Blower Casing:

2.1.3.1 The blower casing shall be of one-piece construction, with separate side plates that are bolted and pinned to the housing.

2.1.3.2 Materials shall be close-grained cast iron ASTM A48 suitably ribbed to prevent distortion under the specified operating conditions.

2.1.3.3 Minimum blower casing pressure rating shall be 36 psig.

2.1.3.4 Inlet and outlet shall be flanged connections.

2.1.3.5 The casing shall incorporate a proven means of pulsation cancellation.

2.1.3.6 The vibration level as measured at the blower casing, in the X/Y planes of the bearings, shall not exceed ½ "/ sec RMS when operating at the specified maximum operating pressure and speed in the actual blower package.

2.1.4 Factory Testing:

- 2.1.4.1 Each blower stage shall be factory tested in accordance with ISO 1217 performance test to verify flow and brake horsepower at blower maximum conditions. A slip test shall not be acceptable.
 - 2.1.4.2 The acceptance criteria are +5% tolerance on power and –5% tolerance on flow regardless of the size of the machine.
- 2.1.5 Rotors:
 - 2.1.5.1 Each rotor shall be of the “stiff” design with first lateral critical speed at least 120% of the maximum allowable operating speed.
 - 2.1.5.2 The rotors shall be of the straight, three-lobe type, and shall operate without rubbing or liquid seals or lubrication.
 - 2.1.5.3 Rotor/shaft shall be drop forged in one single piece of AISI 1043 or equivalent. Cast, hollow rotors shall be capped, dust tight. Open rotors are not acceptable.
 - 2.1.5.4 The rotors shall be statically and dynamically balanced per ISO1940/ANSI S2.19 G6.3.
- 2.1.6 Bearings:
 - 2.1.6.1 Each rotor/shaft shall be supported by anti-friction bearings, and fixed to control the axial location of the rotor/shaft in the unit.
 - 2.1.6.2 Regardless of theoretical bearing life calculations, the bearings shall be sized for a minimum expected life of 5 years between overhauls.
- 2.1.7 Timing Gears:
 - 2.1.7.1 The rotors shall be timed by a pair of single helical AGMA 12 quality gears with hardened and ground teeth; minimum AGMA service factor of 1.70.
 - 2.1.7.2 Gears shall be mounted on the shafts with a tapered interference fit, and secured by a locknut.
- 2.1.8 Seals:
 - 2.1.8.1 Seal shall be designed to prevent lubricant from leaking into the air stream as well as to prevent oil from leaking out of the machine.
 - 2.1.8.2 Four rotary piston ring shaft seals, an oil slinger and an O-ring seal shall be provided at the point where the shaft passes through the side plates.
 - 2.1.8.3 Further provision shall be made to vent the rotor side of the oil seal to atmosphere to eliminate any possible carry-over of lubricant into the air stream.
- 2.1.9 Lubrication:

2.1.9.1 The timing gears and the bearings shall be splash lubricated. Grease lubrication shall be not acceptable.

2.1.10 Oil Sight Glass:

2.1.10.1 A recessed oil sight glass must be provided on each oil sump.

2.1.10.2 Protruding sight glasses shall not be acceptable.

2.1.11 Painting:

2.1.11.1 Painting shall be per supplier's standard meeting the following criteria:

- a. Except for machined sealing and machined mounting surfaces, the package shall be painted dark blue.
- b. Aluminum, stainless steel, and brass shall not be painted.
- c. The supplied motor shall not be over sprayed and will be supplied with the motor manufacturer's standard protection and paint color.
- d. Painted Cast Iron and Carbon Steel shall be Alkyd Resin Primer and Final coat with a total dry film thickness of 70µm. Surface preparation SSPC10 or better.
- e. Sound enclosure shall be powder-coated polyester base total dry film thickness 80µm.
- f. Galvanized components shall only be painted with appropriate surface preparation

2.2 BLOWER ACCESSORIES

2.2.1 Inlet Filter / Silencer:

2.2.1.1 Each package shall be supplied with one combination inlet filter silencer.

2.2.1.2 The inlet filter silencer shall be mounted directly to the inlet flange of the blower.

2.2.1.3 The filter media efficiency must meet the requirements of ASHRAE 52.2 MERV7 50-70% @3-10 microns corresponding to EN779 G4.

2.2.1.4 The silencer portion shall be located upstream of the inlet filter.

2.2.1.5 Filter and silencer performance losses shall be included in the blower performance calculation.

2.2.2 Base Frame / Discharge Silencer:

2.2.2.1 Each package shall be supplied with one combination base frame / discharge silencer.

- 2.2.2.2 The silencer shall be a chamber type design for maximum sound attenuation and shall not use fibrous or absorption materials of any kind.
- 2.2.2.3 The silencer shall be fabricated of a single shell of pressure vessel quality steel with continuous welds.
- 2.2.2.4 The silencer shall be subject to a pressure test for tightness and strength at a minimum of 1.65 times the maximum blower operating pressure.
- 2.2.2.5 The silencer shall have a machined inlet connection where the discharge flange of the blower stage bolts directly to, with no intermediary pieces.
- 2.2.2.6 Discharge silencer performance losses shall be included by the blower vendor in the blower performance calculation.
- 2.2.2.7 The base frame shall be constructed from welded carbon steel or cast iron that shall be designed to maintain alignment of the blower internal components and the drive during operation.
- 2.2.2.8 The base frame shall be designed to resist distortion while being installed on vibration isolating mounts.
- 2.2.2.9 The blower manufacturer shall supply a stainless-steel grounding lug fully welded to the base.

2.2.3 Flexible Connectors:

- 2.2.3.1 Each package shall be connected to the plant piping via flexible connector(s) located downstream of the discharge silencer.
- 2.2.3.2 Flexible connectors shall prevent the transmission of noise and vibrations from the blower package into the piping.
- 2.2.3.3 Flexible discharge connectors shall be Proco Style 240, Type EE, EPDM, with a standard ANSI flange discharge connection, rated for 300 °F at 20 psig.

2.2.4 Electric Motor:

- 2.2.4.1 Each package shall be supplied with a WEG manufactured TEFC motor that shall operate on 460 Volts, 3 Phase, 60 Hertz current, 1,800 RPM.
 - a. Torque NEMA B
 - b. Temperature Rise Class B
 - c. Dust tight enclosures (Severe Duty)
 - d. Class F inverter rated insulation with Class H applied varnish
 - e. 3:1 constant torque
 - f. All cast iron construction, including frame, end bells, conduit box and fan cover
 - g. NPT threaded and gasketed F3 top mounted conduit box
 - h. Copper windings

- i. Regreasable bearings, positive pressure lubrication system with automatic drawn plugs – pressure compensated (Frame sizes 254T and larger).
- 2.2.4.2 All frame sizes shall be NEMA standard, suitable for overhung belt drive and with the conduit box location on top of the motor. IEC frame motors shall not be allowed.
- 2.2.4.3 The motor shall be mounted on a pivoting base to provide automatic tensioning of the belts.
- 2.2.4.4 The motor nominal rating after any corrections for ambient conditions shall be 10% above the maximum operating bHp.
- 2.2.4.5 The motor shall have a 1.15 service factor.
- 2.2.4.6 Motor windings shall be supplied with a normally closed thermostat, one per phase, wired in series to form a fail-safe motor protection circuit for the external fault circuit of the motor controller.
- 2.2.4.7 Blower manufacturer shall be responsible for coordinating the starting torque requirement of the blower and the motor.
- 2.2.5 Start Unloading Valve:
 - 2.2.5.1 The blower package shall include an unloaded start valve that is mounted between the blower and the discharge check valve.
 - 2.2.5.2 Unloading valve shall be an automatic type mechanically operated valve requiring no electrical connections mounted upstream of the check valve.
- 2.2.6 V-Belt Drive:
 - 2.2.6.1 Each package shall be supplied with a V-belt drive that shall be of the high capacity type, oil and heat resistant. Drive shall be designed for a minimum service factor of 1.4 times operating power (bHp), or 1.1 times the motor nameplate Hp, whichever is larger to allow a minimum of 1.4-service factor based on the maximum blower bHp.
 - 2.2.6.2 Belt tensioning shall be automatic without the use of any devices or interaction on the part of the operator. Neither slide rails nor load-adjusting springs shall be used.
 - 2.2.6.3 Sheaves shall be dynamically balanced regardless of the operating speed.
- 2.2.7 Belt Guard:
 - 2.2.7.1 The belt drive shall be guarded in compliance with OSHA regulations.
 - 2.2.7.2 Portions of the guard shall be easily removable allowing for belt inspection and replacement.
 - 2.2.7.3 Guard material shall be perforated carbon steel.

2.2.8 Vibration Isolators:

- 2.2.8.1 Each package shall be supplied with vibration isolating feet with a minimum efficiency of 80%.
- 2.2.8.2 Blower manufacture shall be responsible for attenuating noise and vibration in the blower package such that no special installation base shall be required, nor shall any additional measures be required to reduce vibrations from the blower package being transmitted to the base or the piping.

2.2.9 Pressure Safety Valve:

- 2.2.9.1 Each package shall be supplied with a single pressure safety valve on the discharge side of the blower mounted downstream of the discharge silencer and upstream of the check valve.
- 2.2.9.2 The safety valve shall be set to protect the blower from exceeding its maximum pressure rating, and shall be sized to pass 100% of the design flow.
- 2.2.9.3 The safety valve shall be field adjustable, spring loaded, and have a certificate of conformity to PED.
- 2.2.9.4 The pressure relief valve shall be housed by the sound enclosure and shall relieve into a segmented section of the sound enclosure.
- 2.2.9.5 The valve shall be manufactured by Aerzen or approved equal.

2.2.10 Check Valve:

- 2.2.10.1 Each package shall be supplied with one check valve that shall be installed on the discharge line.
- 2.2.10.2 The check valve shall be of the full-bore low pressure-drop, flapper type design with a steel body, and steel flap embedded in EPDM with full-contact seal.
- 2.2.10.3 The valve shall be removable without disturbing the piping. Pressure losses produced by the check valve shall be included in the blower performance calculation.
- 2.2.10.4 The valve shall be manufactured by Aerzen or approved equal.

2.2.11 Instrumentation:

- 2.2.11.1 Each package shall be supplied with the following instrumentation:
 - a. Inlet Vacuum Gauge
 - 1. Dwyer model 2040 with 4" dial and scale from 0 to -40 inches of water column or approved equal.
 - 2. Gauge to function as a filter maintenance indicator.

b. Discharge Pressure Gauge

1. Aerzen model 32-0053-02 with 4" dial and scale from 0 to 20 psig or approved equal.
2. The pressure gauge shall have a stainless-steel case and be glycerin-filled for pulsation dampening.
3. A pulsation snubber shall be provided.

c. Discharge Temperature Gauge / Switch

1. Jumo type 8523-20-10 with 4" dial and scale from 32°F to 572°F or approved equal
2. NEMA 4 enclosure, 5A @ 250volt, SA 28 SPDT microswitch
3. UL & CSA approved.

2.2.12 Each blower shall receive its initial oil filling at the factory. Oil to be fully synthetic Aerzen Delta Lube for oil changes every 2 years or 16,000 hours.

2.2.13 Acoustical Sound Enclosure:

2.2.13.1 Each package shall be supplied with a sound enclosure covering the entire blower package.

2.2.13.2 The enclosure shall provide suitable protection for outdoor installation under the specified site conditions (wind load and snow load).

2.2.13.3 The enclosure shall be designed so as to be able to install them side-by-side with all maintenance done from the front or back of the package.

2.2.13.4 Details shall be as follows:

- a. Panels shall be made of galvanized steel sheet, powder coated in a light reflecting, blue color per RAL 5001. The skid shall be of the same color.
- b. Sound enclosure acoustic material shall comply with UL 94 - HF1 for fire-retardant, self-extinguishing, non-dripping materials.
- c. The enclosure and the blower package shall both be mounted on a skid / oil-drip pan designed for meeting environment protection standards and for easy transportation and installation.
- d. A grounding strap shall be installed between the blower base and the package skid to bypass any vibration isolating mounts.
- e. Quick release panels, each less than 50 lb. (as mandated by MSHA) must provide easy and quick access for routine maintenance of the blower and the package components.
- f. Enclosure Cooling Fan:

1. A high efficiency blower shaft driven ventilation fan shall provide ventilation and cooling integral to the sound enclosure.
 2. Cooling fan shall be sized for sufficient heat removal from the sound enclosure, even when the blower is operated with a VFD.
- g. Electrical components, instrumentation and instrument connections shall not be mounted or interface with moving panels of the sound enclosure.
 - h. Both blower oil sumps shall be piped to a common fill and drain, located at the front of the package for easy maintenance. An oil level indicator shall be mounted on the outside of the enclosure, which gives an accurate oil level indication while the blower is in operation. All oil lines to be hydraulic hose with fittings. No plastic tubing with compression fittings are allowed.

PART 3 EXECUTION

3.1 INSTALLATION

- 3.1.1 The Contractor shall install the blowers in accordance with the Manufacturer's written instructions.
- 3.1.2 The Contractor shall make all electrical and process connections to the blower package prior to the arrival of the manufacturer's representative.
- 3.1.3 The Contractor shall complete and return the Manufacturer's installation check list prior to having a Manufacturer's representative come onsite.
- 3.1.4 Representatives of the blower manufacturer shall verify and adjust blower and motor alignment.

3.2 FIELD TESTING

- 3.2.1 After installation of all equipment has been completed and as soon as conditions permit, the manufacturer shall provide ONE (1) trip for TWO (2) 8 hour days on site to verify the installation and conduct an acceptance test under actual operating conditions.
 - 3.2.1.1 The Manufacturer shall perform a physical check of the blower installation, perform safety checks, power up the equipment and perform functional testing.
 - 3.2.1.2 The functional test shall consist of 4 hours of operation of each blower with vibration, temperature, and pressure readings as well as motor amp readings taken and recorded at 60-minute intervals.

3.2.1.3 The Manufacturer shall provide operations and maintenance training to the plant personnel. The training shall consist of 1 hour of classroom training using the Operation and Maintenance Manual for reference and 2 hours of hands-on training at the blower package.

3.2.2 Manufacturer shall provide a written field test / start up report after completion of testing.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 3600

DRY CHEMICAL FEEDER

PART 1 GENERAL

1.1. DESCRIPTION

1.1.1. The dry chemical feeder shall be a volumetric screw type feeder, capable of feeding 0.6 cubic feet/hour of Soda Ash. It shall be a Series 32-055 feeder as manufactured by Cleanwater1, Inc. or approved equal.

1.1.2. Equipment included with the dry chemical feeder shall include:

- A. Feeder Mounting Stand
- B. Solution Tank
- C. Mixer
- D. Storage Hoppering

PART 2 PRODUCT

2.1. FEEDER

2.1.1 The dry chemical feeder shall be designed with an inlet hopper assembly, feed screw, gearbox and DC motor mounted on a rectangular fiberglass base. Operating range shall be 20:1 provided by the variable speed drive. This shall be extendable to 60:1 by changing belt position on the 3:1 ratio, 4-step drive pulley. Accuracies of 2% of full scale can be achieved when a uniform, free flowing chemical is being fed.

A. The inlet hopper shall have a minimum capacity of 1.6 cu. ft. and shall be constructed of stainless steel.

- 1. Vibrating plates in the hopper walls shall be provided for constant agitation of the dry chemical to prevent arching and packing of the chemical through the hopper. These agitation plates shall be driven from an eccentric on the feed screw shaft, which drives a rocker arm that is connected to the vibrating plates in the hopper walls. The plates shall be sealed behind Buna-N covers. The agitator drive shall be easily disconnected by the user.

2. There shall be a low level switch mounted in the inlet hopper providing a dry contact for actuating the customer's low chemical alarm.
- B. The feed screw, discharge spout and hopper bottom trough shall be 304 stainless steel construction. The feed screw shall be 3/4".
- C. The feed screw shall be driven by a 1/6 Hp, 90 VDC, TENV permanent magnet motor with SCR drive.
 1. The motor shall be supplied with a 4-step pulley for adjustment of feed screw speed and capacity.
 2. The drive mechanism shall be enclosed to comply with OSHA safety requirements for rotating machinery (OSHA section 1910.212 and .219 Machine Guarding).
 3. The DC drive motor shall drive a helical feed screw via a worm and worm wheel speed reduction in a gearbox. The gearbox shall be supplied with a slip clutch to protect the motor.
 4. The feeder controls are mounted in a NEMA 12 enclosure on the feeder assembly. Power requirements are 4 amps at 115 VAC. Feeder operation shall be automatic mA. The control panel will include the SCR drive, power on/off and feeder remote/local/stop and auto/man control switches as well as a feed rate control pot, dosage control pot and feed rate indicator.

2.2 FEEDER MOUNTING STAND

- 2.2.1 The feeder shall be supplied with a stand designed to support the full weight of feeder and product in the hoppering.
 - A. This feeder stand shall be designed to conveniently mount the dry feeder.
 - B. This stand shall be a UGSI, Chemical Feed, Inc. 1,000 lb. capacity feeder stand.

2.3 SOLUTION TANK

- 2.3.1 A 35-gallon solution tank shall be provided. The tank shall be constructed of 316 stainless steel. The tank shall be mounted alongside the feeder stand. The tank shall include a gravity discharge adapter, jet agitator, feeder downspout, dust arrestor, overflow and drain connections.
- 2.3.2 A mechanical mixer shall be provided with stainless steel shaft and propeller, a ¼ HP, (115/230 V, 1 Ph, 60 Hz), TENV motor.

2.4 HOPPERS 1000 LB. FEEDER STAND SUPPORTED

- 2.4.1 A 24" square converging hopper shall be provided with 4.5 cubic foot storage capacity. Hopper shall be constructed of #16 gauge steel.
- 2.4.2 An adapter plate shall be provided for mounting a bag loader. The adapter plate shall be constructed of #12 gauge steel.
- 2.4.3 A bag-loading hopper shall be provided for mounting over the converging hopper. It will be suitable for handling one 30" bag and will include a bag spear and a removable screen. Hopper shall be constructed of #16 gauge steel.

PART 3 EXECUTION

3.1 INSTALLATION

- 3.1.1. The equipment shall be installed per the contract documents and manufacturer's recommendations.

3.2 WARRANTY

- 3.2.1. The equipment/system warranty, unless otherwise stated, shall be one year as required by the Contract.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 5300

BIOLOGICAL TREATMENT SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- 1.1.1 The treatment process selected for this project is the Long Sludge Age, Activated Sludge Process. The system shall consist of one (1) basin, as shown on the project drawings. Equipment furnished under this section shall include the in-basin aeration system, aeration valves (listed in this section), aeration blowers, integral clarifiers, waste sludge valve and control panel as specified in this section to provide a completely functional system. To ensure the integrity of the system, all the components listed above must be supplied and guaranteed by the same system manufacturer.

1.2 BASIS OF DESIGN

- 1.2.1. The plans and specifications are based on the Biolac System as manufactured by Parkson Corporation, Fort Lauderdale, FL. This system has been selected by the PROFESSIONAL to best meet the requirements of this project. Other manufacturers desiring to submit a bid must complete the prequalification requirements as outlined in Section 1.4. All cost for redesign of structural, electrical, and mechanical components for alternate systems shall be paid by the alternate supplier, including costs for review and approval by the local approving agency(ies). This specification shall serve as the standard by which any alternative system shall be reviewed. Alternate suppliers must meet submittal and construction schedules as outlined in the Contract.
- 1.2.2. The Biolac System is the base bid system. The decision of the PROFESSIONAL with respect to approval of any proposed alternate systems is final.
- 1.2.3. The valves, equipment, materials of construction, and controls specified under this section supersede any other specifications located elsewhere in the contract documents.

1.3 PERFORMANCE

1.3.1. Mechanical Guarantee

- 1.3.1.1 All equipment manufactured by the supplier shall be guaranteed to be free from defective material and workmanship, under normal use and service, for a period of twelve (12) months from the date of substantial

completion.

1.3.2. Experience

- 1.3.2.1 The minimum acceptable experience level is five (5) installations in the US provided by the supplier, using a long sludge age, single basin total nitrogen removal process with moving aeration chain and integral clarifier equipment, similar to that specified for this project, that have been operating for a minimum of five (5) years.

1.3.3. Process Performance Guarantee and Bond

- 1.3.3.1 The treatment system supplier shall provide a written process performance guarantee (PPG), guaranteeing the final effluent quality in accordance with this specification section. The PPG shall be supplied as part of the equipment submittal.
- 1.3.3.2 The PPG shall guarantee effluent requirements as listed in this specification and shall remain in effect for a period of one year from substantial completion.

1.4 PRE-QUALIFICATION SUBMITTALS

- 1.4.1. To be considered as an approved alternate supplier, equipment manufacturers (other than those listed) must submit a pre-qualification submittal for review by the PROFESSIONAL no later than fourteen (14) calendar days prior to the bid date. Pre-qualification packages received after this submittal deadline will not be considered. The pre-qualification submittal shall demonstrate the alternate supplier's ability to meet the project plans and specifications including the experience and process performance requirements. The pre-qualification submittal shall include the following information:

- 1.4.1.1 Design calculations showing SRT, HRT, MLSS, sludge yields, F:M, nitrification rates, AOR, SOR, blower sizing calculations, and WAS rates.
- 1.4.1.2 Certified, full-scale field mixing test report that demonstrates the aeration systems ability to completely mix activated sludge (2000-5000 mg/l) in sloped wall basins using an air rate of less than 4 SCFM/1000ft³ basin volume.
- 1.4.1.3 Clarifier hydraulic calculations demonstrating that the proposed clarifier, sludge return system and overflow weir design meets the specified project requirements at minimum, average, and peak day design flows.

- 1.4.1.4 Detailed P&ID and PFD including all equipment included in the scope of supply specified in this spec section.
- 1.4.1.5 Detailed process control description explaining how the system will be controlled to meet the specified effluent requirement.
- 1.4.1.6 Detailed specifications describing the equipment proposed.
- 1.4.1.7 Detailed description of how the proposed aeration equipment design can add a minimum of 25% additional diffuser surface area in the future using the same number of diffuser assemblies.
- 1.4.1.8 Draft Process Performance Guarantee including all terms, conditions, and stipulations that will be submitted in the final version.
- 1.4.1.9 Drawings showing modifications required to the project plans in order to accommodate the supplier's equipment. Drawings shall detail all changes to mechanical, structural, and electrical sheets.
- 1.4.1.10 Technical data sheets for packaged components such as pumps, blowers, valves, instrumentation, and controls.
- 1.4.1.11 A complete list of exceptions to the specifications.
- 1.4.1.12 A current long sludge age, activated sludge system installation list of projects that demonstrates compliance with the experience requirement specified above. All cited installations must be of similar process design, size, and equipment scope. The information for each plant must include the name and location of the facility; influent and effluent design parameters; minimum of twelve (12) months of operating data including flows and loads that demonstrate compliance; names of contacts and contact information for owner, professional, operator, facilities manager, design engineer, sub-contractor and/or general contractor.
- 1.4.1.13 A maintenance schedule including all recommended spare parts for one (1) year and five (5) years operation.
- 1.4.1.14 Annual operating cost at Average Day Flow condition.

1.5 DESIGN CONDITIONS

1.5.1. Table 1.05A Influent Conditions

Influent Parameter	Value	Unit	Value	Unit
Design Flow	0.9	MGD		
Peak Day Flow	3.10	MGD		
BOD ₅	300	mg/l at ADF	2,253	lbs/d
TSS	200	mg/l at ADF	1,502	lbs/d
TKN	35	mg/l at ADF	263	lbs/d
Ammonia	23.3	mg/l at ADF	175	lbs/d
Phosphorous	6.0	mg/l at ADF	45	lbs/d
Alkalinity, CaCO ₃	340	mg/l at ADF	2,554	lbs/d
Site Elevation	500	feet		
Max wastewater temperature	25	°C		
Min wastewater temperature	10	°C		

1.5.2. Table 1.05B Effluent Requirements

Effluent Parameter	Maximum Monthly Ave. Value	Unit
BOD	10	mg/l
TSS	10	mg/l
Ammonia	1.0	mg/l

1.6 SYSTEM REQUIREMENTS

- 1.6.1. The process shall be an activated sludge process designed using long sludge age parameters. The aeration basin capacity and organic loading shall not exceed a daily volumetric loading of 12 lbs BOD./1000 ft³ – day.
- 1.6.2. The process shall be operated with alternating oxic and anoxic zones to permit simultaneous BOD removal, nitrification, and denitrification within one treatment basin.
- 1.6.3. Design parameters for the process shall be per the following table:

Table 1.06A Design Parameters

Number of treatment basins	1
Basin volume, each (MG)	1.46
Basin SWD (ft)	9.0
Design MLSS (mg/l)	3000
Minimum SRT (days)	30-60
Actual Oxygen Required, AOR (lbs/hr)	190
Alpha	0.70
Beta	0.95
Standard Oxygen Required, SOR (lbs/hr)	399
Hydraulic Retention Time (hrs)	1.62

1.7 SPARE PARTS

1.7.1. The following spare parts shall be provided, packaged for long term storage:

1.7.1.1 Thirty-six (36) BioFuser Tube assemblies.

1.7.1.2 Two (2) Clarifier Limit Switches

1.8 SUBMITTALS

1.8.1. Shop Drawings and Product Data

1.8.1.1 Submit detailed dimensional shop drawings and product data.

1.8.1.2 Design calculations, and a complete description of the proposed operating strategy.

1.8.1.3 Drawings, diagrams, and catalog cuts, for all mechanical and electrical equipment that needs to be integrated with other process, structural, or ancillary equipment or associated modifications required to comply with the full intent of the job specifications.

1.8.2. Equipment

1.8.2.1 Complete descriptions of the equipment.

1.8.2.2 Certification of compliance with the materials of construction specified.

1.8.2.3 Maintenance schedule, method of maintenance performance, and life expectancy of all equipment when applied as intended in the specification.

1.8.2.4 All recommended spare parts.

1.8.3. Maintenance Data and Operating Instructions

Submit three (3) copies of an Operation and Maintenance Manual for equipment furnished, including a detailed description of the function of each principal component, procedures for operation, instruction for overhaul and maintenance. Include lubrication schedule, safety precautions, test procedures, electrical schematics, and parts list.

PART 2: PRODUCTS

2.1 MOVING AERATION CHAIN SYSTEM

2.1.1. General

2.1.1.1 The aeration system shall include all the aeration system components specified below.

2.1.1.2 Mixing capability is critically important to efficiently operating a long sludge age process. The moving aeration chain system must be able to completely mix activated sludge using less than 4 SCFM air/1000 ft³ basin volume.

2.1.2. Aeration System

2.1.2.1 Moving Aeration Chain System

- A. The moving aeration chain system suspending fine bubble diffusers near the bottom of the basin shall be the Biolac system as manufactured by Parkson Corp or approved equal. It is the intent of this specification that the manufacturer provides a complete aeration system including all equipment and hardware required for the in-basin components.
- B. The aeration system shall be designed so that there are no anchors or points of attachment to the basin bottom. The aeration system must be completely suspended above the basin bottom and not be supported or resting on the bottom. The aeration system must be easily accessible for service and maintenance without basin dewatering or a complete aeration system shutdown.
- C. The aeration chain system shall be self-propelled and move back and forth systematically in the wastewater to provide high efficiency mixing of basin contents. The aeration chains shall move approximately six (6) feet in each direction from their starting position. This capability is critical to allow turndown flexibility in the operation of the aeration system while maintaining a completely mixed system.
- D. Note that the mixing energy and air requirement shall not exceed seventy (70) percent of that required to provide the design SOR. This is important as this turndown capability is critical to the operating economy of the aeration system.
- E. Each aeration chain shall be fed air from one (1) side and connect to the air main through individual branches with butterfly valves. The butterfly valve shall provide individual control or isolation of the airflow to each aeration chain. An adjustable tension line consisting of stainless-steel cable shall be provided on each end of each aeration chain. The adjustable tension line shall connect from the last aeration assembly at each end over to a hook and anchor post on each side of the basin as shown in the drawings.

2.1.2.2 Moving Aeration Header Assembly

- A. The moving aeration chain shall be constructed of a single continuous polyethylene header. All header piping shall be manufactured by continuous extrusion process of high density, high molecular weight resin defined by ASTM D-3350. Each header shall be field assembled using butt fusion welds.
- B. Aeration chain piping shall be SDR 17, four (4) inch diameter pipe with a minimal wall thickness of 0.25 inches. End caps and adaptors for hose feed end shall be SDR 11 minimum.

2.1.2.3 Air Feed Hose & Connections

- A. The connecting hose between each moving aeration header and the butterfly valve shall be EPDM rubber and suitable for high temperature service. The hose shall provide adequate flexibility for the required chain movement and be the same diameter as the moving header. It shall be attached to the butterfly valve by a stainless-steel adapter and to the moving header by a machined polyethylene adapter. Designs that do not use a flexible hose connection and/or use a rigid pipe connection do not allow for proper aeration chain movement and are unacceptable.
- B. The stainless-steel adapter shall incorporate a $\frac{3}{4}$ " additional valved outlet. Galvanized metal or non-metallic adapters to the butterfly valve shall not be accepted.
- C. The polyethylene adapter shall have a minimum wall thickness equal to SDR 11. Metallic adapters to the polyethylene header shall not be accepted.
- D. The connecting hose shall be held in place by not less than two (2) band-type clamps at each end. Clamps shall be constant torque-type for the connection to the stainless-steel adapter and standard band clamps at the polyethylene header. All clamp components shall be 304 S.S., minimum. Working clamp rating shall not be less than forty (40) inch-pounds. Rigid pipe connections shall not be accepted.

2.1.2.4 Valves and valve actuators

- A. Valves specified in the table below shall be provided by the manufacturer. Electric actuators shall operate from 460 volts, 3 phase, 60 Hz per source.

Table 2.01A Valves

Function	Quantity	Size	Type	Operator
Air	14	4"	Butterfly	Manual
Influent Channel	2	4"	Plug	Manual
WAS Valve	2	4"	Plug	120 Volt, Automatic
Scum Valve	2	4"	Plug	120 Volt, Automatic

- B. Plug Valves: All plug valves shall be permanently lubricated and shall be of the tight-closing, rubber seat type. Valves shall be suitable for sewage and wastewater application, shall have throttling capability, and shall be rated 150 lb. WOG. Valve bodies shall be cast iron. Valve plugs shall be balanced type and constructed of either cast iron or ductile iron. Passage size shall be a minimum of 80% of the full port area for valves through 20" size and a minimum of 70% of the full port area for valves 24" and larger. Upper and lower bearing shall be either stainless steel or bronze and permanently lubricated. Packing shall be O-ring, U-cup or V-type, and shall be self-adjusting or externally adjustable by means of an external packing gland. Packing gland shall be visible through a standoff between the valve bonnet and actuator base. Packing shall be replaceable without removing the valve actuator or bonnet. All valves shall be leak tested to their full rating prior to shipment. Manual plug valves shall have worm gear actuators with handwheels. Actuators shall be sized for 50 PSI reverse shut off pressure against the face of the plug. Gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant. Seals shall be provided on all shafts to prevent entry of dirt and water into the actuator.
- C. Butterfly Valves: Valves shall be specifically designed for air service and clean water service. All valves shall have a maximum of 50 PSI pressure rating and valves for air service shall have a temperature rating of 250°F. Valves shall be either wafer or lug design with cast iron body. Valve disc shall have an uninterrupted 360° seating surface and shall be aluminum bronze, ductile, or cast iron with an appropriately suitable edging. Shafts shall be one piece and shall be of hi-strength carbon steel with phosphate coating, or stainless steel. Shaft bearings shall be self-lubricating, and corrosion resistant. Packing materials shall be either adjustable or self-adjustable and shall be suitable for the intended temperature and service conditions. Manual butterfly valves 4" and smaller shall be provided with lever actuators. Manual butterfly valves 6" and larger shall be provided with geared actuators with handwheels. Valves shall be sized appropriately for the service conditions and specific application.

Lever operated valves shall latch in the open, closed, or several intermediate positions. Gearboxes shall be self-locking.

- D. The electric motor operator shall consist of motor, reduction gearing, position limit switches and torque limiting switches mounted in a NEMA 4X/6 housing. Actuators shall be sized for 50 PSI working pressure. Actuators shall be supplied with local Open / Stop / Close pushbuttons, Local / Off / Remote selector switch, and Open / Close / Fault indicating lights. Open / close switches shall also be provided for hand operation of valves at the Biolac control panel.
- E. The motor shall be of the high torque type, designed for a minimum 15-minute duty rating. Motors and wiring shall have Class "B" or better insulation. Overload protection shall be provided by auto-reset thermal trip circuit breakers embedded in the motor windings. All motor leads shall be terminated at an internal terminal strip. Actuators shall be provided with integral motor starters (if required). All termination caps shall be plug and socket connection permitting removal without disturbing field wiring. Power for all automatic valves shall be the responsibility of the installing contractor. Valves shall not be powered from the Biolac control panel.
- F. The integral self-locking power gearing shall be compound epicyclic or combined helical and worm gear type only. Motor breakers are unacceptable. Gearing shall be grease or oil lubricated with high-speed parts running on anti-friction bearings. Motor shall operate from open to full close in 60 seconds. Disassembly of gears shall not be required to remove the motor. Motor wiring shall be connected by plug and socket connection.
- G. The handwheel shall not rotate during electrical operation. When the unit is being operated manually, it shall automatically return to electric operation when the actuator motor is energized. The transfer from electrical operation to manual operation shall be accomplished by a declutching mechanism, which will disengage the motor mechanically. The unit shall be capable of being clutched or declutched while the motor is energized with no damage to the clutch or gear mechanism. Clockwise rotation of the handwheel shall close the valve. If the motor is energized during manual operation, the unit shall remain in manual mode without endangering personnel operating the unit.
- H. Failure of the motor or motor gearing shall not hinder manual operation. Limit switches set at the open and close positions shall be provided. Limit switch adjustment shall be possible with no more than 5 turns of the limit adjuster. Switches shall be mechanical and shall include provisions for powered or isolated contacts for remote indication.
- I. A double-acting torque limiting switch shall be provided, which is responsive to the mechanical torque developed by seating or an obstruction. Torque shall be directly measured from the worm shaft

through a series of compressible washers and mechanical torque arm and switch.

2.1.2.5 Suspended Oxygen Transfer and Mixing Unit

- A. The suspended air diffuser assembly shall consist of a fully functioning unit capable of housing five (5) diffuser tubes total. A maximum of four (4) diffuser tubes per assembly shall be used to meet design SOR conditions, so there is the ability to add 25% additional diffuser area to each unit for future expansion. Designs that do not have this expansion capability are not acceptable. The design of the unit must allow for the addition and/or removal of diffuser tubes by the OWNER without disturbing its stability or air distribution characteristics. Any unused diffuser connections shall be sealed with airtight, removable plugs. The plugs shall provide easy removal after extended use for the addition of diffuser tubes for future capacity increases. The installed diffusers shall be supplied air at each end by an air supply manifold and secured by means of sealed connection held by a threaded flow-thru bolt and nut.
- B. All diffuser tubes shall be constructed with a complete, internal flow-through design to minimize buoyancy and reduce counterweight/ballast requirements. A maximum ballast weight of 30 pounds shall be allowed to insure ease of maintenance over the life of the unit. Ballast more than this weight will only be approved if a diffuser lifting device is included in the design. Ballasts must be designed to allow locating the diffuser centerline within 12" of the basin bottom while maintaining not less than 8" clearance for variations in the basin bottom and liner. Rubberized or coated carbon steel ballast assemblies may experience coating failure and are not acceptable. Concrete ballasts are not acceptable. Ballast assemblies not contained within rigid, corrosion-proof enclosures must be supplied using stainless steel materials equal to 304 or lower carbon content grades.

2.1.2.6 Diffuser Frame

- A. The diffuser frame shall be formed from a polypropylene compound of sufficient strength to prevent warping or deflection. The end connections of each frame shall be sealed using mechanical welding procedures providing a connection as strong as the tube itself. Simple solvent welding shall not be acceptable.

2.1.2.7 Diffuser Sheath

- A. The diffuser sheath shall be composed of a special urethane soft

thermo plastic material. This soft urethane sheath shall be held in place by stainless steel clamps with stainless steel screws. Clamps shall be reusable. The sheath material shall not require any plasticizers or other volatile additives. No softeners shall be allowed. Sheaths which require softening additives shall not be approved. Rigid, micro porous, ceramic, silicon or rubber-based (EPDM) diffuser membrane materials are not acceptable. To maximize membrane life expectancy, the diffuser design airflow rate shall not exceed 2.0 SCFM/active ft. of diffuser length at the design loading specified.

2.1.2.8 Connection of Diffuser Assembly Air Supply to Moving Aeration Header

- A. Each diffuser assembly shall be connected to the moving aeration chain by two EPDM hoses. Suspended diffuser systems that use one connecting hose per diffuser assembly are not stable and are not acceptable. The connection of each hose to the aeration header shall be formed by an insert type nozzle fitting with 1" dia. ID. Fittings shall be injection molded from polyamide resin with 33% glass filled content for strength and durability. Fittings that are not reinforcement with glass fiber will not be approved. Fittings shall have an internal radius to fit the aeration chain pipe ID, and be made airtight using BUNA-N gaskets. Fittings shall be factory molded and field installed.

2.2 AERATION BLOWERS

2.2.1 General

- 2.2.1.1 The system supplier shall furnish completely packaged positive displacement blowers, including electric motors, silencers, filters, check valves, pressure relief valves and all necessary accessories. Blowers shall be sized to provide one unit as an installed spare and located as shown on the plans.

2.2.2 Design Requirements:

2.2.2.1	Quantity of Blowers	3
2.2.2.2	Discharge Pressure	5.00 PSIG
2.2.2.3	Minimum Motor Horsepower	60 HP
2.2.2.4	Max. Brake Horsepower Required	46
2.2.2.5	Inlet Volume - SCFM	1,410 SCFM
2.2.2.6	Inlet Air Temperature	100° F

- 2.2.3 Each blower shall be of the horizontal, rotary, positive displacement type. Each assembly shall be rugged in construction and of such design that it may be

disassembled and all parts inspected without disturbing the inlet or discharge piping. The maximum pressure rating of the blower shall be 7 psig.

- 2.2.4 The casing shall be of one piece with separate head plates, and shall be made of close-grained gray cast iron suitably ribbed to prevent distortion under the specified service conditions.
- 2.2.5 Fabricate drive and gear end head plates of close-grained cast iron which are precision machined for exact bearings housing fit.
- 2.2.6 Impeller and shaft shall be made from common cast iron. Impeller shall be of the straight, two lobe involute type and shall operate without rubbing or liquid seals or lubrication and shall be positively timed by a pair of accurately machined heat-treated alloy steel, spur tooth, timing gears. Timing gears shall be mounted on the impeller shafts on a tapered or machined fit and property secured.
- 2.2.7 Each impeller/shaft shall be supported by double row ball or spherical roller bearings sized for a minimum of 60,000 hours of B-10 life.
- 2.2.8 Provide a lip type oil seal at each bearing, designed to prevent lubricant from leaking into the airstream. Further provisions shall be made to vent the lubrication system to atmosphere to eliminate any possible carryover of lubricant into the air stream.
- 2.2.9 The timing gears and the bearings shall be splash-oil-lubricated from oil slingers mounted on the driving shaft and dipping in the oil. Grease lubricated bearings are acceptable on the drive end only.
- 2.2.10 Provide a single speed, constant torque, TEFC 1800 RPM motor, 1.15 S.F., suitable for mounting on a slide base and connecting to the blower shaft by a v-belt and sheave drive assembly for the blowers. Motor shall have a cast iron frame and brackets. Motors with rolled steel frames are also acceptable. Motors shall be as manufactured by U.S. Motors, Baldor, Reliance, and Siemens. Variable Torque motors shall not be considered.
- 2.2.11 Blower Package Accessories
 - 2.2.11.1 The blower packages shall be fabricated and assembled with the following accessories and shipped complete as a unit. Packages knocked down for shipment are not acceptable. Contractor assembly of component parts is also not acceptable.
 - 2.2.11.2 The blower base shall be built so that the blower and the motor are mounted to provide for horizontal tensioning of the v-belt drive. The base shall be plate steel. The blower package supplier shall submit detailed drawings of the base for review by the PROFESSIONAL prior to manufacture. All welds are to be continuous and full penetration. Each leg shall be gusseted in two planes. The inlet and discharge

silencers must bolt to the base. The discharge silencer may not be welded to the baseplate.

- 2.2.11.3 Provide V-belt drive assembly consisting of sheaves, quick detachable bushings, V-belts, and sliding motor base. Provide drive assembly with a 1.4 service factor based on motor nameplate horsepower.
- 2.2.11.4 Provide OSHA Style steel bolt guard to enclose drive and belts. Design guard for easy removal. The guard shall be constructed to allow visual inspection of the drive system without removing the guard.
- 2.2.11.5 Provide each blower with a suitably sized air filter for the flow rates listed under design criteria. Inlet filters to be Model CCF Type as manufactured by Universal Silencer.
- 2.2.11.6 Provide a heavy duty, all welded, inlet noise attenuation unit constructed of carbon steels sheet and plate and featuring an acoustically treated outlet for pulse control. Provide silencer equal to Model RISY on silencers larger than 4" and RIS type on sizes 4" and smaller. URB silencers are not acceptable. Silencers shall be manufactured by Universal Silencer Company.
- 2.2.11.7 Provide two (2), carbon steel, clamp type supports at each end of silencer for rigidly mounting silencer horizontally to the blower package base.
- 2.2.11.8 Provide a heavy duty, all welded, outlet noise attenuation unit constructed of carbon steel sheet and plate and featuring an acoustically treated outlet for pulse control. Provide silencer equal to Model RDY on sizes larger than 4" and RD type on, 4" and smaller. URB & SD silencers are not acceptable. Silencers shall be manufactured by Universal Silencer Company.
- 2.2.11.9 Provide two (2), carbon steel, clamp type supports at each end of silencer for rigidly mounting silencer horizontally to the blower package base. Fasteners are to be plated steel. The discharge silencer may not be welded to the baseplate. The relief valve may not be mounted in the shell of the discharge silencer. Welding coupling into the silencer body shall not be accepted.
- 2.2.11.10 Provide flanged sleeved cylindrical type, three ply bias fiberglass reinforced silicone rubber connectors for blower inlet and discharge connections. Furnish units that are capable of withstanding 26 psig and operating temperatures of 250° F.
- 2.2.11.11 Provide weighted pressure relief valve with proper sizing and weights for set point pressure. Provide valves equal to PW Series. Spring type and Kunkle valves are not acceptable. The relief valve shall be mounted in a

spool piece bolted or threaded to the end of the discharge silencer. Mounting of relief valves in the silencer body is not acceptable.

2.2.11.12 Check valves shall be wafer type with cast iron body and aluminum internals for mounting on blower discharge piping. Provide valve equal to Techno Model 5118. Threaded valves are not acceptable.

2.2.11.13 The valve shall be lever operated, capable of bi-directional, drop tight service to 100 psi. The body shall be lug style, cast iron and meet ANSI class 125/150 flange standards. The seat shall be EPDM molded into the valve body and shall ensure drop tight, bi-directional shut off. The disc shall be aluminum bronze with the edges polished to a 32 AARH finish to reduce frictional torque. The stem shall be one piece, 416 stainless steel. The valve shall have bronze upper and lower bearings and polyester upper stem support bushing.

2.2.11.14 Provide a stem mounted discharge pressure gauge on the blower package to be equal to U.S. Gauge, McDaniel Instruments or approved equal.

A. Range: 0-15 psig.

B. Accuracy: 1 percent of full scale.

C. Dial: 2 ½ dia., 270-degree scale.

2.2.12 Shop Painting

2.2.12.1 Shop Prime Coating: Prime all components with gray Kem-Flash primer manufactured by Sherwin Williams Company. Sherwin Williams's data sheet must be included with submittal package. Prime paint by the individual component manufacturer is not acceptable.

2.2.12.2 Shop Finish Coating: Finish paint all component parts before assembly with machine tool gray Kem-Lustral Enamel as manufactured by Sherwin Williams Company. Field painting of blower equipment is not acceptable.

2.2.13 Sound Reduction Enclosure

2.2.13.1 Each blower assembly shall be furnished with a weather tight, sound attenuating enclosure. The enclosure shall be manufactured of 16-gauge aluminum, and shall be lined with three (3) inches of acoustical foam, and 20 ga. galvanized perforated steel; sufficient to meet an 80 dba attenuation requirement at three (3) feet from any exterior surface of the enclosure. The enclosure shall have removable side panels which will allow full access to the assembly for maintenance or repair.

2.2.13.2 An air ventilation fan shall be mounted on the enclosure and sized as necessary to keep the assembly at a temperature needed to maintain proper operation as recommended by the assembly manufacturer. The

ventilation fan motor will be 115v/1ph/60Hz; provide approx. 10 CFM/motor HP.

- 2.2.13.3 The two side panels shall provide for a minimum of 50% of each side to be removed for access. The panels shall include two locking latch assemblies and a minimum of two lifting handles. The doors shall also be hinged for easy access.
 - 2.2.13.4 Any pipe penetration holes in the enclosure shall be sized to allow for passage of pipe flanges. All penetration holes shall have flash rings installed to seal around the pipe.
 - 2.2.13.5 The enclosure will be free standing and not attached or mounted onto the blower package frame in any way. The enclosure will require field assembly and shall be supplied with installation instructions as well as all special tools and fasteners required for assembly.
- 2.2.14 All equipment specified in this section shall be factory assembled and shipped as a complete unit. Component parts such as silencers, valves, filters, enclosures etc., may not be field assembled. All equipment must be shipped via a flatbed open-top type trailer. Shipments in van type trailers shall not be accepted and returned to the shipper for proper transportation to job site. Partial shipments are also not acceptable. Blower packages must arrive at the job site fully assembled and finish painted.

2.3 SYSTEM INTEGRAL CLARIFIER

2.3.1 General.

- 2.3.1.1 A rectangular integral clarifier(s) with a double-V bottom design shall be provided at the discharge end of the long sludge age treatment basin opposite the influent. All internal metal clarifier components shall be fabricated from 304 SS. Galvanized steel or other forms of carbon steel shall not be approved. The clarifying zone is formed by four concrete walls and a concrete bottom as shown on the plans. Location of the clarifier is as shown on the plans.

2.3.2 Clarifier Design.

- 2.3.2.1 The clarifier shall be designed using a low-velocity crossflow pattern to provide improved hydraulic efficiency and performance. The design overflow rate shall be less than 218 GPD/sq. ft. at the minimum water level, based on the design flow rate of 0.90 MGD. Overflow rates in excess of 385 GPD/sq ft shall not be approved.

2.3.3 Inlet Channel

2.3.3.1 Each clarifier shall be designed with a surface inlet channel to:

- A. Provide easy isolation of each clarifier individually
- B. Evenly distribute the clarifier influent flow along the feed side of the clarifier. The system supplier shall provide calculations showing the maldistribution along the inlet channel does not exceed ten (10) percent at design conditions.
- C. Provide a maximum of twelve (12) inches of automatic in-basin peak flow equalization using large diameter orifice plates
- D. Allow for surface wasting of floating material and scum via a surface overflow gate

2.3.3.2 Each inlet channel shall be located and dimensioned as shown on the plans. Manual, 304 SS, inlet slide gate(s) allows for isolation of each clarifier individually. Removable 304SS large diameter orifice plates at the top of each clarifier inlet distribution pipe are designed to provide a maximum of twelve (12) inches in-basin equalization at design peak flow. Inlet distribution pipes are spaced along the length of the inlet channel as shown in the plans. The clarifier influent enters the clarifier horizontally along the length of the clarifier feed side at an elevation above the V-bottom. A manually adjustable, 304SS overflow weir at the end of each inlet channel provides the ability to waste floating material prior to entering the clarifier. Surface wasting will be manually controlled by a 4" dia. plug valve.

2.3.4 Flocculating Rake/Skimmer Mechanism

2.3.4.1 A flocculating rake/ skimmer mechanism shall be designed and furnished by the system supplier for each integral clarifier. Each rake shall be furnished complete with all mechanical equipment required for proper operation, including complete drive units, complete rake/ skimmer mechanism and all hardware required for installation. Clarifiers without mechanical rake/ skimmers shall not be approved.

2.3.4.2 The flocculating rake/ skimmer mechanism shall consist of a drive assembly and a non-drive/pulley assembly. Each assembly shall be located approximately six inches (6") above the clarifier's sidewalls as located on the plans. The rake mechanism shall be driven by a 1/4" diameter plastic impregnated galvanized steel cable stretching across the width of the integral clarifier. The rake mechanism consists of a vertically hung structural steel assembly clamped to the floating skimmer assembly and drive cable with 304 stainless steel U-bolts, as shown on the plans. Stainless steel fingers shall be hung from the rake assembly extending down into the sludge blanket to be used to aid in distribution and concentration of the sludge in the V-bottom sludge removal zone.

The rake mechanism shall run continuously at approximately 9 feet per minute.

- 2.3.4.3 Each drive unit shall be anchored to a stainless-steel baseplate located at the top of the clarifier wall. The drive unit shall consist of a 1.0 HP helical-bevel type unit with high efficiency motor. Both the drive and driven pulleys of this assembly shall be protected for safety. Motor shall be fan-cooled type. Open drip type motors shall not be approved.

2.3.5 Sludge Removal System

2.3.5.1 General

- A. A sludge removal system shall be designed and furnished by the system supplier to provide a positive and controllable method for removing sludge from each V-bottom of the integral clarifier. This system shall be furnished complete with all the mechanical equipment required for proper operation, including airlift pump and sludge suction piping. Return sludge shall flow by gravity to the front end of the aeration basin. Mechanical pumps for sludge removal/ return will not be approved.

2.3.5.2 Airlift Air Supply Piping

- A. A four (4) inch diameter air header for supplying air to the air lift(s) shall be buried along the back of the integral clarifier running from the airlift piping as shown on the plans. The airlift piping shall be removable to allow for cleaning if required. All inserts required for passage of the air piping through the clarifier concrete shall be provided by others as indicated on the supplier plans.

2.3.5.3 Sludge Suction Piping

- A. Sludge suction piping for removing the settled solids from the clarifier shall be located along the length of each clarifier V-bottom. Holes shall be spaced along the length of this piping for even removal of sludge. The system supplier shall provide calculations showing the maldistribution across the sludge collection header does not exceed ten (10) percent at design conditions.
- B. The sludge suction piping shall be of SCH 40 PVC construction, and shall be as shown on the plans. All sludge piping in the clarifier and all hardware for installing and supporting the piping shall be provided by the system supplier. A cleanout must be provided. The flushing system must permit cleaning without removing the pump or piping.

- C. The air supply line to each airlift pump shall be fitted with a solenoid valve to allow timer operation of each airlift pump individually.

2.3.5.4 Waste Sludge Control Valve

- A. The waste sludge flow shall be controlled by a four (4) inch diameter plug valve outlined in the valve table.

2.3.6 Fixed Overflow Weir

2.3.6.1 General

- A. A fixed, V-notch overflow weir shall be provided by the system supplier for each integral clarifier. It shall attach to the effluent launder and be located along the length of the effluent side of the clarifier as shown in the plans. It controls the liquid level in the clarifier and the flow out of the clarifier to the effluent pipe. The materials of construction shall be 304 stainless-steel (S.S.) for the weir and scum baffle. All mounting hardware shall be 304 S.S. minimum.

2.3.6.2 Weir Design

- A. The overflow weir shall be designed such that the weir loading is less than 5,000 GPD/lineal foot of weir length at average flow and 20,000 GPD/Linear foot at peak flow. Weir loadings exceeding these values shall not be acceptable. The weir plate shall be 304 stainless-steel with a minimum wall thickness of 1/8" and shall be adjustable.

2.3.6.3 Scum Baffle.

- A. A scum baffle shall be provided by the system supplier to prevent floating objects from passing over the overflow weir. The baffle plate shall be 304 stainless-steel with a minimum wall thickness of 1/8 inch.

2.3.7 Scum Removal

2.3.7.1 General

- A. The scum removal system shall include a floating skimmer; rotary scum pipe or scum beach; and an automatic scum valve. The floating skimmer shall be designed to push the floating material towards the end of the clarifier where a rotary scum pipe or scum beach shall be

designed to remove the material from the clarifier surface when the automatic scum removal valve is open.

2.3.7.2 Scum Removal Mechanism

- A. A rotary scum pipe or scum beach shall be located at the end of the clarifier perpendicular to the effluent weir. The scum pipe or beach shall be manually adjustable. Floating material shall flow by gravity over the edge of the scum pipe or beach to a collection sump. The number, type and location of the scum removal devices shall be as shown on the plans.

2.3.7.3 Automatic Scum Removal Valve

- A. Scum removal will be initiated when the floating skimmer position reverses the direction of travel of the rake/ skimmer mechanism. The 4" dia. automatic scum removal valve located in the scum piping will open, allowing floating material to be discharged from the scum removal mechanism. The scum valve shall be a plug valve with an electric actuator as manufactured by Promotion or approved equal. The duration of the scum valve open time shall be adjustable from the operator interface screen of the system control panel.

2.4 BIOLAC SYSTEM CONTROL PANEL

2.4.1. General

- 2.4.1.1 A PLC based electrical control panel shall be provided as required to safely and efficiently operate the aeration blowers, the clarifier rake/skimmer mechanism, the sludge waste valve, the scum valve and any other Parkson supplied equipment, as specified in this section. The Biolac control panel shall comply with the design specifications below and as shown on the plans.
- 2.4.1.2 Provisions shall be in place to allow for future conversion to WaveOx controls.
- 2.4.1.3 Placement:
 - A. Provisions shall be provided by the installing contractor to isolate all control panels from extreme heat, rain, water, ice, humidity, sun, or other properties of weather.
- 2.4.1.4 Cabinet Requirements:
 - A. The control enclosures shall be UUCSA approved, sufficiently

sized to house all components required. The panels shall be NEMA twelve (12).

2.4.1.5 Starters

- A. All motor starters provided shall be IEC type with solid state overloads. For motors less than 100 HP, IEC starters shall be one size larger than required. Siemens or equal shall be used.

2.4.1.6 Protective Devices:

- A. The panel(s) shall be protected using circuit breaker and/or motor circuit protectors as permissible in the NEC and UL. Single phase wiring less than 250VAC/VDC shall be protected using fuses.
- B. A three-phase power monitor shall monitor the incoming power to the panels(s). The unit shall disconnect the control voltage in the event of loss of voltage on one or more phases.

2.4.1.7 Terminal Blocks:

- A. Terminal blocks shall be of a set-screw terminal, pressure plate design.

2.4.1.8 Pushbuttons, Switches, Indicator lights:

- A. Where needed, these devices shall be by Allen-Bradley 800 series or equal. Devices shall be based on the panel rating (NEMA 12). Color and configuration of the devices shall be as reflected on the drawings. All indicator lights shall be transformer type.

2.4.1.9 Relays:

- A. General purpose "ice cube" type control relays shall be of DPDT or 3PDT. Contacts shall be 10 Amp or greater. Relays shall be socket mountable. Relays shall be IDEC or equal.

2.4.1.10 Control Power Transformer:

- A. The Control Power Transformer shall be sized as needed.

2.4.1.11 PLC System:

- A. Shall consist of Allen-Bradley CompactLogix System utilizing any or all I/O devices needed to satisfy system requirements most efficiently.

2.4.1.12 Operator Interface:

- A. Shall have sufficient capabilities to control all system devices.
- B. Should have a multi-level menu system that requires no PLC programming knowledge.
- C. Operator interface should also be compatible with Allen-Bradley CompactLogix PLC.
- D. Allen-Bradley PanelView Plus twelve (12) inch interface shall be used.

2.4.2 Local Clarifier Rake Control Panel, 1 per clarifier rake as follows:

- 2.4.2.1 Enclosure, NEMA 4X FRP,
- 2.4.2.2 1 - UL 508A label for assembled control panel
- 2.4.2.3 1 - Main disconnect with through-the-door type operating handle
- 2.4.2.4 1 - Motor starter, FVR, IEC type
- 2.4.2.5 1 - Programmable relay
- 2.4.2.6 1 - Control power transformer with spare fuses
- 2.4.2.7 1 - Lot of control relay, Idec
- 2.4.2.8 1 - Lot of terminal blocks (Weidmuller WDU-4)
- 2.4.2.9 4 - Door mounted pilot devices

2.5 MAINTENANCE PLATFORM

- 2.5.1 An aluminum A-frame style maintenance platform suitable for doing in-basin maintenance shall be supplied by the system manufacturer.
- 2.5.2 The approximate overall dimensions of the maintenance platform shall be 12' long x 8' wide x 8' high.
- 2.5.3 The platform shall be supplied with a battery-operated winch for lifting a section of the aeration chain out of the water to provide easy access to the diffuser assemblies.
- 2.5.4 A battery-operated trolling motor shall be provided for easy movement throughout the lagoon.
- 2.4.6 A galvanized steel or aluminum trailer for moving the platform over the road shall be provided. The trailer shall be supplied with running lights, break lights, turn signals and one (1) spare tire. The trailer hitch shall require a two (2) inch or 2-5/8 inch ball.

PART 3: EXECUTION

3.1 INSTALLATION

- 3.1.1. Contractor shall install the Biolac equipment to its totality and completely ready for

operation in accordance with the contract documents, drawings, and specifications. The proprietary treatment process must meet the requirements given under Paragraph 1.1.A. of this specification section, and instructions to bidders. Install all equipment in accordance with the manufacturer's instructions.

3.2 ACCEPTANCE AND START-UP

- 3.2.1. Contractor shall notify the OWNER, PROFESSIONAL and manufacturer in writing when the installation is ready for inspection. Notification must be given a minimum of ten (10) days prior to inspection date.
- 3.2.2. System supplier shall supply personnel to be present at final equipment installation/inspection and provide start-up assistance for a maximum of three (3) trips and eight (8) man-days.

3.3 OPERATION AND MAINTENANCE MANUALS

- 3.3.1. Three (3) bound Operation and Maintenance Manuals shall be furnished during start-up. These manuals shall include maintenance instructions for all equipment provided. Electronic copy of the Operation and Maintenance Manuals in pdf format shall also be provided.

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 6100

FILTRATION EQUIPMENT

PART 1 DESIGN DETAILS

The filtration equipment shall be ISO-DISC DISK FILTER AUTOMATIC BACKWASH DISC FILTER Model: IDDF-7D60S-SS as manufactured by Alfa Laval or approved equal.

1.1. DETAILS

1.1.1.	Average daily design flow (ADDF):	625 gpm (0.9 MGD)
1.1.2.	Peak 2-hour design flow (P2HDF):	2,153 gpm (3.1 MGD)
1.1.3.	Influent temperature (°C):	15-30 °C
1.1.4.	Filter model selected:	IDDF-7D60S-SS
1.1.5.	Effective filtration area available per disk:	50 ft ²
1.1.6.	Number of disks per filter:	7
1.1.7.	Effective filtration area available per filter:	350 ft ²
1.1.8.	Number of disk filters required:	2 (1 duty & 1 redundant)
1.1.9.	Total effective filtration area available:	700 ft ² (2); 350 ft ² (1)
1.1.10.	Filtration rate per filter (ADDF):	1.79 gpm/ft ²
1.1.11.	Filtration rate per filter (P2HDF):	6.15 gpm/ft ²
1.1.12.	Maximum filter headloss (at average/peak flow):	12 inches of water column
1.1.13.	Maximum influent TSS concentration to filters:	35 mg/L
1.1.14.	Maximum influent TSS concentration to filters:	15 mg/L
1.1.15.	Average influent TSS concentration to filters:	10 mg/L
1.1.16.	Average filter effluent TSS concentration:	≤ 5 mg/L

1.2. QUALITY ASSURANCE

1.2.1 Applicable Standards

- A. ASTM – American Society for Testing and Materials
- B. AISI – American Iron and Steel Institute
- C. AGMA – American Gear Manufacturer's Association
- D. NEMA – National Electrical Manufacturer's Association
- E. NEC – National Electrical Code

PART 2 PRODUCT DESCRIPTION

2.1. MATERIALS

- 2.1.1. All fabricated material shall be ANSI 304 stainless steel. All welding shall conform to the latest standards of the American Welding Society. Filter media shall be designed for easy removal and installation. Media supports shall be non-metallic or stainless steel construction.

2.2. EQUIPMENT

2.2.1 Filter Tank

- A. The filter tank shall be constructed of a minimum ¼" thick 304 stainless steel plate with horizontal reinforcing channels installed around the perimeter of the tank.
- B. All structural steel shapes shall be designed for the intended use and of adequate strengths to withstand all loads during fabrication, shipping and operations.
- C. The filter tank shall have one (1) 18" flanged influent connection.
- D. The filter tank shall incorporate seven (7) 4" x 8" effluent nozzles connected to a filtrate trough designed to remove the entire flow of the filter tank from each individual disk.
- E. The filter tank shall incorporate eight (8) 4" backwash shoes connected to a backwash mechanism (washbox carriage) within the tank. The backwash mechanism shall be constructed of 304 stainless steel.
- F. The filter tank shall have a drain/sludge removal port with one (1) 3" flanged nozzle. Inside the tank there shall be a perforated drainpipe sized adequately and designed to evenly remove settled sludge from the filter tank.
- G. The filter tank effluent trough shall have one (1) 18" flanged effluent connection.

2.2.2 Filter Assembly

- A. The filter frame shall be comprised of structural steel shapes designed for the intended use and be of adequate strength to withstand all loads during shipping and operations.
- B. The filter assembly shall include a robust framework with 304 stainless steel structural steel sections with a minimum thickness of ¼ inch. The framework shall be adequate to provide mounting and

structural support for the drive mechanism, backwash carriage and multiple filter elements.

- C. The filter tank assembly will be supplied complete with an integrated 304 stainless steel effluent trough into which each individual filter element will discharge. Each element and the trough will have corresponding rectangular openings that will be 4" x 8". A Neoprene rubber sleeve lined mechanical clamp shall connect the element and the discharge trough to provide a watertight seal.
- D. Four (4) 4" electrically actuated butterfly valves shall be installed at each of four (4) backwash connections on the filter tank. The wafer style butterfly valves will be mounted between the piping manifold flange and the tank flanged connections. The individual valves will be removable for maintenance with minimal effort and without having to remove piping.
- E. One (1) 3" electrically actuated butterfly valve is to be installed at the sludge withdrawal manifold connection on the filter tank. The butterfly valve will be wafer style and will be removable for maintenance with minimal effort and without having to remove piping.
- F. All piping for connection of the backwash valves and sludge withdrawal valve to the suction of the backwash pump shall be 3" sch. 80 PVC. The discharge piping from the backwash pump shall be 3".
- G. The backwash carriage assembly on the filter unit will be complete with eight (8) backwash shoes that will fit tightly against the filter cloth on the filter elements. There will be two (2) backwash valves that clean 3 cloth surfaces (two shoes, one cleans one surface, one cleans two surfaces) and two (2) backwash valves that clean the surfaces of 4 cloths (two shoes, both clean two surfaces each).
- H. A 3" sch. 80 PVC sludge withdrawal piping manifold shall be installed in the bottom of the tank. The manifold shall draw settled solids from the entire tank bottom when suction is applied by the backwash pump.

2.2.3 Filter Element Assembly (7 per filter)

- A. The filter element frames shall be constructed from Type 304 stainless steel and plastics as an integral unit completely welded and supported for all operating and installation loads.
- B. Each element shall have media support structure incorporated and it shall be designed to secure the grid in place and minimize wear to the media.

- C. Each element shall be complete with two filter media surfaces.
- D. Each element shall have an integral effluent manifold adequately sized for the application and designed to allow easy removal and replacement of the element assembly.
- E. Each element shall be attached to the effluent trough independently to allow element isolation. Only one wall connection point per element shall be allowed and it shall be 8" tall x 4" wide. The disk filter design shall ensure the ability to sample filtrate from each element independently.
- F. A plug shall be supplied for installation into the effluent trough wall connection to allow disk removal and prevent unfiltered water discharge allowing continued filter operation with one elements removed. With optional additional plugs more disks can be removed allowing continued operation of the remaining disk.

2.2.4 Support Frame

- A. Each element shall be secured in place in the filter frame. The element supports shall be designed to withstand all loads of the disk and cleaning mechanism. Element restraints shall be easily accessible for removal from the top of the tank.

2.2.5 Backwash Carriage Assembly

- A. Each filter unit shall incorporate a linear backwashing system that will operate by passing the cleaning shoes over the filter media to remove accumulated solids by suction. The backwash carriage will also act as the transmission conduit for the backwash water being drawn by the backwash pump located externally to the filter tank.
- B. The backwash carriage shall be constructed from 304 stainless steel.
- C. The backwash carriage shall be complete with a drive mechanism that will allow the suction shoes to be operated over 100% of the available area of filtration media.
- D. The backwash carriage shall be designed as to not inhibit the removal of filter elements for routine service or maintenance.
- E. The cleaning face of the backwash shoes shall be designed to maintain a linear position which is parallel to the element face and maintain a tolerance from the surface of the filter media to allow free release of entrapped solids.

2.2.6 Drive Mechanism

- A. The drive assembly shall be designed to cycle the backwash carriage during the backwash cycle.
- B. Power for the drive system shall be provided by a 1.5 hp, 480V/3-phase/60Hz right angle gearmotor.
- C. A reversing motor starter shall be used to allow the backwash carriage to move across the filter media surface in either direction.
- D. Four (4) bevel gearboxes are driven by the right angle gearmotor and rotate four (4) jackscrews to cause the washbox carriage to raise or lower based on jackscrew direction of rotation. Jackscrews are 1-¼" diameter with ¼ pitch Stub Acme threads.
- E. Four (4) ultrahigh molecular weight polyethylene drive nuts are installed in the backwash carriage that cause raising and lowering as the jackscrews are rotated.
- F. Two inductive proximity sensors monitor the position of the washbox carriage. The sensors are located above the water level and monitor the position of a flag that moves upward and downward with the wash carriage. The flag allows the operator to have a visual indication of the carriage position.

2.2.7 Control Panel and Description

- A. A filter control panel will be supplied and installed onto each filter tank. Wiring of filter mounted components including the backwash valves, the sludge withdrawal valve, backwash carriage drive unit and tank level monitoring devices shall be complete to the control panel when the equipment is shipped. The wiring from the filter mounted control panel to or from external points of connection will be by the installing electrical contractor. Each disk filter control panel will include but not be limited to the following components:
 - i. NEMA 4X, 304 SS, wall mount enclosure with 3 point latch.
 - ii. PLC (Allen-Bradley MicroLogix - 1400) for system operation
 - iii. 10" Human-Machine Interface (Automation Direct C-More EA7-T8C)

- iv. Control power and valve power transformer shall be included. Transformer to be mounted on the panel exterior for superior heat dissipation.
 - v. IEC motor starters to be included in each panel for a backwash carriage drive and one backwash pump. The backwash carriage drive starter shall be rated for 1.5 hp and shall be of the reversing type. The backwash pump starter shall be rated for 5 hp.
 - vi. Each panel front shall be complete with selector switches for four (4) backwash valves, one (1) sludge withdrawal valve, one (1) backwash pump and one (1) backwash carriage drive.
 - vii. Equipment status indications will be displayed on the HMI
 - viii. Emergency stop and alarm silence pushbuttons located on panel front
 - ix. Alarm Horn on panel exterior
 - x. Door mounted circuit breaker
 - xi. Magnetic circuit breakers
 - xii. 20 amp quadruple receptacle
 - xiii. Relays for control as required
 - xiv. Level transmitter connections
 - xv. Relays for resistance probes for high and low level monitoring
- B. The backwash cycle is independently initiated by a level control transmitter located in each filter tank, by a timer setting or by manual operator initiation. The filter drive unit and the backwash pump are activated, and electrically actuated valves open in sequence to accomplish backwashing of the filter. Both level controlled and timer backwash operating modes can be active at any given time.
- C. A submersible pressure transmitter will be supplied in each filter tank. The transmitter will provide the primary level measurement feedback for the control system.
- D. Resistance probes will be installed in the filter tanks as shown on the submittal drawings. The probes will provide for high-high and low-low level indication to the control system. They are included to act as back-up to the pressure (level transmitter). High-high level will cause

an alarm and initiate a backwash. Low-low level will cause an alarm, terminate the backwash cycle if in progress or inhibit backwash if not. Low-low will protect the pump against dry run. The probes also provide for continued filter operation in the case of level transmitter failure.

- E. The panel operational sequence shall include a sludge withdrawal cycle timer. This timer shall be pre-set and field adjustable. Sludge withdrawal can also be programmed by the operator to occur after a setpoint selected number of backwash cycles.
- F. All operating parameters shall be setpoint adjustable. The operator will select the backwash start level setpoint. The operator shall select the backwash stop level setpoint. Under constant flow conditions the backwash cycle will begin with valve number one and sequence through all valves until all media surfaces have had the backwash shoe make one complete pass over them. If the flow is low or intermittent the backwash process may take the tank level to the stop backwash level at which time the cycle will end to protect the pump from dry run. The backwash system will be reset at that point and will start at the beginning of the cycle next time the start backwash level has been reached.

2.2.8 Backwash Pump

- A. The backwash pump for each filter shall serve that filter independently and shall be a cast iron, self-priming, solids handling, centrifugal pump designed for domestic wastewater applications. The pump will have an integrated 5 hp, 480V/3-phase/60Hz drive motor.
- B. Pump and motor shall be installed on a painted steel base.
- C. Semi open bronze impeller to be mounted on the motor shaft.
- D. The pump shall be sized to provide adequate suction for cleaning up to 4 media surfaces simultaneously as determined by the filter manufacturer.
- E. Duty point is 288 GPM at 30 feet TDH.
- F. Pump shall handle a minimum of 3/8" spherical solids.
- G. Pump shall have 3" suction and 3" discharge connections.
- H. One (1) 3" manual butterfly valve shall be provided by the filter supplier for each pump discharge pressure regulation.

- I. One (1) 3" manual butterfly valve shall be provided for suction line adjustment and isolation for each backwash pump.
- J. One (1) 3" check valve shall be provided for each filter discharge force main.
- K. A vacuum gauge shall be provided in the pump suction header and a pressure gauge shall be provided in the pump discharge header to allow monitoring and fine tuning of the pump operating conditions.

2.29 Automatic Backwash Control Valves

- A. The backwash valves shall be Electrically Actuated Butterfly Valves.
- B. Valves shall be 115 VAC operated and controlled automatically from the control panel.
- C. Valves shall have manual override and position indicator (dry contacts for open and close indication).
- D. Valve actuators shall be housed in a NEMA 4X enclosure and incorporate an internal brake, thermal overload monitor and heater.
- E. Valves shall move from fully closed to fully open in 21 seconds.

2.2.10 Automatic Sludge Withdrawal Control Valves

- A. The sludge withdrawal valves shall be an Electric Actuated Butterfly Valves.
- B. Valves shall be 115 VAC operated and controlled automatically from the control panel.
- C. Valves shall have manual override and position indicator (dry contacts for open and close indication)
- D. Valve actuators shall be housed in a NEMA 4X enclosure and incorporate an internal brake, thermal overload monitor and heater.
- E. Valves shall move from fully closed to fully open in 21 seconds.

2.2.11 Backwash Pump Manual Discharge Control Valve

- A. One (1) 3" manual butterfly valve is to be provided in the discharge line from the pump.

- B. Valve shall be rated for 150 psi.
- C. Valve shall have stainless steel shaft and shall be blow-out proof.
- D. Valve shall be a wafer body design, fully supported flange bolt holes, and full bodied with v-notch EPDM liner.

2.2.12 Backwash Pump Manual Isolation Valve

- A. One (1) 3" inch manual butterfly valve is to be provided for the pump suction piping.
- B. Valve shall be rated for 150 psi.
- C. Valve shall have stainless steel shaft and shall be blow-out proof.
- D. Valve shall be a wafer body design, fully supported flange bolt holes, and full bodied with v-notch EPDM liner.

2.2.13 Filter Media

- A. Each filter element will be fitted with two filter cloths. They shall be attached using 304 stainless steel battens that are secured to the element face with corrosion resistant fasteners.
- B. The filter media shall be a knit fabric. The fabric shall be a knit type with a polyester backing coated with acrylic latex.

PART 3 INSTALLATION, WARRANTY AND SPARE PARTS

3.1 INSTALLATION

- A. General
 - i. Install the disk filter system per the manufacturer's directions and the drawings. Provide all supports and anchoring device required to install the disk filter unit. The Equipment Manufacturer will provide adequate crating and protection of the disk filter equipment for shipment to the project site.
 - ii. Install instructions will be provided that specifically outline installation of the equipment.
 - iii. Lifting instructions will be provided to assist the Installing Contractor.

3.2 FIELD SERVICES

The equipment manufacturer shall furnish the service of a factory-trained representative for six (6) working days and two (2) trips.

3.3 WARRANTY

The equipment manufacturer shall materially conform to the description in this Specification and the Contract Documentation and shall be free from defects in material and workmanship. Warranty periods are 12 months from filter startup for 18 months after shipment.

3.4 SUPPLIER SPARE PARTS

- A. Two (2) Proximity Switches
- B. Two (2) Sets of Backwash Mechanism Springs
- C. One (1) Spare Filter Level Sensing Pressure Transmitter
- D. One (1) Backwash Valve with Actuator
- E. One (1) Spare Backwash Pump
- F. Two (2) Lifting Nuts (RH)
- G. Two (2) Lifting Nuts (LH)
- H. Ten (10) Spare Cloths
- I. Seven (7) Effluent Connection Sleeves
- J. One (1) Spare Disk Discharge Plug
- K. One (1) Spare Backwash Drive Motor

- End of Section -