"RE-BUILDING THE CITY'S WATER SYSTEMS FOR THE 21ST CENTURY"

Sewerage & Water Board OF NEW ORLEANS

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Addendum No. 5

Date: 2/25/2026

Your reference is directed to **Contract Number:** 2025-SWB-67 (30270) for East Bank Water Treatment Plant Upgrades which is scheduled to open at **11:30 a.m. CST** on **March 12, 2026.**
This addendum provides for the following:

1. Additional requirements requested by LDEQ to comply with SRF funding.
2. Responses to Vendor questions submitted on January 16, 2026.
3. Revised Louisiana Public Bid Form
4. Revised Technical Specifications and Drawings
5. Sewerage and Water Board Change Order Policy

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1. Additional requirements requested by LDEQ to comply with SRF funding.
   - ***The contract is to be expected to be funded in whole or part using funds from the Louisiana Clean Water State Revolving Funds (CWSRF) which require the successful bidder to comply with the Federal Build America, Buy America (BABA) Act requirements. Refer to the Supplementary Conditions for more details regarding CWSRF and BABA requirements.***
   - ***The Contractor must comply with the prevailing wage rates for laborers, mechanics, and other applicable trades as determined by the Secretary of Labor in accordance with the provisions of the Davis-Bacon and related acts."***
2. Responses to Vendor questions submitted on January 16, 2026
   - ***Please see attachments (29 pages).***
3. Revised Technical Specifications and Drawings
   - ***Please see attachments (92 pages).***
4. Revised Louisiana Public Bid Form
   - ***Please see attachments (two (3) pages)***
5. Sewerage and Water Board Change Order Policy
   - ***Please see attachments (12 pages).***

The above revisions shall be incorporated in and take precedence over any conflicting part of the original proposal documents. This addendum is hereby officially made a part of the referenced proposal.

Receipt of this addendum shall be acknowledged by inserting its number and date in the space provided on the Louisiana Uniform Public Works Bid Form.

This addendum consists of one (1) page and four (4) attachments with multiple pages.

*** END OF ADDENDUM ***

SEWERAGE & WATER BOARD OF NEW ORLEANS

EAST BANK STP PHASE IA – SECONDARY TREATMENT UPGRADE

Date February 20, 2026

ADDENDUM NO. 5

A. MODIFICATIONS TO THE SOLICITATION

1. **DELETE** the "Louisiana Uniform Public Work Bid Form included in **Addendum No. 1,** dated December 29, 2025", in its entirety and **REPLACE** with a new "Louisiana Uniform Public Work Bid Form, consisting of three pages", included in Exhibit A, in **Addendum No. 5.**

2. In Specification Section 005213, Agreement, paragraph 3, Contract Times, subparagraph 3.2.1, **MAKE** the following modifications:

   - **DELETE** "670 calendar days" and **REPLACE** with "840 calendar days"
   - **DELETE** "730 calendar days" and **REPLACE** with "900 calendar days"

3. In Specification Section 007300, Supplementary Conditions, page 3, paragraph SC-4.02.C.1, **AFTER** the words "subsurface utility exploration" **ADD** the following:

   "The following reports:

   a. Subsurface Exploration Map, East Bank Sewage Treatment Plant, dated June 23, 2023, prepared by Infinity Engineering, Inc.

   b. Geotechnical Exploration, Sewerage & Water Board of New Orleans, East Bank Sewage Treatment Plant, Phase 1, Wastewater Treatment Plant Improvements, dated October 19, 2023, prepared by Eustis Engineering, LLC."

   c. Geotechnical Exploration, Sewerage & Water Board of New Orleans, East Bank Sewage Treatment Plant, Phase 1, Secondary Treatment and Solids Upgrade, dated February 6, 2026, prepared by Eustis Engineering, LLC."

4. In Specification Section 007300, Supplementary Conditions, page 3, paragraph SC-4.02.D.1, **DELETE** the words "Record drawings of the Main Water Purification Plant" and **REPLACE** with the following:

   "The following existing drawings are provided for reference only. The Contractor shall field verify exiting infrastructure, equipment, electrical and underground systems as part of the design and construction effort. The Contractor shall not rely soley on the record drawings, as undocumented modifications may have occurred since the preparation of the attached documents. The following drawings of physical condition, if any, relating to exiting surface and subsurface structures at the Site (except Underground Facilities) are known to Owner:

DRAFT

a. Record drawings of Contract NO. 3050, Expansion of the East Bank Sewage Treatment Facilities, City of New Orleans, Louisiana, dated 1981, prepared by Waldemar S. Nelson and Company, Inc.

b. Record drawing of Contract No. 3075, Modifications to the Return Activated Sludge PS at the East Bank Sewer Treatment Plant, Sewerage & Water Board of New Orleans, dated December 2014, prepared by Trigon Associates.

c. Record drawings of the Sodium Hypochlorite Disinfection System at the East Bank Wastewater Treatment Plant, Sewerage & Water Board of New Orleans, dated August 2016, prepared by Trigon Associates."

B. MODIFICATIONS TO THE TECHNICAL SPECIFICATIONS

1. **DELETE** the "Section 3, Technical Specifications, entitled East Bank Sewage Treatment Plant, Phase IA, Secondary Treatment Upgrade, dated May 2025, and published on December 9, 2025, in its entirety, and **REPLACE** with a new "Section 3, Technical Specifications, entitled, East Bank Sewage Treatment Plant, Phase IA, Secondary Treatment Upgrade, dated February 2026.

C. MODIFICATIONS TO THE DRAWINGS

1. **DELETE,** the drawing set entitled "Sewerage and Water Board of New Orleans, Engineering Department, Contract No. 30270, East Bank STP – Phase 1A Secondary Treatment Upgrade, dated April 30, 2025", totaling 92 drawings, in its entirety and **REPLACE** with a drawing set entitled, "Sewerage and Water Board of New Orleans, Engineering Department, Contract No. 30270, East Bank STP – Phase 1A Secondary Treatment Upgrade, dated February 2026", totaling 92 drawings.

D. WRITTEN QUESTIONS RECEIVED AND ANSWERS:

Question 1

1. Please provide a geotechnical soil report for this project.

Answer to Question 1

A copy of the subsurface geotechnical exploration report is included in Appendix B of the Technical Specifications, dated February 2026, for additional information. As noted in Specification Section 007300, Supplementary Conditions, paragraph 4.02.E, copies of the reports and drawings itemized in SC-4.02.C and SC-4.02.D are not part of the Contract Documents, but the "technical data" contained therein upon which the Contractor may rely, as expressly identified and established above ae incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data know to or identified by the Owner.

Question 2

2. Please confirm that Special Inspections will be by the Owner.

Answer to Question 2

Confirmed.

Question 3

3. Please confirm the existing clarifier concrete walls do not require coating. We see Specification Section 03930 references concrete coatings and states that it shall per as shown on the drawing but do not see coatings required on the drawings nor do we see any other concrete coatings except inside the existing RAS pump station. Please confirm.

Answer to Question 3

There are no concrete coatings or Specification Section 03930 – Concrete Coatings in this Project.

Question 4

4. Regarding Bid Items 6 and 7, are these quantities above and beyond any quantities already called for on the drawings - in a utility trench for example? Or is this a measurement and payment bid item for any excavation or backfill required?

Answer to Question 4

Bid Item 7 has been changed to Excavation of Unsuitable Material, Replacement Backfill and Disposal. The quantities for Bid Items 6, Additional Earthwork Materials-Compacted Select Fill, and 7, Unsuitable Material, Replacement Backfill and Disposal, are to establish unit prices should additional work be required on the project. Overall, the Project requires the Contractor to perform earth excavation respective of various Bid Items. Depth and width of earth excavation is a function of the Contactor's means and methods. Replacement and disposal of unsuitable material, if deemed necessary in the field by the Engineer, shall be paid for at the said unit price. Refer to the Technical Specifications, dated February 2026, Specification Section 01150A, Measurement and Payment, for additional information.

Question 5

5. A bollard detail is provided but no bollards can be found on the drawings unless we missed them.

Answer to Question 5

There are no bollards to be installed under this contract. The bollard detail is not applicable to this Contract and may be disregarded. Refer to the Drawings Set, dated February 2026, for additional information.

Question 6

6. Specification Section 01010A, Summary of Work, paragraph 3.2b2b, references the startup and demonstration of a "temporary groundwater dewatering system". Is this alluding to a sump pump system within trenches to remove any groundwater from within the trench or is this for a different requirement?

Answer to Question 6

This paragraph refers to the temporary construction dewatering system specified in Specification Section 02140, should it be determined by the Contractor that an engineered system is required. It is the Contractor's responsibility to determine the means and methods required to control groundwater levels for the duration of the project and perform the scope of work in accordance with the Bidding Documents.

Question 7

7. Bid Item 3 has a quantity of 250 VF for the steel pipe piles. Is this above and beyond what is shown on the drawings? If not, we believe that quantity is not sufficient for the qty shown on the drawings.

Answer to Question 7

Bid Item 3, Additional Steel Rolled Form Concrete Filled Piles, is an additional unit price item that is above and beyond the quantity illustrated in the Bidding Documents. These additional quantities may be utilized if required for the piles to achieve design capacity. Refer to the Technical Specifications, Specification Section 01150A, Measurement and Payment, dated February 2026, for additional information.

Question 8

8. The original bid form as well as the bid documents state that the clarifier demolition and replacements are all alternates. Amendment No. 1 has all of that work listed as Bid Item 8 in the base bid. Please get this cleared up as the original bid documents still refer to this work as alternates.

Answer to Question 8

The work in Secondary Clarifiers Nos. 7, 6 and 8 are all bid alternates (Bid Alternate A, B and C). The Bid Form in Addendum No.1 is to be replaced with a new Bid Form. Refer to Paragraph A, in Addendum No. 5, for additional information.

Question 9

9. Specification Section 02050A, Demolition, paragraph 3.1 I.2., references the removal of all grit, sludge, rags, debris, etc. to be paid at the unit cost identified in the Bid Form. We do not see that Bid Item listed.

Answer to Question 9

As noted in Specification Section 02050A, Demolition, the Owner will be responsible for removal and disposal of the liquid and solids contents of the existing structures, i.e., secondary clarifiers, effluent channel. Then when the existing treatment structures are empty of liquid (drained by the Owner/STP

Operator), any solids and/or debris remaining that are not easily drained by the Owner as part of normal facility operations shall be the responsibility of the Contractor. The Contractor will be responsible for the draining of liquid contents of various piping systems associated with the N. RAS Pump Station including: the 30-inch diameter RAS line from the N. RAS PS to the influent channel, the WAS liquid to the S. RAS PS, and the scum/grease, plant/process water, sump pump water to Secondary Clarifiers Nos. 5, 6, 7 and 8. Contractor to coordinate the disposal of the RAS, WAS, grease, process water or sump pump water with the STP Operator. The Contractor will be responsible for the removal and disposal of all grit, sludge, rags, solids and/or debris within the treatment structures (i.e., Secondary Clarifiers) at the Contractor's expense. The cost for the removal and disposal of excess grit, sludge, rags, and other debris is to be included in Bid Items 1, 2 and or Bid Alternates A, B and C. Refer to the Technical Specifications, Specification Section 01150A, and Specification Section 01100, Bid Alternates, dated February 2026, for additional information.

Question 10

10. We noted in the demolition specification as well as the dewatering and excavation support spec discussed protecting existing structures from damage. Please confirm:

Answer to Question 10

The Contractor is required to protect the existing structures and utilities from damage for the construction work including demolition, installation and removal of temporary shoring, earth excavation, dewatering, etc. for the duration of the project.

Question 11

11. Are the grease collection systems at the clarifiers, pile supported? If not, how does the Engineer propose that these be protected in accordance with the specifications or should these be estimated to be demolished and reinstalled?

Answers to Question 11

Refer to the Specification Section 007300, Supplementary Conditions, paragraph SC-4.02, that lists several record drawings used as a basis of design of the proposed improvements. These drawings are available for reviewing the Sewerage and Water Board of New Orleans, LA office. It will be the Contractor's responsibility to determine how the existing grease structure shall be protected and supported. Refer to paragraph A, Modifications to the Solicitation, of this Addendum for additional information.

Question 12

12. Section 02140, Temporary Construction Dewatering System, paragraphs 3.2 and 3.3 states that should the dewatering system attempt to meet the specified groundwater elevation lowering required using an acceptable and approved method of dewatering but movement or settlement of the structure is noted, the contractor shall provide a revised "Corrective Action" plan and system at no additional costs to the Owner. Is this referring to switching between a deep well to a well point system as an example? What if this proposed method of dewatering change does not produce better results? At what point would this be considered a changed condition? The Contractor does not have adequate time nor data to analyze the existing structures to take this risk in bidding the project.

Answers to Question 12

The subsurface geotechnical exploration report is included in Appendix B to facilitate bidding and design of the dewatering system. As noted in Specification Section 007300, Supplementary Conditions, paragraph 4.02.E, copies of the reports and drawings itemized in SC-4.02.C and SC-4.02.D are not part of the Contract Documents, but the "technical data" contained therein upon which the Contractor may rely, as expressly identified and established above ae incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data know to or identified by the Owner.

Question 13

13. Per the excavation support system specification, what will be the allowable vibration to the existing structures? If the Contractor stays within these limits and the structure moved or is damaged, is this considered a changed condition to the contract?

Answers to Question 13

Per Specification Section 02156, Temporary Excavation Support System, paragraph 1.4.D, the Contractor's vibration monitoring consultant is to identify a proposed allowable vibration threshold value in their excavation support system monitoring plan submittal, along with justification for the selected value, for the Engineer's review and consideration during the submittal review process.

Question 14

14. Specification Section 02156, Temporary Excavation Support System, states that the sheeting shall be abandoned in place as well as discussed removal. Please clarify whether sheets will be removed or abandoned.

Answer to Question 14

Temporary support of excavation sheet piling shall be abandoned in place. Refer to the Specification Section 02156, Temporary Excavation Support System, in the Technical Specifications, dated February 2026, for additional information.

Question 15

15. We have a few questions concerning Specification Section 02468 – Rolled Steel Section Piles: In Paragraph 2.1, it calls for pile tips or points on the ends of the pipe piles. Please confirm these are required for these piles.

Answer to Question 15

The pile recommendations provided in the subsurface geotechnical exploration report in Appendix B of the Technical Specifications, dated February 2026, and are based on open end steel pipe (OSP) piles. If closed piles are considered, the Geotechnical Engineer of Record shall evaluate the effect on pile capacity and drivability. Refer to Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 16

16. In Specification Section 02468, Rolled Steel Section Piles, This section calls for piles to be impacted with a certain required energy but states that any damage as a result of these activities will be repaired at no cost to the Owner. How is the Contractor expected to estimate the costs associated with this risk? Is there a vibration threshold that is to be followed and worked within whereas any damage to be repaired within that threshold will be additional costs to the contract? This section states that pulled piles shall be done so with an impact hammer. Please clarify.

Answer to Question 16

Pile driving energy shall be determined by the pile contractor to develop the required pile capacity without damaging adjacent property, utilities, or structures based on the subsurface geotechnical exploration report. Refer to Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 17

17. In Specification Section 02468, Rolled Steel Section Piles, Splices are discussed but also stated that they are not allowed unless the pile has not been driven to cut off. Please confirm as this will require a long set of leads at a considerable distance to drive these piles.

Answer to Question 17

Pile splices are permitted. Refer to Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 18

18. In Specification Section 02468, Rolled Steel Section Piles, the following tests are listed for these piles. Please confirm they are ALL required and if both 10" and 12" pipe piles are to be tested:

1) Compression
2) Tension
3) Lateral
4) Dynamic

Answer to Question 18

Only dynamic compression testing is required for 10-inch and 12-inch piles. Refer to Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 19

19. Are the steel pipe piles to be filled with concrete as stated in the Bid Item or are they open ended and have a plate welded per the drawing detail? If concrete filled, what concrete strength and will they need to be filled the entire length or just from the mud line within the pile?

Answer to Question 19

Piles shall be filled with Class B concrete to 30 feet below cutoff elevation based on the soil-pile interaction analyses presented in the subsurface geotechnical exploration report, then a cap plate welded on per the Pile Connection Detail on sheet S-99-503. Refer to Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 20

20. The structural drawings state that the concrete crack repairs shall be approximately 25 lf. Bid Item 4 has a quantity of 200 lf. Is the 200 lf above and beyond the 25 lf that should be included in the bid or are they the same?

Answer to Question 20

The 25 lf of crack repairs indicated on the drawings is included in the 200 lf indicated in the Bid Form.

Question 21

21. The Process Drawings general notes state that buried lines shall have a sleeve type flexible connection 4 feet from the structure. These are not detailed on the drawings. Please confirm the requirement.

Answer to Question 21

Yes, solid sleeve type flexible/restrained connections are required on buried lines, including pressurized lines 4 feet from structures. Solid sleeve couples are not illustrated on all pressurized lines. Refer to Note 3 on Drawing PR-00-001, Process Notes, in the Drawing Set, dated February 2026 and Specification Section 02655, Couplings and Connectors for Buried Applications, in the Technical Specifications, dated February 2026, for additional information.

Question 22

22. The Process Drawings general notes state that pressurized buried lines shall have be solid sleeve type restrained couplings. Are the RAS lines considered pressure lines?

Answer to Question 22

Yes, solid sleeve type flexible/restrained connections are required on buried lines, including pressurized lines 4 feet from structures. These lines include the RAS lines from each secondary clarifier (No. 5, 6, 7 and 8) to the N. RAS Pump Station in two locations along with the 8-inch WAS line from the N. RAS PS to Sedimentation Basin 2. Solid sleeve couplings are required on all new pressurized lines. Refer to Note 3 on Drawing PR-00-001, Process Notes, in the Drawing Set, dated February 2026, for additional information.

Question 23

23. Are coatings or linings required for the casing pipe on the RAS lines? If so, please provide.

Answer to Question 23

No exterior or interior coating system is required for the Class 56 Steel Carrier pipe.

Question 24

24. Please confirm the Temporary RAS pump systems are already in place and the Contractor is only required to coordinate, cut, drain, remove, and reinstall the pipe as required under this phase of work. The Summary of Work specs states that this is to be constructed in this contract which is confusing.

Answer to Question 24

A portion of the temporary RAS piping has been installed, tested and ready for use. The Contractor will be required to furnish, install and start up a temporary diesel RAS pumping system (2 pumps), some discharge and suction piping, fittings and valves. Once the Temporary RAS pumping is started up, tested and operational, the STP Operator will operate the RAS pumping system for the duration of the project. The Contractor will be responsible for supplying fuel for the duration of the project. The temporary RAS pumping system shall remain in use throughout construction or as long as necessary. The Contractor will be responsible for draining sections of temporary RAS lines when deemed necessary along with the coordination of the disposal of the liquid and solid contents at the STP. It will be the Contractor's responsibility to coordinate with the STP Operator two weeks prior to shutting down segments of the temporary RAS suction lines. Refer to Specification Section 02050A, Demolition, Specification Section 01500, Temporary Facilities, and Specification Section 01515, Temporary Bypass Pumping Systems, in the Technical Specifications, dated February 2026 for additional information.

Question 25

25. Please confirm the 8" WAS pipeline is NOT required under this phase of work. The civil drawings have these lines bolded and references drawings that are not provided. The process drawings state this is to be constructed under Phase 1B.

Answer to Question 25

The 8-inch WAS piping is to be installed under this contract from the N. RAS PS to the existing Sedimentation Tank No. 2. Refer to the Drawing set and the Technical Specifications, dated February 2026, for additional information.

Question 26

26. Can drawing C-01-115 be provided? This is referenced on drawing C-01-109.

Answer to Question 26

On Drawing, C-01-109, under General Notes, Note 2, the correct drawing reference is C-01-104. Refer to the Drawing Set, dated February 2026, for additional information.

Question 27

27. In Specification Section 007300, Supplementary Conditions, paragraph 6.02.A it states, "Contractor shall employ a Professional Land Surveyor with current Louisiana registration to survey and lay out the work." Is this really required?

Answer to Question 27

Yes. It is recommended that the Contractor have a registered professional land surveyor from the State of Louisiana on its team to assist with verifying existing conditions as well as laying out new construction work including piles, clarifiers weirs, etc. as indicated on the Contract Drawings and producing record drawing information. The scope of services for the professional land surveyor will be between the Contractor and surveyor.

Question 28

28. In Specification Section 007300, Supplementary Conditions, paragraph 6.02.C, it States "Contractor shall reimburse Owner for Engineer's additional extraordinary costs…" Can you define what "additional extraordinary" costs are? Can you define the hourly costs in this case?

Answer to Question 28

Additional extraordinary costs incurred by the Owner or Engineer, would include, for example, costs associated with the Contractor working outside the normal working hours for an extended period, which would result in additional costs to the Owner or Engineer.

Question 29

29. In Specification Section 007300, Supplementary Conditions, paragraph 6.03.E – Can you confirm that all of the approved manufacturers of materials and equipment listed throughout the technical specifications are of Domestic Manufacturer as defined via the various Buy American provisions of the contract specifications?

Answer to Question 29

A cursory review of the equipment and materials used within this Project are compliant with the Build America, Buy America and Clean Water State Revolving funds requirements. However, it is the

Contractors responsibility to verify that the material provided in this project are compliant with the Contract Documents requirements.

Question 30

30. In Specification Section 007300, Supplementary Conditions, paragraph 6.04 - Contractor does not acknowledge that the Contract Times for the performance of the work is reasonable**….** Further, upon review of the overall scope of work contemplated, and considering that the documents do not allow work on weekends or holidays and include an allowance for normal anticipated weather delays, the 730 calendar days to substantial completion do not provide sufficient time to perform the work contemplated with the various restrictions and the required startup and commissioning. Please consider allowing weekend work and extending the contract duration by 100 calendar days. In addition, due to the lead times for various critical path materials and equipment, we ask that you consider a procurement period of 100 calendar days at the outset, including potholing and the test pile program within those 100 days.

Answer to Question 30

The contract times will be extended to 840 calendar days to meet Substantial Completion and 900 calendar days to meet Final Completion. Refer to the revised Agreement for additional information. As stated in Section 005213, Agreement, paragraph 3.4, night, weekend and holiday work which requires the presence of an engineer or inspector, will not be permitted except in cases of emergency or by permission of the Engineer. Refer to the Agreement, paragraph 2.4.1 for additional information. Also, by submitting a Bid, the Contractor is acknowledging all terms within the Specifications, including Supplementary Conditions, paragraph SC-6.04 as written.

Question 31

31. In Specification Section 007300, Supplementary Conditions, paragraph 6.08 - Permits. Can you confirm whether this type of work requires a building permit from the City of New Orleans? We can include the permit costs in our proposal to obtain the permit, should it be required, but we have no control over how long the process will take. To possibly expedite the process, can the Sewerage and Water Board of New Orleans provide any contract plans and specifications to the City of New Orleans Permit Department for review before the bid? Our experience is that the process can delay the start of work, as there is no control over the timing of their review.

Answer to Question 31

The contract drawings were submitted to the City of New Orleans, LA, One Stop Shopping Permitting and Licensing, Portal site in February 2025 for the Renovation Permit (Non-Structural and Structural) and Building Permit. Additional information will be required to be submitted to the City and or the Contractor including an executed agreement between SWBNO and the selected Contractor, schedule of values, contractors' information, etc.

Question 32

32. In Specification Section 007300, Supplementary Conditions, paragraph 10.03.A.5 – States "There shall be no Contractor delay claim based upon Contractor's inability to perform Change Order Work due to delay caused by the Owner's approval process." Can you explain in detail the Owner's change order approval process you are referring to, as this is confusing based on the language included in Article 10 of the general conditions?

Answer to Question 32

The Owner's change order policy is summarized in Specification Section 012600, Contract Modification Procedures. Refer to this document for additional information.

Question 33

33. In Specification Section 007300, Supplementary Conditions, paragraph 11.01 - Can you confirm if notarial fees apply to change orders, and if so, this should be reimbursable under the change order cost?

Answer to Question 33

Notarial fees, if incurred by the Contractor, is considered incidental cost to the overall project and is to be paid by the Contractor.

Question 34

34. In Specification Section 007300, Supplementary Conditions, paragraph 13.03.B – Can you confirm whether all testing and inspections are performed by the contractor or the owner, since there are various versions throughout the contract specifications on who is responsible?

Answer to Question 34

Per Specification Section 007300, Supplementarty Conditions, paragraph, 13.03.B, the Contractor shall employ an independent testing laboratory or testing agency and shall be responsible for the arranging and shall pay for specified tests, inspections and approvals required by the Owner's and Engineer's acceptance of the work at the Site except: noted in subparagraph 13.03.B.1 and 13.03.B.2. Refer to Part 2, Contracting Requirements and Specification Section 01400, Quality Control, in the Technical Specifications, dated February 2026, for additional information.

Question 35

35. Specification Section 00800, Supplementary Conditions, Mandatory Clean Water State Revolving Fund Terms and Conditions, paragraph VII (1,2,3) - Can you confirm that all manufactured products specified and listed by manufacturer and model numbers throughout the technical specifications for various materials and equipment adhere to this contract requirement.

Answer to Question 35

During the design phase, the Engineer conducted a good faith effort to confirm that major process equipment systems and manufacturers are compliant with the American Iron, Steel, Manufactured Products and Construction Materials along with the Build America, Buy America (BABA) requirements. However, it will be the Contractor's responsibility to verify the applicable iron and steel, building materials, and manufactured products provided comply with the Clean Water State Revolving Fund terms in conditions, and obtain waivers if required.

Question 36

36. Specification Section 00800, Supplementary Conditions, paragraph IX - can you confirm that the requirements defined in this portion of the contract specifications align with the S&WB DBE program requirements specified in the contract specifications?

Answer to Question 36

All forms related to DBE Participation must be filled out completely and in entirety, without reference to finding answer on other pages.

Page 39, Acknowledgement of Negotiated Terms between Prime Contractor and DBE Subcontractor; shall include the agreed scope of work, and monetary compensation. Acceptable signature is regarded as ink signature, or E-signature.

Page 40, Economically Disadvantaged Business Participation Summary Sheet; shall include the name of a SLDBE, or LA-UCP certified business participant, performing a commercially useful function in regards to this project. A DBE that is bidding as a prime contractor must meet the DBE subcontractor's goal with other DBE subcontractor participants. A total of less than 15.0% DBE subcontractor participation requires the submission of a Good Faith Effort.

Page 180, Contractor's Guide and Record for Implementation of Six Good Faith Efforts (RF-200); Answer each question in completeness.

In regards to Question #5, Using the services and assistance of the SBA, and MBDA to identify qualified DBEs; address this if bid does not meet EDBP established goal of 15.0% SLDBE and/or LA-UCP subcontractor participation. A completed Good Faith Effort and documentation of effort to use assistance of SBA, and MBDA to identify qualified DBEs must be submitted. Otherwise, indicate use of SLDBE and LA-UCP Certified Directories.

Page 181, Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49); Review, sign, and address check box

Page 184, Disadvantaged Business Enterprise (DBE) Program – DBE Subcontractor Participation Form (EPA Form 6100-2); Prime Contractor must provide form to each DBE subcontractor as an opportunity and option to describe work received or report concerns (e.g., termination of contract, late payment, etc.) to EPA DBE Coordinator at any time during projects performance period. Issuing/Funding Entity is LDEQ.

Page 186, Disadvantaged Business Enterprise (DBE) Program – DBE Subcontractor Performance Form (EPA Form 6100-3); DBE Subcontractor must identify work, service, and or supplies rendered and monetary reimbursement. Issuing/Funding Entity is LEDQ. DBE must be certified by SLDBE or LA-UCP.

Page 188, Disadvantaged Business Enterprise (DBE) Program – DBE Subcontractor Utilization Form (EPA Form 6100-4); Prime Contractor must review and complete form in entirety.

Question 37

37. Specification Section 01010A, Summary of Work, paragraph 1.1(A)(1) – It includes the construction of a temporary pump station to convey RAS from Clarifiers 5 through 8 to the Raw Influent Channel. Based on the contract drawings, specifically C-00-100 and C-00-101, it appears that the temporary RAS pumps and discharge piping are currently installed. Can you clarify whether the system is indeed operable and, if so, what, if anything, the General Contractor is required to do to maintain the existing system operated by plant personnel?

Answer to Question 37

Portions of the temporary RAS pumping system suction and discharge piping system are installed and tested. The Contractor will need to furnish, install and test the temporary pumping system, fuel storage tanks, and temporary piping, valving, and fittings connecting the pumps to the previously installed suction and discharge piping. The Contractor will need to relocate the previously installed temporary RAS suction and discharge piping as necessary to facilitate the construction work. The Contractor will

also be responsible for draining the temporary RAS lines for each time the temporary RAS lines need to be moved and or relocated.

Question 38

38. Specification Section 01010A, Summary of Work, paragraph 1.1.3(A) – Notes that the demolishing scope of work includes clarifier collector mechanisms 6 through 8. Can you confirm what work, if any, is contemplated for clarifier no. 5?

Answer to Question 38

The project does not include the replacement of the bridge assembly, clarifier mechanism, drive assembly and auxiliary equipment systems for Secondary Clarifier No. 5. The Project does include work associated with the replacement of the RAS piping from the exterior of Secondary Clarifier No. 5 wall to the N. RAS PS. Other work shall include the removal and replacement of existing walkway from the effluent channel to the clarifier bridge assembly, if deemed necessary by the Contractor, miscellaneous electrical, instrumentation and piping work. Refer to the drawing set and technical specifications, dated February 2026, for additional information.

Question 39

39. Specification Section 01010A, Summary of Work, paragraph 1 1.4 (A) – Scope of work mentions the replacement of Clarifiers Nos. 5, 6, 7, and 8. Still, upon review of the bid form, it is not clear where, or even if, clarifier no. 5 is being replaced. If it is part of the base bid scope, can you clarify or confirm which bid item this work is to be included in?

Answer to Question 39

The Project does not include the replacement of Secondary Clarifier No. 5 mechanism, drive, bridge assembly and ancillary equipment systems. The Bid Form, Specification Section 01100A, and Summary of Work have been replaced with an updated version which notes that work associated with Secondary Clarifiers No. 6, 7 and 8 are Bid Alternates. Secondary Clarifier No. 5 bridge assembly, mechanism, drive, and auxiliary equipment systems are not being replaced. Refer to the drawings and technical specifications dated February 2026, for additional information.

Question 40

40. Specification Section 01010A, Summary of Work, paragraph 1 1.5 – Mentions maintenance of plant flow and treatment processes as detailed in Part 3 of the specification. The majority of the scope of the work detailed in Part 3 mentions operations of the entire plant that are beyond the scope of the work contemplated under the scope of this contract. The work included in the scope of this contract is, as we understand it, in general, specific to the North RAS pump station (which we assume is presently mechanically inoperable, please confirm), and the removal of no more than 2 of the existing clarifiers nos. 5 through 8, along with not impacting the operations of the temporary North RAS pump system. Since we have no idea of the conditions of the existing clarifier equipment or the reliability of that equipment, can you confirm that the existing equipment (Clarifiers no. 1 through no. 8) is in good service and that we have no restrictions on taking any two clarifiers (from Nos. 5 through 8) as this will impact the general contractors ability to plan or perform the work contemplated under the scope of this contract. In addition, can we assume that the existing Temporary RAS pumps, Nos. 1 & 2, are in the same condition, or are we required to provide redundant equipment and piping in case either of them becomes inoperable during construction? If we are required to provide backup RAS pump units, can you provide performance specifications for the pumping equipment?

Answer to Question 40

It is the responsibility of each Bidder to visit the site to become familiar with the general condition and functionality of the facilities within the scope of work. It is correct that in general, the scope of work is specific to the North RAS Pump Station area. The Contractor is generally responsible for ensuring that their work does not compromise the operator's ability to maintain treatment and functionality of the remaining treatment and auxiliary systems at the facility. The existing North RAS Pump Station is currently operable and is intended to be taken offline and bypassed to perform the proposed improvements. The Contractor is required to maintain a minimum six clarifiers online at all times. It should be noted that one of the eight clarifiers is currently dedicated to sludge storage, meaning that only one additional clarifier may be taken offline at one time to comply with the treatment maintenance requirements. Refer to specification section 01515, Temporary Bypass Pumping Systems, included in the technical specifications dated February 2026, for more details regarding the temporary RAS bypass pumping system requirements.

Question 41

41. Specification Section 01010A, Summary of Work, paragraphs, 3.1.4(B)2 - Can you confirm specifically what pumping equipment you are referring to in this paragraph?

Answer to Question 41

The paragraph referenced, Specification Section 01010A, Summary of Work, paragraph 3.1.4 (B) 2 does not exist. However, note that in Specification Section 01010A, Summary of Work, paragraph 3.1.5.b, it references two or more dewatering feed pumping systems shall be available and online at all times.

Question 42

42. Specification Section 0101A, Summary of Work, paragraph, 3.2.E – Contractor shall include the cost of all temporary facilities required to maintain treatment during the construction period in their lump-sum price. Since it appears the temporary RAS pumps and piping are in place, and we assume (please confirm), could you clarify which "temporary facilities" you are referring to? Would this be temporary electrical services to the existing clarifiers nos. 5 through 8 during the demolition and construction of the North RAS Station? In addition, are there any temporary facilities required relative to instrumentation and controls at clarifiers nos. 5 through 8?

Answer to Question 42

Temporary Facilities generally include, but are not limited to, power/control/monitoring/flushing water feed/sump pump piping to Clarifier Nos. 5 through 8, power/control/monitoring/process water feed to the Sodium Hypochlorite Facility powered from the North RAS Pump Station, and all other utilities passing through the North RAS Pump Station that feed other systems onsite that are required to be maintained. Refer to Specification Section 01515, Temporary Bypass Pumping Systems included in the Technical Specifications, dated February 2026, for more details regarding the temporary RAS bypass pumping system requirements.

Question 43

43. Specification Section 01010A, Summary of Work, paragraph, 3.2.J - States "limited down-time of certain existing process unit is specified in this specification". Can you confirm that, with respect to the contemplated scope of work, this would require maintaining the temporary North RAS pump systems and maintaining six of the eight secondary clarifiers?

Answer to Question 43

This includes, but is not limited to, maintaining power/control/monitoring/flushing water feed to Clarifier Nos. 5 through 8, power/control/monitoring/process water feed to the Sodium Hypochlorite Facility powered from the North RAS Pump Station, sump pumping system and all other utilities passing through the North RAS Pump Station that feed other systems onsite. It should be noted that one of the eight clarifiers is currently dedicated to sludge storage, meaning that only one additional clarifier may be taken offline at one time to comply with the treatment maintenance requirements. Refer to Specification Section 01515 Temporary Bypass Pumping Systems, included in the Technical Specifications, dated February 2026, for more details regarding the temporary RAS bypass pumping system requirements.

Question 44

44. Specification, Section 01050, Coordination, paragraph, 1.1.A - States Contractor is required to work in close proximity to Owners/Operator's existing facilities. The majority of the work contemplated under this contract is located in or around Secondary Clarifiers Nos. 5 through 8 and at the Existing North RAS pump station. Can you confirm that is what you are referring to?

Answer to Question 44

This is a broad statement that generally refers to coordinating construction activities with the Owner/STP Operator in the area of the North RAS Pump Station to ensure that services, facilities, and safe working conditions are maintained such that Operators are able to perform their working duties.

Question 45

45. Specification Section 01050, Coordination, paragraph, 1.3**. -** Coordination With Others includes coordination with the City of New Orleans, Entergy New Orleans, and Verizon. Can you confirm which of the contemplated work tasks is related to either of these entities?

Answer to Question 45

Coordination with these entities may or may not be required during the course of construction, however they are provided as a convenience to the Contractor should they be deemed necessary.

Question 46

46. Specification Section 01050, Coordination, paragraph 1.4.a - Can you provide details on the proposed Contractor's Laydown area shown on the drawings?

Answer to Question 46

The Contractor's laydown areas are illustrated on Drawings G-00-101 and C-01-101. Contractor to coordinate the layout of construction trailers and parking with the Contract Operator. Refer to the drawing set, dated February 2026, for additional information.

Question 47

47. Specification Section 01050, Coordination, paragraph 1.4.b – Can you provide details on the Contractor's Trailer and Parking areas shown on the drawings?

Answer to Question 47

The Contractor's laydown areas are illustrated on Drawing G-00-101. Contractor to coordinate the layout of construction trailers and parking with the Contract Operator. Refer to the drawing set, dated February 2026, for additional information.

Question 48

48. Specification Section 01050, Coordination, paragraph, 1.4.d - Will it be a contract requirement to have a Contractor's representative at the plant entrance at all times during the work hours to generate records of all personnel entering and exiting the site, or is there presently security services that exist at the plant to perform such a function? Can you confirm?

Answer to Question 48

No. The STP Operator has a security guard at the entrance gate and is on duty from 7 am to 4 pm.

Question 49

49. Specification Section 01050, Coordination, paragraph, 1.4B - Work hours 7 am – 4 pm. Can you consider expanding this to 6 am to 6 pm?

Answer to Question 49

No; the gate is manned outside normal business hours by Operations staff. Guard is only on site 7 am to 4 pm.

Question 50

50. Specification Section 01100 – Alternates 2.2,2.3 & 2.4 - Can you confirm that the work contemplated includes any concrete surface restoration, crack repair, and cementitious overlay work related to each of the clarifier units, specifically, is any of the work contemplated in Clarifier No. 5? We want to make sure the scope of the work is clear, where this is being paid for under the revised bid form.

Answer to Question 50

Any work identified by the Owner, STP Operator or Engineer requiring concrete restoration, crack repair or cementitious overly for existing structures such as Secondary Clarifiers Nos. 5, 6, 7, 8 or within the N. RAS Pump Station, shall be paid for at said unit price included in the Bid Form under Bid Item 4 and 5.

Question 51

51. Specification Section 01150, Measurement and Payment: paragraph **1**.9.A, Incidental Items, Item#17 Listed as incidental work is material testing. Can you confirm whether the contractor or the owner performs the material testing? Refer to Section 01400 Quality Control, which states that the owner provides testing services.

Answer to Question 51

Per Specification Section 007300, Supplementarty Conditions, paragraph, 13.03.B, the Contractor shall employ an independent testing laboratory or testing agency and shall be responsible for the arranging and shall pay for specified tests, inspections and approvals required by the Owner's and Engineer's acceptance of the work at the Site except: noted in subparagraph 13.03.B.1 and 13.03.B.2. Refer to Part 2, Contracting Requirements for additional information.

Question 52

52. Specification Section 01150, Measurement and Payment, paragraph 1.9.A Item #21 Can you confirm what specific sewer flows and repair of existing sewer pipes are included in the scope of this contract?

Answer to Question 52

The Contractor shall include incidental cost within the bid price to maintain existing flows associated with the existing scum pumping, process water, temporary RAS pumping, utility water, etc. for the Secondary Clarifiers Nos. 5, 6, 7 and 8.

Question 53

53. Specification Section 01150A, Measurement and Payment, paragraph 1.9.A Item #26 Listed as incidental work is quality assurance testing. Can you confirm whether this testing is by the contractor or by the owner? If by 'contractor,' you can clarify which specific quality assurance testing you are referring to?

Answer to Question 53

Per Specification Section 007300, Supplementarty Conditions, paragraph, 13.03.B, the Contractor shall employ an independent testing laboratory or testing agency and shall be responsible for the arranging and shall pay for specified tests, inspections and approvals required by the Owner's and Engineer's acceptance of the work at the Site except: noted in subparagraph 13.03.B.1 and 13.03.B.2. Refer to Part 2, Contracting Requirements for additional information.

Question 54

54. Section 01150A, Measurement and Payment: Need to clarify where the payment is being made for the work on the 8" WAS line?

Answer to Question 54

The payment of the 8-inch WAS line from the N. RAS Pump Station to Sedimentation Tank 2 should be included under Bid Item No. 1. We have modified Specification Section 01150, Measurement and Payment, paragraph 1.1.B, Bid Item No. 1, North RAS Pump Station Upgrade. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 55

55. Specification Section 01150A, Measurement and Payment: Need to clarify where the payment is being made for the work on the two (2) 30 RAS Lines, as detailed in Dwg C01-102?

Answer to Question 55

Payment for the replacement of the existing 30-inch RAS piping, fittings and valves are to be paid for under Bid Item No. 1, North RAS Pump Station Upgrade. Also, the 30-RAS piping work associated with the South RAS Pump Station force main has been removed from the project scope. Refer to the drawings set and Technical Specificiations, dated February 2026, for additional information.

Question 56

56. Specification Section 01150A, Measurement and Payment: Can you confirm where payment is being made for the work described as Note 5 on Dwg PR-50-102?

Answer to Question 56

Should structural repairs such as crack repairs or cementitious overlay be determined necessary by the Owner or Engineer, these items shall be paid for at the said unit price noted in the Bid Form under Bid Item 4 and 5. Refer to Specification Section 01150A, Measurement and Payment, in the Technical Specifications, dated February 2026, for additional information.

Question 57

57. Specification Section 01150A, Measurement and Payment Can you confirm where payment is being made for the work described as Note 11 on Dwg PR-50-102?

Answer to Question 57

Type 2 concrete coating system is not required for any of the secondary clarifiers. This note has been deleted from Drawing PR-50-102. Refer to the drawing set, dated February 2026, for additional information.

Question 58

58. Specification Section 01500, Temporary Facilities and Controls, paragraphs 1.1.A.1 & 3, 1.2.2.1 – Since the contemplated work is within the existing plant site and far removed from access to any temporary electrical services, it would make economic sense for the owner to allow the contractor access to or use of the existing electrical services on the project site. If metering services were required to allow for usage and reimbursement of such costs, it would be far more economical and reliable to provide temporary power to the contractor. We are asking that you consider and advise.

Answer to Question 58

In the past, Contractors have located field trailers at the end of the railroad tracks and at the end of the Effluent Channel. There is temporary power available at these locations. Power is also available near the Bleach Tank area. The Contractor will be responsible for providing temporary power from one of these locations to the Hypochlorite area. Facility operations staff will work with the general and electrical contractors to provide a source of temporary power.

Question 59

59. Specification Section, 01500 Temporary Facilities and Controls, paragraph1.1.A.6 - Can you clarify what you mean by “Provide temporary protection of existing concrete tanks”? This is pretty vague.

Answer to Question 59

This sentence means for the Contractor to protect the existing concrete structures, within the Project area, from being damaged due to the construction work.

Question 60

60. Specification Section 01500, Temporary Facilities and Controls, paragraph 1.2.A.1 – Obtain permits as required by local governmental authorities. Can you confirm whether the City of New Orleans needs a building permit for this scope of work? If so, we can include the permit costs. Can you confirm whether the Sewerage and Water Board of New Orleans has provided any contract plans and specifications to the City of New Orleans Permit Department for review? If not, our experience is that the process could delay the start of work, as there is no control over the timing of their review process.

Answer to Question 60

The Sewerage and Water Board of New Orleans submitted the Project to the City of New Orleans for governmental approval. A copy of the permits approved for the Project are included in Appendix C of the Technical Specifications, dated February 2026, for additional information.

Question 61

61. Specification Section 01520, Site Security: Can you confirm what the specific intent is for the contractor's site security services? Does this requirement cover 24-hour security, 7 days a week, for the entire plant site for the duration of the contract, or is it specific to the contractor's work areas? Does it require a certain number of security personnel, etc.

Answer to Question 61

The intent of this specification is that the Contractor is responsible to provide site security for the project work area(s), to prevent vandalism and theft from the Contractor as well as the Owners' facilities. How the site security is performed is the responsibility of the Contractor to determine for the duration of the project.

Question 62

62. Section 02050A, Demolition, paragraph 1.1.A.7 – States" The Contractor shall not collect any samples of either Building Materials, Wastes, Solid or any other site/project materials, nor have the samples analyzed for any reason without prior approval of the Owner or Engineer……" To comply with the applicable health and safety requirements, this requirement needs to be waived. We plan to test the soils before placing our personnel in that environment, and we will need to do so to legally dispose of any materials off-site as required by the contract specifications. We would ask that this requirement be deleted from the contract documents.

Answer to Question 62

The sentence referenced under 1.1.A.7. is not included in the Demolition Specification.

Question 63

63. Specification Section 02050A, Demolition, paragraph 1.3.1. It states, "The Owner will be responsible for removal and disposal of the liquid contents of the existing structures. We would assume that any solid contents will be removed. Can you confirm? Also, can you confirm that the existing 16" RAS lines will also be cleaned once the clarifier is taken out of service?

Answer to Question 63

The Contract Operator will be responsible for removal and disposal of liquid contents within the existing structures and pipes, and the Contractor can assume that they will be responsible for cleaning drained structures and pipes and disposing of any solid contents within structures or pipes.

Question 64

64. Specification Section 01240, Temporary Construction Dewatering System, paragraph 1.3 - Can you confirm if it is acceptable to utilize the soils boring no. 5 information provided as part of Appendix B – Subsurface Geotechnical Exploration Report for the basis of our design of this system?

Answer to Question 64

The Subsurface Geotechnical Exploration Report may be used as warranted by the Contractor. As noted in Specification Section 007300, Supplementary Conditions, paragraph 4.02.E, copies of the reports and drawings itemized in SC-4.02.C and SC-4.02.D are not part of the Contract Documents, but the

"technical data" contained therein upon which the Contractor may rely, as expressly identified and established above ae incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data know to or identified by the Owner.

Question 65

65. Specification Section 01240, Temporary Construction Dewatering System, paragraph 1.31.5 F - Includes language that states the Contractor is solely responsible for the dewatering system and necessary to prevent damage and settlement of adjacent buildings, roads, structures, utilities, … Although designed and operated prudently, it is IMPOSSIBLE to draw groundwater down at non-pile-supported components without causing settlement and lowering the surrounding water table, whether minor or significant. Please reconsider removing or rewording this language to require the contractor to design and operate the dewatering system responsibly.

Answer to Question 65

It is the contractor's responsibility to design the temporary construction dewatering system to mitigate the potential for subsidence due to dewatering activities. The Contractor may propose to use other means and methods to control ground water, such as cut off with longer sheets, monitoring, etc.

Question 66

66. Specification Section 02156, Temporary Excavation Support System, paragraph 1.4 E - Includes language that states the Contractor is solely responsible for the temporary excavation support system and is necessary to prevent damage and settlement of adjacent buildings, roads, structures, utilities…. The submittals will be reviewed for consistency with the design intent. All temporary shoring systems are designed in accordance with a specific technical criterion or methodology, usually specified in the applicable contract documents. We would suggest acknowledging that no criterion is provided, and that the contractor and its design engineer have latitude to use whatever design criteria or a specific design methodology, with factors of safety to be provided or a particular design methodology should be provided.

Answer to Question 66

Specification Section 02156, Temporary Excavation Support System, is a delegated design performance specification, and it is the Contractor's, and/or their representative's responsibility to ensure the design is completed by a professional engineer licensed in the State of Louisiana. They are to use the boring logs provided in the specification appendices and their professional judgement to establish the temporary support system design criteria and methodology.

Question 67

67. Specification Section 02156, Temporary Excavation Support System, paragraph 3.4 & 3.6 – Paragraph 3.5 notes that the temporary sheeting shall be abandoned in place, while Paragraph 3.6 directs the removal of all sheeting. Under the circumstances, where the existing structural capacities of the existing structures are unknown, we would suggest requiring the sheeting be left in place and cut off 4'0" below the existing surface. Please clarify.

Answer to Question 67

Temporary support of excavation sheet piling shall be abandoned in place. The Contractor can cut the sheeting or such component at least 4 feet below the ground surface. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 68

68. Specification Section 02468 – Rolled Steel Section Piles, paragraph 2.1.B - Can you confirm if pile points are required in this application?

Answer to Question 68

The pile recommendations provided in the subsurface geotechnical exploration report are based on open end steel pipe (OSP) piles. Refer to Specification Section 02468, Open End Steel Piles, in the Technical Specifications, dated February 2026, for additional information.

Question 69

69. Specification Section 02468, Rolled Steel Section Piles, paragraph 3.7 – Upon review of this specification, it appears that there is missing information in terms of exact requirements relative to pile load testing. Can you review and provide the locations of the load test piles, the quantity of test piles, the pile tip elevations, the specific design or load-testing requirements, and the particular test (compression, tension, PDA, etc.) you require to be included in the contract?

Answer to Question 69

Pile load testing information is provided in Specification Section 02468, Open End Steel Pipe Piles, in the Technical Specifications, dated February 2026.

Question 70

70. Specification Section 02468, Rolled Steel Section Piles, paragraph 3.7, Can you confirm the compressive strength of the concrete pile fill, along with the lower limits of the pile fill?

Answer to Question 70

Concrete pile fill shall be Class B concrete per Specification Section 03300, Cast-in-Place Concrete, and extend to 30 feet below cutoff elevation.

Question 71

71. Specification Section 02615, Ductile Iron Pipe & Fittings (Buried Application), paragraph 2.1.C.1.c – Can you confirm if the bolting hardware is required to be Corten or stainless steel, or is black iron bolting acceptable?

Answer to Question 71

All bolting hardware, either exposed or buried to be 316 stainless steel. Refer to the Technical Specifications or drawing set dated February 2026, for additional information.

Question 72

72. Specification Section 03300, Cast-in-Place Concrete, paragraph 2.5.G.6 – References Cementitious Waterproofing: per Section 07100. Specifications do not include Section 07100. Please clarify whether this is within the scope of work.

Answer to Question 72

Specification Section 07100, Cementitious Waterproofing, is not required for this project and the reference noted in Specification Section 03300, Cast-in-Place Concrete removed. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 73

73. Specification Section 03320, Concrete Placement, paragraph 3.4.G - This refers to grout at the clarifiers. Can you provide details on the required thickness and material type for grouting the clarifier bottoms? Also, can you provide information on the demolition of the existing grout, surface preparation, bonding agent requirements, finishing requirements, etc.?

Answer to Question 73

The project does not include the demolition of grout in the bottom of Secondary Clarifiers 6, 7 and 8 and the reference note in Specification Section 03320, Concrete Placement modified. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 74

74. Specification Section 03350, Concrete Finishing, paragraph 3.6 – Can you clarify exactly what surfaces the slab sealer is to be applied to?

Answer to Question 74

Slab sealer is required on all new exposed exterior concrete slabs and stairs.

Question 75

75. Specification Section 03350, Concrete Finishing, paragraph 3.7 - Can you clarify exactly what surfaces the slab hardener is to be applied to?

Answer to Question 75

A slab hardener is not required under this Project, and the paragraph will be removed from the specification section. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 76

76. Specification Section 03930, Concrete Coatings, paragraph 3.3. Can you clarify exactly what surfaces are to be coated and the limits of the coating on the structures.

Answer to Question 76

There are no concrete coatings in this Project. Specification Section 03930, Concrete Coatings has been eliminated from the Technical Specifications, dated February 2026.

Question 77

77. Specification Section 05120, Structural Steel, paragraph 3.6 - Since the acceptable manufacturers are a reasonable distance from this project site, are there any acceptable local galvanizing facilities?

Answer to Question 77

Specification Section 05120, Structural Steel, has been revised to omit the listed acceptable manufacturers. It is the contractor's responsibility to select a galvanizing facility that meets the intent of the specifications. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 78

78. Specification Section 05500, Metal Fabrications, paragraph 3.7 - Since the acceptable manufacturers are a reasonable distance from this project site, are there any acceptable local galvanizing facilities?

Answer to Question 78

Specification section 05500, Metal Fabrications, has been revised to omit the listed acceptable manufacturers. It is the contractor's responsibility to select a galvanizing facility that meets the intent of the specifications. Refer to the Technical Specifications, dated February 2026, for additional information.

Question 79

79. Specification Section 11351, Circular Type Sludge Collection Equipment, paragraph 1.3B - Can you confirm what work (if any) is required for the Clarifier effluent launder (See Dwg PR-50-102), other than the installation of the V-Notch Effluent Wier Plates (Item 7)? Do the existing holes in the effluent launder match the layout and details shown in the Clarifier Weir Detail (see Dwg 50-PR-501)? In addition, is there any coating work required on this existing effluent launder?

Answer to Question 79

For Secondary Clarifiers Nos. 6, 7 and 8, the work shall include the removal and replacement of the existing scum baffle and V-notch weirs, brackets and hardware. The Contractor will be required to field verify the existing conditions including elevations, v-notch spacing, dimensions, bolt hole locations for the v-noch weirs and scum baffles. The Project will not include for the removal and replacement of the existing lauders or any coating work. Refer to the Drawing Set, dated February 2026, for additional information.

Question 80

80. Dwg C-00-100 Demo Note 1 - Can you confirm if the owner/operator will drain, cut, remove, and reinstall, or if this is the actual work of the general contractor? Also, how long can this line be out of service to allow the work to be performed, as detailed in Dwg C-01-106?

Answer to Question 80

The Contract Operator will be responsible for removal and disposal of liquid contents within the existing pipes, and the Contractor can assume that they will be responsible for cleaning the pipe and the remaining work items described in the demolition note.

Question 81

81. Dwg C-00-101 Note 2 – Can you confirm whether the Owner/STP Operator will drain, cut, remove, and reinstall temporary RAS piping as necessary, or if this is the responsibility of the general contractor? Also, how long can this line be out of service to allow the work to be performed?

Answer to Question 81

The Contract Operator will be responsible for removal and disposal of liquid contents within the existing pipes, and the Contractor can assume that they will be responsible for cleaning the pipe and the remaining work items described in the note.

Question 82

82. Dwg C-00-101 Note 3 – Note is not provided?

Answer to Question 82

There is no reference Note 3 on Drawing C-00-101. Additional explanation is required.

Question 83

83. Dwg C-01-102 – Section 1 – Can you confirm that the existing 30 "Kennedy Mode KS-RW/2638, when closed, will isolate the segment that we are to tie in to? Also, can you confirm the weight of the 30" lines (see photos 1 & 2) that we will need to support to make the tie-ins?

Answer to Question 83

Discussions with the STP Contract Operator indicate the existing valves within the vault can be closed. The existing elevated 30-inch diameter RAS pipe is 316 stainless steel with an approximate pipe wall thickness of 0.375 inches. The Contractor is responsible for determining the weight and temporary support requirements while making the pipe and valve modifications for the RAS line to the N. RAS Pump Station.

Question 84

84. Dwg C-01-103, Note 10 – Are the existing piles to be located timber piles? If so, are they treated or untreated piles?

Answer to Question 84

Contractor to refer to Specification Section, 007300, Supplementarty Conditions, paragraph SC-4.02.D.1, that lists several record drawings that illustrate the type and location of piles and whether they are treated or untreated. These drawings are available to be reviewed at the Sewerage & Water Board of New Orleans, LA office.

Question 85

85. Dwg C-01-105 – Which pay item should this work be included?

Answer to Question 85

All work associated with the removal of existing 24 and 30-inch RAS piping, fittings, valves, and installation of new 24 and 30-inch RAS piping, fittings and valves shall be included in Bid Item 1, North RAS Pump Station Upgrade. Refer to the Technical Specifications, Specifications, Section 01150A, Measurement and Payment, Page 4, Bid Item 1, North RAS Pump Station Upgrade, dated February 2026 for additional information.

Question 86

86. Dwg C-01-107, Notes 2 & 3 – Can you provide the missing reference drawings?

Answer to Question 86

Reference Notes 2 and 3 on Drawing C-01-107 are included in the Drawing Set, dated February 2026, for additional information.

Question 87

87. Dwg C-01-107 – Can you provide a detail on the 8" WAS pipe supports?

Answer to Question 87

Specification Section 15094, Pipe Supports and Hangers, calls for the Contractor to provide all necessary hangers, support and braces as need to provide a functional and adequately supported and restrained system. The specification also requires the delegated design of pipe hangers, supports and bracing and the performance criteria, design requirements and material of construction are specified herein and on the Structural Drawings. Refer to the Technical Specifications and Drawing Set, dated February 2026, for additional information.

Question 88

88. Dwg C-01-108- Is the 30" RAS line that will be connected to the North RAS Pump Station presently live or not? Also, is the existing RAS fluid in the line? If there are currently process materials in the line, will the owner/stp operator be responsible for evacuating the materials to allow time-in to the line?

Answer to Question 88

The existing 30-inch RAS line from the N. RAS Pump Station is currently active and full of liquid. The Contractor will be responsible for draining and disposing the liquid and solids content in both lines. The Contractor will need to submit a written plan identifying the time period that the existing line will need to be taken out of service. Refer to the Technical Specifications and Drawing Set, dated February 2026, for additional information.

Question 89

89. Dwg C-01-108, Note 3 – Note 3 states that the contractor is to modify or rehabilitate the existing pipe supports. Upon review of the layouts of the new lines at Clarifiers Nos. 5 & 7, it is clear that the new lines do not align with the existing lines (Dwg C-01-109, Dwg C-01-111); therefore, new pipe supports appear to be required at those locations. If that is the case, can you provide details on the new concrete supports, confirm that foundation piling will be required, and provide the quantity, location, and length of those piling?

Answer to Question 89

Existing pipe supports for the buried 16-inch RAS piping are to be demolished and removed, and new pile supported pipe supports are to be installed for the new 24-inch RAS piping. Refer to the Civil drawings C-01-109 through C-01-112 and the 24-inch RAS Pipe Support Detail on drawing S-99-502 in the drawing set dated February 2026, for additional information.

Question 90

90. Dwg C-01-109, Note 3 – Can you provide details on what items on this drawing are related to Specification 01100 -Alternates, as the work associated with Clarifier No. 5 is not in Alternate A, B, or C per the contract specifications?

Answer to Question 90

Note 3 on Drawing C-01-109 was removed from the drawing. Refer to the Drawing C-01-109 in the drawing set dated February 2026, for additional information.

Question 91

91. Dwg C-01-109 – To remove the existing 16" RAS DI line at the existing North RAS pump station structure (See existing profile and demolition plan), we must remove fill between the existing timber foundation piling below the bottom of the existing Effluent Channel (this condition exists at Clarifier No. 7, too). The safe working area will be a minimum of 8-10 feet wide from the face of the existing effluent channel to the back wall of the North RAS Pump Station. Can you confirm that the existing structural channel is designed to span from the foundation piling to facilitate this work? Please note that this work does not, and cannot, adhere to the "Pipe Trench Detail" shown on Dwg C-01-113. This is mentioned in Dwg S-00-001, Foundation Note 3. Still, the contract documents do not provide sufficient information about the structure's design, nor, given the scope contemplated, is it clear how one can protect it when we have no idea exactly what it is. In addition, the groundwater dewatering system will be designed to handle groundwater in the excavated area. Still, it will not accommodate any process water that may leak at the effluent channel structure. Is there any way to dewater the existing effluent

channel to inspect the conditions and, if necessary, address this potential issue? Also, if water is flowing below the effluent channel structure and the existing slab, from up or down the channel, this would be beyond the anticipated groundwater dewatering scope of work contemplated by the contract documents.

Answer to Question 91

The Contract Drawings note for the Contractor to install and maintain a cofferdam and bulkheads within the effluent channel. The design of the cofferdam, bulkheads and temporary pumping system is the responsibility of the Contractor. A portion of the effluent channel above the proposed work area can be drained. The Contractor to coordinate the drainage of liquid and solids from the effluent channel with the STP Operator. The design, installation and operation of a temporary groundwater system is responsibility of the Contractor. The Contractor is responsible for installing a temporary sheeting and shoring design for the proposed work. The pipe trench detail is a generic detail and not applicable for the RAS work in and around the N. RAS Pump Station. Ultimately, it is the Contractor's responsibility to furnish, install and maintain temporary sheeting and shoring system to ensure a safe working environment for the construction workers. Refer to the Technical Specifications and drawing set, dated February 2026, for additional information.

Question 92

92. Dwg C-01-109 – To install a TRS sheet piling system to facilitate the removal of the existing 16" RAS line, it appears that the existing concrete walkway leading to Clarifier No. 5 will have to be removed (this condition is at Clarifier No. 7, too). Would it be acceptable to provide a structural steel catwalk replacement similar to that detailed via the contract drawing at Clarifier No. 6 (Dwg S-52-104)?

Answer to Question 92

The existing concrete walkway (catwalk) plus the set of stairs from the effluent channel to Secondary Clarifier No. 7 is to be removed to facilitate the installation of the new RAS lines. Contractor to provide temporary OSHA approved stairs from the N. RAS to existing grade as well as a set of temporary OSHA approved stairs to access Secondary Clarifier Nos. 5 and 7 bridge assembly and ancillary equipment systems. A new catwalk/walkway plus a set of stairs will be required to be installed. Refer to the drawing set, dated February 2026, for additional information.

Question 93

93. Dwg C-01-109 – We may have a conflict between the TRS sheet piling system and the Grease Collection Box at the existing clarifier units. Would it be acceptable to remove and replace this structure if required?

Answer to Question 93

The existing Grease Collection Box is to remain in place and be temporarily supported as required to facilitate removal and reconnection to the 16-inch RAS line exiting each Secondary Clarifier Nos. (5, 6, 7 and 8). Refer to Specification Section 007300, Supplementarty Conditions, paragraph SC.-4.02, that lists several record drawings that can be reviewed by the Contractor. These drawings are available to be reviewed at the Sewerage & Water Board of New Orleans, LA office.

Question 94

94. Dwg S-51-001 – Can you confirm that the only Fire Extinguisher required is in the new electrical room?

Answer to Question 94

Only one new fire extinguisher is required for the Electrical Room as illustrated on Drawing S-52-001.

Question 95

95. Dwg S-99-503 – Steel Bollards – Can you please confirm the required quantity?

Answer to Question 95

There are no bollards to be installed under this contract. This detail has been removed from the drawing set, dated February 2026.

Question 96

96. Dwg PR-00-001 Process General Note 19 – Contract specifications Section 15180 not included in contract specifications issued to date.

Answer to Question 96

A copy of Specification Section 15180, Pipe and Equipment Insulation, is included in the Technical Specifications, dated February 2026, for additional information.

Question 97

97. Dwg PS-00-001 Process General Note 27 – Is the tolerance of 0.005" feet obtainable? Is it truly required to be that accurate?

Answer to Question 97

The tolerance will be revised to within +/- 0.005" the weir elevations indicated on the drawings. Refer to the drawing set, dated February 2026, for additional information.

Question 98

98. Dwg PS-00-001, Demolition Note 9 – Upon review of the scope of work contemplated, it appears that all RAS process equipment and lines at the North RAS station are presently not in operation, and the Temporary RAS is handling the RAS Pumps No. 1 & 2 and related piping system. In addition, we cannot see any flow monitoring devices in the temporary system. Can you confirm that this is correct? Can you also confirm that the only process lines that are in presently in operation that interface with the scope of work are the 42" clarifier effluent lines from the clarifiers to effluent channel, the ½" instrument airline at the clarifiers, 8" Scum line from scum baffle to the scum pits at the clarifiers and the domestic water to hose bibb at center of clarifier, existing level equipment at clarifier bridge,?

Answer to Question 98

The existing 24 and 30-inch RAS lines leaving the N. RAS PS to the influent channel are operational. The temporary RAS lines are installed and not operational at this time. The Contractor will be responsible for furnishing, installing and starting up temporary diesel RAS pumping systems. Once the temporary diesel RAS pumping system are accepted and operational, the STP Contract Operator will operate the system. Should a portion of the temporary RAS piping system need to be relocated, the Contractor will be responsible for draining and disposing the temporary RAS suction and/or discharge lines and relocating the lines as necessary to facilitate the construction of the new piping and other facilities as indicated on the Drawings. The temporary RAS pumping and piping system will not have a

flow meter. The current RAS pumping system does not have a flow meter to monitor the RAS flow. The STP Contractor Operator will be monitoring the sludge blankets in the secondary clarifiers. Each secondary clarifier has a 42-inch effluent line, an 8-inch grease/scum line, sump pump discharge piping, process water to the hose bibb at the center clarifier along with conduit and wiring for lighting, control panels, disconnect switches and level instrumentation equipment. Contractor is required to field verify existing conditions at each secondary clarifier prior to commencement of any demolition work. Refer to Specification Section 01515, Temporary Bypass Pumping Systems, included in the technical specifications dated February 2026, for more details regarding the temporary RAS bypass pumping system requirements.

Question 99

99. Dwg PS-00-001, Demolition Note 14 – Can you further clarify specifically what existing walls and floor surfaces will require patching and painting in the existing North RAS Pump Station?

Answer to Question 99

Specific walls and surfaces within the existing N. RAS Pump Station have not been identified for repairs. The Contract Drawings and Technical Specifications provide guidance on how to repair and pay for the repairs should locations be identified by the Engineer or the Owner's RPR for structural crack repair (Bid Item 4) and cementitious overlay (Bid Item 5) of structures. Refer to the drawing set and Technical Specifications, dated February 2026, for additional information.

Question 100

100. Dwg PR-00-001, Note 3 – Can you confirm if this note to install couplings is required on both ends of the new 16"/24" clarifier effluent RAS lines and the 30" RAS Effluent at the clarifiers and North RAS Pump Station Effluent Line? At Clarifiers Nos. 5 & 7, that would fall inside the 30" Casing? Where at the existing 16" RAS clarifier effluent lines would they be placed?

Answer to Question 100

Solid sleeve restrained couplings are required at each end of RAS suction lines for Secondary Clarifiers Nos. 5, 6, 7 and 8 as well as the 30-inch RAS line leaving the N. RAS PS towards the influent channels. For Secondary Clarifiers Nos. 5 and 7, the solid sleeve couplings would be installed outside the 36-inch carrier/casing pipe. Note that solid sleeve couplings are required on all pressurized lines as noted on Drawing PR-1, Note 3. The specific location of the coupling is to be coordinated in the field with the Engineer.

Question 101

101. Dwg PR-50-101, Demolition Notes – Can you confirm if the demolition scope includes the removal and replacement of the existing 2" grout at the bottom slab of each of the clarifiers being replaced?

Answer to Question 101

The demolition work within Secondary Clarifiers Nos. 6, 7 and 8 under Bid Alternates A, B and C does not include for the removal of the 2-inches of concrete grout at the bottom of the slab.

Question 102

102. Dwg PR-50-101, Demolition Note 5 – Is this intended to be paid for under bid item #5?

Answer to Question 102

The removal and reinstallation of the existing light poles on the existing bridge assemblies for Secondary Clarifiers 6, 7 and 8 and as noted in Demolition Note 5 on Drawing PR-50-101, is to be paid for under Bid Alternates A, B and C. Refer to the Bid Form, the drawing set and Technical Specifications, dated February 2026, for additional information.

Question 103

103. Dwg PR-52-101, Demolition Note 10 – Can you confirm if this is still operable at this time? Also, is there any replacement of this existing bridge crane?

Answer to Question 103

The existing bridge crane trolley and hoist is operational. A new monorail, trolly and hoist system is illustrated in the drawing set and Technical Specifications, dated February 2026. Refer to these documents for additional information.

Question 104

104. Dwg PR-52-103, Note 3 – Note 3 places the design of the supports onto the contractor. Can you provide all the specific load conditions these supports will see so the contractor can design accordingly, considering the loads defined in Section 15094l, Para. 1.1A?

Answer to Question 104

The specific load conditions are summarized in Specification Section 15094, Paragraph 1.4.M. Also refer to specification section 15050 Pipe and Pipe Fittings, General, in the Technical Specifications, dated February 2026, for additional information.

Question 105

105. Dwg PR-99-501 - Can you please confirm the required quantity of the Washdown (HBF) Hose Bibb Stations?

Answer to Question 105

One flushing hose bibb station shall be provided in the Lower Level of the North RAS Pump Station. Two wash down hose bibbs are also required for Secondary Clarifier Nos. 6, 7 and 8. Refer to the drawings set, dated February 2026, for additional information.

Question 106

106. Dwg PR-99-502 – Bar Rack Details – Can you confirm if this is part of the scope of work?

Answer to Question 106

The bar rack is not part of this Project. Refer to the drawing set, dated February 2026, for additional information.

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: Sewerage and Water Board of New Orleans
Purchasing Department, Room 133
625 St. Joseph St.
New Orleans, LA 70165
(Owner to provide name and address of owner)

BID FOR: Contract 30270
East Bank Sewage Treatment Plant - Phase I
Secondary Treatment and Solids Upgrade
(*Owner to provide name of project and other identifying information)*

The undersigned bidder hereby declares and represents that she/he: a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: Wright-Pierce, Inc. and dated: February 2026
(Owner to provide name of entity preparing bidding documents.)

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____.

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate A: Removal & Replacement of Secondary Clarifier Mechanism No. 7, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational for the lump sum (Total Base Bid Plus Alternate A) of:
_____ Dollars ($ _____)

Alternate B: Removal & Replacement of Secondary Clarifier Mechanism No. 6, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational for the lump sum (Total Base Bid Plus Alternate A + B) of:
_____ Dollars ($ _____)

Alternate C: Removal & Replacement of Secondary Clarifier Mechanism No. 8, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational for the lump sum (Total Base Bid Plus Alternate A + B + C) of:
_____ Dollars ($ _____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC WORK BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

**** A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA R.S. 38:2218(A) attached to and made a part of this bid.

LOUISIANA UNIFORM PUBLIC WORK BID FORM
UNIT PRICE FORM

TO: Sewerage and Water Board of New Orleans
Purchasing Department, Room 133
625 St. Joseph St.
New Orleans, LA 70165
(Owner to provide name and address of owner)

BID FOR: Contract 30270
East Bank Sewage Treatment Plant - Phase I
Secondary Treatment and Solids Upgrade
(*Owner to provide name of project and other identifying information)*

UNIT PRICES: This form shall be used for any and all work required by the Bidding Documents and described as unit prices. Amounts shall be stated in figures and only in figures.

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ North RAS Pump Station Upgrade			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
1	1	Lump Sum		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Replacement of Buried RAS Suction Piping			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
2	1	Lump Sum		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Additional Steel Rolled Form Concrete Filled Piles			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
3	250	VF		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Crack Repair of Existing Concrete Tanks and Structures			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
4	200	LF		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Cementitious Overlay in Existing Concrete Tanks and Structures			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
5	200	SF		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Additional Earthwork Materials - Compacted Select Fill			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
6	200	CY		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Excavation of Unsuitable Material, Replacement Backfill and Disposal			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
7	1,100	CY		

DESCRIPTION:	☒ Base Bid or ❑ Alt.# ___ Flowable Fill			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
8	200	CY		

Wording for "DESCRIPTION" is to be provided by the Owner.
All quantities are estimated. The contractor will be paid based upon actual quantities as verified by the Owner

LOUISIANA UNIFORM PUBLIC WORK BID FORM
UNIT PRICE FORM

TO: Sewerage and Water Board of New Orleans
Purchasing Department, Room 133
625 St. Joseph St.
New Orleans, LA 70165
(Owner to provide name and address of owner)

BID FOR: Contract 30270
East Bank Sewage Treatment Plant - Phase I
Secondary Treatment and Solids Upgrade
(Owner to provide name of project and other identifying information)

UNIT PRICES: This form shall be used for any and all work required by the Bidding Documents and described as unit prices. Amounts shall be stated in figures and only in figures.

DESCRIPTION:	❑ Base Bid or ☒ Alt.# A Removal & Replacement of Secondary Clarifier Mechanism No. 7, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
9	1	Lump Sum		

DESCRIPTION:	❑ Base Bid or ☒ Alt.# B Removal & Replacement of Secondary Clarifier Mechanism No. 6, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
10	1	Lump Sum		

DESCRIPTION:	❑ Base Bid or ☒ Alt.# C Removal & Replacement of Secondary Clarifier Mechanism No. 8, Drive, Bridge Assembly, and Ancillary Equipment Systems Complete and Operational			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*
11	1	Lump Sum		

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

Wording for "DESCRIPTION" is to be provided by the Owner.
All quantities are estimated. The contractor will be paid based upon actual quantities as verified by the Owner

CONTRACT NO. 30270

EAST BANK SEWAGE TREATMENT PLANT PHASE 1A

SECONDARY TREATMENT UPGRADE

SEWERAGE & WATER BOARD OF NEW ORLEANS

NEW ORLEANS, LOUISIANA

SECTION 3 - TECHNICAL SPECIFICATIONS

FEBRUARY 2026

21163

WRIGHT-PIERCE
Engineering a Better Environment

SEWERAGE & WATER BOARD OF NEW ORLEANS

NEW ORLEANS, LOUISIANA

SECTION 3
TECHNICAL SPECIFICATIONS

FOR

CONTRACT NO. 30270

EAST BANK SEWAGE TREATMENT PLANT
PHASE 1A SECONDARY TREATMENT UPGRADE

FEBRUARY 2026

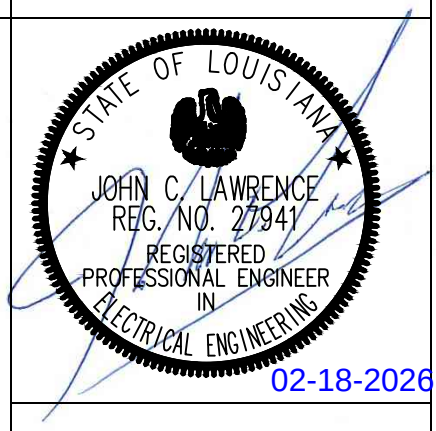
Prepared By:

Wright-Pierce
601 South Lake Destiny Road, Suite 290
Maitland, Florida 32751
Phone: 407-906-1776

SPECIFICATIONS CERTIFICATION

PROJECT SPECIFICATIONS – GENERAL DIVISIONS 0 AND 1	 2/18/26 STEVEN C. HALLOWELL, PE
PROJECT SPECIFICATIONS – CIVIL DIVISION 2	 2/18/26 STEVEN C. HALLOWELL, PE
PROJECT SPECIFICATIONS – ARCHITECTURAL DIVISIONS 4, 6, 7, 8, 9, 10, AND 12	 2/18/26 STEVEN C. HALLOWELL, PE

PROJECT SPECIFICATIONS – STRUCTURAL DIVISIONS 3, AND 5	 2/18/26 JUSTIN KELLOGG, PE
PROJECT SPECIFICATIONS – PROCESS DIVISIONS 11, 14, AND 15	 2/18/26 STEVEN C. HALLOWELL, PE
PROJECT SPECIFICATIONS – MECHANICAL DIVISION 15	 2/18/26 STEVEN C. HALLOWELL, PE

PROJECT SPECIFICATIONS – PLUMBING DIVISION 15	 STEVEN C. HALLOWELL, PE
PROJECT SPECIFICATIONS – INSTRUMENTATION DIVISION 13	 STEVEN C. HALLOWELL, PE
PROJECT SPECIFICATIONS – ELECTRICAL DIVISION 16	 JOHN C. LAWRENCE, PE

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SECTION 01010A

SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Upgrading the New Orleans East Bank Sewage Treatment Plant (STP). The major proposed work under this Contract generally includes:

1. Construction of:
   a. A Temporary RAS Pumping System to convey RAS from the Clarifiers No. 5 through 8 to the raw influent channels until the new North RAS PS is constructed;
   b. Five new vertical dry pit submersible pumps, bridge crane, piping, fitting, valves, instruments, and other associated appurtenances at the North RAS PS;
   c. A new Electrical Building pile foundation and block structure at the North RAS PS to house new variable frequency drives, motor control center, distribution panels, light panels, instrumentation, heating, ventilation, and other associated appurtenances;
   d. Sump pumps for the North RAS PS;
   e. Piping, piles, pile caps, site work, temporary groundwater dewatering, earth excavation, sheeting and shoring, removal and disposal of excess excavated material, backfill material, flowable fill, equipment systems, structures, instrumentation, control and electrical systems, as indicated on the Drawings.
   f. All other appurtenances as shown on the Drawings and specified herein.
2. Conversion of:
   a. All other appurtenances as illustrated on the Drawings and as specified herein.
3. Demolition of:
   a. Secondary clarifier collector mechanisms 6 through 8 including mechanisms, bridges, scum removal system, piping, valving, conduit, wiring, controls, and other associated appurtenances (Refer to Section 01100 Alternates for additional details).
   b. Removal of existing RAS piping from Secondary Clarifiers 5, 6, 7 and 8, including pile caps, piles as necessary to facilitate new RAS piping, piles, pile caps, including earth excavation, temporary groundwater dewatering, sheeting, shoring, backfill material, flowable fill and other associated appurtenances.
   c. Return sludge pumps, piping, valving, conduit, wiring, HVAC equipment, and other associated appurtenances in the North RAS Pump Station.
   d. Draining and disposing liquid contents within the existing and temporary RAS lines, grease/scum lines, process water to and from the N. RAS pump station to the influent channel and secondary clarifiers Nos. 5, 6, 7 and 8.
   e. Piping and other appurtenances, as indicated on the Drawings.

f. Draining, cleaning interior tank walls (secondary clarifiers 5, 6, 7 and 8 and effluent channel) of liquid and solids contents and disposing on site at the STP.
g. Install, operate and maintain a temporary cofferdam and backup bulkhead systems within the existing effluent channel as necessary to facilitate the construction work.
h. Install, operate, and maintain a temporary bypass system conveying Secondary Clarifiers 7 and 8 effluent, from the end of the Effluent Channel to the Effluent Channel downstream of the temporary cofferdam and bulkhead system to facilitate installation of the RAS piping beneath the Effluent Channel.

4. Replacement of:
   a. Secondary Clarifier Nos. 6, 7 and 8 sludge removal mechanisms, bridge assemblies, controls, and ancillary systems (Refer to Section 01100 Alternates for additional details);
   b. Miscellaneous process piping and appurtenances;
   c. Elevated walkways to secondary clarifiers 5, 6, 7 and 8.
   d. Other removals/demolitions as shown on the Drawings and specified herein.
5. Maintain plant flow and treatment processes as detailed in Part 3 of this section.
6. Remove and/or relocate equipment as indicated on the Drawings.

B. Removals, Relocations and Rearrangements
1. Examine the existing site for the work of all trades which will influence the cost of the work under the bid. This work shall include removals, relocations and rearrangements which may interfere with, disturb or complicate the performance of the work under the bid involving systems, equipment and related service lines, which shall continue to be utilized as part of the finished project. The Contractor is responsible for all coordination in this regard.
2. Provide in the bid a sufficient amount to include all removals, relocations, rearrangements and reconnections herein specified, necessary or required to provide approved operation and coordination of the combined new and existing systems and equipment.

C. **As required by the Southeast Louisiana Flood Protection Authority − East, the total weight of trucks carrying concrete, equipment, piping, etc. inside the treatment plant flood protection walls shall not exceed 72,000 lbs.**

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 MAINTAIN EXISTING WORKS

A. Existing Operations:

1. The existing STP provides influent pumping, mechanical fine screening, aerated grit basins, secondary treatment via oxygen reactors, and secondary clarification. Sludge is dewatered (via gravity belt thickeners, followed by belt filter presses) and discharged to incinerators or disposed in roll-off containers to an off-site landfill.
2. Typical raw sewerage influent flows to the STP are as follows:
    a. Minimum: 85-mgd;
    b. Annual Average: 122-mgd;
    c. Peak Hour: 239-mgd;
    d. Contractor shall be required to convey the entire range of influent flows for the duration of the project. Bypass pumping, if provided, shall be variable speed to match influent flows.
3. Typical waste sludge generation at the STP is as follows:
    a. Current Average: 800,000 gallons per day (gpd) at 0.5-1.0% oven dry solids (ODS, by weight);
    b. Design Average: 1,300,000-gpd at 0.5-1% ODS;
    c. Current Max Month: 950,000-gpd at 0.5-1% ODS;
    d. Design Max Month: 2,000,000-gpd at 0.5-1% ODS;
    e. Sludge wasting is performed on a daily basis at a maximum rate of approximately 1,900-gallons per minute (gpm).
4. Routine laboratory analyses are performed in conjunction with treatment. Treatment plant maintenance equipment and vehicles are stored on the premises.
5. Utilities include municipal water, electric power, telephone and fuel oil.

B. Maintain Treatment:
1. State and federal regulations require that at all times during construction work under this contract, the treatment facility remain operational (i.e. provide secondary treatment as well as sludge handling, dewatering and disposal) throughout construction, until such time as the new facilities are accepted and on-line.
2. The Contractor shall provide, maintain and operate all temporary facilities such as dams, pumping equipment, conduits, and all other labor and equipment necessary to intercept the sewage, sludge and supernatant flow before it reaches the points where it would interfere with the work, and carry it past the work such that essential treatment processes remain operational and effective.
3. The Contractor's operations shall not hinder the delivery, storage and use of materials and supplies, nor hinder staff duties, nor disrupt utility service.
4. The Owner/Operator must have access to the existing plant and equipment at all times unless a specific exception is granted by the Owner/Operator.
5. In order to maintain the required degree of treatment, Contractor shall schedule their operations so that the following requirements can be complied with:
    a. Six or more Secondary Clarifiers are available and on-line at all times. Note that one of the eight total clarifiers is currently being used for alternative means as a sludge storage tank.
    b. Two or more dewatering feed pumping systems shall be available and on-line at all times.

c. Three or more Belt Filter Presses are available and on-line at all times.
d. Disinfection chemical feed systems are available and on-line at all times.

C. Minimize Interference:
1. The Contractor shall at all times conduct their operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Owner/Operator, Engineer, and interested officials, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted.
2. Work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference. It may be necessary to work outside of normal working hours to minimize interference. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.
3. Any demolition of existing concrete, ductwork or equipment in the Thickened Sludge Pump Pipe Gallery, Solids Handling Building, or North RAS PS Building shall require the Contractor to keep dust from entering the rest of the building. Contractor shall provide temporary measures as required to control the exposure of dust to the treatment plant personnel and the remainder of the facility. The Contractor shall provide for continuous safe passage around work for treatment facility personnel.
4. The Contractor shall not use the Owner/Operator's bathrooms or kitchen facilities.
5. The Contractor shall limit their personnel to the proposed work areas and limits of work.
6. The Contractor shall limit parking of workers and subcontractors to the area outlined on the Drawings. On-site speed limit is 10 MPH.

3.2 CONSTRUCTION SEQUENCE

A. Construction of the proposed treatment facilities will disrupt the existing treatment facility structures and operations. To maintain treatment and to minimize disruption, the construction must be divided into phases or sequenced appropriately. The construction sequence phases and dates must allow the facility to maintain treatment as specified in paragraph 3.1,B. Refer to paragraph 3.1,B,5. The Contractor may deviate from this construction sequencing as outlined in paragraph 3.2,C.

B. Phase 1 – Secondary Clarifier and North Return Sludge Pump Station Improvements
1. The intent of Phase 1 is to replace all buried Return Activated Sludge suction piping from Secondary Clarifiers 5 through 8 to the North RAS Pump Station, and perform improvements to the North RAS Pump Station. Replacement of Secondary Clarifier Mechanisms 6, 7, and 8 are listed as bid alternates, and will be added to this phase of construction if elected by the Owner.
2. North RAS Pump Station and Return Sludge Piping Improvements
a. Install, startup, test, and demonstrate temporary Return Sludge pumping system to the satisfaction of the Engineer and Owner.

b. Install, startup, test, and demonstrate temporary groundwater dewatering system.
c. Prior to taking the pump station offline to perform improvements, install and demonstrate temporary power feed to all existing equipment and systems fed from the pump station Electrical room that require to remain in service.
d. Install, operate, and maintain a temporary cofferdam and bulkhead systems within the existing effluent channel. Draining, cleaning walls and channel base and disposal of liquid and solid contents of portion of the effluent channel.
e. Install, operate and maintain a temporary pumping system to convey treated effluent from Secondary Clarifiers Nos. 7 and 8.
f. Install temporary excavation support system(s) and excavate to expose return sludge suction piping, discharge piping, and piping pile support systems at Secondary Clarifiers 5 through 8.
g. Demolish 16-inch Return Sludge suction piping at Clarifiers 5 through 8 per limits shown in the Contract Drawings.
h. Mobilize pile driving equipment and install new foundation support piles as indicated in the Contract Drawings.
i. Install 36-inch steel sleeve pipes beneath the Effluent Channel to assist with the installation of new Return Sludge suction piping associated with Secondary Clarifiers 5 and 7 to the North RAS Pump Station Pump Room.
j. Demolish existing return sludge pumps, piping, supports, and associated appurtenances within the pump station lower-level Pump Room.
k. Core drill new holes through Pump Station foundation walls to accept new 24-inch Return Sludge suction piping.
l. Install 24-inch Return Sludge suction piping through 36-inch sleeves to interior of pump station. Seal foundation wall penetrations and make water tight. Infill annular space between steel sleeves and suction piping.
m. Install remaining new buried 24-inch Return Sludge suction piping, fittings, and foundation support systems at all clarifiers.
n. Furnish and place flowable fill beneath the effluent channel within the excavated area.
o. Install new 30-inch Return Sludge discharge piping and connect to existing force main.
p. Backfill and remove temporary excavation support system(s).
q. Install new Return Sludge pumps, interior piping, supports, accessories, and all other associated appurtenances.
r. Construct new Electrical Room structure.
s. Install new Electrical Room equipment, HVAC systems, instruments, and other furnishings.
t. Complete Pump Room and Mezzanine furnishings and accessory installation.
u. Decommission and remove temporary dewatering system.

v. Decommission and removal of the temporary RAS pumping and piping system. Contractor to transfer all existing temporary RAS piping and valves in the area adjacent to sodium hypochlorite storage area.

3. Secondary Clarifiers 6, 7, and 8 Improvements (Bid Alternates B, A, and C Respectively)
   a. If awarded, the three secondary clarifiers will be taken offline, isolated, and locked out/tagged out by Veolia when seasonally deemed appropriate.
   b. Veolia staff will pump off and remove settled sludge and grit, and drain, washdown, and dewater each clarifier prior to turning over to the Contractor.
   c. Perform demolition work including the demolition and removal of the clarifier mechanisms, bridges, scum beach and piping, and all other associated appurtenances.
   d. Conduct improvements at each clarifier including installation of new sludge and scum collector mechanisms, bridges, scum piping, and all other associated appurtenances.
   e. Repeat these steps for bid alternate clarifier improvements as applicable.
4. Effluent Channel:
   a. Replacement of the RAS lines from Secondary Clarifiers 5 and 7 will require a portion of the effluent channel will be temporarily taken out of service thus a temporary bypass pumping system will be required to convey effluent from Secondary Clarifiers 7 and 8 to a location in the effluent channel downstream of the channel isolation when seasonally deemed appropriate. In addition, temporary sodium hypochlorite chemical feed piping will need to be extended from the current discharge location to a point downstream of the bulkhead locations to maintain disinfection.
   b. Once the Contractor has furnished, installed and secured a temporary cofferdam, back up bulkheads, and bypass pumping system, the STP Operator (Veolia) staff will pump off and remove liquid, solids, grit, and drain, washdown, and dewater a portion of the effluent channel prior to turning over to the Contractor.
   c. Once drained and cleaned and suitable for entry into the effluent channel, the Engineer shall perform a structural assessment of the drain portion of the channel and make a recommendation to the Owner/STP Operator for structural repairs if necessary.
   d. Owner will notify Contractor of structural repairs to be performed within the effluent channel.
   e. Conduct excavation, removal of existing RAS piping from secondary clarifiers 5 and 7, install new piping, backfill area under effluent channel, and RAS lines and all other associated appurtenances.
5. Place Phase 1 Facilities into Operation:
   a. Phase 1 facilities shall be fully tested and ready for operation with automatic controls, alarms and equipment protection devices functional. It is recognized that the full plant-wide SCADA system may not be available but the necessary local control panels and instrumentation shall be fully tested and functional.

b. Place the Phase 1 treatment facilities in service including:
   i. North Return Sludge Pump Station.
   ii. Secondary Clarifier No.7 (Bid Alternate A).
   iii. Secondary Clarifier No.6 (Bid Alternate B).
   iv. Secondary Clarifier No.8 (Bid Alternate C).

c. Existing Treatment Systems to Remain in Service:
   i. It is necessary to maintain three north battery final settling tanks in service at all times to meet effluent discharge requirements.

C. The Contractor shall submit to the Engineer for review and acceptance a complete schedule of their proposed sequence of construction operations prior to commencing any work. This schedule shall include the Contractor's plans for doing the work. The sequencing plan and schedule shall clearly identify critical timeframes for taking facilities offline and for placing facilities into service, including sufficient time required for new equipment and/or processes to be tested and proven reliable before proceeding to the next item. This reliability testing is above and beyond any specified demonstration and site acceptance testing.

D. The Contractor shall submit to the Engineer a written request to deviate from the above sequence with adequate supporting information to demonstrate to the Engineer that the continuity and degree of treatment will not be adversely affected.

E. The Contractor shall include the cost of all temporary facilities required to maintain treatment during the construction period in their lump-sum bid price. The cost shall include the cost for all labor, tools, equipment and materials necessary.

F. It shall be recognized that certain interruptions of, and disruptions to, the treatment processes and present plant operations will be required to complete the work of this Contract. Scheduled interruptions requiring interruption or bypassing of treatment process shall be kept to a minimum frequency and duration. Such interruptions shall be coordinated by the Contractor and the Owner/Operator using the Contractor’s proposed work schedule, but shall not affect the facilities ability to maintain treatment as described above.

G. The Contractor shall notify the Owner/Operator a minimum of seven (7) days in advance of any work which may affect or disrupt the operation of the existing facilities and two (2) calendar weeks in advance of removing tanks from service. Once the interruption occurs the Contractor must maintain a workforce on-site to complete the work in the agreed upon time.

H. Any work by the Contractor which requires the mechanical or electrical isolation of an existing piece of equipment, process or system shall be coordinated with the Engineer. Any and all isolation of electrical or mechanical equipment or process shall be accomplished in strict accordance with applicable codes and standards and the stricter of the Contractor's or Owner/Operator’s lock-out/tag-out procedures.

I. The Contractor shall have all materials and equipment on-site, and shall receive the Owner/Operator's approval, prior to initiating work which requires any part of the existing wastewater treatment plant to be off-line.

J. Limited down-time of certain existing process units is specified in this specification. Should the Contractor fail to complete the Work within the down-time specified and should the Owner/Operator incur any actual costs directly or indirectly as a result thereof that would otherwise not have incurred had the Contractor successfully

completed the Work within the specified down-time, the Contractor agrees to pay the Owner/Operator such actual incurred costs. Such costs may include, but not be limited to, Owner/Operator's actual costs of any additional maintenance and operations labor, material, equipment, and chemical costs, or any other related actual costs incurred in order for the Owner/Operator to keep the existing plant in normal operating condition.

K. The Contractor shall allow in the Bid reasonable time to accommodate operations at the existing wastewater treatment plant, including the need for the Owner/Operator to respond to emergencies. The Contractor shall not be eligible for additional compensation due to interruptions of the Contractor's schedule, in order for the Owner/Operator to respond to routine conditions.

END OF SECTION

SECTION 01045

CUTTING, CORING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included - This section establishes general requirements pertaining to cutting, excavating, coring, fitting, and patching of the Work required to:
   1. Make alterations to existing structures.
   2. Make the parts fit properly.
   3. Replace work not conforming to requirements of the Contract Documents.
   4. Contractor is responsible for all cutting, coring, and rough and finish patching. Contractor shall coordinate the work of any and all subcontracting trades performing the work.
   5. Contractor is responsible for reviewing with the Owner/Operator and Engineer and receiving permission to proceed prior to cutting and coring and patching.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Perform all cutting, coring and patching in strict accordance with pertinent requirements of these Specifications, and in the event no such requirements are determined, in conformance with the Engineer's written direction.

1.4 SUBMITTALS

A. In accordance with the requirements specified in Section 01340. Provide the following information at least 30 days prior to cutting or coring:
   1. Identification and qualifications of cutting/coring subcontractor(s) including: company name, business address contact information, or if by Contractor, indicated as such.
   2. Key plan and schedule of cuts/cores indicating the: location of the cut/core, size (i.e., wall, floor, roof, etc.), equipment to be used and identification of any potential obstructions or embedded conduits and wiring.

B. Request for the Engineer's consent to proceed:
   1. Prior to cutting which affects structural safety, submit written request to the Engineer for permission to proceed with cutting.
   2. Should conditions of the work, or schedule, indicate a required change of materials or methods for cutting and patching, Contractor shall notify the Engineer and secure written permission prior to proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for replacement of work shall be equal to those of adjacent construction and shall comply with the pertinent sections of these Specifications.

B. Concrete and grout for rough patching shall be as specified in Divisions 3 and 4.

PART 3 - EXECUTION

3.1 CONDITIONS

A. Inspection:

1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, coring, backfilling, and patching.
2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Engineer and secure needed directions.
2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION PRIOR TO CUTTING AND CORING

A. Provide all required protection including, but not necessarily limited to, shoring, bracing and support to maintain structural integrity of the work.

B. All cutting and coring shall be performed in such a manner as to limit the extent of patching.

C. All holes cut through concrete and masonry walls or slabs shall be core drilled unless otherwise approved. No structural members shall be cut without approval of the Engineer and all such cutting shall be done in a manner directed by Engineer. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

D. If holes are cored through floor slabs they shall be drilled from below.

E. The Contractor shall determine from Owner/Operator’s information, logical deduction and field testing if there are embedded electrical conduits, wiring or piping in the coring locations and shall readjust locations if possible to avoid coring through them. If concealed embedded conduit and piping are damaged, or severed, the coring contractor shall immediately notify the Contractor, Owner/Operator and RPR to determine impact of the damage and develop and implement a plan to repair the damage and reactive the lines.

F. If embedded concealed conduit, wiring or pipe is damaged or severed and all reasonable steps were taken by the Contractor to identify embedded items, and alternate routing was investigated, the repair work will be compensated by the Owner/Operator through a Change Order. If it was reasonable to expect an embedded item could have been present at the location, the Contractor shall repair at no additional cost to the Owner/Operator.

3.3 CORING

A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
B. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
C. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
D. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling. Slurry or tailings shall not be allowed to enter floor drains.
E. Work area (e.g., adjacent walls, floors, ceilings, pipes, conduits, etc.) shall be cleaned to remove splash residues from coring operation.

3.4 CUTTING

A. Cutting shall be performed with a concrete wall saw and diamond saw blades of proper size.
B. Provide for control of slurry generated by sawing operation on both sides of wall.
C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
E. Provide equipment of adequate size to remove cut panel.
F. Slurry or tailings resulting from cutting operations shall be vacuumed or otherwise removed from the area following drilling. Slurry or tailings shall not be allowed to enter floor drains.
G. Work area (e.g., adjacent walls, floors, ceilings, pipes, conduits, etc.) shall be cleaned to remove splash residues from cutting operation.

3.5 PERFORMANCE

A. Perform all required excavating and backfilling as required under pertinent sections of these specifications. Perform cutting, coring and demolition by methods which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and/or new work. Perform fitting and adjustment of products to provide finished installation complying with the specified tolerances and finishes.
B. Coring or cutting which exposes cut surfaces of reinforcing steel or structural steel shall be coated. Coating shall be 10 mil (dry film thickness) applied in two 5 mil (dry film thickness) coats of a single component moisture cured coal tar urethane or two part coal tar epoxy corrosion barrier. Alternately the exposed steel can be cut back two inches from the surface and a non-shrink grout applied over the steel flush to the concrete core or cut surface.

C. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.
D. Finish patching shall match existing surfaces as approved.

END OF SECTION

SECTION 01050

COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Contractor is required to work in close proximity to Owner/Operator's existing facilities. The Contractor, under this Contract, will be responsible for coordinating construction activities with Owner/Operator to ensure that services, facilities, and safe working conditions are maintained.

B. Other Construction Contractors will be interfacing with this Contract and working within the work area and in the vicinity of this Contract. The Contractor, under this contract, shall act as Construction Coordinator and shall coordinate construction activities with other Contractors working for Owner/Operator.

C. Any damage to existing structures, equipment and property, accepted equipment or structures, and property or work in progress by others; as a result of the Contractor's or their subcontractor's operations shall be made good by the Contractor at no additional cost to the Owner/Operator.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 COORDINATION WITH OTHERS

A. City of New Orleans:
   1. Contractor shall coordinate access, egress, detours and traffic control, if required, at each site with the New Orleans Police Department. The Contractor shall notify New Orleans Police, Fire Department and Rescue Squad at least 24 hours in advance of any street closings or detours.
   2. Contractor shall coordinate all work on City property with the treatment plant personnel.
   3. The Contractor shall be responsible for coordinating and maintaining public services to all public and private properties.

B. Sewerage and Water Board (S&WB) of New Orleans
   1. Contractor shall be responsible for coordinating all work in the vicinity of water lines with the S&WB. Contractor shall bear all costs for the S&WB's inspection requirements, temporary facilities, water main adjustments and other requirements.

C. Entergy New Orleans (ENO):
   1. The Contractor shall be responsible for coordinating all work around ENO facilities with ENO and shall bear all costs of inspection requirements, temporary facilities relocation and other requirements.

D. Verizon:
   1. The Contractor shall be responsible for coordinating and providing telephone service to all construction sites, both temporary and permanent. The Contractor

shall also be responsible for coordinating all work around Verizon facilities with Verizon and shall bear all costs of inspection requirements, temporary facilities relocation and all other requirements.

E. The Contractor shall provide the Resident Project Representative and Chief Operator a construction schedule indicating the times to perform the work required. The Contractor shall update the schedule when required and give the facility one week notice before the start of any work. The Contractor shall provide the facility personnel enough time to obtain materials and perform the work required of them. The Contractor shall daily communicate with the Resident Project Representative and Chief Operator concerning updating the schedule, job progress, delay or early starts that affect the treatment process, facility staffing, etc.

F. Weekly coordination meetings shall be held between the Contractor, Owner/Operator's Chief Operator/Superintendent and the Resident Project Representative. This meeting shall cover the following:
   1. Work to be completed the following week
   2. Project Schedule
   3. Shop Drawing and O&M issues
   4. Outstanding RFIs and Clarifications
   5. Change Orders and Field Orders
   6. Review of Record Drawing Information
   7. Discussion/Resolution of any old issues
   8. New issues discussion
   9. Contractor's Safety and Health Plan Updates

G. The Contractor shall be responsible for explicitly notifying all equipment suppliers, electrical subcontractor, and the instrumentation supplier that they are required to coordinate their work with the instrumentation supplier by providing operating sequences, input/out specifications with wiring diagrams for all equipment, and that they shall review and comment on each other's shop drawings to ensure that all interfaces are compatible.

1.4 CONTRACTOR'S USE OF PREMISES

A. Contractor shall have use of the premises within the limits shown on the Drawings and as defined in the General Conditions for the performance of the Work.
   1. Wastewater Treatment Facilities
      a. Contractor laydown area as shown on the Drawings.
      b. Contractor's trailer location and parking area established on the Drawings. Additional off-site vehicle parking may be required and will be coordinated with the Owner/Operator.
      c. Entrance to the site: The main entrance to the site is at the south end through 6501 Florida Avenue, and will be used for Contractor's personnel, deliveries and large vehicle traffic. There are no other alternative entrances to the site.
      d. Restricted access: A record of all personnel entering and exiting the site shall be kept at all times. This includes all deliveries and activities after hours.
      e. Personnel ID Badges: All Contractor personnel shall wear clear identification indicating their name and employer company name; this is

also required for any subcontractors' onsite. Visitor ID Badges shall be available in the Construction Trailer.

B. Contractor work hours will be limited to 7:00AM to 4:00PM, Monday through Friday . Any work outside these hours will require permission of the Owner/Operator and adequate notice.
C. Contractor shall maintain access and utilities to the Wastewater Treatment Facility and all other adjacent facilities at all times. Whenever access is cut off in one direction, an alternative route for accessing all equipment and tankage must be maintained.
D. Contractor shall coordinate delivery schedules, site access, and other construction-related activities with any other contractors that may be hired by the Owner/Operator during the course of construction.
E. Contractor shall assume full responsibility for security of all of their, and their subcontractors, materials and equipment stored on the site.
F. If directed by the Owner/Operator, Contractor shall move any stored items which interfere with operations of Owner/Operator.
G. Obtain and pay for use of additional storage or work areas if needed to perform the Work.
H. Contractor shall not have access to Owner/Operators lunch room, toilet or locker room facilities at any time and shall provide all necessary facilities in accordance with Specification Section 01500.

END OF SECTION

SECTION 01070

ABBREVIATIONS & SYMBOLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Where any of the following abbreviations are used in these Specifications, they shall have the meaning set forth opposite each.

AASHTO	American Association of State Highway & Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
AGA	American Gas Association
AIC	Ampere Interrupting Capacity
AGMA	American Gear Manufacturers Association
AIEE(IEEE)	American Institute of Electrical Engineers (Institute of Electrical and Electronics Engineers, Inc.)
AISC	American Institute of Steel Construction
AMP	Ampere 125-16
Amer. Std.	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class l25 (ASA Bl6 ll960)
ANSI	American National Standards Institute
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWWA	American Water Works Association
CCTV	Closed Circuit Television
CF	Cubic Foot
CFM	Cubic Foot Per Minute
CFS	Cubic Foot Per Second
CI	Cast Iron
CIPP	Cured-in-Place Pipe
CIPRA	Cast Iron Pipe Research Association
CSI	Construction Specifications Institute
CY	Cubic Yard
DC	Direct Current
DEP	Department of Environmental Protection
DI (DIP)	Ductile Iron (Pipe)
DOT	Department of Transportation
EDR	Equivalent Directional Radiation

EPA	U.S. Environmental Protection Agency
FPS	Feet Per Second
FT	Feet
GAL	Gallons
GPD	Gallons Per Day
GPM	Gallons Per Minute
HP	Horsepower
IBR	Institute of Boiler and Radiator Manufacturers
IN	Inches
ISA	Instrument Society of America
KVA	Kilovolt-ampere
KW	Kilowatt
LB	Pound
MACP	Manhole Assessment and Certification Program
MAX	Maximum
MGD	Million Gallons Per Day
MIN	Minimum
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBS	National Bureau of Standards
NEC	National Electrical Code, Latest Edition
NEMA	National Electrical Manufacturers Association
NEWWA	New England Water Works Association
NPT	National Pipe Thread
OS&Y	Outside Screw and Yoke
PCA	Portland Cement Association
PPM	Parts Per Million
PSI	Pounds Per Square Inch
PSIG	Pounds Per Square Inch Gage
PVC	Polyvinyl Chloride
RPM	Revolutions Per Minute
RUS	Rural Utility Service
SF	Square Foot
STL. W.G.	U.S. Steel Wire, Washburn and Moen, American Steel and Wire Cos., or Roebling Gage
SY	Square yard
TDH	Total Dynamic Head
USAS	Standards of the United States of America Standards Institute (formerly American Standards Association)
USS GAGE	United States Standard Gage
VC	Vitrified Clay
WSP	Working Steam Pressure
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, D.C.

END OF SECTION

SECTION 01100

ALTERNATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Each Bidder shall be held fully responsible for examining the scope of the Alternates generally defined herein and for recognizing any modifications to the Work caused by any Alternate.
2. The Owner (STP Operator) will be responsible for removal and disposal of the liquid contents of secondary clarifiers (5 through 8), including the existing RAS, plant water, sump pump, and scum piping, etc. When the existing secondary clarifiers (5, 6, 7 and 8) are empty of liquid (drained by the Owner/STP Operator), any solids and/or debris remaining that are not easily drained by the Owner as part of normal facility operations shall be the responsibility of the Contractor. The Contractor will be responsible for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifiers (5, 6, 7 and 8) at the Contractor's expense. The cost for the removal and disposal of excess grit, sludge, rags, and other debris is to be included in Bid Items 1 and Bid Alternates A, B and C.

B. Alternate:

1. To enable the Owner to compare total costs where alternate materials and methods might be used, an Alternate has been established as described in this Section of these Specifications.

C. Submittals:

1. All Alternates described in this Section are required to be reflected on the Bid Form as submitted by bidders. However, do not submit alternates other than as described in this Section, except as provided, for "substitutions" under the General Conditions.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

2.1 PRODUCT HANDLING

A. If the Owner elects to proceed on the basis of one or more of the Alternatives described, make all modifications to the Work required in furnishing and installing the selected Alternative or Alternatives to the approval of the Engineer and at no additional cost to the Owner other than as proposed on the Bid Form.

2.2 ALTERNATE A: – REMOVAL & REPLACEMENT OF SECONDARY CLARIFIER MECHANISM NO. 7, DRIVE, BRIDGE ASSEMBLY AND ANCILLARY EQUIPMENT SYSTEMS, COMPLETE AND OPERATIONAL

A. The work of this ALTERNATE shall consist of full compensation for furnishing all

labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridges, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring and all other associated appurtenances complete as indicated on the Drawings and as specified for Secondary Clarifier No. 7, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to the DRAWINGS for explicit details on location, orientation, connecting piping, etc.

2.3 ALTERNATE B – REMOVAL & REPLACEMENT OF SECONDARY CLARIFIER MECHANISM NO. 6, DRIVE, BRIDGE ASSEMBLY AND ANCILLARY EQUIPMENT SYSTEMS, COMPLETE AND OPERATIONAL

A. The work of this ALTERNATE shall consist of full compensation for furnishing all labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridge, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring, and all other associated appurtenances complete and operational as indicated on the Drawings and as specified for Secondary Clarifier No. 6, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to the DRAWINGS for explicit details on location, orientation, connecting piping, etc.

2.4 ALTERNATE C – REMOVAL & REPLACEMENT OF SECONDARY CLARIFIER MECHANISM NO. 8, DRIVE, BRIDGE ASSEMBLY AND ANCILLARY EQUIPMENT SYSTEMS, COMPLETE AND OPERATIONAL

A. The work of this ALTERNATE shall consist of full compensation for furnishing all labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridge, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring and all other associated appurtenances complete as indicated on the Drawings and as specified for Secondary Clarifier No. 8, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to the DRAWINGS for explicit details on location, orientation, connecting piping, etc.

PART 3 - EXECUTION

3.1 ADVANCE COORDINATION

A. Immediately after award of the Contract, or as soon thereafter as the Owner has made a decision on whether the Alternate will be selected, thoroughly and clearly advise all necessary personnel and suppliers as to the nature and extent of Alternates selected

by the Owner. Use all means necessary to alert those personnel and suppliers involved as to all changes in the work caused by the Owner's selection or rejection of the Alternate.

END OF SECTION

SECTION 01150A

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. For lump sum items, payment shall be made to the Contractor in accordance with an accepted Progress Schedule and Schedule of Values on the basis of actual work completed.

B. For unit-price items, payment shall be based on the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.

1. All units of measurement shall be standard United States convention as applied to the specific items of work by tradition and as interpreted by the Engineer.
2. At the end of each day's work, the Contractor's Superintendent or other authorized representative of the Contractor shall meet with the Resident Project Representative and determine the quantities of unit price work accomplished and/or completed during the workday.
3. The Resident Project Representative will then prepare two "Daily Progress Reports" which shall be signed by both the Resident Project Representative and Contractor's Representative.
4. Once each month the Resident Project Representative will prepare two "Monthly Progress Summation" forms from the month's accumulation of "Daily Progress Reports" which shall also be signed by both the Resident Project Representative and Contractor's Representative.
5. These completed forms will provide the basis of the Engineer's monthly quantity estimate upon which payment will be made. Items not appearing on both the Daily Progress Reports and Monthly Progress Summation will not be included for payment. Items appearing on forms not properly signed by the Contractor will not be included for payment.
6. After the work is completed and before final payment is made therefor, the Engineer will make final measurements to determine the quantities of various items of work accepted as the basis for final settlement.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SCOPE OF PAYMENT

A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents. Upon completion of the construction, if these actual quantities show either an increase or decrease from the quantities given in the Bid Form, the Contract unit prices will still prevail.

B. The Contractor shall accept compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the

completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance by the Engineer, and for all risks of every description connected with the prosecution of the work, except as provided herein, also for all expenses incurred in consequence of the suspension of the work as herein authorized.

C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall affect the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.

1.4 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of work not requiring supplemental agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as stipulated in such agreements.

1.5 OMITTED ITEMS

A. Should any items contained in the bid form be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.6 PARTIAL PAYMENTS

A. Partial payments shall be made monthly as the work progresses. Partial payment shall be made subject to the provisions of the Supplemental and General Conditions. Contractor's Partial Payment Requests shall be submitted in two parts; one part for EPA/DEP grant eligible quantities and one part for non-eligible quantities. The breakdown of quantities will be determined by the Engineer.

B. Technical Specifications may include Special Payment Provisions which provide additional restrictions on partial payments.

1.7 PAYMENT FOR MATERIAL DELIVERED

A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used, and have been delivered to the construction site or placed in storage places acceptable to the Owner. Payment shall be subject to the provisions of the General and Supplementary Conditions.

B. No payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures or other work of any kind which are not a permanent part of the Contract.

1.8 FINAL PAYMENT

A. The Engineer will make, as soon as practicable after the entire completion of the project, a final quantity invoice of the amount of the Work performed and the value of such Work. Owner shall make final payments of the sum found due less retainages subject to the provisions of the General and Supplementary Conditions.

1.9 INCIDENTAL WORK

A. Incidental work items for which separate payment is not made include (but are not limited to) the following items:
   1. Clearing, grubbing and stripping
   2. Dust control
   3. Temporary Construction Dewatering
   4. Clean-up
   5. Erosion control
   6. Loam, seeding, grading, liming, fertilization, mulching and watering
   7. Pipe bedding and backfill
   8. Compaction testing of backfill
   9. Restoration of property, and replacement of fences, curbs, structures, signposts, guard rails, rock wall, mail boxes, traffic loop detectors and other minor items disturbed by the construction activities
   10. Coordination with the Owner, Utilities and others, including related inspection cost (refer to Section 01050)
   11. Utility crossings and relocations, unless payment is otherwise made
   12. Traffic control plan and regulation
   13. Project Signs
   14. Routine flag person services
   15. Trench boxes, steel and/or wood sheeting as required, including that left in place
   16. Project record documents
   17. Materials testing
   18. Construction schedules, bonds, insurance, shop drawings, warranties, guarantees, certifications, and other submittals required by the Contract Documents
   19. Repair and replacement of water lines under two inches in size, culverts, underdrains, rock lined drainage trenches in streets and other utilities damaged by construction activities and corresponding proper disposal of removed materials unless otherwise paid for
   20. Cleaning, testing and disinfection of all water lines and appurtenances
   21. Maintenance of all existing sewers flows and repair of existing sewer pipes
       Final cleaning of sewers, force mains and storm drains
   22. Removal and disposal of existing sewer structures and pipe as and where indicated in the Drawings
   23. Temporary utilities for construction and to maintain existing service during construction
   24. Temporary utility services to buildings as required to maintain service during construction

25. Quality assurance testing not eligible for payment under Material and Testing Allowance as described under paragraph 1.10.
26. Notarial fees.
27. Temporary construction and other facilities not to be permanently incorporated into the Work necessary for construction sequencing and maintenance of operations, including but not limited to scaffolding and staging.
28. Weather protection
29. Permits not otherwise paid for or provided by the Owner
30. Visits to the Project site or elsewhere by personnel or agents of the Contractor, including manufacturer's representatives, as may be required
31. On-site and other facilities acceptable to Engineer for the storage of materials, supplies and equipment to be incorporated into the Work
32. Facilities start-up services required by the Contract Documents
33. Mobilization/demobilization
34. Test pits to determine existing utility locations and elevations, soils conditions, groundwater conditions, dewatering requirements and as required to complete the project
35. Pipe markings
36. Pavement markings
37. Removal of existing pavement
38. Earthwork (except ledge)
39. Preconstruction photos and videos
40. Construction administration and insurance

1.10 DESCRIPTION OF PAY ITEMS

A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid Form.
B. Each unit or lump sum price stated in the Bid Form shall constitute full compensation, as herein specified, for each item of the work completed.
C. Refer to Section 01100 - Alternates for a description of the measurement and payment for work performed under Alternates.

(1) North RAS Pump Station Upgrade

A. Method of Measurement: Lump Sum (no separate measurements will be made for the North RAS Pump Station upgrades).
B. Basis of Payment: Payment of the lump sum price for Item 1 shall be full compensation for furnishing all labor, materials, tools and equipment required and for upgrading of the North RAS Pump Station, including earth excavation, dewatering, temporary sheeting, shoring, complete as indicated on the Drawings and as specified with all its' appurtenances in its entirety, except that work included for payment under other items.
C. Said lump sump price shall include for all labor, materials, tools and equipment for the removal of the existing 8-inch WAS lines, fittings, and supports from the N. RAS Pump Station, into and through the S. RAS PS; furnish and installation of the new 8-inch WAS piping, fittings, supports, painting, from the N. RAS PS, to and through the S. RAS PS, and to the Sedimentation Tank No. 2, including coring of holes, fittings, hardware, pipe supports, link seals, painting, complete and operational as

indicated on the Drawings and as specified with all its appurtenances in its entirety, except that work included for payment under other items.

D. Said lump sum price shall include compensation for all labor, materials, tools and equipment required and for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifiers 5, 6, 7 and 8.

E. Said lump sum price shall include for all labor, materials, tools, and equipment for the removal of the existing 24 and 30-inch RAS piping from the N. RAS PS, fittings, and valves and furnish and installation of new pipe, fittings, valves, supports, painting, earth excavation, dewatering, temporary sheeting, shoring, replacement backfill; furnishing temporary support of the existing RAS piping, draining and disposal of all liquid and solids contained within the N. RAS lines from the N. RAS PS to the influent channels; testing of the new pipe and valves; complete and operational as indicated on the Drawings and as specified with all its appurtenances in its entirety.

(2) Replacement of Buried RAS Suction Piping

A. Method of Measurement: Lump Sum (no separate measurements will be made for the replacement of buried RAS suction piping).

B. Basis of Payment: Payment of the lump sum price for Item 2 shall be full compensation for furnishing all labor, materials, tools and equipment required for replacing all buried Return Activated Sludge suction piping from Secondary Clarifiers 5 through 8 to the North RAS Pump Station, including, earth excavation, temporary sheeting, shoring, dewatering, test pits, removal and reinstallation of the temporary RAS pump suction and discharge piping, removal and replacement of the existing concrete bridge, handrail and stairs from the effluent channel to Secondary Clarifiers No. 7, installation, operation and maintenance of the temporary cofferdam an backup bulkhead systems in the effluent channel; the installation, operation and maintenance of a temporary pumping system to convey effluent from Secondary Clarifiers Nos. 7 and 8 in the effluent channel, complete as indicated on the Drawings and as specified with all its' appurtenances in its entirety, except that work included for payment under other items. The lump sum price shall also include for the labor, equipment, materials for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier and effluent channel. Temporary excavation support systems, 36-inch steel sleeve pipes, core drills, and other associated appurtenances are included in this item. Furnish and placement of flowable fill shall be paid for at said unit price.

(3) Additional Open End Steel Piles

A. Method of Measurement: The quantity of open end steel piles to be paid for under this item shall be the actual height in vertical feet, installed and accepted complete in place.

Basis of Payment: The contract unit price per vertical foot for open end steel piles installed shall be full compensation for all labor, materials, equipment and supervision necessary to complete this work including temporary excavation support systems, mobilization of pile driving equipment, installation of new foundation support piles as indicated in the Contract Drawings, pile caps, and all else incidental thereto for

which payment is not provided under other items.

(4) Crack Repair of Existing Concrete Tanks and Structures

A. Method of Measurement:
   1. Crack repairs to existing concrete tanks and structures are to be provided under this item. The cracks to be repaired will be field located by the Engineer during construction.
   2. Cracks to be repaired shall be delineated as follows:
      a. Cracks that are dry at the time of repair.
      b. Cracks that are wet at the time of repair.
   3. The quantities to be considered under these items shall be based on the actual linear feet of cracks repaired and measured to the extent as ordered by the Engineer. Payment under this Bid Item shall only be for those quantities in excess of the quantities (if any) shown on the Drawings. This Bid Item does not include repair of cracks in new tanks and structures. Cracks in new concrete structures are considered to be structural defects to be repaired by the Contractor at no additional expense to the Owner.

B. Basis of Payment:
   1. Crack repair of existing concrete tanks and structures shall be paid for at the Contract unit price per linear foot as stated in the Bid Schedule.
   2. The unit price as stated in the Bid Schedule shall be full compensation for furnishing all labor, materials, tools and equipment as necessary for cleaning and removing all debris from cracks and installing crack repair material including all necessary appurtenances, materials and equipment. All crack repairs shall be in accordance with the Drawings and Specifications.

(5) Cementitious Overlay in Existing Concrete Tanks and Structures

A. Method of Measurement:
   1. Cementitious overlay over existing concrete tanks and structures are to be provided under this item. The areas to receive a cementitious overlay will be field located by the Engineer during construction.
   2. The quantities to be considered under these items shall be based on the actual areas repaired and measured using square feet to the extent as ordered by the Engineer. Payment under this item shall only be for those quantities in excess of the quantities (if any) shown on the Drawings which are included in the Base Bid.

B. Basis of Payment:
   1. Cementitious overlay in existing concrete tanks and structures shall be paid for at the Contract unit price per square foot as stated in the Bid Schedule.
   2. The unit price as stated in the Bid Schedule shall include all compensation for materials, and labor required for placing new cementitious overlays including removal of existing coatings , preparation of concrete surfaces to receive overlays, curing, finishing and environmental controls. All cementitious overlays shall be in accordance with the Drawings and Specifications.

(6) Additional Earthwork Materials – Compacted Select Fill

A. Method of Measurement: The quantity of compacted select fill shall be measured in cubic yards of final material placed within the limits shown on the plans.

B. Basis of Payment: Select fill shall be paid for at the Contract unit price per cubic yard as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, equipment, and supervision necessary for the placement and compaction of the select fill.

(7) Excavation of Unsuitable Material, Replacement Backfill and Disposal

A. Method of Measurement:
   1. Earth excavation of unsuitable material (by order of the Engineer), replacement backfill, and disposal accepted for payment shall be the actual number of cubic yards installed and accepted complete in place.

B. Basis of Payment:
   1. Excavated unsuitable materials shall be paid for at the unit price per cubic yard stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all labor, equipment, and tools necessary for the excavation of unsuitable material including replacement suitable backfill, and for all other work and expenses incidental thereto for which payment is not provided under other items.
   2. Material excavated that could have, in the opinion of the Engineer, remained in place through the use of adequate dewatering efforts shall be replaced by the Contractor at no additional cost to the Owner.
   3. The Contract unit price per cubic yard for earth excavation and replacement backfill furnished and installed shall be full compensation for labor, materials, tools and equipment necessary to complete this work including excavation and disposal of unsuitable materials including muck, trees, stumps and all other buried refuse, replacement suitable fill (common borrow), compaction, dewatering and all else incidental thereto for which payment is not provided under other items.
   4. Earth excavation of unsuitable material and replacement backfill, and disposal shall be paid at the Contract unit price per cubic yard as stated in the Bid Schedule.

(8) Flowable Fill

A. Method of Measurement: Flowable fill furnished, placed, tested and accepted for payment shall be the actual total cubic yards of flowable fill and accepted in place.

B. Basis of Payment:
   1. The Contract unit price per cubic yard of flowable fill and accepted in place shall be full compensation for labor, materials, tools and equipment necessary to complete this work including flowable fill concrete, placement, curing and all else incidental thereto for which payment is not provided under other items.

(9) Bid Alternate A: Secondary Clarifier No. 7 Improvements

A. Method of Measurement: Lump Sum

B. Basis of Payment: Payment of the lump sum price for Item 8 shall be full compensation for furnishing all labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridges, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring and all other associated appurtenances complete as indicated on the Drawings and as specified for Secondary Clarifier No. 7, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to Specification Section 01100, Bid Alternates for additional information.

(10) Bid Alternate B: Secondary Clarifier No. 6 Improvements

A. Method of Measurement: Lump Sum

B. Basis of Payment: Payment of the lump sum price for Item 9 shall be full compensation for furnishing all labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridge, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring, and all other associated appurtenances complete and operational as indicated on the Drawings and as specified for Secondary Clarifier No. 6, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to Specification Section 01100, Bid Alternates for additional information.

(11) Bid Alternate C: Secondary Clarifier No. 8 Improvements

A. Method of Measurement: Lump Sum

B. Basis of Payment: Payment of the lump sum price for Item 10 shall be full compensation for furnishing all labor, materials, tools and equipment required for the demolition, removal and replacement of clarifier mechanisms, bridge, scum baffle, v-notch weirs, piping, removal and reinstallation of existing light poles, wash down hose bibbs, new mechanism, bridge, handrails, scum baffle, v-notch weirs, control panels, new scum, process water piping, supports, instrumentation, electrical, conduit, wiring and all other associated appurtenances complete as indicated on the Drawings and as specified for Secondary Clarifier No. 8, except that work included for payment under other items. Work shall also include for the removal and disposal of all grit, sludge, rags, solids and/or debris within secondary clarifier. Refer to Specification Section 01100, Bid Alternates for additional information.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.4 SUBMITTALS

A. Agenda items: To the maximum extent practicable, advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.

B. Minutes: The Engineer will compile minutes of each project meeting and will furnish a copy to the Contractor. The Contractor may make and distribute such other copies as they wish.

PART 2 - PRODUCTS

(No products are required in this Section.)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held monthly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

A. Meetings will be held at the job site in the Engineers' field office, unless the Owner/Operator and/or Engineer determine that virtual meetings are applicable and appropriate for any reason (e.g., COVID, Safety and Health Plan, etc.).

1. If meetings are required by Owner/Operator/Engineer to be held virtually, Engineer will host the meetings via Microsoft Teams. All required meeting attendees are responsible for providing hardware necessary to view, share, be heard and hear content of the meeting.

3.3 PRECONSTRUCTION MEETING

A. Preconstruction meeting will be scheduled within twenty days after the Effective Date of the Agreement, but before the Contractor starts work at the site. Provide attendance by authorized representatives of the Contractor and all major subcontractors. The Engineer will advise other interested parties and request their attendance.

B. Minimum agenda: Distribute data on, and discuss:
   1. Identification of key project personnel for Owner/Operator, Engineer, Contractor, funding/regulatory Agencies.
   2. Responsibilities of Owner/Operator, Engineer, Resident Project Representative, Contractor.
   3. Channels and procedures for communications.
   4. Construction schedule, including sequence of critical work.
   5. Easements, permits.
   6. Contract Documents, including distribution of required copies of original documents and revisions.
   7. Processing of Shop Drawings and other data submitted to the Engineer for review.
   8. Processing of field decisions and Change Orders.
   9. Rules and regulations governing performance of the Work, including funding/regulatory Agency requirements.
   10. Procedures for safety and first aid, security, quality control, housekeeping, and other related matters.

3.4 PROJECT MEETINGS

A. Attendance: To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work. The Superintendent shall attend. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the Work are involved.

B. Minimum agenda:
   1. Review, revise as necessary, and approved minutes of previous meeting.
   2. Review progress of the Work since last meeting, including status of submittals for approval.
   3. Review schedule of work to be accomplished prior to next meeting.
   4. Discuss monthly partial payment request.
   5. Review status of change order requests and Work Directive Changes.
   6. Identify problems which impede planned progress.
   7. Develop corrective measures and procedures to regain planned schedule.
   8. Complete other current business.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES – SHORT FORM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Within ten (10) days after the effective date of the Agreement between Owner/Operator and Contractor submit to the Engineer an estimated progress schedule as specified herein.

B. Form of Schedules:
   1. Narrative: Completely describe the construction methods to be employed.
   2. Network Analysis System:
      a. Provide a separate horizontal schedule line for each trade or operation and show concurrent and preceding activities.
      b. Present in chronological order the beginning of each trade or operation showing duration and float time.
      c. Scale: Identify key dates and allow space for updating and revision.
   3. Mathematical Analysis:
      a. A mathematical analysis shall accompany the network diagram. A computer printout will be acceptable.
      b. Information shall be included on activity numbers, duration, early start, late start, etc. and float times.

C. Content of Schedules:
   1. Provide complete sequence of construction by activity:
      a. Shop Drawings, Project Data and Samples:
         i. Submittal dates.
         ii. Dates reviewed copies will be required.
      b. Decision dates for:
         i. Products specified by allowances.
         ii. Selection of finishes.
      c. Estimated product procurement and delivery dates.
      d. Dates for beginning and completion of each element of construction.
   2. Identify work of separate phases and logically grouped activities.
   3. Show the projected percentage of completion for each item of work as of the first day of each month.
   4. Provide separate sub-schedules, if requested by the Engineer, showing submittals, review times, procurement schedules, and delivery dates.

D. Updating:
   1. Show all work activities including those already complete.
   2. Show all changes occurring since previous submission.
   3. Indicate progress of each activity, show completion dates.
   4. Include:
      a. Major changes in scope.
      b. Activities modified since previous updating.
      c. Revised projections due to changes.

d. Other identifiable changes.

5. Provide narrative report, including:
   a. Discussion of problem areas, including current and anticipated delay factors.
   b. Corrective action taken or proposed.
   c. Description of revisions that may affect schedules.
   d. Description of activities to be performed in the next 6-week period.
   e. Updated list of key shop drawings, project data and samples to be submitted in the next 6-week period.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SUBMITTALS

A. Submit updated schedules with each progress payment request.
B. Submit 4 copies of initial and updated schedules to the Engineer.

END OF SECTION

SECTION 01320

SAFETY AND HEALTH PLAN

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work, as outlined herein and in the General and Special Conditions of the Contract Documents. Within 10 days after the effective date of the Agreement between Owner/Operator and Contractor, submit to the Engineer a Safety and Health Plan as specified herein. Refer to submittals section below.
2. Contractor shall comply with all applicable Laws and Regulations related to the safety of persons or property, or for the protection of persons or property from damage, injury, illness, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
3. Contractor shall designate a qualified and experienced safety representative (OSHA defined "Competent Person") at the site whose duties and responsibilities shall be the prevention of accidents and maintaining and supervising of safety precautions and programs, including a "Job Hazards Analysis".
4. The Contractor shall be solely responsible to provide all labor, equipment, and utilities sufficient to ensure no construction noise, particulates, or odors, are allowed to accumulate to levels which adversely affect health or work in, or near the construction area.

B. Content of Safety and Health Plan:

1. Prepare complete safety and health plan in accordance with the requirements of CFR Title 29 Part 1926 - Safety and Health Regulations for Construction.
   a. Provide documentation that Contractor's hazardous communication program is up to date.
   b. Provide documentation that Contractor's safety training is up to date.
   c. Prepare a project specific Safety and Health Plan addressing construction safety and protection, including but not limited to excavations, fall protection, egress, as well as provisions for construction in hazardous environmental conditions, confined space entry, electrically-classified spaces, chemical storage/handling, biological hazards, etc., at the project site.
2. Safety provisions for confined space entry shall follow the requirements of CFR Title 29 Part 1926, Subpart AA – Confined Spaces in Construction and will be incorporated into the Safety and Health Plan.
   a. The Owner/Operator has provided Table 1 at the end of this section listing confined space locations which may be encountered during the execution of this Contract. The Contractor is required to perform a site evaluation

to identify all hazards and potential hazards in work areas whether included in Table 1 or not, prior to control of site.

b. The Contractor shall be responsible for all aspects of construction site safety including development of appropriate confined space entry procedures. The plan shall include, but not necessarily be limited to, the following:
   i. Definitions
   ii. Confined Space Evaluations
   iii. Equipment Selection
   iv. Confined Space Entry Training Documentation
   v. Permit Required Confined Space Entry Requirements
   vi. Testing (Monitoring) and Ventilation
   vii. Confined Space Entry Permit Form
   viii. Rescue and Emergency Procedures
   ix. Emergency Contact Information

c. The Contractor shall inform the Owner/Operator and Engineer's representative whenever work will be performed in a confined space and the permit space program that the Contractor will follow.

d. The Contractor shall inform the Owner/Operator and Engineer's representative of any hazards confronted or created during entry operations, either through a briefing or during the entry operation.

e. The Contractor will coordinate entry operations with the Owner/Operator when both Owner/Operator personnel and Contractor personnel will be working in or near permit spaces.

f. The Owner/Operator, Engineer, their representatives, independent testing laboratories and government agencies, when inspecting the site, shall be supplied by the Contractor proper safety equipment when entry into a confined space is required.

3. The Owner/Operator has provided Table 2 at the end of this section listing the spaces that are considered “classified” per NFPA 820 (Standard for Fire Protection in Wastewater Treatment and Collection Facilities) where the Contractor may be required to carry out work tasks. The Contractor is required to perform a site evaluation to identify all hazards and potential hazards in work areas whether included in Table 2 or not, prior to control of site. Contractor shall implement appropriate safety precautions and/or construction practices to comply with classification requirements. Contractor shall ensure that all employees and subcontractors working in these areas have received appropriate training and are properly equipped in accordance with Contractor's Safety and Health Plan.

4. The Owner/Operator has provided Table 3 at the end of this section listing chemical storage and handling spaces where the Contractor may be required to carry out work tasks. The Contractor is required to perform a site evaluation to identify all hazards and potential hazards in work areas whether included in Table 2 or not, prior to control of site. Contractor shall ensure that all employees and subcontractors working in these areas have received appropriate

training and are properly equipped in accordance with Contractor's Safety and Health Plan.

C. Updating:
   1. Contractor shall be responsible for updating the Safety and Health Plan as appropriate throughout the course of the construction period.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SUBMITTALS

A. Submit the Contractor's site-specific Safety and Health Plan to the Engineer, in accordance with Section 01340. Submit hardcopy submittals, if required.
B. Submit updated Safety and Health Plans as necessary during the course of the project.
C. The Safety and Health Plan is provided “for information only” to inform the Owner/Operator, Engineer and Resident Project Representative of the project specific safety program requirements; however, if the Safety and Health Plan is incomplete (e.g., missing elements relevant to the project work), inadequate (e.g., outdated qualifications) or not project-specific, it will be returned “revise and resubmit”. Delays related to an incomplete Safety and Health Plan are the responsibility of the Contractor.
D. The Contractor will overview the plan with the Owner/Operator (and staff), Engineer (and Resident Project Representative) prior to work beginning at the project site, and subsequently when/if the safety plan is updated.
E. Contractor's most current Safety and Health Plan shall be available at the construction site throughout the construction project.

1.4 ON-SITE COORDINATION MEETINGS

A. Contractor shall review key aspects of Safety and Health Plan at the Pre-Construction Meeting, and subsequent on-site safety informational meeting.
B. Contractor shall report to Engineer and Owner/Operator at each progress meeting concerning compliance with the Safety and Health Plan for the most recent construction period and new considerations and requirements for the upcoming period.
C. Contractor shall hold weekly on-site coordination meetings with Resident Project Representative and Owner/Operator to ensure that Owner/Operator's staff is aware of key Safety and Health Plan requirements of the current phase of construction.

1.5 OWNER/OPERATOR’S CONFINED SPACE ENTRY PROGRAM INFORMATION

A. A copy of the Owner/Operator’s Confined Space Entry Program is available for viewing at the facility and is not included herein.

1.6 SITE-SPECIFIC INFORMATION

A. Refer to Tables 1, 2 and 3 below for site specific information, excluding items such as manholes, handholes, etc.

TABLE 1
NEW ORLEANS EAST BANK SEWAGE TREATMENT PLANT
CONFINED SPACES LISTING

Confined Space Location	Hazard Description
North RAS Pump Station	Possible lack of oxygen or presence of explosive or hazardous gases - Hydrogen Sulfide.
Secondary Clarifiers	Possible lack of oxygen or presence of explosive or hazardous gases - Hydrogen Sulfide. Engulfment.
New Thickened Sludge and WAS Storage Tanks	Possible lack of oxygen or presence of explosive or hazardous gases - Hydrogen Sulfide.
Thickened Sludge Pump and Pipe Gallery	Possible lack of oxygen or presence of explosive or hazardous gases - Hydrogen Sulfide.
New Liquid Sludge and Septage Receiving Facility	Possible lack of oxygen or presence of explosive or hazardous gases - Hydrogen Sulfide.

Note: This list has been provided by the Owner/Operator based upon their knowledge of the site and project scope and may not include all site hazards. Its intent is to aid the Contractor in determining the magnitude of effort needed to fulfill the safety and health requirements of this Contract.

TABLE 2
NEW ORLEANS EAST BANK SEWAGE TREATMENT PLANT
CLASSIFIED SPACES LISTING (NFPA 820)

Location	NFPA 820 Classification
1.5-foot envelope above surface of Secondary Clarifiers	Class 1, Division 2
10-foot envelope around Secondary Scum Wells	Class 1, Division 2
North RAS Pump Station	Class 1, Division 2
1.5-foot envelope above surface of Sludge Tanks	Class 1, Division 2
Solids Handling Building Dewatering Room	Class 1, Division 2
Solids Handling Building Sludge Cake Transfer Room	Class 1, Division 2

Note: This list has been provided by the Owner/Operator based upon their knowledge of the site and may not include all site hazards. Its intent is to aid the Contractor in determining the magnitude of effort needed to fulfill the safety and health requirements of this Contract.

TABLE 3
NEW ORLEANS EAST BANK TREATMENT PLANT
CHEMICAL HAZARDS LISTING

Location	Chemical Hazard
Existing Ferreter Chemical Feed System Canopy	Ferreter
New Polymer Chemical Feed System	Polymer

Note: This list has been provided by the Owner/Operator based upon their knowledge of the site and may not include all site hazards. Its intent is to aid the Contractor in determining the magnitude of effort needed to fulfill the safety and health requirements of this Contract.

END OF SECTION

SECTION 01340

SUBMITTALS – BABA PROJECT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Submit all shop drawings, operations and maintenance manuals, Manufacturers' certificates, project data, and samples required by the Specifications.
2. Submittals without the proper BABA certifications and compliance documentation will be returned as incomplete. Refer to Supplemental Conditions for certification and compliance documentation requirements.
3. Submittals – Electronic via Web-Based Software with Hard Copy for Record
   a. The Contractor shall utilize the web-based software provided by the Engineer or by the Contractor for the Project Team. The Contractor shall provide contact information for its members of the Project Team for the web-based software. The Contractor shall conform to the format and work-flow of the web-based software provided for the Project.
   b. The Contractor shall submit to the Engineer an electronic submittal of shop drawings and O&M Manuals in portable document format (PDF) transmitted via the provided web-based software tool. The Engineer shall return an electronic PDF of the submittal review comments to the Contractor through the provided web-based software tool. The electronic submittals shall serve as the electronic record of the project.
   c. In addition, completed shop drawings and completed operations and maintenance (O&M) manuals shall be provided in hard copy (paper) format, for the record, in accordance with the following requirements.
      i. Shop drawings and O&M manuals shall be considered "completed" once an action code of "0" or "1" has been attained, as specified below, unless otherwise directed by the Engineer.
      ii. Once completed, the Contractor shall provide three hard copy sets for Owner, Engineer, and Resident Project Representative.
      iii. Hard copy submittals shall be updated on a monthly basis, for those submittals completed during the preceding month.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SHOP DRAWINGS

A. Shop Drawings are required for each and every element of the work.

B. Shop Drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills of material, manufacturers data, spare parts lists, and other data prepared by the Contractor, their subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction, and installation of the work, or a portion thereof.

C. The Contractor shall provide a completed Contractor Submittal Certification Form

(copy provided for Contractor's use at the end of this Specification Section) which shall be attached to every copy of every shop drawing and signed by the Contractor and Manufacturer (where applicable). Shop Drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the work.

1. Each shop drawing submittal shall include a complete copy of the relevant specification section markup up to reflect “compliance” or “deviation” on an item-by-item basis.

D. Shop Drawings shall be submitted as a complete package by specification section, unless otherwise reviewed and approved by the Engineer. It is the intent that all information, materials and samples associated with each specification section be included as a single submittal for the Engineer's review. Any deviation from this requirement, shall be requested in writing with an anticipated shop drawing breakdown/schedule prior to any associated submittal. An exception to this requirement are shop drawings for reinforcing steel, miscellaneous metals and structural steel, which shall be submitted separately for each structure unless otherwise permitted by the Engineer.

E. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.

F. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.

G. Until the necessary review has been made, the Contractor shall not proceed with any portion of the work (such as the construction of foundations), the design or details of which are dependent upon the design or details of work, materials, equipment or other features for which review is required.

H. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from their subcontractors and returning reviewed drawings to them. Shop drawings shall be formatted to standard paper sizes to enable the Owner to maintain a permanent record of the submissions. Approved standard sizes shall be: (a) 24 inches by 36 inches; (b) 11 inches by 17 inches, and (c) 11 inches by 8-1/2 inches. Provision shall be made in preparing the shop drawings to provide a binding margin on the left hand side of the sheet. Shop drawings submitted other than as specified herein may be returned for resubmittal without being reviewed.

I. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by their subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to confirm that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer.

J. If a shop drawing shows any deviation from the Contract requirements, the Contractor

shall make specific mention of the deviations in the transmittal. Shop Drawings that contain significant deviations that are not brought to the attention of the Engineer may be subject to rejection.

K. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, Contractor shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.

L. A maximum of two submissions of each Shop Drawing will be reviewed, checked, and commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Drawings and Specifications, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Drawings and Specifications, or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each Shop Drawing, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking, as determined by the Owner, and based upon Engineer's documentation of time and rates established for additional services in the Owner-Engineer Agreement for this Project, may be deducted from the Contractor to make all modifications and/or corrections as may be required by the Engineer in an accurate, complete, and timely fashion. Resubmittals for the sole purpose of providing written responses to review comments will not be considered a resubmittal counting towards the two submission limit.

M. Shop Drawings that include drawings or other material that is illegible or too small may be returned without review.

N. American Iron & Steel certifications must be submitted with the initial shop drawing.

1.4 SAMPLES

A. The Contractor shall submit samples when requested by the Engineer to establish conformance with the specifications, and as necessary to define color selections available. Submittals of “samples” shall be documented through the electronic submittal process by including a photograph of the item(s) and indicating the date the sample was mailed and/or delivered.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance (O&M) Manuals are required for certain elements of the project, as specified herein.

B. The Contractor shall provide a completed Operation and Maintenance Manual Certification Form (copy provided for Contractor's use at the end of this Specification Section) which shall be attached to every copy of every Manual and signed by the Contractor and Manufacturer.

C. Each hard copy of an O&M Manual shall be provided in a stand-alone binder or shall be suitable for insertion into a 3-ring binder. Include the General Contractor's and Manufacturer's representative's contact information on the front cover. O&M manuals must be appropriate for the project and customized for the project. If a Manufacturer's standard O&M manual is included in the submittal, all non-applicable content must be removed or crossed out.

D. O&M Manuals shall contain the following operational information:

1. Safety Precautions: List personnel hazards, equipment or product safety precautions for all operating conditions.

2. Operator Prestart: Include all procedures required to set up and prepare each system, equipment or component for use.
3. Startup Procedures: Provide a narrative description for all startup operating procedures, include all control sequences.
4. Shutdown Procedures: Provide a narrative description for all shutdown operating procedures, include all control sequences.
5. Post-Shutdown Procedures: Provide a narrative description for all post-shutdown operating procedures, include all control sequences.
6. Normal Operating Procedures: Provide a narrative description of normal operating procedures. Include control diagrams with data to explain operation and control of systems and specific equipment.
7. Emergency Operations: Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.
8. Operator Service Requirements: Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, alignment, spare parts installation and gage reading or recording.
9. Environmental Conditions: Include a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which the equipment should not be allowed to run.

E. O&M Manuals shall contain the following maintenance information:
1. Lubrication Data: Include a table showing recommended lubricants for specific temperature ranges and applications. Also, include charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, capacities and a lubrication schedule showing service interval frequency
2. Preventative Maintenance Plan: Include the manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation as well as to ensure minimization of corrective maintenance and repair. Provide the manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide the manufacturer's specified frequency and procedures for each separate operation.
3. Troubleshooting Guides: Include recommendations on procedures and instructions for correcting problems and making repairs. Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.
4. Wiring and Control Diagrams: Provide Wiring diagrams and control diagrams. All diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number

electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to the actual installation numbering.

5. Maintenance and Repair Procedures: Include instructions and list the tools required to restore products and/or equipment to proper conditions or operating standards.
6. Removal and Replacement Instructions: Include step-by-step procedures, list required tools/supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.
7. Spare Parts and Supply Lists: Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration shall be required for facilities at remote locations. List spare parts and supplies that have a long lead times to obtain.
8. Corrective Maintenance Work Hours: Include the manufacturer's projection of corrective maintenance work-hours including craft requirements by type of craft. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

F. O&M Manuals shall contain the following additional information:

1. Parts Identification: Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirements to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items.
    a. When illustrations omit a part number and description, both the illustration and a separate listing shall show the index, reference, or key number which shall cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.
2. Warranty Information: List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep warranties in force. Include warranty information for all primary components included in product systems.
3. Personnel Training Requirements: Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.
4. Testing and Special Tools: Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.
5. Contractor Information: Provide a list that includes the name, address, and telephone number of the General Contractor and each subcontractor installing the respective product or equipment. Include local representatives and service

organizations most convenient to the project site. Provide the name, address, and telephone number of the product or equipment manufacturers.

6. Written confirmation from the manufacturer that the Contractor has coordinated the equipment One Year Service Call in accordance with specification Section 01800.

1.6 MANUFACTURER'S CERTIFICATES

A. Prior to accepting the installation, the Contractor shall submit manufacturer's certificates for each item specified.

B. Such manufacturer's certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction. All costs for meeting this requirement shall be included in the Contractor's bid price.

1.7 SUBMISSION REQUIREMENTS

A. Accompany submittals with a transmittal cover sheet, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. The sequential shop drawing number for each shop drawing, project data and sample submitted shall be:
      a. Specification Section number followed by a dash and then a sequential number beginning with 01 (e.g., 16000-01).
      b. Under limited situations when additional different pieces of equipment are submitted under the same specification section, those submittals shall be numbered sequentially (e.g. 05500-01, 05500-02, 05500-03, etc.).
      c. Resubmittals shall include an alphabetic suffix after the corresponding sequential number (e.g., 16000-01A).
      d. O&M submittals shall be numbered with the Specification Section number followed by a dash, the letters “OM”, another dash, and then a sequential number beginning with 01 (e.g. 16000-OM-01). Resubmittals of O&Ms shall include an alphabetic suffix after the corresponding sequential number (e.g. 16000-OM-01A).
   5. Notification of deviations from Contract Documents.
   6. Other pertinent data.

B. A completed Contractor Submittal Certification Form shall be attached to each hardcopy and electronic PDF of each shop drawing and must include:
   1. Project name
   2. Specification Section and sequential number with alphabet suffix for resubmittal
   3. Description
   4. Identification of deviations from Contract Documents.
   5. Contractor's stamp, initialed or signed, certifying review of the submittal, verification of field measurements and compliance with Contract Documents.
   6. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
   7. Where specified, manufacturer's guarantee.

C. Additional Requirements for Electronic Submittals:
   1. Each individual shop drawing or O&M submittal shall be contained in one PDF.
   2. The first page of the PDF shall be the Contractor Submittal Certification Form as described above.
   3. The electronic PDF shall be **exactly** as submitted in the hardcopy.
   4. The electronic PDF shall include an electronic table of contents that is bookmarked for each section of the submittal.
   5. The electronic PDF shall be configured such that is fully searchable.
   6. PDF versions of 24x36 drawings shall be converted to 24 x 36 PDFs so as not to lose the clarity of the original drawing.
   7. Electronic PDF submittals that are not submitted in accordance with the requirements stated above will not be reviewed by the Engineer.
   8. Electronic submittals shall be transmitted via the protocol established in Part 1 above.

1.8 RESUBMISSION REQUIREMENTS

A. Revise initial submittals as required and resubmit as specified for initial submittal.

B. Indicate on submittals any changes which have been made other than those required by Engineer. All renumbering of shop drawings, relabeling of individual pieces or assemblies or relocating of pieces or assemblies to other Drawings within the submittal shall be clearly brought to the attention of the Engineer. If relabeling of individual pieces or assemblies has taken place, the labels from the previous submittal shall be indicated to assist in comparing the original and resubmitted shop drawing.

C. All resubmittals shall include a summary of the previous submittal review comments with the vendors' written response as to how the previous comments were addressed.

1.9 ENGINEER'S REVIEW

A. The review of shop and working drawings hereunder will be general only, and nothing contained in this specification shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.

B. The Engineer's review comments will be summarized on a Submittal Review Form, which includes an action code. A description of each action code is provided below.
   1. No Exceptions Taken (Status 0 on shop drawing log). The shop drawing complies with the Contract Document requirements. No changes or further information are required. Where appropriate, the submittal review form will be used to alert the Contractor, Owner and Field personnel of remaining items within that specification section that still needs to be submitted.
   2. Make Corrections Indicated (Status 1 on shop drawing log). The shop drawing complies with the Contract Document requirements except for minor changes, as indicated. Engineer requires that all comments will be addressed by the Contractor, unless otherwise notified in writing prior to execution of the relevant work.
   3. Conditional to Remarks (Status 2 on shop drawing log). The shop drawing potentially complies with the Contract Document requirements, contingent upon satisfactory resolution of all review comments. Resubmittal from the Contractor shall address each review comment and include supplemental information, as necessary.

4. Revise and Resubmit (Status 3 on shop drawing log). The shop drawing does not comply with the Contract Document requirement as submitted, but may with changes indicated and/or submission of additional information. The entire package must be resubmitted with the necessary information and a cover letter which identifies all changes made to the submittal, indicates how each review comment has been addressed and indicates where to find the information in the resubmittal.
5. Rejected (Status 4 on shop drawing log). The shop drawing does not comply with the Contract Document requirements, for the reasons indicated in the remarks, and is unacceptable.
6. For Information Only (Status 5 on shop drawing log). The shop drawing review was for information only.
7. In Review (Status 6 on shop drawing log). The shop drawing is currently under review.

CONTRACTOR SUBMITTAL CERTIFICATION FORM

PROJECT: _____ CONTRACTOR'S PROJ. NO: _____

CONTRACTOR: _____ ENGINEER'S PROJ. NO: _____

ENGINEER: _____

SHOP DRAWING NUMBER: _____ - _____

SPECIFICATION SECTION OR DRAWING NO: | SEQUENTIAL NUMBER (& ALPHA SUFFIX FOR RESUBMITTAL)

DESCRIPTION: _____

MANUFACTURER: _____

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

☐ NO DEVIATIONS

or

☐ A COMPLETE LIST OF DEVIATIONS (attached)

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment complies with the BABA requirements of Section 70914 of the Infrastructure Investment and Jobs Act (IIJA, Public Law 117-58).

☐ BABA COMPLIANT - Certification & Documentation attached
☐ BABA COMPLIANT - Certification & Documentation provided in previous submittal
☐ NOT COMPLIANT - Cost information attached for inclusion on De Minimus tracking
☐ BABA IS NOT APPLICABLE TO THIS PRODUCT

By: _____ By: _____
Contractor Manufacturer

Date: _____ Date: _____

Page ___ of ___

General Contractor's Stamp

OPERATIONS AND MAINTENANCE MANUAL CERTIFICATION FORM

PROJECT: _____ CONTRACTOR'S PROJ. NO: _____

CONTRACTOR: _____ ENGINEER'S PROJ. NO: _____

ENGINEER: _____

O&M NUMBER: _____ SPECIFICATION SECTION OR DRAWING NO: - OM- _____ SEQUENTIAL NUMBER (& ALPHA SUFFIX FOR RESUBMITTAL)

DESCRIPTION: _____

MANUFACTURER: _____

The above referenced operations and maintenance manual has been reviewed by the undersigned and I/we certify that the manual is customized as needed for this project, is suitable for mounting in a 3-ring binder, and contains the following items:

- ☐ Table of Contents
- ☐ Contractor and Manufacturer Contact Information
- ☐ Preventative Maintenance Schedule and Summary
- ☐ Removal and Replacement Instructions
- ☐ Lubrication Schedule
- ☐ Troubleshooting Information
- ☐ Warranty Information
- ☐ Rebuild Information for All Components
- ☐ Startup, Operation and Shutdown Procedures
- ☐ Normal and Emergency Operations
- ☐ Safety Procedures and Precautions
- ☐ Shop Drawings corrected to As-Built Conditions
- ☐ Personnel Training Requirements
- ☐ Project-Related Design Data
- ☐ Serial Numbers
- ☐ Maintenance and Repair Procedures
- ☐ Wiring and Control Diagrams
- ☐ Equipment Drawings & Schematics
- ☐ Equipment Performance Curves
- ☐ Parts and Service Contact Information
- ☐ Manufacturer's Contact Information
- ☐ Emergency Operations Plan
- ☐ List of All Component Part Numbers
- ☐ List of Spare Parts Supplied
- ☐ Testing Equipment & Special Tools
- ☐ Other System Specific Information

By:_____ By:_____

Contractor[a] Manufacturer[b]

Date: _____ Date:_____

[a] Contact information shall include name, address and telephone number.
[b] Required on all Operation and Maintenance Manuals.
[c] When required by Specifications. Page ___ of ___

General Contractor's Stamp

PROCESS EQUIPMENT MANUFACTURER SUBMITTAL CERTIFICATION
(Divisions 11 and 14)

Owner:_____ Date: _____

_____

Project:

_____

_____

Contractor: _____

_____

Equipment Manufacturer: _____

_____

_____

Equipment: _____

As an authorized representative of the equipment manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of Section 11000, Part 1.3.K. The undersigned authorized representative of the manufacturer further certifies that the equipment manufacturer or supplier has: reviewed the Contract Documents, the intended installation by the Contractor, and the intended functional and operational conditions; determined all conditions to be acceptable; and found no conditions which would cause the warranty to be void; or the equipment to function improperly, or not meet the performance requirements.

_____ _____

(Authorized Representative of the Manufacturer) (Date)

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide a detailed breakdown of the Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.
B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer substantiating the sums described.

1.4 SUBMITTALS

A. The proposed schedule of values (hereinafter referred to as "SOV"), meeting the requirements outlined below, shall be submitted to the Engineer for review. The SOV shall be used as the basis for reviewing and approving payment requisitions along with determining percentages of work completed. No payment requisitions will be processed until the Engineer has taken no exceptions to the schedule of values.
B. The SOV shall consist of a detailed breakdown of all the work within the Contract Documents, as specified herein, and shall include a sufficient number of work items to serve as an accurate basis the General Contractor's Application for Payment. Each work item shall include its prorated share of overhead and profit and subcontractor markup. The breakdown shall provide the level of detail outlined below.
   1. General Conditions:
      a. Includes all work indicated in all specifications within Division 0 and 1.
   2. Civil and Site Work:
      a. Includes all work indicated on the Civil (C) Drawings and all specifications within Division 2.
   3. Architectural:
      a. Breakdown by building and structures.
      b. Includes all work indicated on the Architectural (A) Drawings and in all specifications within Divisions 4, 5, 6, 7, 8, 9, 10 and 12.
   4. Structural:
      a. Breakdown by building and structures.
      b. Includes all work indicated on the Structural (S) Drawings and in all specifications within Divisions 3, 5 and 13 (through and including Section 13133).

5. Process Equipment:
   a. Breakdown by process system, including submittals, O&M manuals, equipment, installation, startup, commissioning and training.
   b. Includes all work indicated on the Process (PR) Drawings and in all specifications within Division 11 and relevant specifications in Divisions 14 and 15.
6. Mechanical and Plumbing:
   a. Breakdown by building and structures.
   b. Includes all work indicated on the Mechanical (M) Drawings and in relevant specifications within Division 15.
7. Instrumentation and System Integration:
   a. Breakdown by overall network, overall instruments, overall programming, startup, commissioning, and training.
   b. Includes all work indicated on the Instrumentation (I) Drawings and in all specifications within Division 13 (from Sections 13410 through and including 13460).
8. Electrical:
   a. Breakdown by overall utility service, power distribution, standby power, building and structures, startup and commissioning.
   b. Breakdown ductbank costs on a linear foot basis.
   c. Breakdown conduit and wire separately.
   d. Includes all work indicated on the Electrical (E) Drawings and in all specifications within Division 16.
9. Line items shall be broken down into work performed by the General Contractor or a Subcontractor
10. Provide an aggregate percentage completed calculation for each major subcontractor (e.g., site, HVAC, ATC, systems integrator, plumber, electrician, etc.).
11. If a work item, or series of work items, are separated into construction phases which will require phased payments, the SOV shall have separate line item values for each phase.

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Pre-Construction Record: Contractor shall take digital photographs and video to obtain a visual record of the project area prior to beginning any work at the project site.
2. Construction Progress: Contractor shall take ground-based digital photographs and aerial digital photographs at monthly intervals in order to obtain a visual record of the project area.
3. Post-Construction Record: Contractor shall take ground-based digital photographs and aerial digital photographs of the project site after the work has been completed.
4. Notify Engineer at least three (3) working days prior to photographing or videoing the project area so Engineer may, at their option, observe.

1.2 QUALITY

A. Pre-Construction Record: Quality shall be such that the condition of existing pavement, curbing, driveway entrances, sidewalks, walls, doors, equipment, piping, etc. can be readily determined. Pre-construction record photographs and videos shall be taken by the Contractor with the Engineer or RPR present.

B. Construction Progress: Quality shall be such that the progress of the work is satisfactorily documented. Construction progress photographs may be taken by a professional photographer or may be taken by the Contractor.

C. Post-Construction Record: Aerial photographs shall be taken by a professional aerial photographer acceptable to the Engineer. Post-construction record photographs shall be taken by a professional photographer acceptable to the Engineer.

D. Electronic files shall be high resolution digital images in *.jpeg format and shall not be compressed or downsized. Electronic files shall not be less 2MB in size

1.3 SUBMITTALS

A. Pre-Construction Record:

1. Submit pre-construction photographs/videos in accordance with Section 01340 prior to initiating any work on-site.
2. All high resolution digital images shall have a minimum resolution of 1,920 x 1,080 pixels in *.jpeg format and shall not be compressed or downsized.

B. Construction Record:

1. Submit construction record photographs/videos in accordance with Section 01340 concurrent with the monthly payment requisition.

C. Post-Construction Record:

1. Submit post-construction record photographs in accordance with Section 01340 prior to final payment requisition.

D. The quality of the photos and video are subject to approval by the Engineer.
E. Photographs and videos taken for the project and submitted are released to the Owner and Engineer for reproduction and use for records retention, governmental, commercial, and marketing purposes.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. General Quality Control.
B. Workmanship.
C. Manufacturer's Instructions.
D. Manufacturer's Certificates.
E. Manufacturer's Field Services.
F. Testing Laboratory Services.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY CONTROL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.4 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
B. Perform work by qualified people to produce workmanship of specified quality.
C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURERS' INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate that products meet or exceed specified requirements.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.
B. Representative shall submit written report to Engineer listing observations and recommendations.

1.8 TESTING LABORATORY SERVICES

A. Contractor will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services wherever an Independent Testing Laboratory is required by individual specification sections or as indicated on the drawings. Material testing that is responsible by the contractor shall include earthwork, disposal tests, density, proctors, concrete and masonry block and grout compression tests.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will present observations and test results and indicate compliance or non-compliance with specified standards and with Contract Documents. Independent Testing Laboratory will submit one copy of each report directly to each of the following: Contractor, Owner, STP Operator, Engineer, Resident Project Representative, Contractor. Reports will be submitted within 5 days of obtaining test results. If test results indicate deficiencies, Independent Testing Laboratory shall telephone or email results to Owner, STP Operator, Engineer, Resident Project Representative and Contractor within 24 hours.

D. Contractor shall cooperate with Independent Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

E. Contractor shall coordinate all testing work and shall notify Owner, STP Operator, Engineer and Independent Testing Laboratory at least 24 hours prior to performing work requiring testing services. If scheduled tests or sampling cannot be performed because the work is not ready as scheduled, testing costs associated with the delay will be by the Contractor.

F. If adequate notice is not provided, Contractor shall suspend work on that portion of the Project until testing can be performed. Such suspension will not be grounds for a claim against the Owner for delay, nor will it be an acceptable basis for an extension of time.

G. Payment for Independent Testing Laboratory services shall be as follows:

1. General: The Contractor is responsible for all material testing including earthwork, concrete, masonry and welding.
2. Initial Testing: Contractor will pay for initial tests.
3. Retesting: Costs of retesting due to non-compliance will be paid by the Contractor.
4. Contractor's Convenience Testing: Inspections and tests performed for Contractor's convenience will be paid for by Contractor.

PART 2 - PRODUCTS
Not Used

PART 3 - EXECUTION
Not Used

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and pay for all temporary applicable utilities required to properly perform the Work at no additional cost to the Owner including the placement and removal of the utilities.
2. Completely remove all temporary equipment and materials upon completion of the Work and repair all damage caused by the installation of temporary utilities.
3. Make all necessary applications and arrangements for electric power, light, water and other utilities with the local utility companies. Notify the local electric power company if unusually heavy loads, such as welders, will be connected.
4. Except as otherwise specified in the various Sections of the Specifications, the General Contractor shall provide, set up and maintain all derricks, hoisting machinery, scaffolding, staging, and planking, and do all hoisting required for the Work, or any part of the Work.
5. General Contractor shall furnish and maintain dumpsters as required to adequately control the disposal of all trash, construction debris, and waste materials resulting from the work of General Contractor and all filed sub-contractors.
6. Provide temporary protection of existing concrete tanks and other unheated concrete structures taken out of service for the General Contractor to complete the Work as indicated on the Contract Documents in that area.
7. Provide, operate and maintain a temporary cofferdam and secondary bulkhead system within the effluent channel to assist with the removal and installation of new RAS piping from Secondary Clarifiers 5 and 7. Contractor to remove the temporary cofferdam and secondary bulkhead system once the temporary facilities are not longer required for the project.
8. Furnish, install, startup, test and maintain the temporary RAS pumping and piping facilities for the duration of the project. Contractor to furnish fuel for the temporary RAS pumping facilities for the duration of the project. Contractor to drain and disposal liquid and solids contents with the RAS suction and discharge piping along with the cutting, removal and relocation of the temporary RAS suction and discharge piping as necessary to facilitate the construction work. Contractor to coordinate the disposal of liquid or solids contents with the STP Operator at the STP.
9. General Contractor shall provide temporary ventilation during construction as required to ensure a safe working environment. The temporary ventilation systems shall address the following conditions, including but is not limited to: removal of hazardous fumes from explosion-proof rated spaces (Class 1, Division 1 rated spaces), removal of paint fumes and other potentially toxic

conditions associated with the contractor's activities, and ventilation of confined spaces, in compliance with all OSHA and State safety requirements.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Obtain permits as required by local governmental authorities.
   2. Obtain easements, when required, across private property other than that of the Owner for temporary power service.
   3. Comply with the latest National Electrical Code.
   4. Comply with all local, State and Federal codes, laws, and regulations.

B. All temporary utilities are subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Electrical:
   1. The General Contractor shall make necessary arrangements with the local power company for connection to the existing power supply and shall provide and pay for all temporary light and power requirements except as otherwise specified hereunder. In general, the temporary electrical service shall include all necessary switches, poles, wiring, cables, conduit, raceways, panelboards, fixtures, lamps and receptacles to supply construction power of adequate capacity for the project. Temporary transformers and meters shall be furnished and installed by the appropriate power authority, but paid for by the General Contractor, who shall be responsible for making all arrangements for their installation prior to using any existing power for temporary purposes.
   2. Use new or used materials adequate in capacity for the purposes intended.
   3. Materials must not create unsafe conditions or violate the requirements of applicable codes.
   4. Conductors:
      a. Wire, cable or busses of appropriate type, sized in accordance with the latest National Electrical Code for the applied loads.
      b. Use only UL approved wire.
   5. Conduit:
      a. Rigid steel, galvanized: ANSI C80.1.
      b. Electrical metallic tubing: ANSI C80.3.
      c. Other material approved by NEC.
   6. Equipment: Provide appropriate enclosures for the environment in which used in compliance with NEMA Standards.
   7. Temporary power shall be based upon the following minimum requirements:
   8. Lighting - 300 watt per 1,000 square feet of floor area.
   9. Receptacles - One 15 ampere duplex for 1,000 square feet of floor space.
   10. Special Construction Equipment - Provide one 30-amp, 2-pole fused switch for equipment connection. The cost for cables and connection from switch to the special equipment will be borne by the Sub-Contractor requiring same.

11. The General Contractor will pay for the cost of energy consumed by all trades, including cost of lamp replacement. The General Contractor and Subcontractors of all trades shall furnish their own extension cords and such additional lamps as may be required for their work, shall pay for the cost of temporary wiring of a special nature for light and power required, other than that above mentioned.
12. All temporary work shall be furnished and installed in conformity with the National Electrical Code and in accordance with local ordinances and requirements of the municipal power authority. All temporary wiring and accessories shall be removed after it has served its purpose.

B. Heating and Ventilation:

1. The General Contractor shall furnish, install, and maintain a complete temporary heating and ventilation systems, including fuel therefore, which will provide heat and ventilation as required by the trades and for the protection of personnel in the work spaces, and stored and installed materials from injury as can be caused by dampness and cold. The General Contractor shall employ, within the terms of the General Contract, a competent watchman who will maintain and operate the systems, as required. The General Contractor shall bear all costs incurred from the temporary heating and ventilation from the time the systems are first required until the date of Substantial Completion of the General Contract, as defined in the General Conditions and Supplementary Conditions.
2. Under no circumstance shall the permanent heating system be used for temporary heating purposes, until the building/buildings have been considered as satisfactorily enclosed by the Engineer, specified hereunder.
3. Temporary heating equipment must be smokeless and fumeless type, Underwriters Laboratories, Factory Mutual, Fire Marshal and Engineer approved, and will fulfill the heating requirements specified hereunder.
4. As soon as practicable, after the building/buildings have been considered satisfactorily enclosed by the Engineer, the General Contractor shall have the permanent heating and ventilation systems and apparatus put in operation. Electrical service, wiring, controls, and other essential parts of the permanent system must be installed prior to utilizing the heating system. The General Contractor shall pay for all power and fuel consumed in the temporary operation of the permanent systems until the time the building/buildings are partially or permanently occupied by the Owner, whichever comes first in accordance with the provisions specified herein for use and occupancy prior to acceptance by the Owner.
5. After enclosure of the building/buildings and before installation of wet work such as interior masonry and tile, maintain temperatures of 50 degrees minimum, except for a period commencing 10 days prior to the installation of interior woodwork, interior flooring, or interior painting, whichever occurs first, after which time the temperature shall be maintained at a minimum of 65 degrees F., until the project is either partially or permanently occupied by the Owner.

C. Water and Sanitary:
   1. The General Contractor shall make necessary arrangements for connection to the municipal water supply and shall provide, at their own expense, any extensions as required for the operation of this project. The General Contractor shall bear all costs incurred for the temporary water services, including the costs of the water itself.
   2. All lines, temporary or permanent, shall be protected and maintained by the General Contractor. Temporary lines shall be removed by the General Contractor when the temporary service is no longer required.
   3. The General Contractor shall provide an adequate drinking water supply, satisfactorily cooled, for their employees.
   4. See Site Plan for nearest water hook-up.
   5. The General Contractor shall furnish, install, maintain and pay for adequate temporary chemical type toilet accommodation, for all persons employed on the work and located where approved by the Engineer. The accommodations shall be in proper enclosures and in accordance with Municipal Ordinances and shall be maintained in proper, safe and sanitary conditions and suitably heated when requested.
   6. Relocate temporary toilet facilities as required to facilitate the construction.
   7. Remove all temporary facilities at completion of work when directed by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Electrical:
   1. Provide electrical energy to:
      a. All necessary points on the construction site so that power can be obtained at any desired point with extension cords no longer than 100 feet.
      b. Construction site offices.
      c. Lighting as required for safe working conditions at any location on the construction site.
      d. Night security light.
      e. When applicable, Owner's present facilities during the changeover of electrical equipment.
   2. Maintain electrical energy throughout the entire construction period.
   3. Capacity:
      a. Provide and maintain adequate electrical service for construction use by all trades during the construction period at the locations necessary, as specified herein.
   4. Installation:
      a. Install all work with a neat and orderly appearance.
      b. Have all installations performed by a qualified electrician.
      c. Modify service as job progress requires.
      d. Locate all installations to avoid interference with cranes and materials handling equipment, storage areas, traffic areas and other work.

B. Heating and Ventilation:
   1. Maintain a heated and ventilated environment for the work at the temperature and for the length of time specified or as directed by the Engineer, and as needed to protect all individuals on the construction site.
   2. Precaution:
      a. Operate temporary heating apparatus in such a manner that finished work will not be damaged.
      b. Repair all damage, caused by temporary heating operations, to the complete satisfaction of the Engineer.

C. Weather Protection
   1. The Contractor shall be entirely responsible for all weather protection during the Contract Time, and shall be liable for any damage to the Work, or any part thereof caused by the Contractor's failure to supply adequate and proper weather protection.
   2. Any work damaged by frost shall be promptly removed and replaced by the Contractor at no increase in Contract Price or Contract Time.

D. Water:
   1. Provide and maintain water for drinking and construction purposes as required for the proper execution of the Work.

E. Sanitary Accommodations:
      a. Provide and maintain sanitary accommodations for the use of the employees of the General Contractor, subcontractors, and Engineer.
      b. Sanitary accommodations shall meet the requirements of all local, State and Federal health codes, laws and regulations.

END OF SECTION

SECTION 01515

TEMPORARY BYPASS PUMPING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall design, furnish, install, test, operate, maintain and remove temporary bypass pumping system(s) in order to divert wastewater flow around the work area. Temporary bypass pumping system(s) shall be fully automated and able to reliably convey the full range of wastewater flows, as scheduled herein.

B. Temporary Return Activated Sludge Bypass System

1. The temporary bypass pumping system is intended to convey return activated sludge from the bottom of Secondary Clarifiers 5 through 8 to the Raw Influent Channels upstream of the Oxygen Reactors to bypass the North RAS Pump Station in order to complete the proposed improvements. The Owner previously installed a temporary bypass pumping system that consisted of two bypass pumps, suction piping tap connections to the buried return activated sludge withdrawal piping, temporary suction piping from the buried piping taps to the pumps, and temporary discharge piping from the pump outlets to the Raw Influent Channels. One pump was dedicated to two secondary clarifiers each. The previously installed temporary bypass pumps, and suction and discharge bypass piping local to the pumps have been removed, however the buried suction connection taps, suction piping, and discharge force main from the North RAS PS to the Raw Influent Channels remains for the Contractors use in installing the temporary bypass system.
2. The intent is for the Contractor to replicate the previously installed duplex temporary return activated sludge bypass system. Refer to the Contract Drawings more details regarding the existing bypass pumping infrastructure conditions.

C. Effluent Channel Temporary Bypass System

1. This system will consist of pumping Secondary Clarifier Nos. 7 and 8 effluent from their discharge point at the end section of the Effluent Channel, around and downstream of an isolated section of the channel in order to perform the installation of return activated sludge piping beneath the Effluent Channel. It is anticipated that bulk heads will be required to be installed within the Effluent Channel to isolate sections of the channel to perform the work.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. All system components specified herein shall be furnished by a Supplier who regularly engages in temporary bypass pumping systems. Supplier shall have a minimum of 15 years of experience with temporary bypass pumping systems.

Supplier shall provide at least 5 references of project of a similar size and complexity as this project that have been performed within the past 5 years within the gulf region.

B. Supplier shall have sufficient equipment and spare parts inventory to perform normal rentals, including this project, and maintain at least 100% reserve equipment for this project for immediate delivery. Supplier shall have sufficient service personnel to provide service calls within 4 hours, 24 hours per day, 7 days per week.

C. Temporary bypass pumping systems shall be:
   1. Godwin Pumps, Lakeland, FL;
   2. Thompson Pump, Port Orange, FL;
   3. or equal.

D. A qualified representative of the Supplier shall inspect the installation and supervise the startup and testing of the temporary bypass pumping system.

E. The temporary bypass pumping system shall meet all applicable local, state and federal requirements.

F. The temporary bypass pumping system shall be designed by a Professional Engineer licensed to practice in the State of Louisiana. Compliance with this requirement shall be demonstrated via a signed and sealed submittal package, as specified herein.

1.4 SUBMITTALS

A. In accordance with the requirements of Section 01340.
   1. Qualifications information.
   2. Proposed schedule, sequence of construction, duration of activities and description of sewer control methods to be utilized for each element of the project.
   3. Coordination Drawings showing detailed layout of equipment, bulk heads, pumps, suction piping, discharge piping, fittings, valves, supports, materials, temporary controls provided under this section.
   4. List of duty equipment, pumps, piping, fittings, valves, level elements, controls, and materials to be utilized by the Contactor for the temporary bypass pumping system.
   5. List of standby equipment and spare parts available on-site and off-site in order to ensure uninterrupted operation of the bypass pumping system in the event of a utility power failure.
   6. Fuel consumption rate at full speed duty and standby pumping.
   7. Fuel storage tank and secondary containment provision, including Spill Prevention Control and Countermeasure (SPCC) Plan, if applicable.
   8. Catalog cut sheets/ technical data for equipment and appurtenances.
   9. Performance curves for wastewater bypass pumps and suction lift, static head, headloss, and total dynamic head (TDH) calculations.
   10. Description of maintenance procedures to be utilized.
   11. Description of controls and alarm equipment to be utilized. Sample alarm log.
   12. Names of individuals responsible for on-call response, 24 hours per day, 7 days per week. Call list for alarm response.

B. No construction related activities requiring the need for bypass pumping operations shall begin until the related project submittals are reviewed and all provisions of the work have been fully coordinated with the Owner, Agency, Engineer and any other parties having jurisdiction for the proposed work activities.

PART 2 - PRODUCTS

2.1 WASTEWATER BYPASS PUMPING SYSTEM

A. Pumping Equipment:

1. Temporary bypass pumping system(s) shall designed to convey the full range of flows and head conditions as scheduled herein.

NORTH RAS PUMP STATION	
Number of Pumps (Minimum)	2 Duty, 1 Standby
Duty	Return Activated Sludge
Duty Pumps	Diesel or Electric
Standby Pumps	Diesel or Electric
Variable Speed Required for Duty Pumps	Yes
Flow per Pump (Minimum)	4,000 gpm
Total Flow (Minimum)	8,000 gpm

EFFLUENT CHANNEL/SECONDARY CLARIFIER Nos. 7 & 8 EFFLUENT BYPASS	
Number of Pumps (Minimum)	Duty Pumps as Dictated by Supplier; 2 Standby Pumps
Duty	Secondary Clarifier Effluent
Duty Pumps	Diesel or Electric
Standby Pumps	Diesel or Electric
Variable Speed Required for Duty Pumps	Yes
Minimum (two clarifiers)	10,500 gpm
Average Day (two clarifiers)	23,150 gpm
Peak Hour (two clarifiers)	56,715 gpm

2. The temporary bypass pumping system shall be able to convey the peak instantaneous flow, as scheduled herein:
   a. with the largest available pump off-line; and
   b. without utility power.
3. Each pump shall be a skid-mounted unit. The pump system may utilize available on-site manholes, junction/splitter structures, and/or tankage for suction and discharge, as appropriate.
4. The pumps shall be centrifugal trash pumps suitable for handling raw, unscreened sewage with solids up to 3 inches in diameter, and capable of running completely dry for extended periods of time without damage. Pumps shall be capable of static suction lifts to 28 vertical feet, at sea level.

5. The pump priming system shall be fully automatic, needing no form of adjustment or manual addition of water. The priming system shall be capable of priming the pump from a completely dry casing.
6. All pumps shall be critically silenced to less than 69 decibels at 30 feet.
7. Contractor shall provide appropriately sized portable spill guard containment dikes to contain leaks resulting from the pumping system, from the fuel storage tanks(s) and/or from the pumps and process piping within 5 feet of the system.

B. Piping and Valves:
1. Suction piping and discharge piping shall be constructed of:
   a. Rigid galvanized steel pipe with ball and socket joints, Bauer HK Quick Coupling Piping or equal.
   b. Fused HDPE piping
   c. Connection to existing piping shall be made equivalent materials.
2. Aluminum "irrigation" type piping or glued PVC pipe shall not be allowed.
3. Each pump shall be provided with suction gate valve, and discharge check and gate valves for isolation. Valves are to be suitable for the application. Refer to Division 15 fo

C. Controls and Alarms:
1. Each pumping system shall be furnished with a weather-proof automatic control system consisting of floats and/or transducer level controls.
2. The controller shall start/stop the pumps based on signals from high and low level floats, a transducer, or remote operator adjustable flow set point. The controller shall be capable of automatically varying the pump speed to match varying flow conditions and maintain a constant suction level, if scheduled herein.
3. The controller shall annunciate and log all alarm conditions including but not limited to high upstream water level, duty pump failure, utility power loss and standby pump failure. The alarm log shall include the type of alarm, time of alarm, time alarm acknowledged, and time alarm condition cleared. Annunciation shall be via teledialer, two-way radio, cellular telephone, or equivalent.

PART 3 - EXECUTION

3.1 COORDINATION OF WORK

A. Provide all labor and equipment necessary to coordinate work of this section and maintain communications.

B. Notify all personnel, including but not limited to Owner, Engineer and Utility Companies, seven days in advance of any temporary bypass pumping work. The Owner will identify personnel to be notified in addition to those identified by the Contractor.

C. Contractor shall coordinate temporary bypass pumping operations with the Owner and Engineer on a daily basis.

3.2 PERFORMANCE:

A. General

1. The Contractor shall install and test all sewer flow control methods to the satisfaction of the Owner and Engineer prior to proceeding with the Work.
2. The Contractor shall be solely responsible for clean-up, repair, property damage costs and claims resulting from failure of the diversion system.
3. Any temporary pumps, piping, fuel storage, or other appurtenances associated with the temporary pumping system shall be either located above the 100-year flood elevation or protected against flotation or other damage which would be caused by a flood event.

B. The temporary bypass pumping systems shall be furnished, installed, tested, operated, maintained and removed as follows:

1. The Contractor shall furnish, install, and test temporary bypass pumping system and discharge pipelines.
2. The Contractor shall test and debug all systems and verify that all necessary equipment, materials, spare parts, and labor are available on-site prior to operation of the system and prior to the demolition of any part of the existing pumping station facilities.
3. The Owner shall operate and maintain the system until the new Work is completed, demonstration tested and accepted by the Owner and Engineer. Contractor shall coordinate with the Owner on a daily basis.
4. Contractor shall be responsible for making regulatory reporting notifications for any release of wastewater or fuel to the environment. Contractor shall provide copies of notifications to the Owner and Engineer.
5. The Contractor shall anticipate that the Owner will require 7 calendar days of operation on the new, permanent Work following satisfactory completion of demonstration testing prior to beginning disassembly of the temporary bypass pumping system.
6. Upon receipt of approval by the Owner and Engineer, the Contractor shall disassemble and remove the temporary bypass pumping system, including all appurtenant piping not scheduled to remain in place. The existing temporary RAS bypass piping network is the property of the Owner and shall be salvaged and turned over to the Owner. Contractor shall restore the area impacted by the temporary bypass pumping system to a like-new condition.

C. Contractor shall be responsible for cleanup, repairs, restoration and fines required to address spills or overflows from a failed bypass pumping system.

END OF SECTION

SECTION 01520

SITE SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall:
   1. Protect work premises and Owner's operations from theft, vandalism, and unauthorized entry.
   2. Initiate program in coordination with Owner's existing security system at job mobilization.
   3. Maintain program throughout construction period.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 ENTRY CONTROL

A. The Contractor shall:
   1. Restrict entry of persons and vehicles into Project site and existing facilities.
   2. Allow entry only to authorized persons with proper identification.
   3. Maintain log of workmen, visitors and deliveries and make log available to Owner on request.
   4. Coordinate entrance of persons, vehicles (including deliveries) in such a manner to not interfere with Owner’s operations.

B. Owner will control entrance of persons and vehicles related to Owner's operations.

3.2 RESTRICTIONS

A. The Contractor shall not allow cameras on site or photographs taken except by written approval of Owner.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. Work Included:

1. Furnish and apply water or calcium chloride on the road surfaces within the construction site, when required to control dust and when directed by the Engineer.
2. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Water for Sprinkling:

B. Clean, free of salt, oil, and other injurious matter.

C. Calcium Chloride:

1. Meet the requirements of AASHTO M144.

PART 3 - EXECUTION

3.1 APPLICATION

A. Water:

1. Apply water by methods approved by the Engineer.
2. Use approved equipment including a tank with gauge equipped pump and spray bar.

B. Calcium Chloride:

1. Apply at a rate sufficient to maintain a damp surface but low enough to assure non-contamination of water courses.
2. Apply water prior to calcium chloride addition.

END OF SECTION

SECTION 01580

SPECIFICATION FOR LOUISIANA CLEAN WATER STATE REVOLVING FUND PROJECT SIGN

PART 1 - GENERAL

1.1 SUMMARY

A. This specification covers the fabrication and installation of a project identification sign for projects receiving funding through the Louisiana Clean Water State Revolving Fund Program.

PART 2 - PRODUCTS

2.1 GENERAL

A. The project sign shall be fabricated and erected within 21 days following the notice to proceed and shall be maintained by the Contractor until completion of construction and the Owner's acceptance of the work.

B. For projects which include greater than one funding source the information specified for CWSRF projects may be combined with other project signage requirements onto one sign, as allowed and approved by the funding agencies.

C. There should be one project sign per project. If the project has multiple locations, one project sign centrally located as directed by the Engineer is sufficient.

2.2 MATERIALS AND FABRICATION

A. Refer to attached figure titled "CWSRF Project Sign Elevation" for typical layout of a sign. The size and spacing of the lettering on the sign may change to accommodate the addition of other funding agencies

B. Sign Panel: The sign panel shall be constructed of 3/4-inch APA rated, A-B grade exterior plywood rabbeted into a 2" x 4" nominal frame or other suitable materials and construction capable of withstanding typical weather conditions common to the project site.

C. Fasteners: All fasteners used in the fabrication of the sign shall be rust-proof.

D. Sign Supports: The sign shall be adequately supported and braced to remain in the proper positioning and alignment, including resistance to wind loads and toppling of the sign.

E. Coating: All paint or exterior coverings used shall be exterior grade coating suitable for use on wood or the material of construction. The sign shall be prepared as follows:

1. Sign Face: The sign face background shall be white and can consist of a minimum two coats of paint.
2. Supports and Trim: The supports and trim shall be white and can consist of a minimum of two coats of paint. The front facing surface of the 2" x 4" frame shall be royal blue.

F. Lettering and Emblem: The lettering shall be of the size and color as specified on the attached figure. The size and spacing of the lettering on the sign may change to accommodate the addition of other funding agencies. The emblem shall be of the size

specified on the attached figure in royal blue.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The project sign shall be erected in the location and alignment, as directed by the Engineer, with the bottom of the sign panel a minimum of five feet above existing grade.

3.2 MAINTENANCE

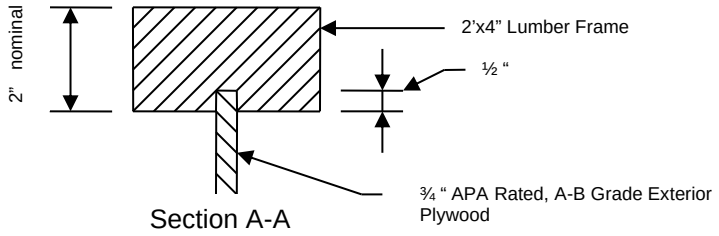
A. The Contractor shall provide any and all materials required to maintain the sign in good condition throughout the duration of the Contract.

B. The Contractor shall remove the project sign from the construction site upon completion of construction and Owner's acceptance of the work, or when directed by the Engineer.

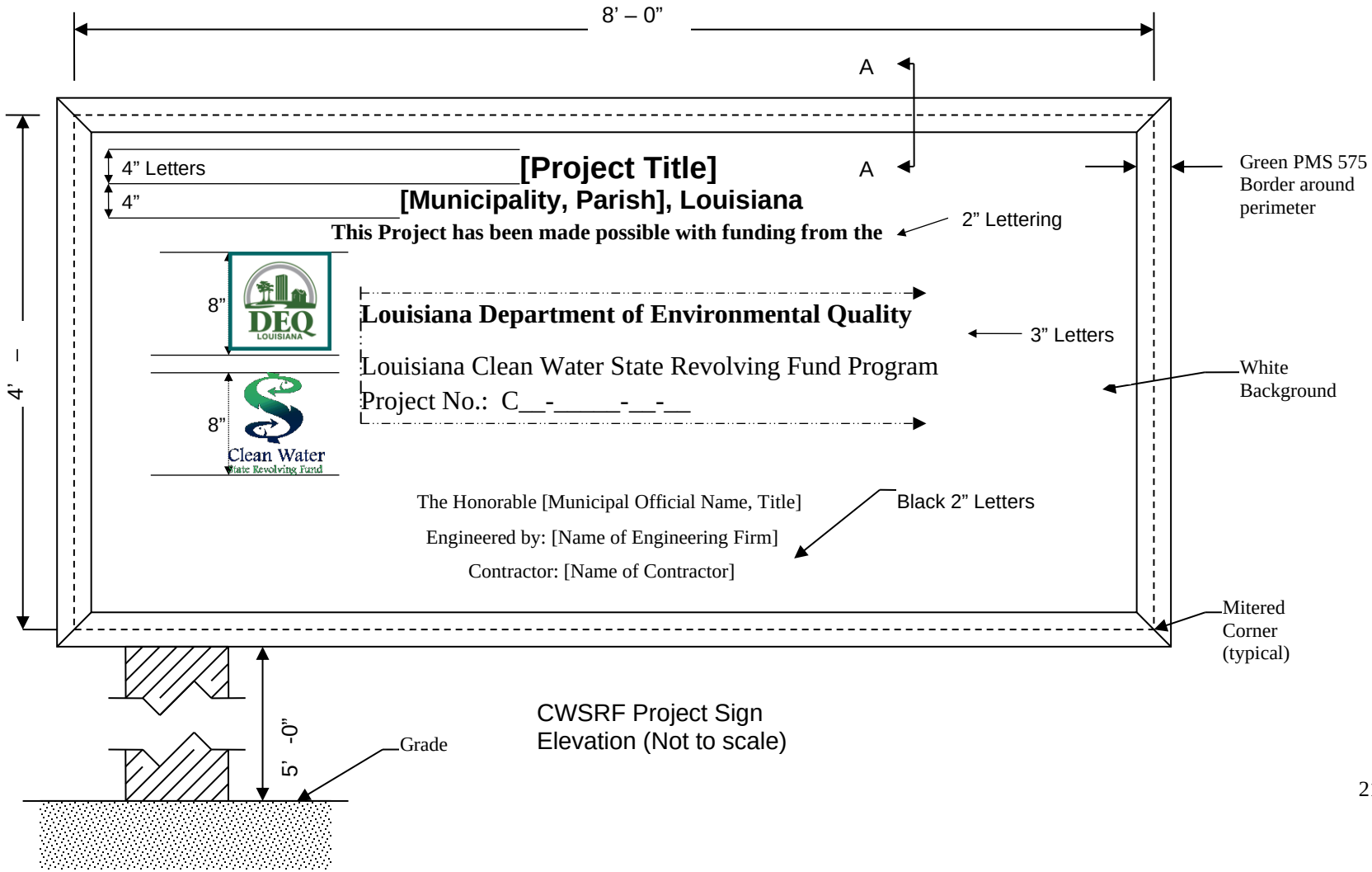
END OF SECTION

PROJECT SIGN SCHEMATIC

Note: All lettering shall be Green PMS 575 except as noted. Spacing between lines shall be 1" except as noted.



Section A-A



CWSRF Project Sign
Elevation (Not to scale)

SECTION 01590

TEMPORARY FIELD OFFICE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and maintain a temporary field office for the exclusive use of the Engineer during the duration of the Contract.

B. Temporary Field Office must be set up prior to the first week of construction activities.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Provide a separate structure or mobile field office trailer, as specified below:

1. Size: l0 feet by 30 feet. Windows arranged for cross ventilation with screens and adequate window coverings to minimize glare on computer screens
3. Door with closure and secure lock.
4. Adequate lights over all work areas.
5. Convenient and accessible electrical outlets on each wall.
6. Adequate heating and air conditioning system with thermostat control.
7. Sanitary conveniences meeting the requirements of all local and state health codes for temporary offices.
8. Bathroom with plumbed toilet and sink and sanitary conveniences including hot water meeting the requirements of all local and state health codes. The Contractor shall set-up a temporary sewer connection from the mobile field office trailer within the first two weeks of construction activities.

Furnish the following furniture and supplies:

1. One flat top desk, 30 inches by 52 inches, with drawers at each side. Two desk trays, one pencil sharpener and one office chair per desk.
2. One plywood drawing table, 3 by 6 feet. One straight chair being suitable for use with drawing table.
3. One folding conference table, 36 inches by 72 inches, and 8 folding chairs.
4. Two 4-drawer steel filing cabinets with lock and key.
5. Two large wastebaskets
6. One rack for drawings, including related appurtenances.
7. Two wall mounted fire extinguishers
8. One bookcase, 48 inches long by 60 inches high by l0 inches deep
9. One electric wall clock
10. One inside/outside thermometer with maximum and minimum recordings, General Tools, Model DTR900, or equal.

11. One first aid kit
12. One each, broom, dust pan, brush
13. One refrigerated, 5-gallon bottle water cooler with refills as needed.
14. One paint gauge:
    a. magnetic non-destructive type with calibration kit
15. Two full body harnesses, that properly fit assigned Resident Project Representative, and that meets or exceeds all applicable industry standards including ANSI A10.14-1991, ANSI Z359.1-1992, OSHA 1910.66 and OSHA 1926.502. Manufacturers: DBI/SALA.
16. Four lanyards with shock absorbing devices. Meet or exceed all applicable standards including ANSI Z 359.1-1992, ANSI A10.14-1991, OSHA 1910.66 and OSHA 1910.66 and OSHA 1926.502. Manufacturers: DBI/SALA.
17. One multi-function gas meter. Gas meter shall be intrinsically safe for use in Class 1, Division 1, Group A, B, C, D hazardous environments. Meter shall be a multi-gas type meter consisting of 5 sensors as follows: oxygen (0_2); flammable/combustible (LEL); carbon monoxide (CO); hydrogen sulfide (H_2S); and a photoionization (PID) or similar toxics sensor. Meter shall have audible alarms, visual readout display with backlight, straps or belt clip, as applicable. Contractor shall coordinate calibration of meter by an approved source and per manufacturer's recommendations in regard to frequency, etc. Acceptable manufacturers are Enmet (Sapphire Model), BW Technologies (GasAlert Micro 5 PID model), or equal.

C. Furnish the following telecommunications equipment:
    1. Private telephone line and internet (using a local phone number) service for the exclusive use of the Engineer. The Contractor is responsible to select the telephone long distance carrier, and to assure that nationwide (in-state and out of state) long distance rates, at any time of the day, are less than $0.15 per minute.
    2. Contractor to provide 4 two-way radios to enable on-site communication between the Owner, Engineer and Contractor (to be returned to the Contractor at the end of the project).

D. Furnish the following internet and office equipment for the duration of the project:
    1. Unrestricted, secure, internet service. Engineer’s service shall be separate from the Contractor’s service. Verizon Wireless 5G Modem with unrestricted Internet service. If the construction site is not accessible by Verizon Wireless’s network, some other form of unrestricted wired Internet service will be provided (i.e., secured, encrypted, HTTPS and VPN connections in addition to simple web browsing.One combination inkjet printer/copier/scanner, including maintenance and paper, Printer shall be capable of printing in black and white or color on 8.5x11 and 11x17 paper (e.g. HP OfficeJet Pro 7740 Wide Format All-in-One Printer or equivalent). Printer shall be wireless enabled and shall support IEEE 802.11 standard Wi-Fi protocol. Provide ink cartridges, paper and maintenance for the duration of the project.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in approved location and properly set up for all anticipated weather conditions.
B. Provide electric power and heat for the duration of the work.
C. All monthly telephone charges, internet charges, and installation fees shall be the Contractor's expense.

3.2 CLEANING

A. Upon completion of the project, remove the temporary field office and thoroughly clean and restore the area to the Owner’s satisfaction.
B. The Field Office and furnishings shall remain the property of the Contractor.

END OF SECTION

SECTION 01600

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the general requirements for the delivery, handling, storage and protection for all items required in the construction of the work. An updated delivery and storage log is required with the monthly payment requisition prior to approval. An example log is included in this section.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 TRANSPORTATION AND DELIVERY

A. Transport and handle items in accordance with manufacturer's instructions.

B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than 120 days prior to installation without written authorization from the Engineer.

C. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for the protection of components.

D. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended, including cross reference of the applicable contract specification section.

E. Deliver spare parts at the same time as pertaining equipment. Deliver spare parts to the Owner after completion of work.

F. Deliver products to the site in manufacturer's original sealed containers or other packing system, complete with instructions for handling, storing, unpacking, protecting and installing.

G. Instructions for handling, storing, unpacking, protecting and installing equipment shall be included in the Equipment O&M Manuals, which shall be submitted prior to the equipment being shipped to the site. This information shall be filed in a dedicated three ring binder(s) on-site, in the Contractor trailers, accessible to the Owner and Engineer. The binder(s) shall be clearly labeled, and include dividers for each specification section. The manufacturer-provided instructions for each equipment item shall be labeled with the specification number, equipment name, and equipment number. The instructions shall also be submitted to the Engineer.

H. Assume responsibility for equipment material and spare parts just before unloading from carrier at site.

I. All items delivered to site shall be unloaded and placed in a manner which will not hamper the Contractors normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.

J. Provide equipment and personnel to unload all items delivered to the site.

K. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e.

Owner, other Contractors), perform inspection in the presence of the Engineer. Notify the Engineer in writing of any problems.

L. Pay all demurrage charges if failed to promptly unload items.

1.4 STORAGE AND PROTECTION

A. Store and protect products and equipment in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instructions shall be studied by the Contractor and reviewed with the Engineer by them. Instructions shall be carefully followed and a written record of this kept by the Contractor for each product and pieces of equipment.

B. Arrange storage of products and equipment to permit access for inspection. Periodically, inspect to make sure products and equipment are undamaged and are maintained under specified conditions.

C. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs of corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufactures requirements related to warranties.

D. Store loose granular materials on a solid flat surface in a well-drained area. Prevent mixing with foreign matter.

E. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.

F. All mechanical and electrical equipment and instruments shall be covered with canvas and stored in a weather tight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it shall be satisfactory to the Engineer.

1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by manufacturer.
2. Moving parts shall be rotated at a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Log all rotation maintenance for each piece of equipment in the written record noted above.
3. Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use. Log all startup for each piece of equipment in the written record noted above.
4. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
5. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the

manufacturer to be in condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

G. The weather tight building shall be provided with adequate heating/cooling and ventilation as required by the manufacturer to prevent condensation. Maintain temperature and humidity within range required by manufacturer and to prevent condensation on the equipment being stored.

H. Temporary heating and cooling is acceptable. Equipment shall be protected from environmental effects as required by the manufacturer and dependent on the season. Equipment that arrives on site without coating shall be protected from environmental impacts through coating or protection at the Contractor's expense. Any equipment that displays defects or corrosion from environmental impacts will not be accepted for installation.

I. The location of all stored material and equipment shall be reviewed with the Owner and Engineer. The Owner and Engineer may request that equipment and material be moved to an alternate location to accommodate plant maintenance and operation, or if the location is deemed unacceptable or unsuitable.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING MONTHLY LOG

A. An updated storage and delivery log is required with the monthly payment requisition prior to approval.

B. The monthly log shall include the specification section, equipment description, equipment tagging, submittal approval date, date of equipment delivery, date of O&M submittal, contractor start-up sign-off, certified equipment testing date, operator training date, spare parts turnover date, required maintenance (activity and date), and equipment turnover (Owner's witness and date).

3.2 STORAGE AND PROTECTION

A. Equipment requires acceptance and verification of the storage from the Owner, Engineer, Manufacturer and Contractor at the Engineer's discretion.

B. Following delivery, the equipment warranty from the Manufacturer is the responsibility of the Contractor.

C. All storage and maintenance will be the responsibility of the Contractor, conducted at the Contractor's expenses and verified by the Engineer.

D. It is the Contractor's responsibility to coordinate all storage requirements on site as required by the Manufacturer to achieve acceptance.

Section 01600 Delivery, Storage and Handling

Specification Section	Equipment Description	Equipment Tags	Submittal Approved	Date of Equipment Delivery[1]	Date of O&M Submittal	Equipment Start-Up[2]		Certified Equipment Testing	Operator Training	Spare Parts Turnover	Required Maintenance by Contractor (activity & date)	Equipment Turnover	
						Date	Witness	Date	Date	Date		Owner's Witness	Date

1. If equipment is delivered and placed in storage, all steps for Stored Equipment shall be followed and tracked separately
2. Log weekly start-ups of installed equipment, performed by Contractor, until Equipment Turnover

END OF SECTION

SECTION 01710

PROJECT CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
2. At completion of work, remove waste materials, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces. Leave project clean and ready for use.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Conduct cleaning and disposal operations in accordance with all applicable local and state laws, ordinances, and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Cleaning During Construction:

1. Execute cleaning operations to ensure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
2. Entirely remove and dispose of material or debris during the progress of the work that has washed into or has been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations.
3. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
4. At reasonable intervals during the progress of work, clean the site and dispose of waste materials, debris, and rubbish.
5. Clean interiors of buildings, when applicable, prior to finish painting, and continue to clean on an as-needed basis until buildings are ready for occupancy.
6. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw material from heights.

7. When applicable, schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

B. Control of Hazards:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which may create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Disposal:
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.

D. Final Cleaning:
   1. Employ experienced workers, or professional cleaners, for final cleaning.
   2. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from all sight-exposed interior and exterior finished surfaces.
   3. Repair, patch and touch up marred surfaces to specified finishes.
   4. Broom clean paved surfaces.
   5. Rake clean non-paved surfaces of the project site.
   6. Restore to their original condition those portions of the site not designated for alterations by the Contract Documents.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Keep accurate record documents for all additions, demolition, changes of material or equipment (from that shown on the Drawings), variations in work, and any other additions or revisions to the Contract (via Change Order, Work Change Directive, Field Order or Clarification).

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 MAINTENANCE OF DOCUMENTS

A. Maintain at job site, one copy of:

1. Contract Drawings
2. Specifications
3. Addenda
4. Reviewed Shop Drawings
5. Change Orders
6. Any other modifications to the Contract
7. Field Test Reports

B. Store documents in files and racks specifically identified for Record Drawing use, that are apart from documents used for construction.

C. File documents in a logical manner indexed for easy reference.

D. Maintain documents in clean, dry, legible condition.

E. Do not use record documents for construction purposes.

F. Make documents available at all times for inspection by the Engineer and Owner, and by the end of the project, transmit these documents to the Engineer.

G. Failure to maintain current records, as specified herein, shall be grounds for withholding additional retainage from monthly partial payment requests.

1.4 RECORDING

A. Label each document "PROJECT RECORD" in large high printed letters.

B. Keep record documents current and do not permanently conceal any work until required information has been recorded.

C. General Field Recording Issues:

1. All swing ties shall be taken from existing, permanent features such as utility poles, corners of buildings and hydrants. Porches, sheds or other house additions shall be avoided as they could be torn down. A minimum of two swing ties shall be taken. Survey grade GPS coordinates are also acceptable.
2. Stations shall be recorded to the nearest foot.

3. Inverts shall be recorded to the nearest hundredth of a foot.
4. Elevations shall be recorded to the nearest hundredth of a foot.
5. Building dimensions shall be recorded to the nearest 1/4".
6. Equipment and Piping shall be recorded to the nearest tenth of a foot, and the overall dimensions and layout of the equipment shall be adjusted to reflect the equipment provided.

D. Project Record Drawings - Legibly mark Contract Drawings to record existing utilities and actual construction of all work, including but not limited to the following (where applicable):

1. Existing Utilities
   a. Water mains and services, water main gate valves, sewer mains and services, storm drains, culverts, steam lines, gas lines, tanks and other existing utilities encountered during construction must be accurately located and shown on the Drawings. In congested areas supplemental drawings or enlargements may be required.
   b. Show any existing utilities encountered in plan and profile and properly labeled showing size, material and type of utility. Ties shall be shown on plan. Utility shall be drawn to scale in section (horizontally and vertically) and an elevation shall be called out to the nearest hundredth of a foot.
   c. When existing utility lines are broken and repaired, ties shall be taken to these locations.
   d. If existing water lines are replaced or relocated, document the area involved and pipe materials, size, etc. in a note, and with ties.
2. Manholes, Catch Basins, Valve Pits and other structures.
   a. Renumber structure stationing to reflect changes.
   b. Show ties to center of structure covers or hatches.
   c. In general, show inverts at center of structures. However, for manholes with drop structures, or steep channels (greater than 0.2' change on slope), show inverts at face of manhole.
   d. Show inverts for other structures at the face of the structure.
   e. Draw any new structures that are added on plan and profile.
   f. Show any field or office redesigns.
   g. Redraw plan if the structure's location is moved more than 5 feet in any direction. Note: It is important to show existing utilities, as outlined in Paragraph 1 above, especially if they were one reason for relocating the sewer, manholes and other structures.
   h. Redraw profile if inverts changed by more than 6 inches.
3. Gravity Sewer Line
   a. Change sewer line slopes indicated on Drawings if inverts are changed.
   b. Draw any new gravity lines that are added on plan and profile.
   c. Show any field or office redesigns.
   d. Redraw the sewer line profile if manhole inverts are redrawn.
   e. Redraw the sewer line on plan corresponding to relocated manholes.
4. Water Mains and Force Mains
   a. Show ties to the location of all valves, bends (horizontal and vertical), tees and other fittings. The use of thrust blocks shall be recorded.

b. Revise elevations indicated on the Drawings to reflect actual construction.

5. Yard Piping and Buried Electrical Conduit
   a. Site piping and utilities shall be drawn to reflect the installed locations, with ties and elevation of all bends (horizontal and vertical).
   b. Show routing for electrical conduits and pull boxes, especially in close proximity to buildings and when the conduits change direction or cross process piping.
6. Roads
   a. Show centerline road profile and level spot elevations.
   b. Show pavement widths.
   c. On road cross sections, show the pavement cross slope.
   d. Show any deviations from the design plans.
7. Buildings
   a. In general, small changes to structures shall not be redrawn. If any dimensional changes were made in the field, the numerical change shall be made on the Drawing and be properly labeled. Update dimensions and elevations on Drawings.
   b. Show finished concrete elevations (top of slab, top of wall, top of footing, etc.). Redraw any foundation, frost wall, etc. that was modified, deepened, or altered during construction.
   c. Adjust finished concrete horizontal dimensions that are shown on the Drawings.
   d. Adjust structural steel elevations and horizontal dimensions that are shown on the Drawings.
   e. Show location of anchors, construction and control joints, and waterstops, when they are different from those shown on Drawings.
   f. Any additions or major changes shall be shown in both plan and elevation (i.e. relocated doors, opposite door swings, change in wall location, relocation of floor drains).
   g. Show approximate location and routing of electrical conduits in walls, slabs and ceilings. Most conduits are run in groups, therefore, use range of measurements to define location for entire section of conduits.
   h. Special circuits for computers, alarms and instrumentation shall be shown.
   i. Show any changes in location and elevation of ductwork and devices, fuel piping and equipment, and heat piping and equipment.
   j. Location of gravity sewer system below slabs in buildings shall be shown, if changes are made in the configuration.
   k. If wall mounted electrical switches, control boxes, thermostats, etc. have been relocated significantly, (other side of door, or to a wall other than indicated diagrammatically on electrical plans) make the revision accordingly.
8. Utilities
   a. When encountered, additional utilities (e.g., gas, cable, telephone, fiber optic, etc.) shall be indicated on the Record Drawings.
9. Equipment Systems and Piping

a. Show any changes to equipment systems, whether interior or exterior, for process, HVAC, plumbing, instrumentation or electrical. If any dimensional changes were made in the field, the numerical change shall be made on the Drawing and be properly labeled. Update dimensions and elevations on Drawings. Record Drawings must reflect any equipment configuration and layout changes differing from that shown on the Drawings.

b. Show any changes to piping systems, whether interior or exterior, for process, HVAC, plumbing and instrumentation. If any dimensional changes were made in the field, the numerical change shall be made on the Drawing and be properly labeled. Update dimensions and elevations on Drawings.

E. Specifications and Addenda - Legibly mark up each section to record:
   1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
   2. Changes made by Change Order, Field Order, or other method.

1.5 SUBMITTALS

A. At the completion of the project, and prior to the release of retainage, deliver record documents to the Engineer.
   1. Record drawings shall be provided as a bound paper set of computer generated drawings, an electronic file (pdf format) of the bound paper set, and electronic files in AutoCAD format. Ownership of the drawings and files shall pass to the Owner at the time of submittal.
   2. If the Contractor provides alternate or substitute equipment that requires revised arrangements from the Bidding Documents, the Contractor shall provide supplemental record drawings of these items in AutoCAD format.

B. Accompany submittal with transmittal letter, in duplicate, containing:
   1. Date, project title and number.
   2. Contractor's name and address.
   3. Title and number of each record document with certification that each document is completed and accurate.
   4. Signature of Contractor, or their authorized representative.

C. Failure to supply all information on the Project Record Drawings as specified in Part 1.3 may result in withholding final completion and in non-approval of final payments of the Contract. If Contract Time has elapsed, this shall be grounds for imposing liquidated damages.

1.6 QUALITY ASSURANCE

A. All horizontal and vertical dimensions, swing-ties, and elevations shall be accurate to within one-tenth of a foot, unless greater accuracy is specified elsewhere in the Specifications (e.g., concrete elevations, weir elevations, etc.).

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 MAINTAINING AND PROVIDING RECORDS

A. Records shall be kept current as the work progresses.

B. Records shall be made available for review by the Owner, Engineer, Resident Project Representative and/or Funding Agency(s) upon request.

C. Failure to maintain current records, as specified herein, shall be grounds for withholding additional retainage from monthly partial payment requests. Failure to provide records shall also be grounds for withholding of final payment and, if beyond contract time, shall be grounds for imposing liquidated damages.

3.2 AS-BUILT SURVEY PERFORMANCE

A. From established survey control, and construction baseline as shown on the drawings, conduct surveys of the project area during construction as needed to obtain information of buried and above ground items. Surveys shall include information outlined in Section 1.3.

B. Actual road alignments; walls; fence and guardrail; existing, new and relocated utility poles; traffic and warning sign locations; crosswalks, parking space and stop bar locations; retaining walls and foundations drains; all underground and overhead utility poles and lines within the project limits, including those installed on private property; all other new features and appurtenances and those existing features and appurtenances changed as a result of this project shall be included in the survey.

3.3 FORMAT FOR ELECTRONIC DELIVERABLES

A. AutoCAD digital survey data for the as-built survey shall include:

1. Copy of field notes and sketches of the survey.
2. Paper copy of description of layers.
3. Paper copy of base map.
4. Provide digital information on compact disk with paper copy printout; information shall be provided in .DWG format (AutoCAD 2011 or earlier). Data shall be provided in 3D format (northing, easting, elevation, or Y, X, Z).
5. Drawing scale: Minimum one inch = twenty feet.
6. Layering:
    a. Repetitive symbols made into blocks and defined on layer 0.
    b. All entities shall be drawn “by layer” as opposed to individual properties.
    c. Use one linetype and one color per layer as opposed to numerous colors/linetypes on a single layer.
    d. Preface each layer with the initials of the Survey company or Contractor (example, Survey Company: SC “layername”).
    e. Database text annotation will be coordinated so the text will be right-reading.
    f. Place text on separate layers.

END OF SECTION

SECTION 01800

EQUIPMENT STARTUP, TESTING AND OPERATOR TRAINING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. General: The work of this Section includes the startup, certification and operator training of equipment and control systems sufficient for a fully functional project as determined by the Engineer.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. The following items are integral to this process, in general order of activity:
   a. Submittals, as specified in Section 01340.
   b. Operations and Maintenance Manuals, as specified in Section 01340.
   c. Summary of Work/ Construction Sequencing as specified in Section 01010.
   d. Temporary Facilities and Controls as specified in Section 01500.
   e. Temporary Bypass Pumping Systems as specified in Section 01515.
   f. Pre-Startup Meeting, as specified herein.
   g. Factory Acceptance Testing, as specified in Division 13.
   h. Equipment Startup, as specified herein.
   i. Operator Training, as specified herein.
   j. Equipment Demonstration Testing, as specified herein.
   k. Site Acceptance Testing, as specified in Division 13.
   l. One Year Service Calls, as specified herein.

1.3 GENERAL DEFINITIONS:

A. Equipment Startup shall be generally defined as the initial placing into service of the equipment by representatives of the Contractor, any subcontractors directly responsible for the equipment provided, and the equipment Manufacturer. This shall include verification of all equipment protection and safety control features (e.g., motor high temperature, seal fail, hardwire interlocks, estops, etc.) and include configuration of the VFD (if applicable) prior to equipment startup.

B. Equipment Demonstration Testing shall generally be defined as the formal and scheduled demonstration of equipment/system operations in accordance with the requirements of the Contract Documents, including all required performance or acceptance testing. This formal demonstration shall be performed in the presence of the Engineer by representatives of the General Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment Manufacturer.

C. Operator Training shall generally be defined as the formal and scheduled instruction of plant personnel and other Owner designated representatives in the proper operations of provided equipment, and in the techniques, methods, schedules, etc.

associated with maintenance. This formal training shall be performed in the presence of the Engineer, by representatives of the Contractor, any subcontractors directly responsible for the equipment provided, and the equipment Manufacturer. Operator Training shall also include remote assistance to plant personnel by Manufacturer representatives during the initial operations of the equipment.

1.4 SUBMITTALS:

A. In accordance with the requirements of Section 01340.

B. Contractor shall coordinate with subcontractors and Manufacturers and provide a proposed start-up, testing and training plan for each piece of equipment including detailed plans for temporary bypass pumping or temporary facilities, when required.

1. The startup, testing and training plan shall include a written outline description of the means and methods to be employed during the equipment test of each piece of equipment as well as the anticipated sequence and duration of activities.
2. The startup, testing and training plan shall include the name(s) and resume(s) of the duly authorized Manufacturer's Representatives proposed for the project. The qualifications of duly authorized representatives of the Manufacturer are specified below.
3. The startup, testing and training plan shall include proof of calibration of decibel meter(s) and flow meter(s) to be used in Equipment Startup(s).
4. The startup, testing and training plan shall comply with the sequencing and scheduling requirements outlined in Section 01010.
5. The startup, testing and training plan shall identify the location and type of temporary flow meters to be utilized, where required herein.
6. Equipment startup and testing shall not be scheduled for Fridays without prior agreement by the Owner and Engineer.
7. Contractor shall assume a maximum of 3 days per week of availability by the Engineer for equipment startup, training and demonstration testing. Availability beyond this will be considered on a case-by-case basis with prior agreement by the Owner and Engineer.
8. Contractor shall revise and resubmit the startup, testing and training plan to reflect the discussions and requirements from the Pre-Startup Meeting.
9. Contractor shall submit manufacturer Operations and Maintenance Manuals, along with updated control system drawings, at least 2 months prior to Equipment Startup.

C. Contractor shall submit updated system-specific startup, testing and training plans a minimum of 14 days prior to individual system starts, based on discussions at the Pre-Startup Meeting and subsequent coordination with Manufacturers, RPR and Owner (e.g., process availability, equipment status, valving, lockout/tagout, etc.). Refer to schedule and notification requirements below.

D. Following successful Equipment Startup and prior to placing the equipment into service, submit:

1. Completed Equipment Startup Certification forms
2. Completed VFD Parameter Setup Checklist and VFD Parameter Setup Verification forms
3. Completed Operator Training forms (videos may follow separately)

E. Prior to Equipment Demonstration Testing, submit:
   1. Manufacturer start-up report
F. Following Equipment Demonstration Testing, submit:
   1. Completed Equipment Demonstration Testing Certification form
G. Prior to the equipment is accepted, submit:
   1. Manufacturer demonstration report
   2. Completed Operating Training videos

1.5 PRE-STARTUP MEETING

A. Contractor shall request a Pre-Startup Meeting a minimum of 45 days prior to any startup activities. Engineer will set the meeting date and establish the agenda for the meeting. Contractor shall submit a proposed startup, testing and training plan a minimum of 14 days prior to the Pre-Startup Meeting. If the proposed startup, testing and training plan is insufficient, the Engineer may postpone the Pre-Startup Meeting until the submitted plan is sufficient. The purpose of the Pre-Startup Meeting is to discuss the details of the Contractor's submitted startup, testing and training plan and to discuss overall startup coordination and requirements.
B. The Pre-Startup Meeting will be held at the Project Site or virtually through a web-based video conference software (Teams, Zoom, etc).
C. Contractor shall make arrangements for appropriate individuals from the electrical subcontractor, systems integrator, HVAC subcontractor and relevant Manufacturer(s) to attend. Manufacturer(s) may attend in person or via telephone/video conference.
D. Engineer will distribute a meeting summary to all attendees.

1.6 SCHEDULES AND NOTIFICATIONS:

A. Contractor shall provide Engineer with at least a 14 calendar day notice prior to initiating startup activities to allow necessary coordination with Engineer and Owner representatives. If startups are conducted in groups of activities, the notification shall be provided for each grouping. The actual date and time for testing and/or training will be the first mutually acceptable date and time available to all parties subsequent to receipt of the request.
B. Contractor shall be responsible for any and all coordination necessary with the daily operations of the facility to accommodate the testing schedule.
C. Operator Training shall follow successful Equipment Startup and must be completed prior to the equipment being put on-line for uninterrupted service. Contractor may formally request that Operator Training be conducted concurrently with the Equipment Demonstration Testing; however, this determination will be made on a case-by-case basis by the Engineer and Owner. Under no circumstances will conditions of the testing interfere with the ability of Owner's representatives to observe necessary features, to hear and understand instructions, or to ask questions. If such conditions occur, then Operator Training will not be allowed to run concurrently with Equipment Demonstration Testing.
D. Contractor shall maintain a shared calendar for the Owner, Engineer and Contractor to document the agreed upon dates for individual Equipment Startup, Operator Training, and Equipment Demonstration Testing.

1.7 QUALITY ASSURANCE

A. Duly authorized Manufacturer's Representatives shall meet the following criteria:
   1. A direct employee of the Manufacturer;
   2. Fluent in the English language;
   3. Has a minimum of 5 years of experience in the proper installation, adjustment, operation, testing, and startup of the specified model, including, but not limited to, equipment calibration, and other mechanical or electrical components of the equipment.
   4. Sales personnel, marketing personnel or local representatives will not be accepted as a duly authorized representative of the Manufacturer unless the Manufacturer has certified them accordingly.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 EQUIPMENT STARTUP

A. Equipment startup shall be performed by the authorized representative(s) of the Manufacturer as identified in the Submittals.
B. The Equipment Startup shall be performed prior to Operator Training and prior to Equipment Demonstration Testing.
C. No form of energy shall be applied to any part of the system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor. This certification shall contain a statement by an authorized representative of the equipment Manufacturer that the equipment is ready for testing, as outlined below.
D. As part of the Equipment Startup, the Contractor and Manufacturer shall:
   1. Verify that the equipment is installed properly and in accordance with Manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
   2. Verify that all manual and all automatic equipment protection and safety control features of the equipment function properly, including all alarms, and all activation and deactivation sequences.
   3. Verify that equipment can receive remote control signals and send remote feedback signals.
   4. Verify that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc. during specified conditions.
   5. Verify and document equipment capacity and amperage draws (on all power feeds) with equipment running under specified conditions.
   6. Verify and document the noise level of equipment, drives and motors, unless otherwise noted, shall not exceed 90 dBA, as measured 3 feet from the unit under free field conditions.
      a. Each unit shall be monitored for compliance running under specified conditions with other area equipment deactivated.
      b. Contractor shall provide certified proof of calibration for instrument utilized to measure noise level.

E. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified during the equipment testing are within acceptable limits. The startup shall not be considered complete until the unit is fully capable of passing the equipment testing.
F. Where multiple units are provided, each unit shall undergo startup procedures.
G. The duly authorized representative of the Manufacturer shall provide all specialty tools, specialty testing equipment and labor necessary for the start-up of the equipment.
H. The Contractor shall provide all power, chemical, tools, equipment, labor, water and fuel as required for Equipment Startup.
    1. The Contractor shall be responsible for all contacts and arrangements as necessary with the proper municipal departments and/or public utility companies to arrange for temporary and/or separate billing so that bills associated with testing and startup procedures can be easily identified.
    2. Contacts and arrangements with the local power company shall include, but not be limited to, all arrangements as necessary so that peak power demands incurred during testing and startup procedures will not become a part of the permanent record for determining future power demand charges for the Owner.
    3. All waste materials shall be disposed of by the Contractor in an environmentally acceptable manner at no additional cost to the Owner.
I. In the event of an unsuccessful equipment start-up, Manufacturer and Contractor shall make necessary alternations, adjustments, repairs and replacements and the equipment start-up shall be repeated.
J. The Manufacturer Representative's shall fill out the Equipment Start-Up Certification form included at the end of this Section. Startup will not be considered complete until this form has been provided to the Engineer along with the Manufacturer Representative's field report.

3.2 EQUIPMENT DEMONSTRATION TESTING

A. Equipment Demonstration Testing shall be performed after the Equipment Startup is completed and it has been verified that equipment functions in accordance with the requirements of the Contract Documents in all aspects. Equipment Demonstration Testing shall be performed by the authorized representative(s) of the Manufacturer.
B. Equipment Demonstration Testing shall not be scheduled concurrently with Equipment Startup without the prior approval of the Engineer.
C. If the Engineer has arrived on-site for the scheduled Equipment Demonstration Testing and the equipment is not capable of demonstrating complete compliance with the Contract Documents, or if the Manufacturer's representative is not present, the Contractor shall be responsible for all costs to the Engineer associated with failed testing, including travel expenses. The importance of prior and proper equipment demonstrations to verify that the requirements of the Equipment Demonstration Testing will be met is stressed.
D. At a minimum during the Equipment Demonstration Testing, the Contractor shall complete the following to the satisfaction of the Engineer:
    1. Demonstrate that the equipment is installed properly and in accordance with Manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.

2. Demonstrate all manual and all automatic equipment protection and safety control features of the equipment functions properly, including all alarm, activation and deactivation sequences.
3. Demonstrate that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc. during normal operating conditions.
4. Demonstrate the full specified range of equipment operation when controlled remotely by the controls system.
5. Other specific requirements as outlined within the individual specifications sections.

E. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified are within acceptable limits.

F. Where multiple units are provided, each unit shall undergo equipment testing procedures individually and then with multiple units on-line to verify the total systems output capacity and performance.

G. The duly authorized representative of the Manufacturer shall provide all specialty tools, specialty testing equipment and labor necessary for the start-up and testing of the equipment.

H. The Contractor shall provide all power, chemical, equipment, labor, water and fuel as required for startup and testing.

I. All equipment provided on the project shall be demonstrated to function properly. Demonstration as a component of an overall system shall not relieve the Contractor of their responsibilities to demonstrate proper operation or verify specific requirements for each individual component.

J. Minimum Testing Requirements for Pumps:
1. If sufficient sewage or water is not available for tests, Contractor will provide water at their expense for testing, if so directed.
2. During tests, Manufacturer shall observe and record head, output, rpm, motor input and amperage. Sufficient test points shall be obtained to develop accurate pump system curve. If multiple operational points are specified, compliance with all points must be sufficiently demonstrated.
3. Fully demonstrate ability to operate at specified conditions without motor overload.
4. For mechanical seals, after a run-in period of 30 minutes, the seal area shall be wiped dry. The pump shall be operated for a 10-minute period. No measurable leakage shall be detected from the mechanical seal.
5. Refer to Section 11000, 11310 and 15400, as applicable, for additional details.

K. Minimum Testing Requirements for Instrumentation/Control Systems:
1. All instruments shall be calibrated in the presence of the Engineer.
2. All transmitters or direct-operated receivers shall be calibrated to impose input values representing zero percent, ten percent, and eighty percent of full scale.
3. The inputs and outputs of devices, as appropriate, shall be connected to manometers for differential pressure devices, or compared to measured levels, rates or quantities, during calibration. The receiving devices shall be adjusted to read the calibrated output of the initial calibration.
4. After placing each measuring system in service, an actual comparison of the measured variable versus readout shall be made. For each differential pressure

based measuring system, a manometer shall be connected to the connections provided in the piping, tank, or other appropriate device. Each system shall meet the manufacturer's standard accuracy.

5. Secondary functions, such as sequencing, timing features, alarm actuation and pacing shall be adjusted during initial calibration, demonstrated after the system is placed in service and adjusted during equipment demonstration testing, as necessary.
6. Linkage or range adjustments shall be sealed by colored lacquer in the presence of the Engineer immediately following calibration.
7. Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer. Once established as being within acceptable accuracy limits, future tests which require use of the measuring device to demonstrate system operations can utilize generation of mA signals to simulate level, flow or similar variable variations.
8. Refer to Division 13 and Section 15604 for additional details.

L. Minimum Testing Requirements for Electrical Systems.
   1. Refer to Section 16000, 16469, 16620 and 16950.

M. In the event of unsuccessful Equipment Demonstration Testing, Manufacturer and Contractor shall make necessary alternations, adjustments, repairs and replacements and the equipment testing shall be repeated.

N. The Manufacturer Representative’s shall fill out the Equipment Demonstration Testing Certification form included at the end of this Section. Equipment Demonstration Testing will not be considered complete until this form has been provided to the Engineer along with the Manufacturer representative field report.

3.3 OPERATOR TRAINING

A. Operator Training shall be performed by the authorized representative(s) of the Manufacturer as identified in the Submittals.

B. Unless otherwise noted within the specific specification sections, provide minimum of one day (8-hour days, not including travel time) of combined training and operational assistance for plant operators for each piece of equipment in the proper operations of provided equipment, and in the techniques, methods, schedules, etc. associated with maintenance.

C. The level of the training and operational assistance provided shall be as required to ensure proper understanding of the equipment’s operations, maintenance and warranty conditions. Should manufacturer require time in addition to the minimums indicated herein, or within the individual specification sections, to sufficiently detail the proper operations and maintenance of the equipment, it will be provided at no additional cost to Owner. Under absolutely no circumstances shall warrantees become void due to Owner's failure to follow operational and maintenance procedures which were not fully detailed and described to Owner's representatives during these sessions.

D. Refer to individual equipment specification sections for further requirements.

E. The manufacturer representative shall fill out the Operator Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

3.4 TREATMENT PLANT START-UP AND INITIAL OPERATION

A. Tagging System
   1. A tagging system shall be used to allow for visual identification of the status of equipment testing.
   2. Tags shall be furnished by the Contractor and shall have spaces for the Contractor and Engineer to initial/ sign. Tags shall be colored as follows:
      a. Yellow Tag – Equipment Start-up is completed, as defined herein.
   3. Tags will be signed and dated by the Engineer upon acceptance and shall remain attached to the item until ordered removed by the Engineer.

B. Treatment Plant Start-Up and Initial Operation shall consist of multiple phases conducted in the following order:
   1. Equipment Start-Up - As specified in Paragraph 3.1 of this Section. Demonstrate that:
      a. Equipment is installed as specified and as shown on the Drawings.
      b. Equipment is prepared for operation in accordance with the Contract Documents and with Manufacturer's written instructions.
      c. Provide executed copy of Equipment Start-up Certification Form to the Engineer and RPR.
      d. Affix "Yellow Tag" to equipment
   2. Clear Water Testing
      a. After Equipment Startups for all pertinent equipment and prior to the start of Treatment Plant Startup, Contractor shall conduct Clear Water Testing in the presence of the Engineer.
      b. Clear Water Testing shall demonstrate the ability of the treatment facility, or components of various unit processes thereof, to convey water at the design flows as required below. At a minimum, Clear Water Testing shall demonstrate:
         i. The ability of the pumping systems to meet design flows under simulated normal operation.
         ii. The ability of weirs or other flow control devices to maintain the hydraulic profile at the plant.
         iii. The conveyance capacity of interconnecting piping systems.
         iv. Other criteria related to system operation and performance as specified and as determined by the Engineer.
      c. The following unit processes shall be tested to verify hydraulic conveyance:
         i. Return/waste sludge pumping equipment
         ii. Solids handling equipment
         iii. Septage Receiving Facility
      d. Procedure:
         i. Contractor shall provide a sufficient volume of water as required for Clear Water Testing. Water shall be from a domestic potable water source, unless otherwise approved by the Engineer. Consideration shall be given to nearby ground water or surface sources with approval from the local, State or Federal authorities having jurisdiction.

ii. Contractor shall produce flows at the rates and locations sufficient to adequately conduct the system Clear Water Testing, and as required by the Engineer. Contractor shall provide pumping equipment and meters as required.

iii. Pumping Systems: Minimum requirement shall be to verify pumping rates, pressure and satisfactory operation of pumps.

iv. Hydraulic Control Devices: Contractor shall be responsible for measuring weirs elevations, and control structure crest or inverts, to determine head and flow rates. Elevations of all weirs and inverts shall be verified to the nearest 0.005 feet by qualified individuals. Contractor to make all adjustments required.

v. Contractor shall be responsible for storage and disposal of test water at the conclusion of the test, or each stage of the test. Disposal shall be in accordance with all applicable local, State and Federal regulations. Contractor shall be responsible for contacting such agencies and for obtaining written authorization for test water disposal.

3. Treatment Plant Start-Up and Initial Operation:

a. Treatment Plant Startup shall consist of continuous, 24-hour assistance by the Contractor, during which period the Owner's operating personnel will work directly with the Contractor to operate the plant.

b. The Owner shall be responsible for the operation of the plant, including the positioning of valves, gates, switches, proper operation of equipment devices, controls and associated components.

c. The Owner shall perform normal and routine operation and maintenance functions of the plant, such as start-up and shut-down of the plant, disposal of residuals, ordering of chemicals, etc.

d. Non-routine operations or abnormal maintenance items, such as cleaning a clogged pump, etc., shall be performed by the Contractor. When necessary, adjustments of equipment shall be made during the Start-Up and Initial Operation period.

e. Qualified Manufacturer's Representative shall perform equipment adjustments, when adjustments are necessary.

f. Substantial Completion shall not be granted until the treatment plant is meeting specified performance criteria and permit requirements for a period of 2 weeks.

4. Equipment Demonstration Testing - As specified in Paragraph 3.2 of this Section. Demonstrate that:

a. All requirements of the Contract Documents have been met, including all manual, automatic and safety control features, when the actual process fluid or solid (e.g., return sludge, waste sludge, sewage, chemical, sludge, etc.) is available.

b. Demonstrate all system components work together during continuous operation as well as start-up and shut-down conditions.

c. Provide executed copy of Equipment/System Testing Certification Form to the Engineer and RPR.

5. Site Acceptance Testing – As specified in Division 13. Includes demonstrating overall system performance and fine-tuning parameters and setpoints to optimize system performance.
6. Anticipated Durations – Periods for treatment plant start-up and initial operation shall begin prior to issuance of the Certificate of Substantial Completion, as follows:
    a. Clear Water Test - 2 weeks, minimum
    b. Treatment Plant Startup and Initial Operation - 2 weeks, minimum
    c. Total Time – 4 weeks, minimum
    d. Commissioning and Optimization – 2 weeks, minimum.

C. On-Site/ On-Call Time Requirements for General Contractor and Subcontractors.
1. General Contractor shall assign a superintendent or foreman to the plant during the Start-up and Initial Operation period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
    a. On-Site: First 5 days, 8 hrs per day
    b. On-Call: Remainder of Start-up and Initial Operation period
2. Electrical Subcontractor shall assign one qualified electrician to the plant during the Start-up and Initial Operation period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
    a. On-Site: First 5 days, 8 hrs per day.
    b. On-Call: Remainder of Start-up and Initial Operation period.
3. Heating and Ventilating Subcontractor shall assign a master mechanic to the plant during the Start-up and Initial Operation period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
    a. On-Site: First 3 days, 8 hrs per day.
    b. On-Call: Remainder of Start-up and Initial Operation period.
4. Plumbing Subcontractor shall assign a master mechanic to the plant during the Start-up and Initial Operation period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
    a. On-Site: First 3 days, 8 hrs per day.
    b. On-Call: Remainder of Start-up and Initial Operation period.
5. Instrumentations System Integrator shall assign one programmer who is also familiar with all field devices to the plant during the Start-up and Initial Operation period for the sole purpose of making adjustments required to continue start-up, operation and maintenance of the plant. Durations as follows:
    a. On-Site: First 5 days, 8 hrs per day.
    b. On-Call: Remainder of Start-up and Initial Operation period.
6. All on-call individuals shall be qualified and shall be acceptable to the Owner and Engineer.
7. All on-call individuals shall be capable of arriving at the plant within 24 hours of request.

8. Monitoring plant performance during this period shall be performed by Owner's personnel.

3.5 ONE YEAR SERVICE CALLS

A. In addition to the Manufacturer's installation and startup/testing services, the Contractor shall arrange for the Manufacturer to provide one additional service call of one 8 hour working day on site upon demand of the Owner for each type of equipment within the first year of operation (commencing upon date of Substantial Completion) at no additional cost to the Owner.

EQUIPMENT START-UP CERTIFICATION

Owner: _____ Date: _____

Project _____

Contractor: _____

Equipment Manufacturer: _____

Specification Number/Equipment: _____

As an authorized representative of the equipment manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of the Contract Documents. The undersigned authorized representative of the equipment manufacturer further certifies that the equipment has been installed in accordance with the manufacturer's written instructions, that it is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void. Any items that must be completed prior to Equipment Demonstration Testing are listed below.

_____ _____
(Manufacturer's Authorized Representative/ Signature & Printed Name) (Date)

_____ _____
(Contractor/ Signature & Printed Name) (Date)

_____ _____
(Witnessed by Engineer/ Signature & Printed Name) (Date)

** Manufacturer's Representative to provide a copy of Field Report via separate transmittal **

OPERATOR TRAINING CERTIFICATION

Owner: _____ Date: _____

Project _____

Contractor: _____

Equipment Manufacturer: _____

Specification Number/Equipment: _____

I, the undersigned Manufacturer's Authorized Representative, have trained the Owner's personnel listed below in the proper operation and maintenance of the above listed equipment.

_____

_____

_____

_____

_____

_____ _____
(Manufacturer's Authorized Representative/ Signature & Printed Name) (Date)

_____ _____
(Owner's Representative/ Signature & Printed Name) (Date)

_____ _____
(Witnessed by Engineer/ Signature & Printed Name) (Date)

EQUIPMENT DEMONSTRATION TESTING CERTIFICATION

Owner: _____ Date: _____

Project _____

Contractor: _____

Equipment Manufacturer: _____

Specification Number/Equipment: _____

This certifies that the entire equipment/system has met the requirements of Section 01800, 16950 and all other applicable requirements of the contract documents.

_____ _____
(Manufacturer's Authorized Representative/ Signature & Printed Name) (Date)

_____ _____
(Contractor/ Signature & Printed Name) (Date)

_____ _____
(Witnessed by Engineer/ Signature & Printed Name) (Date)

END OF SECTION

SECTION 02000

REFERENCED SPECIFICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section covers referenced specifications and details applicable to this project and are made part of these project document by reference herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCE STANDARDS

A. Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time, unless otherwise noted. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

B. The 2015 edition of the *City of New Orleans, Department of Public Works, General Specifications for Street Paving* shall be referred to for construction, workmanship, and quality control as specified with exceptions as noted in this Section. The referenced specifications that apply to this project include the following sections along with the sections referenced within these sections:

1. Section C203, Preparation of Roadway Pavement Subgrade
2. Section C204, Environmental Protection and Stormwater Pollution Prevention Plan
3. Section C302, Base and Subbase Course
4. Section C501, Asphaltic Concrete Mixtures
5. Section C503, Asphaltic Concrete Equipment and Processes
6. Section C504, Asphaltic Tack Coat
7. Section C505, Asphaltic Prime Coat
8. Section C507, Asphaltic Binders
9. Section C601, Portland Cement Concrete Pavement
10. Section C743, Testing Laboratory Services

C. Where the referenced specifications cite "the Director," or “the City of New Orleans” this shall be modified to “the Owner and/or Engineer” by this contract.

D. Payment for this project is in accordance with *Section 00 41 13 Bid Form for Construction Contract and Section 01150A Measurement and Payment* and its included Bid Schedule.

E. Additional requirements superseding the applicable portions of the above referenced specifications are provided in the subsequent sections of these Technical Specifications.

1.4 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.

B. The Contractor shall submit shop drawings in accordance with Section 01340 Submittals.

C. A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

D. Delivery slips shall be furnished with each load of mix delivered to the project. Information shall include:
   1. Vehicle identification.
   2. Date.
   3. Project.
   4. Identification of material.
   5. Gross, tare and net weights.
   6. Signed by the producer.
   7. Stamped by a licensed public weighmaster.

E. Environmental Protection and Stormwater Pollution Prevention Plan:
   1. The Contractor shall furnish the Engineer, in writing, his work plan giving proposed locations for storage of topsoil and excavated material, before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of his responsibility for completion of the work as specified.
   2. The Contractor shall furnish the Engineer, an Erosion and Sediment Control Plan meeting the requirements or special conditions of all permits authorizing project construction. Ensure the plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Do not begin any soil disturbing activities before receiving the Engineer's written approval of the Erosion and Sediment Control Plan, including the required signed certification statements.
   3. The Contractor shall furnish a copy of all obtained permits to the Engineer.

1.5 WARRANTIES

A. Warranties shall be in accordance with the General Conditions and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 GENERAL

A. The 2015 edition of the *City of New Orleans, Department of Public Works, General Specifications for Street Paving* shall be referred to for construction, workmanship, and quality control as specified with exceptions as noted in this Section. The referenced specifications that apply to this project include the following sections along with the sections referenced within these sections:
   1. Section C203, Preparation of Roadway Pavement Subgrade

2. Section C204, Environmental Protection and Stormwater Pollution Prevention Plan
3. Section C302, Base and Subbase Course
4. Section C501, Asphaltic Concrete Mixtures
5. Section C503, Asphaltic Concrete Equipment and Processes
6. Section C504, Asphaltic Tack Coat
7. Section C505, Asphaltic Prime Coat
8. Section C507, Asphaltic Binders
9. Section C601, Portland Cement Concrete Pavement
10. Section C743, Testing Laboratory Services

B. Where the referenced specifications cite "the Director," or "the City of New Orleans" this shall be modified to "the Owner and/or Engineer" by this contract.

C. Payment for this project is in accordance with *Section 00 41 13 Bid Form for Construction Contract and Section 01150A Measurement and Payment* and its included Bid Schedule.

D. Additional requirements superseding the applicable portions of the above referenced specifications are provided in the subsequent sections of these Technical Specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. The 2015 edition of the *City of New Orleans, Department of Public Works, General Specifications for Street Paving* shall be referred to for construction, workmanship, and quality control as specified with exceptions as noted in this Section. The referenced specifications that apply to this project include the following sections along with the sections referenced within these sections:

1. Section C203, Preparation of Roadway Pavement Subgrade
2. Section C204, Environmental Protection and Stormwater Pollution Prevention Plan
3. Section C302, Base and Subbase Course
4. Section C501, Asphaltic Concrete Mixtures
5. Section C503, Asphaltic Concrete Equipment and Processes
6. Section C504, Asphaltic Tack Coat
7. Section C505, Asphaltic Prime Coat
8. Section C507, Asphaltic Binders
9. Section C601, Portland Cement Concrete Pavement
10. Section C743, Testing Laboratory Services

B. Where the referenced specifications cite "the Director," or "the City of New Orleans" this shall be modified to "the Owner and/or Engineer" by this contract.

C. Payment for this project is in accordance with *Section 00 41 13 Bid Form for Construction Contract and Section 01150A Measurement and Payment* and its included Bid Schedule.

D. Additional requirements superseding the applicable portions of the above referenced specifications are provided in the subsequent sections of these Technical Specifications.

3.2 ASPHALTIC CONCRETE CURB

A. Conditioning of the Existing Surface:
   1. Thoroughly clean of all objectionable material.
   2. Apply a light tack coat of 0.08 to 0.20 gallons per fifteen linear feet of curb area.

B. Equipment:
   1. The curb shall be placed by an approved power operated extruding type machine using the shape mold called for. A tight bond shall be obtained between the base and the curb. The Engineer may permit the placing of curbing by other than mechanical curb placing machines when short sections or sections with short radii are required. The resulting curbing shall conform in all respects to the curbing produced by the machine.

C. Placing:
   1. Place mix at temperature between 275 - 325°F.
   2. Where conditions necessitate joints in curb, they shall be constructed to ensure bond between old and new sections of the curb. Prior to placing the new curb material, the old joint shall be tack coated.

D. Curing:
   1. Protect from traffic until the heat of the mix has dissipated and the mix has obtained the proper hardness.

E. Backfilling:
   1. Backfill as soon as possible after mix has obtained the proper degree of hardness.

END OF SECTION

SECTION 02050A

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall furnish all labor, materials, tools, equipment and apparatus necessary and shall do all work required to complete the demolition, removal, and alterations of existing facilities as indicated on the Drawings, as herein specified, and/or as directed by the Engineer.
2. Demolition and alteration work within occupied areas shall be accomplished with minimum interference to the occupants and to the plant which shall be in continuous operation during construction.
3. All equipment, piping, and other materials that are not to be relocated or to be returned to the Owner shall become the property of the Contractor and shall be disposed of by him, away from the site of the work and at his own expense.
4. All demolition or removal of existing structures, utilities, equipment, and appurtenances shall be accomplished without damaging the integrity of existing structures, equipment, and appurtenances to remain, to be salvaged for relocation or stored for future use.
5. Such items that are damaged shall be either repaired or replaced at the Contractor's expense to a condition at least equal to that which existed prior to the start of his work.
6. Unless otherwise indicated, all items labeled to be "removed", "demolished" or "remove/demolish" shall be removed and disposed of off site in accordance with all Local, State and Federal Regulations.
7. The Contractor shall not collect any samples of either Building Materials, Wastes, Soils, or any other site/project related materials, nor have the samples analyzed for any reason without prior written approval from the Owner or Engineer. Furthermore, the Contractor shall not hire or contract with another party or Consultant to conduct sampling of either Building Materials, Wastes, Soils, or any other site/project related materials or to conduct analytical analysis.
    a. All sampling requests are to be directed in written format to the Owner and Engineer.
    b. By collecting unauthorized samples, the Contractor shall assume any and all financial burden of the required corrective action.
    c. If a sample is collected and analyzed without prior written approval from the Owner or Engineer, the Contractor shall be responsible for any and all remediation required by any applicable regulatory authority arising from or related to the samples collected and analyzed, as the validity of the materials sampled, sample locations and sampling protocols utilized cannot be confirmed by the Owner's or Engineer's independent Consultant.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 JOB CONDITIONS

A. Condition of Structures:
   1. The Owner assumes no responsibility for the actual condition of structures to be demolished.
   2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner as far as practicable. However, variations within the structures may occur due to Owner's removal and salvage operations prior to the start of demolition work (where applicable).

1.4 UTILITIES

A. Utility Locations:
   1. Utility locations shown on the plans are approximate only, based on information supplied by the utility companies.

B. Coordination with Utilities:
   1. The Contractor shall make all necessary arrangements and perform any necessary work to the satisfaction of affected utility companies and governmental divisions involved with the discontinuance or interruption of affected public utilities and services.

1.5 SUBMITTALS

A. Schedule - Demolition:
   1. Submit two (2) copies of proposed methods and operations of demolition to the Engineer for review prior to the start of work. Include in the schedule the coordination for shut-off, capping and continuation of utility services as required.
   2. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.

1.6 PROTECTIONS

A. Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons. Erect temporary, covered passageways as required by authorities having jurisdiction.

B. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.7 DAMAGES

A. The Contractor shall promptly repair damages caused by demolition operations to adjacent facilities at no cost to the Owner.

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove and dispose of non-salvageable material in accordance with all applicable local and state laws, ordinances and code requirements.
B. Dispose of material daily as it accumulates.
C. Carefully remove, store and protect from damage all materials to be salvaged.
D. Buildings and Adjacent Property:
   1. Protect all buildings and property adjacent to equipment to be removed from damage by erecting suitable barriers or by other suitable means.
   2. Leave such buildings in a permanently safe and satisfactory condition.
E. Maintaining Traffic:
   1. Ensure minimum interference with roads, streets, driveways, sidewalks and adjacent facilities.
   2. Do not close or obstruct streets, sidewalks, alleys or passageways without permission from authorities having jurisdiction.
F. Architectural, structural, mechanical, process and electrical demolition, removal and alteration are indicated in the corresponding sections.
G. Mechanical/Process Demolition:
   1. Mechanical/Process demolition in general shall consist of the dismantling and removal of existing piping, tanks, pumps, motors, equipment and other appurtenances as specified, and indicated on the Drawings.
   2. It shall also include, where necessary, the cutting of existing piping for the purpose of making connections thereto.
   3. Piping not indicated to be removed but which may interfere with construction shall be removed to the nearest solid support, capped and left in place. Where piping that is to be removed passes through the wall of existing structures, it shall be cut off and properly capped on each side of the wall.
   4. When piping is to be altered or removed underground, the remaining piping shall be properly capped or plugged.
   5. Abandoned underground piping shall be left in place unless it interferes with new structures or unless otherwise noted on the Drawings.
H. Salvage:
   1. Salvaged items shall be stored on site for the Owner/STP Operator in an acceptable location and manner.
   2. Contractor shall meet with Owner/STP Operator to verify salvage items prior to beginning demolition work.
   3. Once the N. RAS PS is complete, operational and accepted by the Owner, the Contractor to salvage and transport the existing temporary RAS piping and valves to a staging area adjacent to the Aeration Tanks or Sodium Hypochlorite Storage and Chemical feed system.
I. Temporary Cofferdam:
   1. Contractor shall furnish, install, operate and maintain a temporary cofferdam and backup bulkhead systems with the existing effluent channel. Contractor is

responsible for field verifying the existing conditions, water level and dimensions of the channel along with the design of the systems.

2. Contractor shall provide a minimum 14 calendar day notice to allow the STP operator drain and clean the necessary secondary clarifiers.
3. Refer to Specification 02661 for additional information.

J. Temporary Return Activated Sludge Pumping/Piping Facilities:
   1. Refer to Specification Section 01515 for additional information.

K. Temporary Bypass Pumping System, Secondary Clarifiers Nos. 7 and 8 Treated Effluent)
   1. Refer to Specification Section 01515 for additional information.

L. Treatment Structures, Cleaning and Disposal: (unless indicated otherwise on the Drawings):
   1. Contractor shall give Owner 14 calendar days minimum notice prior to beginning work in structures requiring draining and cleaning; which are to be renovated or cleaned as part of this project. The Owner will be responsible for removal and disposal of the liquid and solids contents of the existing structures.
   2. When the existing treatment structures (secondary clarifiers, effluent channel) are empty of liquid (drained by the Owner), any solids and/or debris remaining that are not easily drained by the Owner as part of normal facility operations shall be the responsibility of the Contractor. Contractor shall remove and dispose of all grit, sludge, rags, solids and/or debris within the treatment structures and piping and paid for by the Contractor. The Contractor shall then clean the structure walls, floor and ceiling using a high-pressure steam cleaning device. Contractor to coordinate the disposal of liquid and solids contents with the STP Operator at the STP. The existing structures to be clean as necessary to facilitate the new construction work to be by and paid for by the Contractor.
   3. If the demolition work does not commence within the Contractor's approved project schedule, the structures may be placed back in operation by the Owner. It will then be the Contractor's responsibility to drain and clean the structures.

M. Existing Pipe Draining, Cleaning and Disposal: (unless indicated otherwise on the Drawings):
   1. Contractor shall give Owner 14 calendar days minimum notice prior to beginning work for the piping (temporary or permanent) requiring draining and cleaning, which are to be renovated or cleaned as part of this project. The Contractor will be responsible for removal and disposal of the liquid and solids contents of the existing piping. Contractor to coordinate with the STP Operator the disposal of the liquid and solid contents at the STP.
   2. The Contractor is responsible for furnishing all labor, tools, equipment and utilities to relocate temporary piping (RAS, WAS, scum/grease, sump pump, process water) and utilities, lighting as necessary to maintain treatment. If the demolition work does not commence within the Contractor's approved project schedule, the piping may be placed back in operation by the Owner. It will then be the Contractor's responsibility to drain and clean the structures.

N. Maintain Treatment:
   1. During demolition, maintain treatment as outlined in Section 01010, Summary of Work.

O. Demolition Sequence:
   1. The demolition sequence is to confirm the reviewed and approved project schedule, and restrictions outlined in Section 01310, Construction Schedules.

P. Pest Control:
   1. Provide pest control when needed or when directed by the Engineer.
   2. Exterminate and prevent migration of rodents to adjoining buildings in accordance with the requirements of the state or local health department.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Clearing and grubbing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of non-salvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:
   1. Perform clearing and grubbing work within the areas required for construction, or as shown on the Drawings, to a depth of l2 inches below the existing grade.
   2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction, or are otherwise objectionable.

C. Work Not Included:
   1. Clearing and grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances and code requirements.

B. Remove and dispose of non-salvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the work.

B. All timber and wood shall become the property of the Contractor unless other agreements are made between the Owner and the Contractor.

C. Repair any damage to structures to the complete satisfaction of the Owner and Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed.

B. Right-of-way:

1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.
2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractor's expense.

3.2 PERFORMANCE

A. Clearing:

1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as "Selective Clearing", and except as otherwise shown on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.
4. Take special care to completely dispose of all elm trees and branches immediately after cutting either by burial in approved locations or, when permitted, by burning in areas well removed from standing elm growth.

B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing.

C. Selective Clearing:

1. When shown on the Drawings and when directed by the Engineer, perform selective clearing work to preserve natural tree cover.
2. Perform selective clearing work only under the direction and supervision of the Engineer.
3. Remove all dead and uprooted trees, brush, roots and other material which, in the opinion of the Engineer, are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the Engineer.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing. Wood exposed as the result of removal of branches is to be left exposed to air and sunlight.
6. Bituminous paint shall not be used on wood exposed as a result of branch removal, excavation around roots, or damage to tree bark.

D. Grubbing:
   1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas and as directed by the Engineer.
   2. Grub out all sod, vegetation and other objectionable material to a minimum depth of l2 inches below the existing grade.
   3. Completely remove all stumps, including major root systems.

E. Disposal:
   1. Remove from the site and dispose of material not being burned.
   2. Provide an approved disposal area unless otherwise specified.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:
   1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures that are over the area to be filled or excavated.
   2. Remove and replace bituminous asphaltic and portland cement concrete in accordance with the appropriate sections of these Specifications.
   3. Properly store and preserve all material to be replaced in a location approved by the Engineer.

B. Shrubs and Bushes:
   1. Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil:
   1. When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this division.

D. Responsibility:
   1. Replace, at no additional cost to the Owner, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02115

STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.

B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer.

B. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

A. Transport topsoil and deposit in storage piles convenient to the areas which are subsequently to receive the application of topsoil.

B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.

C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.

D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.

E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.

F. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.

END OF SECTION

SECTION 02140

TEMPORARY CONSTRUCTION DEWATERING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Design, furnish, operate, maintain, and remove temporary dewatering system to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry; collect and dispose of ground and surface water where necessary to complete the work.
2. Design, furnish, operate, maintain, and remove temporary treatment system for temporary dewatering system effluent prior to discharge.
3. Conduct structure monitoring, as specified herein.
4. Conduct compliance testing, as specified herein and in accordance with the requirements of the permitting authority.
5. Install and protect observation wells to monitor groundwater levels during excavation and backfill activities, at the discretion of the temporary dewatering system designer.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 DESIGN REQUIREMENTS

A. The Temporary Construction Dewatering System shall be designed by a Professional Engineer registered in the State of Louisiana (the “Design Engineer”) who is experienced in the design of Temporary Construction Dewatering Systems for subsurface construction operations.

B. The Temporary Construction Dewatering System shall be of sufficient size and capacity necessary to lower and maintain the ground water table to an elevation at least two feet below the lowest foundation subgrade, or bottom of pipe trench, to allow material to be excavated in a dry condition, including depressurizing the soil stratum beneath the excavation subgrade. Materials to be removed shall be sufficiently dry to permit excavation to grades shown on the Contract Drawings and to stabilize the excavation slopes where temporary excavation support systems are not required. Operate the dewatering system continuously until backfill work has been completed.

C. Control of surface and subsurface water is part of the Temporary Construction Dewatering System requirements. Maintain adequate control so that:

1. The stability of excavated and constructed slopes are not adversely affected by saturated soil, including water entering the prepared subbase and subgrades where underlying materials are not free draining or are subject to swelling or freeze-thaw action.
2. Erosion is controlled.

3. Flooding of excavations or damage to structures does not occur.
4. Surface water drains away from excavations.
5. Excavations are protected from becoming wet from surface water and ensure excavations are dry before additional work is undertaken.
6. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
7. The stability of the sides and bottom of excavations are sustained during excavations. Construction operations shall be performed to dry and stable soils.
8. Any existing dewatering wells that can affect dewatering and excavation shall be sealed below the excavation subgrade.

D. The design shall include an assessment of how the dewatering operations will affect the stability of all adjacent structures.

E. Contractor is responsible to perform additional geotechnical investigations as deemed necessary to facilitate the design of the Temporary Construction Dewatering System and prevent damage to adjacent buildings, roads, structures, utilities and other facilities.

1.4 QUALITY ASSURANCE

A. The Temporary Construction Dewatering System shall be installed, operated and monitored by the Contractor or a specialty subcontractor specializing in and having experience installing and operating dewatering systems in similar subsurface conditions for at least 5 years.

B. Well drillers, if required, shall be licensed in the State of Louisiana.

1.5 SUBMITTALS

A. Provide submittals in accordance with Specification Section 01340.

B. Provide a Temporary Construction Dewatering System Plan prepared by a Professional Engineer (as specified above) at least 30 days prior to beginning operations. This submittal shall include:

1. Qualifications of the Temporary Construction Dewatering System Design Engineer and qualifications of the Contractor or specialty subcontractor installing and operating the system.
2. Signed and sealed design calculations confirming the adequacy of the proposed system to manage groundwater, to eliminate pumping of fines and to prevent damage to adjacent buildings, roads, structures, utilities and other facilities.
3. Signed and sealed, dimensioned layout drawings showing the arrangement, location, depth and size of wells, wellpoints, headers, sumps, ditches; size and location of discharge lines; pumps; standby pumps; standby power equipment; effluent treatment components, effluent disposal location, and observation wells/ piezometers.
4. Detailed written description of dewatering methods to be employed to convey the water from site to adequate disposal, including operations, maintenance and control requirements.
5. Estimated average, minimum and maximum pumping rates (total).
6. Capacity and number of standby pumping equipment.
7. Capacity and number of standby power equipment.
8. Treatment tankage and discharge locations.

9. Technical data on the well screens, filter materials and gradations to demonstrate adequacy of the proposed systems to prevent migration of fines.
10. Structure Monitoring Plan, if required.
11. Pre-Construction and Post-Construction Survey, if required.
12. Effluent monitoring provisions and laboratory testing methods, including sample monitoring log (flow, TSS, etc.).
13. System removal requirements.
14. Written approval from the Louisiana DEQ for disposal of the treated water.

C. The Temporary Construction Dewatering System submittal shall be provided concurrently with and coordinated with the submittals required by Section 02156 (Temporary Excavation Support Systems).
D. Submit water monitoring results at the frequency required by the permitting authority.
E. Submit structure monitoring results, if required, at the frequency specified herein.
F. Submittal review with no exceptions taken of the Temporary Construction Dewatering System Plan shall not in any way relieve the Contractor from full responsibility for the complete and adequate design, installation and performance of the dewatering system and shall not relieve the Contractor of sole responsibility for the dewatering system as necessary to prevent damage and settlement to adjacent buildings, roads, structures, utilities and other facilities adjacent to the excavations and for the safety of people working within the excavated areas.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment used in the Temporary Construction Dewatering System shall adhere to accepted industry standards.
B. Backup equipment for the Temporary Construction Dewatering System shall be identical to the primary equipment, shall be immediately available and in operating condition at all times.
C. Pipes and Well Screens: Schedule 40 PVC or stronger.
D. Sand: Clean, single-size filter sand having an effective size (D10) of 0.3 to 0.5 mm with a fineness modulus of less than 4 and with no more than 4% passing a 100 sieve.
E. Grout: Cement-bentonite grout of adequate mix proportion and consistency. Seals shall consist of bentonite pellets.
F. Pumps, meters, hoses and controls shall be suitable for the intended purpose and application.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Prior to any excavation below the ground water table, place the Temporary Construction Dewatering System into continuous operation (24 hours per day, 7 days per week) to lower the water table as required until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials and dewatering is no longer required.

2. The Contractor shall coordinate the dewatering system operation with existing and proposed conditions.
3. The Temporary Construction Dewatering System Design Engineer and the Contractor shall modify the dewatering system and methods as required by actual field conditions encountered during construction, at no additional cost to the Owner. Any component of the dewatering system that malfunctions or is damaged during its operation shall be promptly repaired or replaced by the Contractor at no additional cost to the Owner.
4. Surface areas adjacent to the excavation shall be graded and/or curbed to prevent flow of surface water into the excavation.
5. The Contractor shall install observation wells / piezometers prior to beginning excavation work.
6. The Contractor shall notify the Engineer 7 days prior to the dewatering system start-up.
7. Keep work areas dewatered until all construction of new structures, pipes, and appurtenances have been substantially completed to the extent that they will not be damaged by water.
8. Thoroughly brace, or otherwise protect against flotation, all pipelines and structures which are not stable until final grades and ground cover is established.
9. Maintain standby, or backup, equipment and power supply throughout the duration of the dewatering operations.
10. Prevent soil particles from entering the discharge points.

B. Disposal of Water:
1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid siltation of adjacent drainage structures and piping, wetlands or water bodies, injury to public health, damage to public and private property, and damage to the work completed or in progress.
2. Provide suitable temporary channels for water that may flow along or across the construction site.
3. Provide treatment as necessary to prevent discharge of contaminated ground water caused by Contractor's operations or any contaminated ground water that may pass through the Temporary Construction Dewatering System.
4. Contractor must obtain all necessary regulatory approvals for the disposal of dewatering flows. These may include, among others, approval by the USEPA under the National Pollutant Discharge Elimination System (NPDES) program for construction activities.

C. Temporary Underdrains:
1. When necessary, temporary underdrains may be placed in excavations.
2. Underdrain pipe shall be perforated corrugated metal, polyethylene or P.V.C. pipe.
3. Surround the underdrain completely and fill the space between the underdrain and the pipe or structure with free draining material.

D. Excavation Sump Pumping:
1. When necessary, and where appropriate to the geotechnical conditions encountered, excavations may be over excavated 12 to 24-inches and filled with

screened stone to allow sump pumping of groundwater. Immediately cease operations if boils, loss of fines, quick conditions, softening of the ground or instability of slopes occur.

2. The system shall be installed with suitable screens and filters so that pumping of fines does not occur.

E. Well and Wellpoint System:

1. If necessary, dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
2. Wellpoint and well systems shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

F. Removal

1. Remove all equipment after the permanent installations are complete.
2. All wells and piezometers shall be properly abandoned at the completion of the work, unless otherwise directed by the Temporary Construction Dewatering System Design Engineer, in accordance with requirements or guidelines in project location.

3.2 MONITORING

A. General:

1. Contractor shall monitor the performance of the dewatering system and the groundwater level achieved throughout construction.
2. Contractor shall monitor the effluent quality from the treatment system as required by the permitting authority.
3. The Temporary Construction Dewatering System Design Engineer shall visit the site during the monitoring program at periodic intervals.
4. General Contractor shall maintain dewatering activities to avoid damage to and settlement of adjacent buildings, roads, structures, utilities and other facilities.
5. Contractor shall monitor the adjacent grade, buildings, roads, structures, utilities and other facilities throughout construction. Monitoring shall include the following at a minimum:
    a. Pre-Installation Structure Elevation Survey. Survey of each structure prior to installation of dewatering system. Survey shall include digital photos of each structure and written description of existing deficiencies:
        i. Structure Monitoring. Conduct structure monitoring as outlined below for the duration of the Temporary Construction Dewatering System operations, as outlined below:
        iii. All monitoring points will be set at the tops of concrete (or structural steel) and will be selected by the Engineer during construction.
        iv. A minimum of 3 monitoring points for each structure will be established. All elevations shall be to the nearest 0.001 foot.
        v. Baseline elevations shall be established for each structure before dewatering activities commence. These elevations will be used for comparison to future elevations to determine if and what magnitude

of movement has occurred.

vi. Elevations shall be taken at the same monitoring points for each structure at the same time on a weekly basis.

vii. Upon either detecting an incremental settlement of 0.005 feet, a total cumulative settlement of 0.01 feet or visible damage to any of the structures, Contractor shall proceed to the Corrective Actions specified below.

b. Post-Installation Structure Survey. Survey after operation of dewatering system is discontinued.

3.3 CORRECTIVE ACTION

A. No movement of or damage to adjacent buildings, roads, structures, utilities and other facilities shall be allowed.

B. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), the Contractor shall stop work and consult with the Design Engineer and resubmit a revised Temporary Construction Dewatering System design submittal. The revised plan shall indicate why the system revisions are needed and indicated what change will be made to address the issues. Contractor shall perform work necessary for reinstatement of foundation soil and damaged structure resulting from such inadequacy or failure by Contractor, at no additional cost to the Owner.

C. Damage to existing structures shall be repaired at no additional cost to the Owner.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____
(Name)
and
CONTRACTOR: _____
(Name)
on
CONTRACT: _____
(Title)
_____
(Number) (Date)

The undersigned hereby certify that the engineer listed below (the "Design Engineer"):

1. Is licensed or registered to perform professional engineering work in the State of _____ (location of Project);
2. Is qualified by education and training to design the Temporary Construction Dewatering System specified in Section 02140 of the subject Contract;
3. Has previously successfully designed comparable groundwater dewatering systems;
4. Has prepared the design in full compliance with the requirements of subject contract, including all applicable laws, regulations, rules, and codes.
5. Has reviewed and coordinated the design of the Temporary Construction Dewatering System with the Temporary Excavation Support System design (specified in Section 02156); and
6. Will inspect and supervise installation of the Temporary Construction Dewatering System and will monitor the in-place system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	DESIGN ENGINEER
By: _____	By: _____
(Signature)	(Signature)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Engineering Discipline)
_____	_____
(Date)	(Date)

END OF SECTION

SECTION 02156

TEMPORARY EXCAVATION SUPPORT SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Design, furnish, install, maintain, and abandon-in-place temporary excavation support system as required to comply with all applicable State and Federal regulations including the Occupational Safety and Health Act. Excavation support system shall consist of steel sheeting, pile and lagging bracing or other systems designed by the Contractor.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 DESIGN REQUIREMENTS

A. The Contractor shall be responsible for the design and construction of the excavation support structures. The excavation support structures (sheeting systems or other special excavation techniques) shall be properly designed by a Professional Engineer registered in the State in which the project is located, who practices in a discipline applicable to excavation work and has more than 5 years of experience in the design of excavation support systems. The excavation support system shall be designed to accommodate an additional 2 feet of excavation below the bottom of excavation shown on the Contract Drawings.

B. The excavation support system shall be designed and installed to limit the upward hydraulic gradient into the bottom of the excavation and to sustain all existing and expected loads and utilities, to prevent migration of fine-grained materials into the excavation, to prevent all movement to earth which could in any way cause injury to workmen, delay the work or endanger adjacent structures. If detrimental effects result from construction activities, the Contractor shall modify the design, revise construction procedures and/or take measures to mitigate and abate further movement at no cost to the Owner.

C. The Contractor shall prepare an excavation support system monitoring plan intended to monitor the performance of the excavation support system, as well as the adjacent grade and adjacent structures, throughout construction. The excavation support system monitoring plan shall include vibration and deformation monitoring. Contractor shall retain the services of a qualified vibration monitoring consultant to perform vibration monitoring during installation of the excavation support system. Refer to Paragraphs 1.3 and 3.4 for additional requirements.

D. The internal lateral bracing shall be located so that the braces shall not pass through walls and/or slabs of existing or proposed structures.

E. The support system shall provide adequate room to properly perform the installation and to allow for inspection of the installation.

F. Prior to the installation of any portion of the temporary lateral support system, the

Contractor shall furnish to the Owner precondition surveys documenting the existing conditions of the adjacent structures.

G. The use of existing structures to support the sheeting bracing or structural framing shall be prohibited.

1.4 SUBMITTALS

A. Provide submittals in accordance with Specification Section 01340.

B. Submit qualifications of temporary excavation support system design engineer.

C. Submit attached certificate of design and complete scaled and dimensioned layout drawings of the proposed excavation system, stamped and sealed by a Professional Engineer registered in the State in which the project is located. Drawings shall show plan, sections and elevations of the support system as well as the proposed structures. Submittal shall identify:

1. Physical location on the site and identify any existing utilities, site piping, site electrical conduit that must be relocated prior to excavation support system installation.
2. Type and location of any surcharge loads adjacent to the excavation support system required by the Contractor to execute the work (e.g., excavators, trucks, cranes, soil piles, etc.).
3. Design calculations, supporting documentation and materials cut sheets.
4. Sample monitoring log.
5. System abandonment requirements.

D. Submit excavation support system monitoring plan, including qualifications of Contractor's vibration monitoring consultant and Contractor's surveyor. The excavation support system monitoring plan shall identify: the specific method, location and frequency of measurements (pre-, during and post-construction); individual(s) responsible for inspection/measurements; submittal and maintenance of on-site records; and threshold vibration values and excavation support system deformation values that, if exceeded, will require immediate stoppage of work and the performance of repairs necessary for reinstatement of a functional system. Provide justification for recommended vibration and deformation tolerances, on a structure-by-structure basis.

E. The Contractor shall have sole responsibility for design, construction, monitoring and abandonment of the excavation support system as necessary to prevent damage to adjacent structures, utilities, streets adjacent to excavations and for safety of persons working within the excavated areas. The submittals will be reviewed for consistency with the design intent.

F. Submittals under this Section shall be provided concurrently with and coordinated with the submittals under Section 02140 (Temporary Construction Dewatering System).

PART 2 - PRODUCTS

2.1 MATERIAL

A. All materials shall conform to all applicable State and Federal regulations including the Occupational Safety and Health Act.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform preparatory work to discover, protect, maintain and restore utilities, foundations or other facilities located in close proximity of the proposed excavation lateral support system.

B. Conduct pre-excavation to remove obstructions along the alignment of the excavation lateral support system which will interfere with installation of the excavation lateral support system.

C. Install the excavation support system, including the installed wall and bracing system, outside the limits of the permanent structure. Construction tolerances (e.g., wall verticality) and lateral wall deflections as a result of excavation and other activities shall be considered in determining the plan location.

D. Excavation shall not proceed more than 2 ft. below the bracing level, anywhere within the excavation support limits, until the entire level of bracing is completely installed.

E. The first level of bracing shall be installed within 5 ft. of the ground surface prior to any excavation below this level.

3.2 INSTALLATION

A. Install excavation support system in accordance with all applicable State and Federal regulations including the Occupational Safety and Health Act. The excavation support system design engineer shall visit the site during excavation support system installation.

3.3 INTERNAL LATERAL WALL BRACING (RAKERS, WALES AND STRUTS)

A. Rakers are only allowed for the temporary lateral brace that is installed within 5 ft. of the ground surface.

B. Use wales, struts, corner braces to provide support of the excavation lateral support walls as required. Include web stiffeners, plates, brackets, or angles as required to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. Allow for eccentricities due to fabrication and assembly. Consider effects of temperature changes.

C. Install and maintain all support members in continuous tight contact with each other and with the wall being supported.

D. Preload all bracing members (including rakers, corner braces, and struts) in accordance with methods, procedures and sequence as described on the reviewed shop drawings. Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges, welded or bolted in place, to maintain the preloading force in the bracing after release of the jacking equipment pressure. Wood shims or wedges shall not be used. Braces shall be preloaded to 50 percent of the maximum design load. Provide means to control the fluctuation of loading due to temperature variations.

E. Accomplish preloading by jacking struts, rakers, etc. in place against the excavation lateral support system walls, or by other methods acceptable to the Owner or Owner's Representative.

3.4 MONITORING

A. Contractor shall implement the excavation support system monitoring plan intended to monitor the performance of the excavation support system, as well as adjacent grade and adjacent structures, throughout construction. Monitoring shall include the following at a minimum:
   1. Pre-Installation Structure Elevation Survey. Survey prior to excavation support system installation.
   2. Vibration Monitoring. Full-time vibration monitoring during excavation support system installation.
   3. Installation Structure and Support System Surveys.
      a. After excavation support system installation but prior to first brace installation;
      b. When at mid-point of excavation;
      c. When at bottom of excavation;
      d. At weekly intervals during structure construction.
      e. Each survey shall assess the support system deformation and key structures.
   4. No movement of or damage to key structures shall be allowed. The following key structures shall be monitored:
      b. Secondary Clarifiers 5 through 8
      c. Effluent Channel
      d. North RAS Pump Station

B. The excavation support system design engineer shall visit the site during the monitoring program at periodic intervals.

C. Additionally, if the excavation support system monitoring criteria/requirements are not satisfied due to inadequacy or failure of the excavation support system (settlement of adjacent grade, settlement of structures, cracking of structures, etc.), immediately stop work and perform repairs necessary for reinstatement of a functional system, as well as restoration of foundation soil and damaged structure resulting from such inadequacy or failure by Contractor, at no additional cost to Owner.

3.5 ABANDONMENT-IN-PLACE OF SHEETING

A. Sheeting shall be abandoned-in-place. Contractor shall cut the sheeting or such component at least 4 feet below the ground surface, or as directed by the Engineer.

B. After cutting the sheeting to the proper depth, complete backfilling in accordance with the Specifications.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____
(Name)
and
CONTRACTOR: _____
(Name)
on
CONTRACT: _____
(Title)
_____
(Number) (Date)

The undersigned hereby certify that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the state of _____(location of Project);

2. Is qualified by education and training to design the _____ _____ specified in Section _____ of subject contract;

3. Has previously designed comparable excavation support systems;

4. Has prepared the design in full compliance with the requirements of subject contract, including all applicable laws, regulations, rules, and codes – including review and coordination with the Dewatering System design; and

5. Will inspect and supervise installation of the excavation support system, and will monitor the in-place system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	ENGINEER
By: _____ (Signature)	By: _____ (Signature)
_____ (Name)	_____ (Name)
_____ (Title)	_____ (Engineering Discipline)
_____ (Date)	_____ (Date)

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
   1. Excavation
   2. Backfilling and Filling
   3. Compaction
   4. Grading
   5. Providing soil material as necessary
   6. Disposal of unsuitable materials
   7. Disposal of excess suitable material

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, Division 1, and Section 02000 Referenced Specifications.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. All work shall be performed and completed in accordance with all local, state and federal regulations.
   2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.

B. Line and Grade:
   1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.

C. Testing Methods:
   1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C117 and ASTM C136 (or latest revision).
   2. Compaction Control:
      a. Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using 10-lb. Hammer and 18-in. Drop, Designation D1557 (Modified Proctor), or latest revision, unless otherwise indicated.

b. The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D1556, (or latest revision) or Nuclear method Designation D6938.
c. Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D698 (Standard Proctor).
d. An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents.

1.4 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.
B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.
D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for embankment construction or fill beneath structures or pavement.

1.5 TESTS

A. The Independent Testing Laboratory shall conform to the procedures and standards listed below. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor. Contractor is responsible for hiring and payment of all independent testing laboratory’s labor, equipment, tools, and tests associated with earthwork.
C. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.
D. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every third lift.
E. Foundation Wall Backfill: Take at least one (1) field density tests per lift per wall at locations and elevations as designated by the Engineer.
F. In addition to the above tests the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.
G. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.

1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. No allowance will be considered for delays in the performance of the work.
2. Reconciliation of re-testing costs are paid for by the Contractor..

1.6 JOB CONDITIONS

A. Site Information:
   1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data are made available for the convenience of Contractor.
   2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

B. Existing Utilities and Structures:
   1. The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warranties that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2 - PRODUCTS

2.1 SOIL MATERIAL

A. Mississippi River Sand: Pumped Mississippi River sand, free of roots, wood, clay lumps, or any other foreign matter and shall meet the requirements of LaDOTD Louisiana Standard Specifications for Roads and Bridges (LSSRB) Section 1003.07, lates edition.

B. Sewer Bedding Material: 100% crushed aggregate listed on Qualified Product of the Louisiana Department of Transportation and Development and conforming to ASTM D2321, class 1A Angular Material (1/4" to 1 ½") and ASTM No. 57. The Owner reserves the right to approve the type of bedding material.

C. Aggregate Base: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. Type B Aggregate for base shall not contain particles of rock that will not pass the 4 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves Type B Aggregate
1/2 inch	35-75
1/4 inch	25-60
No. 40	0-25
No. 200	0-5

D. Aggregate Leveling Course and Untreated Surface Course: Shall be screened or crushed gravel consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the material shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	95-100
3/4 inch	90-100
No. 4	40-65
No. 10	10-45
No. 200	0-7

E. Blanket Drain Material: Shall be gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. Blanket drain material shall not contain particles of rock which will not pass the 2-inch square mesh. The gradation of the part that passes a 2-inch sieve shall meet the following grading requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
2 inch	100
1/4 inch	25-70
No. 40	0-30
No. 200	0-5

The blanket drain material shall have a permeability of 5x10-3 cm/sec. or faster. Permeability supersedes gradation requirements.

F. Crushed Stone: Shall be a uniform material consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, containing angular pieces, as are those which come from a mechanical crusher. Gradation requirements shall be as follows:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10

G. Screened Stone: Shall be a well graded stone consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

H. Select Fill (Structural Fill): Shall consist of a select granular material, such as locally available river sand (AASHTO A-3), be non-plastic, and free of roots, clay lumps, and other deleterious materials and have a maximum organic content of 5% by weight. Sand fill (A-3) shall have no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve.

2.2 CONCRETE

A. If concrete is required for excess excavation, provide 3,000 psi concrete complying with requirements of Division 3.

2.3 FILTER FABRIC

A. If filter fabric is required, refer to Section 02260.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. General:

1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.

2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
3. All excavation shall be classified as either earth or ledge.
    a. Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders that do not meet the definition of "Ledge" below.
4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer and Resident Project Representative who will observe the conditions.
1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%. Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Structural Excavation:
   1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
   2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
   3. Excavate areas large enough to provide suitable room for building the structures.
   4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
   5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.
   6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
   7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
      a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
      b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
      c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
   1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
   2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
   3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
   4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to

ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.

5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
6. Perform excavation for force mains and water mains in a logical sequence.
7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
8. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:
   1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.
   3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
   4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:
   1. Use of explosives is not permitted.

H. Stability of Excavations:
   1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
   2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

I. Shoring and Bracing:
   1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
   2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction. Refer to Specification Section 02156.
   3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.

J. Material Storage:
   1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
   2. Locate and retain soil materials away from edge of excavations.
   3. Dispose of excess soil material and waste materials as herein specified.

K. Dewatering:
   1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).
   2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. Refer to Specification Section 02140.

L. Separation of Surface Material:
   1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.
   2. Prior to excavation, existing pavement shall be cut where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
   3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
   4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

M. Dust Control:
   1. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. Refer to Specification Section 01562.
   2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

3.3 BACKFILL AND FILL

A. General:
   1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
   2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
   3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
      Backfill excavations as promptly as work permits, but not until completion of the following:

a. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
b. Inspection, approval, and recording locations of underground utilities.
c. Removal of concrete formwork.
d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
e. Removal of trash and debris.
f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
g. Density testing having results meeting requirements specified herein.

4. In general, and unless otherwise indicated, material used for backfill of trenches and excavations around structures shall be suitable excavated material which was removed in the course of making the construction excavation. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.
5. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 8 inches in thickness.
6. All structures (including manholes) shall be placed on a 6-inch mat of screened stone unless otherwise indicated.
7. Suitable excavated material shall meet the following requirements:
   a. Free from large clods, silt lumps or balls of clay.
   b. Free from stones and rock fragments with larger than 12 inch max. dimension.
   c. Free from organics, peat, etc.
8. If sufficient suitable excavated material is not available from the excavations, and where indicated on the Drawings, the backfill material shall be select fill, unless otherwise indicated, as required and as directed by the Engineer.
9. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
10. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
11. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
12. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
13. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
14. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.

15. Place material in a manner that will prevent stones and lumps from becoming nested.
16. Completely fill all voids between stones with fine material.
17. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
18. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
19. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
20. Leave sheeting in place when damage is likely to result from its withdrawal.
21. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.

B. Pipe Bedding, Initial Backfill and Trench Backfill:

1. Place bedding and backfill in layers of uniform thickness specified herein, and as shown on the Drawings.
2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
5. Provide underground utility marking tape for new utility trenches as shown on the Drawings. Refer to Section 02650 – Buried Utility Markings.
6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted sand.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule lists the bedding materials for various types of pipe. Refer to the pipe trench detail for dimensional requirements.

BEDDING REQUIREMENTS

Water Mains and Appurtenances	Mississippi River Sand
Sewer Lines	Sewer Bedding Material
DI or Concrete Pipe	screened stone or select fill.
PVC or PE Pipe	screened stone.

9. The following schedule lists the initial backfill requirements for various types of pipes. Refer to the pipe trench detail for dimensional requirements.

INITIAL BACKFILL REQUIREMENTS

Water Mains and Appurtenances	Mississippi River Sand
Sewer Line	Mississippi River Sand
DI or Concrete, Pipe	Screened stone or select fill
PVC or PE Pipe	Screened stone

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.
11. Where pipes or structures pass through or under the impervious core of the lagoon embankments, bedding and backfill material shall consist of the impervious embankment material. Extra care should be given to properly and thoroughly compact the bedding material around the pipe.

C. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.

D. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
2. When existing ground surface has a density less than that specified under "compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION

A. General:
1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.

B. Water Main and Sewer Line Bedding and Backfill Density Requirements:
1. The bedding shall be well compacted (hand or mechanical or method approved by the Engineer) in six inch layers to not less than 95% of maximum dry density (ASTM D 1557). Special care should be given in placing and consolidating the sand under the pipe haunches to provide adequate side support to the pipe while avoiding displacement and misalignment.
2. The remainder of the trench shall be spread in lifts not to exceed (12) inches and shall be compacted by mechanical vibrating equipment or other devices approved by the Engineer to at least 95% laboratory maximum density (dry) as

determined by ASTM D 1557 at a moisture content within the limits of plus five (5) percent to minus three (3) percent of optimum.

C. Percentage of Maximum Density Requirements:
   1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D1557 as indicated.
      a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D698).
      b. Off Traveled Way Areas: Compact each layer of backfill or fill material to at least 90% of maximum dry density (ASTM D698).
      c. Walkways: Compact each layer of backfill or fill material to at least 93% of maximum dry density (ASTM D698).
      d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM D698).
      e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM D698). Where backfilling with excavated material, compact to native field density.

D. Moisture Control:
   1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

E. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
   1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting shall be completely backfilled with suitable materials and thoroughly compacted.
   2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment

instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

F. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING:

A. General:
   1. Grading shall consist of that work necessary to bring all areas to the final grades.
   2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
   3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines:
   1. Grade areas adjacent to building to drain away from structures and to prevent ponding.
   2. Grade surfaces to be free from irregular surface changes, and as follows:
      a. Lawn or Unpaved Areas: Finish grade areas to receive topsoil to within not more than 1" above or below the required subgrade elevations.
      b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2" above or below the required subgrade elevation.
      c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 3/8" above or below the required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs:
   1. Grade surface to be smooth and even, free of voids, and compacted as specified, to the required elevation.
   2. Provide final grades within a tolerance of 1/2" when tested with a 10' straight edge.

D. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

E. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
   2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

A. General:
   1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.

B. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.

C. Placing:
   1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
   2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.

D. Shaping and Compacting:
   1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
   2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
   3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02225

FLOWABLE FILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install flowable fill material in authorized excavation(s) as shown on the Drawings and/or as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with ACI 229, Controlled Low-Strength Materials, or as specified here-in.

1.4 SUBMITTALS

A. Submit Mix designs for each mixture to be provided at least 15 days prior to production.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials shall meet the following requirements:
   1. Portland Cement, Type I or II - ASTM C150.
   2. Fly Ash (LOI limits do not apply) - ASTM C618.
   3. Fine Aggregate/Mineral Filler – ASTM C 33, ASTM or non-ASTM sands or mineral fillers with 100% passing the 1/2" sieve may be considered which produce an acceptable flow and desired performance characteristic. Soils with fine clays will not be considered. All other than ASTM C 33 materials must receive prior approval from the Engineer.
   4. Air Entraining Admixtures - As Per Manufacturer's Specifications.
   5. Light Weight Cellular Admixture - As Per Manufacturer's Specifications.
   6. Water – Potable or ASTM C 94.
   7. Preformed Foam – Procedures for evaluation ASTM C 796 and ASTM C 869.

B. Standard Flowable Fill:
   1. Compressive strength at 28 days less than 1200 psi

C. Excavatable Flowable Fill:
   1. Compressive strength at 28 days between 100-200 psi.
   2. Mix:
      a. Portland Cement: 50-100 lb/yd3
      b. Fly Ash: up to 350 lb/yd3, lime content not to exceed 10% by weight.
      c. Fine Aggregate/Mineral Filler: 2000-3000 lb/yd3
      d. Water: 325-600 lb/yd3, for Class F fly ash and cement-only mixtures up to 1000 lb/yd3 may be acceptable.

D. Low Density Flowable Fill:
   1. The preformed foam shall produce stable air cells capable of resisting the chemical and physical forces imposed during mixing, placing and setting.
   2. Submit the foaming agent Manufacturer's recommended mixing procedures and approved mixing equipment to the Engineer.
   3. Methods of placement must not cause a change in density due to loss of air content beyond predictable ranges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Flowable fill shall be produced and delivered using standard concrete construction equipment and practices.
B. Placing flowable fill shall be by chute, pumping, or other method approved by the Engineer.
C. The flowable fill shall be discharged directly from the mixer truck into the space to be filled.
D. No flowable fill shall be placed on frozen ground.
E. At the time of placement the flowable fill shall have a temperature of at least 40 degrees F.
F. When flowable fill is placed in freezing temperatures, the material should be covered with blankets and protected from freezing until hardening.
G. The Contractor shall provide all necessary means to confine the material within a designated space.
H. Formed walls or other bulkheads shall be constructed to withstand hydrostatic pressure exerted by flowable fill where necessary and as determined by the Engineer.
I. The Contractor is responsible to ensure underground utilities, including but not limited to pipes, tanks, structures, cables, etc. are secured to prevent floating.
J. No compaction or vibration of the material is required.
K. Where flowable fill is being used as pipe bedding it shall be placed in lifts to ensure lateral support of the pipe develops along the side of the pipe before continuing with the backfilling.
L. When paving over flowable fill in cold weather, any frozen material on the surface shall be scraped off and removed prior to paving.
M. The flowable fill shall be left undisturbed until the material obtains sufficient strength. Sufficient strength for paving is achieved when the flowable fill can support the weight of foot traffic without apparent deformation. Sufficient strength for supporting vehicular traffic is 2.5 tons per square foot as measured by a pocket penetrometer.
N. Trenches shall be covered and barricaded until hardening occurs.

END OF SECTION

SECTION 02468

OPEN END STEEL PIPE PILES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Open end steel pipe piles.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM A27/A27M - Specification for Steel Castings, Carbon, for General Application
B. ASTM A36/A36M - Specification for Carbon Structural Steel
C. ASTM D1143/D1143M - Test Methods for Deep Foundations Under Static Axial Compressive Load
D. ASTM D3689/D3689M - Test Methods for Deep Foundations Under Static Axial Tensile Load
E. ASTM D3966/D3966M - Test Methods for Deep Foundations Under Lateral Load
F. ASTM D4945 - Test Method for High-Strain Dynamic Testing of Deep Foundations
G. AWS D1.1/D1.1M - Structural Welding Code – Steel - American Welding Society
H. ASTM A252 – Standard Specification for Welded and Seamless Steel Pipe Piles.

1.4 SUBMITTALS

A. Submit pile placement plan indicating the following:
    1. Layout of piles with dimensions between piles and distances from edges of structures and building grid lines.
    2. Size and type of each pile.
    3. Pile tip and cap elevations.
    4. Existing structures.
    5. Pile encasements.
    6. Pile tip and cap elevations.
B. Pile product data:
    1. Pile mill certifications.
    2. Pile points.
    3. Pile splices.
C. Pile driving equipment:
    1. Impact Hammer:
        a. Make and model.
        b. Ram weight.
        c. Anvil weight.
        d. Rated stroke.
        e. Rated energy range.

f. Rated speed (blows per minute).
g. Steam or air pressure of hammer, boiler and/or compressor.
h. Pile driving cap: make and weight.
i. Cushion block dimensions and material type.
j. Power pack description.

D. Ten (10) working days prior to driving the piles, submit the pile and complete driving equipment data to the Engineer. The Contractor's Geotechnical Consultant must use the submitted information to perform wave equation analyses and must prepare a summary report of the wave equation results. The wave equation analysis using GRLWEAP software by Pile Dynamics, Inc. or equivalent must be used to assess the ability of the proposed driving system to install the pile to the required capacity and desired penetration depth within the allowable driving stresses. Approval of the proposed driving system by the Engineer must be based upon the wave equation analyses indicating that the proposed driving system can develop the required pile capacity at a driving resistance not greater than 120 blows per foot within allowable driving stress limits. The hammer must also be sized or adjustable such that the penetration per blow at the required ultimate capacity does not exceed 0.5 inches.

E. Pile driving records: Submit final record of all driven piles. Submitted information shall include:
1. Pile driving dates and weather conditions.
2. Final as-built pile location plan including deviations from locations indicated on the Contract Drawings.
3. Size and type of each pile.
4. Ground elevation at each pile.
5. Tip elevation of each pile.
6. Cut-off elevation of each pile.
7. Required splices including the types and location of splices.
8. Penetration in blows per foot for the entire length of penetration for each pile.
9. Pile driving equipment data.
10. Unusual circumstance experienced during driving such as:
a. Redriving of piles.
b. Heaving of piles.
c. Weaving of piles.
d. Obstructions.
e. Unanticipated interruptions.

1.5 QUALITY ASSURANCE

A. The Pile Installer shall have a minimum of five (5) years of experience in the driving of piles similar in material, design and extent as that for the Project.

1.6 LINES AND GRADES

A. The Contractor shall employ a licensed Registered Land Surveyor or a Registered Civil Engineer, familiar with pile installation, who shall establish lines and levels. The Contractor shall be responsible for the correct location of piles, as well as keeping up-to-date records of the amount of uplift of individual piles and establishing actual pile locations. Locations of the centers of as-driven piles shall be shown on a drawing in relation to the design location and submitted to the Engineer within two

days after the individual pile or pile group is completed. Drawings shall include the following.

1. Column lines and north arrow.
2. Each pile identified by a separate number.
3. Elevation of each top of pile prior to cutting, to nearest 0.1 foot.
4. Deviation in inches, to the nearest one-fourth inch, from plan location at cutoff elevation.

B. Within two weeks after the completion of all pile driving, the Contractor shall provide for the Engineer a plan, certified by said Surveyor or Engineer, showing the as-driven location of all piles.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage:
   1. Stack piles during delivery and storage so that each pile is maintained in a straight position and is supported every 10 feet or less along its length (ends inclusive) to prevent exceeding the maximum camber or sweep.
   2. Do not stack piles more than 5 feet high.

B. Handling:
   1. Lift piles using a cradle or multiple pickup points to ensure that the maximum permissible camber or sweep is not exceeded due to insufficient support. During installation a one-point pickup may be used for lifting piles (that are not extremely long) into the driving leads.
   2. Point pick-up devices must be of the type that clamp to both pile flanges at each pick-up point.
   3. Holes may be burned in the flanges or webs of piles above the cutoff length for lifting piles into the leads.
   4. Do not drag piles across the ground.
   5. Contractor shall inspect piles for excessive camber and sweep and for damage before transporting them from the storage area to the driving area and immediately prior to placement in the driving leads.
   6. Camber (curvature) in the pile in the direction normal to the pile flanges must be measured with the pile flange base laying on a flat surface and is the distance between the flange base at the mid-length of the pile and the flat surface. Sweep (curvature) in the pile in the direction parallel to the pile flanges, must be measured with the pile flange tips laying on a flat surface and is the distance between the flange tips at the mid-length of the pile and the flat surface. The maximum permissible camber and sweep is 2 inches over the length of the pile. Piles having excessive camber or sweep will be rejected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Piles:
   1. Material: ASTM A252/A252M
   2. Pile sizes shall be as indicated on the Drawings.
   3. Pile Tips: Square and blunt as received from the mill. Same material as the pile.

B. Pile Splices:

1. Material: ASTM A148 90/60
2. Splices shall be drive-on type or full penetration butt weld type. The splice shall maintain the full structural integrity of the pile.
3. Acceptable Products: S-20000 Drive Fit Splicer Sleeve by Associated Pile and Fitting, or equal.

PART 3 - EXECUTION

3.1 PILE DRIVING EQUIPMENT

A. Pile Driving Hammers:
   1. The Contractor shall select and use a pile driving hammer with a capacity at least equal to the hammer manufacturer's recommendation for the capacity of the piles and character or subsurface material to be encountered.
   2. Impact Hammers:
      a. Provide steam, air, or diesel-powered impact pile hammers of the single-acting, double-acting, or differential-acting type.
      b. The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile mass weight and the character of the soil formation to be penetrated.
      c. The rated driving energy of hammers is limited to a minimum of 19,000 foot-pounds.
      d. Hammers must be capable of, and so demonstrated during the development of refusal criteria, hard driving in excess of 20 blows per inch.
      e. Provide boiler, compressor, or engine capacity sufficient to operate hammers continuously at the full rated speed.
      f. Hammers must have a gage to monitor hammer bounce chamber pressure for diesel hammers or pressure at the hammer for air and steam hammers. This gage must be operational during the driving of piles and be mounted in an accessible location for monitoring by the Contractor.
      g. Obtain driving energy by use of a heavy ram and a short stroke with low impact velocity, rather than a light ram and a long stroke with high impact velocity.
      h. Position a pile cap or drive cap between the pile and hammer. Place hammer cushion or cap block between ram and the pile cap or drive cap. Hammer cushion or cap block must have consistent elastic properties, minimize energy absorption, and transmit hammer energy uniformly and consistently during the entire driving period. Do not use a pile cushion block.

B. Pile Driving Leads:
   1. Support and guide hammers with fixed extended leads or fixed underhung leads that will hold full length of pile firmly in position and in axial alignment with hammer. Extend leads to within 24 inches of elevation at which pile enters ground.
   2. Provide two intermediate supports for the pile in the leads to reduce the unbraced length of the pile during driving and pulling.

C. Pile Extractors:

1. Pile extractors shall be impact pile driving hammers.

3.2 INSTALLATION

A. Preparation:
   1. Notify the Engineer 7 days prior to the start of pile driving.
   2. The Contractor shall protect adjacent property, public utilities and structures and completed work, from damage associated with the pile driving operation. The Contractor shall repair damage due to pile driving at no additional cost to the Owner.
   3. Prior to driving piles, establish a permanent base line to provide for inspection of pile placement and maintain during the installation of the job piles.
   4. Inspect piles when delivered and when in the leads immediately before driving. Do not use piles that exceed the specified camber and sweep.
   5. As part of preparation for driving, each pile shall be marked at one foot intervals along the entire pile length. In addition, the footage shall be marked and designated at five-foot intervals, starting from the top of the pile.
   6. Contractor shall coordinate location of piles with the location and elevation of piping. If relocation of either is required to avoid conflicts, contractor shall coordinate relocation with Resident Project Representative prior to work.
   7. Do not start pile driving operations until backfilling has been completed or excavations have reached an elevation of 6 to 12 inches above bottom of footing or pile cap.
   8. Prior to driving and with the pile head seated in the hammer, check each pile to ensure that it has been aligned correctly and that the orientation of the web about the centerline is as shown.

B. Installation:
   1. Drive job and test piles with hammers of the same model and manufacturer, same energy and efficiency, and using the same driving system. Operate hammers at all times at the speed and under the conditions recommended by the Manufacturer.
   2. Drive piles in pile groups starting at the center of the group and proceeding outward in both directions, or start at the outside row and proceed progressively across the group.
   3. Install piles in such an order and with sufficient spacing to insure against distortion or injury to piles already in place.
   4. Do not drive piles within 100 feet of concrete that is less than 7 days old or has not attained 33% of its design strength.
   5. Accurately place piles in the correct location and alignments, both laterally and longitudinally, and to the vertical lines indicated.
   6. Handle and drive piles of a high slenderness ratio carefully to prevent overstress. Provide pile driving rig with rigid supports so that the leads remain accurately aligned.
   7. Once pile driving has begun, keep conditions such as alignment constant.
   8. Drive each pile continuously and without interruption until the required tip elevation, depth of penetration, driving resistance, or refusal blow count has been attained. Using data obtained from control test piles, drive foundation piles to bearing stratum and driving resistance established by test piles. If allowable

capacity is not obtained in bearing stratum, drive piles deeper until required driving resistance is obtained.

9. If, during driving of any pile, previously driven piles show signs of heaving, redrive disturbed piles to their original driving resistance. Remove soil that heaves during or after driving to maintain grades.
10. A pile that can't be driven to the required depth because of an obstruction, as indicated by a sudden unexplained change in blow count and drifting, shall be pulled and redriven or cut off and abandoned, as directed by the Engineer.
11. Piles damaged or not located properly or exceeding the maximum limits for rotation, lateral and vertical deviation, and/or variation in alignment shall be pulled and new piles redriven, or provide additional piles, at a location as directed by the Engineer at no additional cost to the Owner.
12. After piles are driven, cutoff square as required at the indicated cutoff elevation. Backfill any voids around piles or abandoned holes for pulled piles with sand and compact to the same density as the surrounding soil. Where cut-off is below existing grade or mudline elevation, complete excavation, sheeting, dewatering, and backfilling before pile is driven to cut-off elevation. Remove any soil within the piles to 30 feet below the cutoff elevation and fill piles with Class B concrete prior to welding on cap plates.

3.3 TOLERANCES IN DRIVING

A. Piles shall be driven within the following tolerances as measured at the cutoff elevation:
   1. Lateral: A final lateral deviation from the correct location of not more than 3 inches will be permitted for vertical piles.
   2. Plumb: A variation of not more than 0.25 inch per foot of pile length from the vertical for vertical piles will be permitted.
   3. Rotation: A final variation in rotation of the pile about the center line of the web of not more than 7.5 degrees is permitted.

B. In addition to complying with the tolerances stated herein or otherwise specified, the clear distance between the heads of piles and the edges of caps shall be not less than 6 inches. Contractor may provide additional concrete and reinforcement to maintain the required minimum clear distance.

C. Manipulation of piles to force them into proper position will not be permitted.

3.4 DEFECTIVE PILES

A. Piles will be considered defective if one of the following occurs as determined by the Engineer:
   1. Pile is damaged (such as bends, breaks, kinks or deformation).
   2. Pile is driven below the specified butt elevation.
   3. Pile is driven out of its proper location and beyond the tolerances stated above.

B. All proposed repairs for defective piles shall be submitted for review with No Exceptions Taken by the Engineer.

C. Any pile damaged by reason of internal defects or by improper handling or driving shall be corrected by one of the following methods for the pile in question:
   1. The pile is withdrawn if practicable and replaced by a new and, if necessary, longer pile.

2. One or more replacement piles are driven adjacent to the defective pile.

D. Any pile driven below the specified butt elevation shall be corrected by one of the following methods for the pile in question.
   1. The pile is spliced and built up as specified herein.
   2. A sufficient portion of the concrete foundation is extended down to properly embed the pile.

E. Any pile driven out of its proper location and beyond the tolerances stated above shall be corrected by one of the following methods for the pile in question:
   1. One or more replacement piles are driven next to the out of position piles.
   2. The concrete foundation is extended laterally to incorporate the out of location pile.
   3. Manipulation of piles to force them into proper position will not be permitted.

F. Any redesign of the concrete foundation or additional work required due to improper location of piles will be the responsibility of the Contractor.

3.5 SPLICES

A. Provide splices of the full penetration butt weld type or use of proprietary prefabricated splicer sleeves. All welds shall conform to AWS D1.1/D1.1M.

B. All surfaces that will be welded shall be smooth, uniform and free from loose scale, slag, grease or other material that will prevent proper welding. Steel may be oxygen cut.

C. Splice lengths less than 10 feet shall not be permitted.

D. Construct splices to maintain the true alignment and position of the pile sections.

E. Splices shall develop the full strength of the pile in bearing (compression), tension and bending.

F. All welds shall be machined and/or ground such that no more than 1/8 inch protrusion from the pile face is present.

3.6 PILE TESTS

A. High Strain Dynamic Load Test:
   1. Provide high strain dynamic load testing in accordance with ASTM D4945 at the following locations:
      a. West of North RAS Pump Station for 20-kip pile capacity (tip elevation -60.4 feet)
      b. East of North RAS Pump Station for 50-kip pile capacity (tip elevation -81.5 feet)
   2. High strain dynamic load testing shall consist of pile driving monitoring and pile capacity analysis. Dynamic testing shall be performed during the initial installation (termed “end of drive”), and restrikes performed at time intervals of 1 hour, 1 day, and 14 days after end of drive or previous testing, whichever is later.
   3. Pile driving monitoring consists of performing real time evaluation of pile capacity (determined by the Case Method and iCAP), energy transfer, driving stresses and pile integrity for every blow using a high strain dynamic testing system such as the Pile Driving Analyzer (PDA) software by Pile Dynamics, Inc.

4. Pile capacity analysis involves combining field measurements obtained with a high strain dynamic testing system with wave-equation based analytical procedures performed with a signal matching program such as the CAPWAP software by Pile Dynamics, Inc.
5. The Dynamic Testing Consultant retained by the Owner or Owner's Designated Representative will furnish personnel experienced in performing high strain dynamic load testing, including installing and operating the testing and monitoring equipment and interpreting the results.
6. The Dynamic Testing Consultant retained by the Owner or Owner's Designated Representative will furnish equipment to obtain dynamic measurements, record, reduce and display its data and meet the requirement of ASTM D4945. The equipment must have been calibrated within 12 months thereafter throughout the contract duration. Equipment shall include the following:
    a. Dynamic Measurement Apparatus - The dynamic measurement apparatus shall include transducers mounted externally on the pile surface that are capable of independently measuring strain and acceleration versus time during the impact event at a minimum of one specific location along the pile length.
        i. Surface Preparation - Remove any unsound or deleterious material from the pile surface and firmly attach a minimum of two of each of type of transducer at a measurement location that will not penetrate the ground using bolts, screws, glue, solder, welds, or similar attachment.
        ii. Transducer Accuracy - The transducers shall be calibrated prior to installation or mounting to an accuracy of 3 % throughout the applicable measurement range. If damaged or functioning improperly, the transducers shall be replaced, repaired and recalibrated, or rejected. The design of transducers, whether mounted as single units or as a combined unit, shall maintain the accuracy of, and prevent interference between, the individual measurements. Do not mount acceleration, velocity, or displacement transducers so that they bear directly on the force or strain transducers, and place all transducers so that they have immediate contact with the pile material.
        iii. Strain Transducers - The strain transducers shall include compensation for temperature effects, and shall have linear output over the full operating range (typically between –2000 and +2000 microstrain plus an additional allowance for possible strain induced by mounting on a rough surface). Attachment points shall be spaced between 2 to 4 inches apart. When attached to the pile, their natural frequency shall be in excess of 2000 Hz. As an alternate to strain transducers, axial force measurements can be made by force transducers placed between the pile head and the impact device, or affixed in the pile cross-section. Force transducers shall have impedance between 50 and 200 % of the pile impedance. The output signal shall be linearly proportional to the axial force, even under

eccentric load application. The connection between the force transducers and the deep foundation shall have the smallest possible mass and least possible cushion necessary to prevent damage.

iv. Acceleration, Velocity, or Displacement Transducers (Accelerometers) - Velocity data shall be obtained by using the dynamic measurement apparatus to integrate the acceleration signals from accelerometers. The accelerometers shall be directly attached to the pile surface or mounted to the pile with small rigid metal blocks. Accelerometers shall be linear to at least 2000 g and 2000 Hz. For piezoelectric accelerometers using an AC coupled signal path, the resonant frequency shall be above 30000 Hz when rigidly mounted, or above 10000 Hz if the mounting is damped, and the time constant shall be at least 1.0 s to preserve the low frequency signal content. If piezoresistive accelerometers are used, they shall have a resonant frequency of at least 2500 Hz and a damped mounting.

v. Placement of Transducers - To avoid irregular stress concentrations at the ends of the pile, locate transducers a distance of at least 1.5 times the pile width from the top (or bottom) of pile. Align transducers with their sensitive direction parallel to the long axis of the pile. Arrange strain transducers so that when averaged their measurements cancel axial bending stresses. Arrange accelerometers so that when averaged their measurements cancel movements due to bending. Unless located at the pile centroid, place similar types of transducers so that they are symmetrically opposed and equidistant from the pile centroid in a plane perpendicular to the pile axis. Verify the final position, firm connection, and alignment of all transducers.

vi. Signal Transmission - The signals from the transducers shall be transmitted to the apparatus for recording, processing, and displaying the data by means of a cable or wireless equivalent. An intermediate apparatus may be used for initial signal processing prior to transmission of the signal data to the apparatus for recording, processing, and displaying the data. Cables shall be shielded to limit electronic and other transmission interference. If wireless transmission is used, the signals arriving at the apparatus shall accurately represent the continuity and magnitude of the transducer measurements over the frequency range of the dynamic measurement apparatus.

7. The Contractor shall furnish the impact device. The impact device should provide sufficient energy to cause pile penetration during the impact event adequate to mobilize the desired capacity, generally producing a maximum impact force of the same order of magnitude, or greater than, the ultimate pile capacity (static plus dynamic). The impact shall not result in dynamic stresses that will damage the pile, typically less than the yield strength of the pile material after reduction for potential bending and non-uniform stresses.

8. The Contractor shall facilitate the Dynamic Testing Consultants preparation of piles for testing by providing safe access to the piles. The Contractor must either provide a manlift and operator for the Consultant to attach the gauges to the pile after the pile is hoisted into the leads, or provide personnel to climb the hammer leads to attach the gauges to the pile after hoisting. During dynamic testing, the Contractor shall provide either a manlift and operator on hand to facilitate any gauges adjustments deemed necessary by the Consultant or personnel on hand to adjust the gauges as requested by the Consultant.
9. Recording, Processing, and Displaying Data:
    a. General - The signals from the transducers shall be transmitted during the impact event to an apparatus for recording, processing, and displaying the data. The apparatus shall include a visual graphics display of the force and velocity versus time, non-volatile memory for retaining data for future analysis, and a computational means to provide results consistent with Engineer's field testing objectives. The apparatus for recording, processing, and displaying data shall include compensation for temperature effects and provide a self-calibration check of the apparatus for recording, processing and displaying. No error shall exceed 2 % of the maximum signal expected.
    b. Recording Data - The raw data from the transducers shall be recorded on site, electronically in digital form, with a minimum of 12 bit ADC resolution and including at most only the minimal processing required to obtain the force and velocity. Transducer data recorded after minimal processing shall also record the information required to recover the raw data signals for later reprocessing as needed, for example, calibrations, wave speed, mass density, pile area, etc. When determining velocity by analog integration of acceleration, or analog differentiation of displacement, use a minimum sample frequency for each data channel of 10000 Hz for steel piles. When determining velocity by digital integration of acceleration, or digital differentiation of displacement, use a minimum sample frequency for each data channel of 40,000 Hz for steel piles. Both analog and digital frequency content appropriate to the sampling rate of the interpreted velocity signal. The minimum total time sampled for each impact event shall be the greater of 100 milliseconds or 3L/c (where L is the pile length and c is the pile material wave speed) with most of this time following the moment of impact.
    c. Processing Data - As a minimum, the apparatus for processing signals from the transducers shall provide the following functions:
        i. Force Measurements - The apparatus shall provide signal conditioning for the force measurement system. If strain transducers are used, the apparatus shall compute the net axial force on the cross-section of the pile. The force output shall be balanced to a reference level (for example, zero) prior to the impact event.
        ii. Velocity Data - If accelerometers are used the apparatus shall integrate the acceleration over time to obtain velocity. If

displacement transducers are used, the apparatus shall differentiate the displacement over time to obtain velocity. If required, the apparatus shall zero the velocity between impact events and shall adjust the velocity record to account for transducer zero drift during the impact event.

iii. Signal Conditioning - The signal conditioning for force and velocity shall have equal frequency response curves to avoid relative phase shifts and relative amplitude differences and retain all frequency components in the data below at least 2000 Hz.

d. Display of Data - For each impact event, the raw or processed signals from the transducers specified in 5.2 shall be displayed during data acquisition or replay as a function of time, such as on a digital graphics display.

e. Field Supervision - A qualified engineer shall directly supervise all field testing and assess data quality and reliability for later detailed evaluation. Alternatively, field personnel may transmit the data concurrently as acquired to a qualified engineer supervising the testing from a remote location.

10. Procedure:

a. General - Perform any calibration checks recommended by the equipment manufacturer and take the dynamic measurements for the impacts during the interval to be monitored together with routine observations of number of blows per unit penetration or set per blow. Determine the pile response to the high-strain dynamic test from a minimum of ten impact records during initial driving and, when used for soil resistance computations, normally from one or two representative blows at the beginning of a restrike.

b. Determine Pile Properties:

i. Wave Speed - The wave speed of structural steel piles can be assumed as 16800 ft/s (5123 m/s).

ii. Mass Density - The mass density of structural steel piles can be assumed as 490 lb/ft3 (7850 kg/m3).

iii. Dynamic Modulus of Elasticity - The dynamic modulus of elasticity (E) for steel piles can be computed as the product of the square of the wave speed times the mass density. The dynamic modulus of elasticity may be assumed as 29000 psi (207 x 106 kPa) for structural steel.

iv. Assumed and computed values of the wave speed, mass density and dynamic modulus of elasticity should be verified directly if possible, or indirectly through their effect on impedance and proportionality

c. Preparation—Mark the pile clearly at appropriate unit intervals to prepare for recording blow counts. Attach the transducers to the pile. Position the impact device on the pile head to apply the impact force concentric with the long axis of the pile. Prepare the apparatus for recording, processing, and displaying data to receive the dynamic measurements and balance the strain (or force) and acceleration signals to their respective reference levels (for example, zero).

d. Recording Hammer Information—Record the mass of the hammer ram or drop weight. For drop hammers and single acting diesel and air/steam/hydraulic hammers, record the drop height of the ram or the ram travel length. For double acting diesel hammers, measure the bounce pressure, and for double acting steam or compressed air hammers, measure the steam or air pressure in the pressure line to the hammer. For hydraulic hammers or any of the previously listed hammer types, record the kinetic energy from the hammer readout when available. Record the number of impact blows per minute delivered by the hammer.

e. Taking Measurements—Take, record, and display force and velocity measurements for each impact event. Compare the force and the product of velocity and impedance at the moment of impact. Obtain the net permanent displacement per impact from the pile driving blow count record, or from marks placed on the pile prior to and after the test using the same reference, directly from the displacement transducers (if used), or by integration of the velocity versus time record (typically less reliable). Obtain the maximum energy transferred to the location of the transducers from the integral over time of force multiplied by velocity.

f. Time of Testing—Dynamic tests performed during the initial installation of a driven pile typically monitor the performance of the impact device, the driving stresses in the pile, the pile integrity, and relative changes in capacity. If the test results are used for static capacity computations, then dynamic measurements should (also) be performed during restrikes of the deep foundation, after waiting a period of time following the initial installation sufficient to allow pore water pressure and soil strength changes to occur.

11. Data Quality Checks:
    a. Confirm the accuracy of dynamic measurements obtained near the pile head by periodically checking that the average of the measured force signals and the product of the impedance and the average of the measured velocity signals agree proportionally at the moment of impact.
12. Report - A report of the dynamic load test shall be developed and include the following information when applicable and as available:
    a. General:
        i. Project identification and location.
        ii. Log(s) of nearby or typical test boring(s).
    b. Pile Installation Equipment:
        i. Driving methods and installation equipment used for driving piles
    c. Test Pile(s):
        i. Identification (name and designation) of test pile(s).
        ii. Required ultimate axial static compressive capacity.
        iii. Steel designation, grade, minimum yield strength, and type of pile.
        iv. Description and location of splices, special pile tip protection, and any special coatings applied if applicable.
        v. Inclination angle from vertical, design and installed.
    d. Installation:

i. Date of installation, driving records with blow count, and hammer stroke or operating level for final unit penetration.
ii. Elevations of the pile top, pile bottom, and ground surface referenced to a datum.
iii. Cause and duration of installation interruptions and notation of any unusual occurrences.

e. Dynamic Testing:
i. Description of the dynamic test apparatus, including make, model, analog or digital velocity integration, sampling rate, transducers, measurement location(s), etc.
ii. Date of test(s), sequence of testing (for example, “end of driving” or “beginning of restrike”), and elapsed time since end of initial driving for restrikes.
iii. Density, wave speed, and dynamic modulus of elasticity of the test deep foundation.
iv. Penetration resistance (blows per unit penetration or set per blow) and embedment depth.
v. Graphical presentation of velocity and force measurements in the time domain for representative blows.
vi. Analysis method(s) used to interpret or evaluate test measurements.
vii. Interpretation of the test measurements, including measurements down the pile if applicable, to estimate as appropriate the overall magnitude of the dynamic and static axial compressive capacity mobilized at the time of testing, the distribution of the dynamic and static axial compressive capacity along the pile length, and the engineering properties of the pile and the soil or rock adjacent to the pile as used in the interpretation.
viii. Comments on the performance of the impact device as measured by the energy transferred into the deep foundation with comparison to manufacturer’s rating or ram weight and drop height.
ix. Comments on the driving stresses within the deep foundation, and whether measured or estimated through analysis.
x. Comments on the integrity of the deep foundation.
xi. Numerical summary of measured and interpreted results, with statistical analysis as appropriate.

3.7 HOURS OF OPERATION

A. Pile driving operations shall be restricted to weekdays between the hours of 7:00 am and 5:00 p.m. No pile driving operations will be allowed on weekends or holidays.

END OF SECTION

SECTION 02485

LOAMING & SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer where shown on the drawings and protect and maintain seeded areas disturbed by construction work, as directed by the Engineer.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SUBMITTALS AND TESTING

A. Seed:
   1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
   2. This certification shall appear in, or with, all copies of invoices for the seed.
   3. The certification shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates and certificates have been approved.
   4. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:
   1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished.
   2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
   3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
   4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing.
   5. Approval, by the Engineer, to use topsoil for the work will be dependent upon the results of the soils tests.

C. Lime & Fertilizer:
   1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the grade furnished.

2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.4 DELIVERY, STORAGE & HANDLING

A. Seed:
   1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
   2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:
   1. Furnish all fertilizer in unopened original containers.
   2. Containers shall be labeled with the manufacturer's statement of analysis.

1.5 JOB CONDITIONS

A. Topsoil: Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding:
   1. Planting Seasons: The recommended seeding time is from April 1 to September 15. The Contractor may seed at other times. Regardless of the time of seeding, the Contractor shall be responsible for each seeded area until it is accepted.
   2. Weather Conditions:
      a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
      b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
      c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:
   1. Provide the grass seed mixture approved by the Engineer, having the following composition:
      a. Park Mixture:
         i. 50 percent Creeping Red Fescue
         ii. 30 percent Kentucky Bluegrass

iii. 20 percent Annual Ryegrass
iv. Add 1 pound White or Dutch Clover per acre
v. No weed seeds allowed

b. Roadside Mixture:
i. 50 percent Creeping Red Fescue
ii. 15 percent Kentucky Bluegrass
iii. 5 percent White Clover
iv. 2 percent Red Top
v. 3 percent Birdsfoot Trefoil
vi. 25 percent Annual Ryegrass
vii. Add 1 pound of White or Dutch Clover per acre
viii. No weed seeds allowed

c. Lawn Areas:

i.	Kentucky 31 Fescue	25 percent
ii.	Chewing Fescue	15 percent
iii.	Creeping Red Fescue	15 percent
iv.	Pennfine Perennial Rye	25 percent
v.	Lynn Perennial Rye	10 percent
vi.	Common Annual Rye	10 percent
vii.	No weed seeds allowed	

2. Do not use seed which has become wet, moldy, or otherwise damaged in transit or during storage.

B. Topsoil:
1. Fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials and obtained from a well-drained site. Mixture of sand, silt, and clay particles in equal proportions.
2. Free of stumps, roots, heavy of stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, weeds, sticks, brush or other deleterious matter.
3. Not less than 4 percent nor more than 20 percent organic matter.
4. Topsoil depth shall be 4-inches, unless otherwise indicated.

C. Lime:
1. Provide lime which is ground limestone containing not less than 85% of total carbonate and of such fineness that 90% will pass a No. 20 sieve and 50% will pass a No. l00 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. l00 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Fertilizer:
1. Provide a commercial fertilizer approved by the Engineer.
2. Provide fertilizer containing the following minimum percentage of nutrients by weight:
l0% Available phosphoric acid
l0% Available potash
l0% Available nitrogen (75% of the nitrogen shall be organic)

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment:
   1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
   2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.

B. Soil: Perform the following work prior to the application of lime, fertilizer or seed.
   1. Scarify the subgrade to a depth of 2 inches to allow the bonding of the topsoil with the subsoil.
   2. Apply topsoil to a depth of 4 inches or as directed on areas to be seeded.
   3. Trim and rake the topsoil to true grades free from unsightly variations, humps, ridges or depressions.
   4. Remove all objectionable material and form a finely pulverized seed bed.

3.2 PERFORMANCE

A. Grading:
   1. Grade the areas to be seeded as shown on the Drawings or as directed by the Engineer.
   2. Leave all surfaces in even and properly compacted condition.
   3. Maintain grades on the areas to be seeded in true and even conditions, including any necessary repairs to previously graded areas.

B. Placing Topsoil:
   1. Uniformly distribute and evenly spread topsoil on the designated areas.
   2. Spread the topsoil in such a manner that planting work can be performed with little additional soil preparation or tillage.
   3. Correct any irregularities in the surface resulting from topsoiling or other operations to prevent the formation of depressions where water may stand.
   4. Thoroughly till the topsoil to a depth of at least 3 inches by plowing, harrowing, or other approved method until the condition of the soil is acceptable to the Engineer. The surface shall be cleared of all debris and or stones one inch or more in diameter.

C. Placing Fertilizer:
   1. Distribute fertilizer uniformly at a rate determined by the soils test over the areas to be seeded.
   2. Incorporate fertilizer into the soil to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.
   3. The incorporation of fertilizer may be a part of the tillage operation specified above.
   4. Distribution by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time will be acceptable.

D. Placing Lime:
   1. Uniformly distribute lime immediately following or simultaneously with the incorporation of fertilizer.
   2. Distribute lime at a rate determined from the pH test, to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.

E. Seeding:
   1. Fine rake and level out any undulations or irregularities in the surface resulting from tillage, fertilizing, liming or other operations before starting seeding operations.
   2. Hydroseeding:
      a. Hydroseeding may be performed where approved and with equipment approved by the Engineer.
      b. Sow the seed over designated areas at a minimum rate of 5 pounds per 1000 square feet.
      c. Seed and fertilizing materials shall be kept thoroughly agitated in order to maintain a uniform suspension within the tank of the hydroseeder.
      d. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates.
   3. Drill Seeding:
      a. Drill seeding may be performed with approved equipment having drills not more than 2 inches apart.
      b. Sow the seed uniformly over the designated areas to a depth of l/2 inch and at a rate of 5 pounds per l,000 square feet.
   4. Broadcast Seeding:
      a. Broadcast seeding may be performed by equipment approved by the Engineer.
      b. Sow the seed uniformly over the designated areas at a rate of 5 pounds per l,000 square feet.
      c. Sow half the seed with the equipment moving in one direction and the remainder of the seed with the equipment moving at right angles to the first sowing.
      d. Cover the seed to an average depth of l/2 inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker, or other approved devices.
      e. Do not perform broadcast seeding work during windy weather.

F. Compacting:
   1. Seeded areas must be raked lightly after sowing unless seeding is to be directly followed by application of an approved mulch.
   2. Compact the entire area immediately after the seeding operations have been completed.
   3. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
   4. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
   5. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

G. Mulching for Permanent Seeding:
   1. Apply mulch at the specified rate for the given type and as specified by the "Erosion Control Guidelines" prepared by the Louisiana DOTD.
   2. Erosion Control Mix must contain some soil.
   3. Hydraulic mulches, such as paper mulch and cellulose fiber, can include seeds, fertilizer, or soil binders.

Louisiana	
Mulch Type	**Rate**
Straw	2 bales (70-90lbs)/1,000 SF
Erosion Control Mix	<3:1 Slope: 2 inches min. >3:1 Slope: 4 inches min.
Paper Mulch	5 lbs/1,000 SF
Cellulose Fiber	40 lbs/1,000 SF
Erosion Control Blankets	Per manufacturer's instructions
Wood Chips and Bark Mulch	3 inches min.

3.3 PROTECTION & MAINTENANCE

A. Protection:
   1. Protect the seeded area against traffic or other use.
   2. Erect barricades and place warning signs as needed.

B. Maintenance:
   1. At the time of the first cutting, set mower blades two inches high. All lawns shall receive at least two mowings before acceptance. Coordinate schedule for mowing with Engineer.
   2. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.
   3. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding work is completed, and shall not necessarily related to Substantial Completion of the General Contract.
   4. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding as necessary to establish a uniform stand for the specified grasses, and shall continue until Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.4 ACCEPTANCE

A. At final acceptance of the project all areas shall have a close stand of grass with no weeds present and no bare spots greater than three inches (3") in diameter over greater than five percent (5%) of the overall seeded area.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE & FITTINGS (BURIED APPLICATIONS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test ductile iron pipe and fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Standards (As Applicable):
   1. Cement-mortar lining for water: ANSI A2l.4 (AWWA C104).
   2. Rubber gasket joints: ANSI A2l.ll (AWWA C111).
   3. Ductile iron pipe thickness: ANSI A2l.50 (AWWA C150).
   4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A2l.51 (AWWA C151).
   5. Pipe flanges and fittings: ANSI Bl6.l and ANSI A21.10 (AWWA C110).
   6. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
   7. Cast and ductile iron fittings: ANSI A2l.l0 (AWWA C110).
   8. Ductile Iron Compact Fittings: ANSI 21.53 (AWWA C153).
   External zinc-based coating: ISO 8179-1.
   10. NSF 61: Drinking Water System Components – Health Effects.
   11. NSF 372: Drinking Water System Components – Lead Content
   12. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.

B. Acceptable Manufacturers:
   1. American
   2. US Pipe
   3. McWane
   4. Or equal.

1.4 SUBMITTALS

A. Submit shop drawings in accordance with the applicable section of Division 1 and the General Conditions of the Construction Contract.

B. Submit manufacturer’s “Certification of Conformance” that pipe and fittings meet or exceed the requirements of these Specifications.

C. Submit manufacturers installation instructions and specifications for all pipe and fittings.

1.5 DELIVERY, STORAGE & HANDLING

A. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

B. Protect the spherical spigot ends and the plain ends of all pipe during shipment by wood lagging securely fastened in place.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. General:

1. All exterior (buried) ductile iron pipe shall have push-on or mechanical joints unless otherwise specified or shown on the Drawings.
2. All pipe within valve pits and other structures is considered interior pipe and shall be flanged.
3. Unless otherwise shown on the Drawings or in the pipe schedule, the minimum thickness of ductile iron pipe shall be:
   a. For pipe 4 inches in diameter and smaller: Class 51.
   b. For pipe 6 inches in diameter and larger: [Class 52 (water applications)]; [Class 50 (wastewater applications)].
      Pipe with flanges: Class 53.
4. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
5. Pipe shall be double thickness cement lined and seal coated unless noted otherwise on the Drawings, and except for air piping lines which shall be completely unlined.
6. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.

B. Coatings

1. Finish layer of factory applied bituminous coatings (in accordance with AWWA C151) shall be furnished on the exterior of all underground piping unless specified otherwise.
2. Coatings shall be furnished on the exterior of all underground piping as follows unless specified otherwise.
   a. Initial layer of arc-applied, zinc metallic coating (in accordance with ISO 8179-1), having a mass of 200 g/m2. Pipe shall include the word ‘zinc’ in the pipe markings or label required by AWWA C151.
   b. Finish layer of factory applied bituminous coatings (in accordance with AWWA C151) shall be furnished on the exterior of all underground piping unless specified otherwise.
3. The outside of pipe within structures and exposed shall not be coated with bituminous coating, but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer 621 by Koppers Co.; Multiprime by PPG Industries; Chromox 13R50 Primer made by Mobil Chemical Co.; or equivalent.

C. Joints (as shown on Drawings or as specified):
   1. Push-on and Mechanical Joint:
      a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
      b. Provide gaskets manufactured from a composition material suitable for exposure to the fluid to be contained within the pipe. On high temperature applications such as air lines, the gaskets shall be suitable for service from 40*F to 250*F.
      c. Bolts and nuts for buried mechanical joints shall meet the AWWA C-111 requirements and be made of high strength, 316 stainless steel. After jointing, coat entire joint with bituminous material compatible with pipe coating unless other coating required by Section 09900.
   2. Flanged:
      a. Provide specially drilled flanges when required for connection to existing piping or special equipment.
      b. Flanges shall be long-hub screwed tightly on pipe by machine at the foundry prior to facing and drilling.
      c. Gaskets:
         i. Ring type of rubber with cloth insertion.
         ii. Thickness of gaskets l2 inches in diameter and smaller: l/l6 inch.
         iii. Thickness of gaskets larger than l2 inches in diameter: 3/32 inch.
         iv. On high temperature applications such as air lines, the gaskets shall be suitable for service from 40°F to 200°F.
      d. Fasteners:
         i. Make joints with bolt, studs with a nut on each end, or one tapped flanged with a stud and nut.
         ii. The number and size of bolts shall meet the requirements of the applicable ANSI standard.
         iii. Nuts, bolts, and studs shall be 316 stainless steel. After jointing, coat entire joint with bituminous material compatible with pipe coating unless other coating required by Section 09900.
      e. When applicable, provide and install flange clamps as shown on the Drawings.
   3. Joint Bracing:
      a. Provide joint bracing to prevent the piping from pulling apart under pressure as required and as shown on the Drawings.
      b. Types of bracing:
         i. Pipe and fittings furnished with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with bituminous paint in buried installations and shall be coated with the same coatings as the piping system in interior installations after assembly or, if necessary, prior to assembly.

ii. Mechanical joint follower gland pipe restrainers.
(1) Ductile iron gland and restraining ring.
(2) Gasket shall be standard MJ gasket -ANSI/AWWA-C111/A21.11.
(3) Working pressure 350 psi, up to 8 inches; 250 psi, 10 inches to 16 inches.
(4) Test pressure two times working pressure.
(5) Grip Rings™, Romac Industries, or other equivalent as approved by Engineer.

iii. Other types of bracing as shown on the Drawings.

2.2 FITTINGS

A. Standard Fittings:
1. Pressure rating of 350 psi for D.I. compact fittings and 250 psi for all others unless indicated otherwise on the Drawings or as specified.
2. Joints the same as the pipe with which they are used or as shown on the Drawings.
3. Cement lining and seal coat as specified for pipe.
4. Factory applied bituminous coatings shall be furnished for all underground fittings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerances for pipe clearances.
D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. General:
1. Install in strict accordance with the pipe and fitting manufacturer's instructions and recommendations and as specified or as shown on the Drawings.
2. Concrete thrust blocks or other acceptable thrust resistant systems are required to be provided and installed at all valves and fittings on pressure pipe. Where thrust blocks are used, these shall be placed against undisturbed soil or screened gravel compacted to 95 percent and shall be placed so that the joints are accessible for repairs.
3. Provide and install thrust restraint at each pipe joint, as necessary to meet the thrust restraint requirements per Drawings and manufacturer recommendations, whichever provide the larger thrust requirements.

B. Assembling Joints:
   1. Push-on Joints:
      a. Insert the gasket into the groove of the bell.
      b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
      c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
   2. Bolted Joints:
      a. Remove rust preventive coatings from machined surfaces prior to assembly.
      b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
      c. After jointing coat all bolts with bituminous material compatible with the pipe coating required herein and/or in Section 09900.
   3. Flanged Joints:
      a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
      b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.
   4. Mechanical Joints:
      a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
      b. Lubricate the gasket, bell, and spigot by washing with soapy water.
      c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
      d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
      e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
      f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
         i. Range or Torque: 60-90 ft.-lbs.
         ii. Length of Wrench: l0 inches.
      g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.
   5. Bell and Spigot Joints:
      a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
      b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

C. Fabrication:
   1. Tapped Connections:
      a. Make all tapped connections as shown on the Drawings or as required by the Engineer.
      b. Make all connections watertight and of adequate strength to prevent pullout.
      c. Drill and tap normal to the longitudinal axis of the pipe.
      d. Taps in fittings shall be located where indicated by the manufacturer for that particular type of fitting.
      e. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANS A2l.51 based on 2 full threads for ductile iron and 3 full threads for cast iron.
   2. Cutting:
      a. Perform all cutting as set forth in AWWA C600.
      b. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

D. Pipe Deflection:
   1. Push-on and Mechanical Joints:
      a. The maximum permissible deflection of alignment at joints shall be limited to that given in AWWA C600.
   2. Flexible Joints:
      a. The maximum deflection in any direction shall not exceed the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. This work shall consist of providing and installing utility line markings above all buried lines installed as part of this contract and replacing existing markings disturbed as part of this contract. Buried utilities are indicated on the Civil and Electrical Drawings.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with the applicable section of Division 1 and the General Conditions of the Construction Contract.

B. Submit manufacturer's "Certification of Conformance" that utility markings meet or exceed the requirements of these Specifications.

C. Submit manufacturers specifications for utility markings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.

B. Marking tape color shall be in accordance with latest American Public Works Association (APWA) Uniform Color Code and American National Standards Institute ANSI Standard Z535.1, Safety Color Code specifications for buried utility marking as noted in the Schedule below.

1. Schedule

Marker Color	Buried Utility
Blue	Potable Water &Associated lines
Green	Sanitary Sewers, Storm Drain and other Drain lines
Orange	Telecommunication, signal, alarm
Purple	Reclaimed, Recycled, Irrigation Water and Slurry Lines
Red	Electric Power lines cables conduits and lighting cables
Yellow	Gas, Oil, Steam, Petroleum or Gaseous Material Lines

2. Warning Information shall be in Black Letters with typical wording of:
   a. "CAUTION: BURIED (NAME OF UTILITY LINE) BELOW"

C. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly

marking type of buried utility.

D. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.

E. Seton Identification Products, New Haven, CT, Utility Safeguard LLC or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.

B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

SECTION 02655

COUPLINGS & CONNECTORS FOR BURIED APPLICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install couplings and connectors of the type and size in the location shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 QUALITY ASSURANCE

A. Minimum pressure rating equal to that of the pipeline in which they are to be installed.

B. Couplings and connectors, other than those specified herein, are subject to the Engineer's approval. Acceptable Manufacturers:
   1. Romac Industries
   2. Krausz
   3. Smith Blair
   4. Ford Meter Box Company
   5. Or Equal

C. Reference Standards:
   1. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
   2. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
   3. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
   4. AWWA C153 – Ductile-Iron Compact Fittings
   5. AWWA C213 – Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
   6. AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe
   7. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.

1.4 SUBMITTALS

A. Submit shop drawings in accordance with the applicable section of Division 1 and the General Conditions of the Construction Contract.

B. Submit manufacturers product data and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All Couplings and Connectors:
   1. Gasket Materials: Composition suitable for exposure to the liquids to be contained within the pipes.
   2. Diameters to properly fit the specific types of pipes on which couplings and connectors are to be installed.

B. Sleeve Type Transition Couplings (for 4 – 12” pipe size)
   1. Buried Non-Restrained Couplings:
      a. Two top facing bolt design
      b. Fusion bonded epoxy ductile iron center sleeve, end rings and bolt guides. Ductile iron meeting or exceeding ASTM A536, Grade 65-45-12.
      c. Two wedge-section EPDM or NBR rubber gaskets compounded for water service. NSF-61 certified for potable water service.
      d. Ductile iron heat treated grippers, 304 stainless steel draw hooks, and reinforced nylon ramp runners.
      e. Nuts and bolts shall be 304 Stainless Steel with rolled thread and anti-galling compound.
      f. Couplings shall be long barrel type.
      g. Coupling shall be fusion bonded epoxy coated meeting AWWA C213 and NSF-61 standards for potable water applications.
      h. Acceptable Manufacturers:
         i. Romac Industries – Macro HP™
         ii. Krausz – Hymax® 2
         iii. Smith Blair – Model 421
         iv. Or Equal
   2. Buried Restrained Couplings:
      a. Two top facing bolt design
      b. Fusion bonded epoxy steel or ductile iron center sleeve and end rings.
      c. Two wedge-section EPDM or NBR rubber gaskets compounded for water service and NSF-61 certified.
      d. 304 Stainless Steel bridge or Armor over gasket in expansion zone.
      e. Nuts and bolts shall be 304 Stainless Steel with rolled thread and anti-galling compound.
      f. Couplings shall be long barrel type.
      g. Coupling shall be fusion bonded epoxy coated meeting AWWA C213 and NSF-61 standards for potable water applications
      h. Acceptable Manufacturers:
         i. Romac Industries – Alpha™
         ii. Krausz – Hymax Grip
         iii. Smith Blair – Pipe Lock Coupling
         iv. Or Equal

C. Solid Sleeve Couplings
   1. Solid sleeves shall be ductile iron with mechanical joint ends.
   2. Couplings shall meet AWWA/ANSI C-153/A21.53 and C-111/A21.11 for joints, and C-104/A21.4 for cement lining in sizes 3"-24".

3. Nuts and bolts shall be ductile iron low alloy steel per ANSI/AWWA A21.11/C-111.
4. Acceptable Manufacturers:
    a. Romac – Model 501
    b. Smith Blair – Model 441.
    c. Ford – Model FC1 or FC2A
    d. Or Equal

D. Flexible Couplings for drain connections (Fernco or equal)
1. Rubber material with stainless steel clamps
2. Must provide a positive seal against infiltration and exfiltration
3. Coupling materials must conform to applicable portions of ASTM C443 (Concrete), C564 (Cast Iron), D1869 (A.C.), D5926 (PVC), C1173 (transition) and CSA B602.

E. Mechanical Joint Adaptors (Foster Adaptor® – Infact Corporation)
1. Required to connect fittings and valves with mechanical joints
2. Ductile iron construction mechanical joint bolt pattern.
3. Bolts and nuts shall meet AWWA C-111.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Sleeve Type Couplings:
1. Thoroughly clean pipe ends a minimum of 12-inches from the ends prior to installing couplings and use soapy water as a gasket lubricant.
2. Slip an end ring and gasket over each pipe and place the center sleeve centered over the joint.
3. Insert the other pipe length into the center sleeve the proper distance.
4. Press the gaskets and end rings evenly and firmly into the center sleeve flares.
5. For two-bolt systems, insert or tighten the bolts, finger tighten and progressively tighten nuts on the top of the coupling with a torque wrench applying the torque recommended by the manufacturer. For multiple bolt systems, insert or tighten the bolts, finger tighten and progressively tighten diametrically opposite nuts around the coupling with a torque wrench applying the torque recommended by the manufacturer.
6. Insert and tighten the tapered threaded lock pins as needed.

B. Install thrust rods, supports, and other provisions to properly support pipe weight and axial equipment loads.

END OF SECTION

SECTION 02661

COFFERDAM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Furnish, install and maintain temporary cofferdam system and bulkhead systems as necessary to complete the work. The Contractor may use either sandbags, concrete barriers, steel plates, water bags, pre-engineered cofferdam or some other form for the cofferdam construction with the STP effluent channel.

B. Related Work Specified Elsewhere: (When Applicable)
   1. Maintain existing work is specified in Section 01010A
   2. Temporary Facilities is specified in Section 01500.
   3. Temporary Bypass Pumping Faciliteis is specified in Section 01515.
   4. Demolition work is Specified in Section 02050A.

1.2 SUBMITTALS

A. Provide submittals in accordance with Specification Section 01340.

B. The Contractor shall be responsible for the design, installation, maintaining, and removal of the cofferdam and bulkhead systems. The Contractor shall submit design calculations, description and complete layout drawings of the proposed dewatering, temporary facilities and cofferdam and bulkhead systems. Such review shall not relieve the Contractor of sole responsibility for a cofferdam and backup bulkhead systems as necessary to prevent damage to adjacent structures, utilities, adjacent to excavations and for the safety of people working within the excavated areas or effluent channel.

C. The Contractor shall be responsible for reviewing all permits and requirements associated with the project.

D. A Pre-Cofferdam Installation Meeting with the STP Operator, Owner and Engineer will be held 30 calenda days prior to commencement of any work within the effluent channel.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used in cofferdam and bulkhead systems construction may be of a type suitable for the design requirements and for the particular cofferdam being constructed, subject to the Engineer’s approval.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. All materials shall be protected during handling, installation and removal to prevent damage.

3.2 EXAMINATION

A. Contractor shall examine the area where the temporary cofferdam and bulkhead systems will be installed, including field verifying the existing dimensions of the effluent channel, verify existing utilities (pipe, conduit), water levels, to receive temporary cofferdam and notify the Engineer immediately of conditions that would adversely affect installation or removal.

3.3 INSTALLATION AND REMOVAL

A. The Pre-Engineered Cofferdam and bulkhead systems shall be installed and removed per Manufacturer's instructions.
B. The Contractor shall allow for inspection and acceptance of work by the STP Operator and Engineer prior to re-watering the enclosed area.
C. Contractor shall be responsible returning the effluent channel to pre-existing grade conditions at no additional cost to the Owner.

END OF SECTION

SECTION 03010

CONCRETE MODIFICATIONS AND REPAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Modifications and Repairs

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI SPEC-301 – Specifications for Concrete Construction
B. ASTM C920 – Standard Specification for Elastomeric Joint Sealants

1.4 SUBMITTALS

A. Submit product data and Safety Data Sheets for repair materials. Indicate the intended use and locations for all products.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 except as modified herein.
B. All repair materials shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) Compliance.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Grout Paint: 1 part portland cement, 1 part fine sand, and water for the consistency of thick paint.
B. Patching Mortar: 1 part of a mixture of white and grey Type II portland cement to 2.5 parts of damp loose sand. Cement type to match substrate.
C. Bonding Agent:
    1. For concrete - as specified in Section 03150.
    2. For repair mortar – bonding agent shall also serve as anti-corrosion coating for exposed steel reinforcement, and shall be as recommended by the manufacturer for compatibility with the repair material (also specified herein):
        a. Armatec 110 EpoCem by Sika Corporation
        b. Duralprep A.C. by Euclid Chemical Co.
        c. MasterProtect P 8100 AP by Master Builders
D. Repair of random cracks (dry – free of liquid or moisture):
    1. 2-component, 100% solids, moisture-tolerant, low-viscosity, high-strength, multipurpose, epoxy resin adhesive.
    2. Acceptable products:
        a. Sikadur 35 Hi-Mod LV by Sika Corporation
        b. Eucopoxy Injection Resin by Euclid Chemical Co.

c. MasterInject 1380 by Master Builders
d. Or equivalent

E. Repair of random cracks (wet - presence of liquid or moisture):
1. Low viscosity polyurethane resin that expands and forms a closed cell foam when it comes in contact with water.
2. All cracks that are wet (either damp or leaking) at the time of repair shall be repaired with a material that is specifically intended for wet repair as recommended by the manufacturer.
3. Acceptable products:
a. SikaFix HH Hydrophilic by Sika Corporation
b. Dural Aqua-Fil by Euclid Chemical Co.
c. SikaFix HH LV
d. MasterRoc MP 351 LV by Master Builders
e. Flex SLV PURe and Cut PURe by de Neef
f. Or equivalent

F. Repair of excessive cracking:
1. Two component, 100% solids, moisture-tolerant, epoxy or urethane crack healer / penetrating sealer
2. Acceptable products:
a. Sikadur 55 SLV by Sika Corporation
b. Euco Qwikstitch by Euclid Chemical Co.
c. MasterSeal 370 by Master Builders
d. Or equivalent

G. Repair of spalls, honeycombs areas and air voids and cementitious overlays:
1. Polymer modified, non-sag cementitious repair mortar with corrosion inhibitor.
2. Repair material shall include peastone for repairs of greater depth as required by the manufacturer. For repair areas involving depths generally in excess of three (3) inches, utilize a repair material suitable for the depth of repair.
3. Acceptable products:
a. SikaTop 122 Plus or 123 Plus by Sika Corporation
b. Duraltop Gel by Euclid Chemical Co.
c. MasterEmaco N 400 by Master Builders
d. Or equivalent

H. All repair materials shall be installed in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.1 FINISH

A. Repair and properly cure all defects, and match finish of surrounding concrete.
B. Clean all exposed concrete surfaces and adjoining work stained by leakage of repair materials.

3.2 CURING

A. Curing shall be in accordance with Section 03390.

3.3 HOT WEATHER:

A. Repairs during hot weather shall be in accordance with Section 03341.
B. Protect repairs from plastic shrinkage cracking and rapid evaporation of water.
C. Shade from direct sun and protect from wind.

3.4 REPAIRS TO CONCRETE (GENERAL)

A. Definitions:
   1. Honeycombed areas: Areas where voids are left in the concrete due to inadequate vibration and consolidation resulting in a failure of the mortar to effectively fill the spaces among coarse aggregate particles.
   2. Spalls: Concrete that has chipped, flaked, scaled or broken off from the surface of the concrete.
   3. Surface Defects: Those defects that affect the appearance of the finished concrete but do not affect the structural integrity.
   4. Structural Defects: Those defects that affect the appearance of the finished concrete and the structural integrity.
B. Surface Defects include, but are not limited to:
   1. Form tie holes
   2. Air voids (bugholes) larger than those specified for the required surface finish
   3. Honeycomb areas with a depth less than 1 inch
   4. Blisters
   5. Delaminations
   6. Crusting
   7. Visible construction joints, fins and burs
   8. Non-uniform concrete color and appearance
   9. Floors that are not level
C. Structural Defects include, but are not limited to:
   1. Random cracks
   2. Excessive cracking (crazing)
   3. Spalls
   4. Air voids (bugholes) and honeycombed areas with a depth greater than or equal to 1 inch
D. All repairs to newly placed concrete shall be at no additional cost to the Owner.
E. All repairs shall be in accordance with the repair material manufacturer's recommendations.

3.5 REPAIR OF SURFACE DEFECTS

A. As soon as the forms have been stripped and the vertical concrete surfaces exposed or concrete slabs have been finished and cured, repair all surface defects. All concrete repair work shall result in a concrete surface of uniform color and texture and shall be free of all irregularities.
B. Form Tie Holes: After cleaned and thoroughly dampened, apply grout paint and fill holes solid with patching mortar. For taper tie system as specified in Section 03300, upon completion of tightness testing of structure (as applicable), the holes are to be fully packed with a cementitious crystalline waterproofing grout struck flush at both wall faces.

C. Air voids (bugholes): After cleaned and thoroughly dampened, apply grout paint and fill holes solid with patching mortar.

D. Honeycomb areas:
   1. All honeycombed areas shall be removed to sound concrete by means of hand chisels or pneumatic chipping hammers or hydrodemolition.
   2. Saw cut a 1/2-inch minimum square groove around the edges of the defective area perpendicular to the surfaces to serve as the boundary for concrete removal. Saw cut the edges perpendicular to the surface. No feather edges shall be allowed.
   3. Remove all loose aggregate paste and debris and scrub clean. Thoroughly wet area to be repaired. Brush and scrub grout paint into the substrate of the area to be repaired.
   4. Mix patching mortar using as little water as possible. Allow to stand with frequent manipulation of trowel to achieve stiffest consistency. Blend white and gray portland cement to achieve color match with surrounding concrete.
   5. Prior to the set of grout paint (but after it has cast its water sheen), apply a stiff consistency of patching mortar to the area with a trowel. Leave patched surface slightly higher than surrounding surface. Do not finish for 1 hour minimum. Cure in same manner as adjacent concrete.

E. Blisters, delaminations and crusting: Repairs shall be similar to those for honeycomb areas. Depth of saw cut shall match the depth of the defective concrete.

F. Visible construction joints, fins and burrs: Remove by grinding until a smooth uniform surface is attained.

G. Concrete with an overall non-uniform color or appearance as determined by the Engineer shall be repaired with a complete cementitious overlay. Application of the overlay shall be in strict accordance with the manufacturer's written instructions and recommendations.

H. Finished Flatwork exceeding specified tolerances:
   1. High areas shall be repaired by grinding after the concrete has cured 14 days.
   2. Low areas shall be repaired by adding appropriate overlay material. Grind concrete if required to provide minimum overlay thickness as required by the manufacturer. Finish repair area to match adjacent concrete.

3.6 REPAIR OF STRUCTURAL DEFECTS

A. Remove and replace or repair all structural defects in newly placed concrete.

B. Repair all structural defects in existing concrete that are identified by the Engineer during construction. These repairs are identified either on the Structural Drawings or in the Bid Form.

C. Unless otherwise indicated, all concrete defects shall be repaired in accordance with the specific repair material manufacturer's recommendations.

D. Random cracks:
   1. Cleaning of cracks:
      a. Dry cracks: Crack or void must be dry at time of application. Remove all dust, debris or disintegrated material from cracks or voids by the use of oil-free compressed air or vacuuming. Cracks saturated with oil or grease must be chipped out to unsaturated concrete. "Vee" out cracks in horizontal surfaces slightly.

b. Wet cracks: Clean the crack surface so that the crack can be located. If the crack is wide or flowing water is encountered, seal the surface of the crack with a surface sealing material as recommended by the manufacturer.

2. Where cracks extend through horizontal members and are accessible, seal bottom of crack which is to receive the specified repair material.
3. Patching of vertical wall or overhead cracks shall be accomplished in the same manner using a similar material of higher viscosity as recommended by the manufacturer.
4. Apply specified repair material in strict accordance with manufacturer's recommendations.

E. Excessive cracking (Crazing):
1. Floor slabs containing an excessive number of cracks as defined herein, and which will remain exposed, shall receive topping after sealing of cracks in accordance with the above paragraph.
2. Excessive cracking shall be defined as areas containing cracks averaging 1/64th-inch wide or greater, and in excess of 15 linear feet of cracks per 100 square feet of slab. In the event that excessive cracking occurs in isolated areas of a given floor, topping shall only be applied in the area of the cracks bounded by construction, expansion, or control joints.
3. Apply specified repair material in strict accordance with manufacturer's recommendations.

F. Spalls and honeycomb areas:
1. Saw cut a 1/2-inch minimum deep groove around the edges of the defective area to serve as the boundary for concrete removal. Provide regular boundaries without numerous jogs. Saw cut the edges perpendicular, or slightly undercut, to the surface. No feather edges shall be allowed.
2. All weakened, damaged, disintegrated, and unsound concrete shall be removed to sound concrete substrate by means of hand chisels, pneumatic chipping hammers, or hydrodemolition. Pneumatic chipping hammers shall not exceed 15 pounds due to resulting substrate bruising, unless followed by abrasive or high pressure (15 ksi minimum) water blasting.
3. If defective areas extend to reinforcement, chip out concrete to provide a clear space of at least 3/4 inch, and not less than ¼ inch plus the repair mortar maximum aggregate size, all around the bar. Remove concrete along the bar to the point where the bar is fully bonded to the surrounding concrete and without loose corrosion products. Notify the Engineer if excessively corroded reinforcement is encountered so it can be evaluated. This includes 1/8 inch or greater loss of the original bar diameter after removal of corrosion.
4. Exposed reinforcement shall be cleaned to bare metal by wire brushing or abrasive blasting.
5. Fully coat all surfaces of reinforcement with bonding/anti-corrosion agent specified herein.
6. Prepare and fully coat concrete substrate with specified bonding agent as recommended by manufacturer.
7. Apply specified repair material in strict accordance with manufacturer's recommendations.

3.7 MODIFICATIONS TO EXISTING CONCRETE

A. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, temporary bracing and shoring and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work and to prevent damage to the structures or contents by falling or flying debris.

B. Remove concrete to the depths shown or required. Except for the removal of concrete from around reinforcement to remain, the use of heavy-duty pneumatic hammers to remove concrete is not permitted. Line drilling or saw cutting is required.

C. Use of scabblers, scarifiers, bush hammers, or pneumatic hammers greater than 15 pounds is not permitted due to resulting substrate bruising, except if followed by steel shot-blasting, abrasive blasting, or high-pressure (minimum 15,000 psi) water-jetting.

D. Surfaces must be clean and sound. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, and disintegrated materials. Clean surface of all contamination and debris, and roughen by steel shot-blasting, abrasive (sand) blasting, or high pressure (minimum 15,000 psi) water-jetting (hydrodemolition).

E. Exposed reinforcement shall be cleaned by wire brushing, steel shot blasting, or abrasive sand blasting. Reinforcement shall be cut or bent as shown on the Drawings. Additional reinforcement shall be provided as shown on the Drawings.

F. Prepare and fully coat concrete substrate with specified bonding agent as recommended by manufacturer.

G. As indicated, install concrete repairs or specified repair material in strict accordance with manufacturer's recommendations.

3.8 CORING OF HOLES

A. Core drill holes only where shown. Prior to coring holes in existing concrete, Contractor shall coordinate with the Owner and Engineer to determine the location of existing utilities in the concrete.

B. Coring shall be performed with a non-impact rotary tool with diamond core drills, size shall be suitable for pipe conduit, sleeves or mechanical seals to be installed. Protect all existing equipment, utilities and critical areas against water or other damage caused by the drilling operation.

C. No additional structural members shall be cut without review by the Engineer with no exceptions taken.

D. Apply epoxy paint (5 mils DFT minimum) to exposed reinforcing cut during coring that will not be covered with new concrete or repair material.

3.9 CUTTING

A. Prior to cutting existing concrete, Contractor shall coordinate with the Owner and Engineer to determine the location of existing utilities in the concrete.

B. Cutting shall be done with a concrete saw and diamond saw blades of proper size.

C. Provide for control of slurry generated by sawing operation on both sides of wall.

D. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure.

E. New openings in existing concrete shall be overcut and formed as follows:

1. The opening size removed shall be a minimum 6" greater on each side, unless otherwise indicated on the Drawings.
2. The concrete shall be saw cut to the limits indicated.
3. While removing the concrete, either:
   a. Maintain the existing reinforcing steel such that it extends 2" beyond the cut.
   b. Cut the existing reinforcing steel flush with the cut concrete. Prior to placing the new concrete to form the new openings, drill and adhere reinforcing steel dowels into the existing concrete with high strength epoxy as indicated on the drawings.
4. Apply specified bonding agent to the cut concrete surface. Apply surface applied waterstop if indicated on the Drawings
5. Add additional reinforcing steel and place new concrete to form the new opening as indicated.

END OF SECTION

4. Apply specified bonding agent to the cut concrete surface. Apply surface applied waterstop if indicated on the Drawings
5. Add additional reinforcing steel and place new concrete to form the new opening as indicated.

END OF SECTION

SECTION 03100

CONCRETE FORMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete forming

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 PRODUCTS INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A.	Anchor Rods	Section 05120 – Structural Steel
B.	Anchor Rods	Section 05500 – Metal Fabrications
C.	Anchor Rods furnished under other sections including equipment, etc.	
D.	Embedded Angles	Section 05500 - Metal Fabrications
E.	Pipe Sleeves and Castings	Division 15

1.4 REFERENCES

A. ACI SPEC-117 – Specifications for Tolerances for Concrete Construction and Materials

B. ACI SPEC-301 - Specifications for Concrete Construction

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 and ACI SPEC-117 as modified herein.

1.6 SUBMITTALS

A. Submit product data and Safety Data Sheets for form release agent.

B. Submit product data for form ties.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Undamaged smooth form facing materials such as plywood, hardboard, metal and plastic that will produce a smooth form finish with fins and offsets not exceeding 1/8 inch. Surfaces shall be clean, free of scratches, marring, and discolorations. The Engineer may reject formwork the Engineer deems to be unacceptable or that may produce concrete that will not meet the specified requirements including surface finish.

B. Steel: Minimum 16 ga. sheet, well matched, tight fitting, stiffened to resist loads without excess deflection.

C. Aluminum: Forms with unoxidized surfaces shall be pretreated with a calcium hydroxide and water paste followed by repeated water rinsing until hydrogen bubbles no longer form.

D. Chamfer Corners: Chamfer, Wood Strip Type; ¾" x ¾" minimum, maximum possible length.
E. Form Ties:
   1. Liquid retaining structures and backfilled walls of below grade spaces:
      a. Factory fabricated adjustable length assembly providing a minimum 1.5 inch break back dimension with minimum 1 inch diameter tapered plastic cones on both sides of the wall to leave a uniform hole for patching. All ties require a tightly fitted waterstop washer at the midpoint.
      b. Factory fabricated adjustable length tapered assembly that is removed from the wall, and the hole plugged with an EPDM plug insert that is mechanically tightened with a stainless steel bolt. Upon completion of tightness testing of structure (as applicable), the holes are to be fully packed with a cementitious crystalline waterproofing grout struck flush at both wall faces. Similar systems that use plug inserts that don't include a bolt for mechanically tightening are not permitted.
   2. Non-liquid retaining structures: Snap-off type, adjustable lengths designed to break back at least 1 inch from finished surface or ties as indicated above.
F. Form release agent: Non-staining colorless, compatible with finishes.
   1. StarSeal EF Bio-Release by Vexcon
   2. Q-2 Form Release by Unitex
   3. Seacord RA II by Concord Chemical

2.2 STORAGE OF MATERIALS

A. Protect materials from ground and the elements.
B. Remove defective materials, as determined by the Engineer, from site immediately. Do not store on site.

PART 3 - EXECUTION

3.1 FORMWORK

A. Conform to ACI SPEC-301.
B. Verify lines, level, and measurements before proceeding.
C. Erect plumb and straight. Maintain rigid. Brace sufficiently.
D. Allow no concrete leakage. Provide continuous, straight, smooth formed surfaces.
E. Treat forms with form release agent prior to erecting forms. Remove all traces from formed construction joints prior to subsequent concrete placement. Protect reinforcement from contact with form release agent. Form release agent that contacts reinforcement shall be thoroughly removed.
F. Earth forms not permitted for below grade walls, slabs and footings.
G. Camber formwork as necessary.
H. Provide removable wall panels to allow cleaning and inspection.
I. Plugs for tapered form-tie holes:
   1. Installation procedures shall strictly follow all manufacturer's recommendations.
   2. After removal of tapered tie, thoroughly brush out tapered hole as recommended by the manufacturer with a brush provided by the manufacturer.

3. Insert plug from wide end of tapered hole until it is seated and with its tightening nut facing the wide end of tapered hole.
4. Attach socket to nut with extension from the wide end of the tapered hole, and fully tighten with a manual ratchet wrench to ensure that achievement of full tightening is detected by installer.

J. Except where covered by backfill, chamfer all outside corners and edges 0.75 inch unless otherwise noted.

K. Clean out inside of forms of all foreign materials prior to concrete placement.

L. Maintain specified clear cover to reinforcement.

M. Maintain specified tolerances.

N. Maintain forms and shores supporting the cast concrete for the minimum time periods indicated below:
   1. Walls and Vertical Surfaces:
      a. Walls containing liquids (subjected to internal hydrostatic pressure) and backfilled walls of interior spaces - 48 Hours
      b. All other walls – 36 hours
      c. Forms may be unlocked after 24 hours but shall remain in place for the indicated time periods
   2. Elevated Beams and Slabs :
      a. “Clear span” of slabs shall be the shorter span of a slab panel.
      b. Clear spans less than 10 feet – 4 days
      c. Clear spans between 10 feet and 20 feet – 7 days
      d. Clear spans greater than 20 feet – 14 days
   3. Time periods listed above represent cumulative number of days or hours during which the temperature of the air surrounding the concrete is above 50°F and the concrete has been damp and no loss of moisture has occurred.
   4. Alternate form removal periods:
      a. Alternately to the stripping times specified above, additional concrete cylinders may be made of representative concrete, field-cured, and tested at no additional cost to the Owner.
      b. The supporting forms and shores may be removed when the concrete strength of the field-cured cylinders, as tested per ASTM C39/C39M is a minimum of 70 percent of the specified design strength.
      c. General Contractor shall notify the Engineer 24 hours in advance of casting the field-cured cylinders.
      d. Field-cured cylinders - where noted on the plans and/or when used by the Contractor, specimens shall be field-cured in accordance with ASTM C31/C31M under conditions that are not more favorable than the most unfavorable conditions for the portions of the concrete that the test specimens represent.

O. Reshore as required.

P. Form pressures increase with the use of concrete with High Range Water Reducers. Design forms accordingly.

Q. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material is not acceptable. Apply new form release agent as specified for new formwork.

R. Hold PVC waterstop rigid with split bulkhead forms at all joints.
S. Standing water shall be removed from all forms and excavations.
T. The accumulation of concrete on the forms above the level of placement shall be avoided. The splashing of concrete upon formwork that is set for a subsequent concrete placement shall be prevented due to the resulting marks on the finished concrete.

3.2 TOLERANCES

A. Tolerances shall conform to all requirements of ACI SPEC-117.

3.3 PROTECTION

A. Setting of forms upon slabs on ground shall not commence until a minimum of 3-days after placement, and 5-days when gang forms are used. Placement of concrete walls upon slabs on ground shall not commence until after the 7-day curing period.

3.4 DEFICIENT CONCRETE

A. Concrete work will be considered deficient if it does not conform to the requirements of this section and the location, elevation, dimension, shape, alignments, and/or appearance as required in the Contract Documents. Specific examples of deficient concrete include (but are not limited to):
   1. Concrete members cast in the wrong location.
   2. Concrete which differs from the required dimensions.
   3. Formed surfaces that don't comply with specified dimensional tolerances. If the Engineer permits the Contractor to correct the error, it shall be in such a manner as to maintain the strength, function and appearance of the structure.
   4. Concrete with defects that adversely affect the appearance of the specified finish shall be repaired. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete may be rejected by the Engineer. Examples include:
      a. Non-uniform appearance including texture and color
      b. Excessive visible repairs of structural defects

B. Deficient concrete may be subject to rejection and replacement at no additional cost to the Owner if the Engineer deems necessary.

END OF SECTION

SECTION 03150

CONCRETE ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete accessories, including, but not necessarily limited to:
   1. Waterstops
   2. Bonding agents
   3. Bond breaker

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI SPEC-117 – Specifications for Tolerances for Concrete Construction and Materials
B. ACI SPEC-301 - Specifications for Concrete Construction
C. ASTM A48/A48M – Standard Specification for Gray Iron Castings
D. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
E. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
F. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstops

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 and ACI SPEC-117 as modified herein.

1.5 SUBMITTALS

A. Submit layout drawings showing the location and extent of all waterstops, the type and size of all waterstops to be used and splice type, details, and locations for each joint. Submit these layout drawings for review prior to the submittal of the reinforcement shop drawings and the start of concrete work.
B. Submit product data and Safety Data Sheets for concrete accessories.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. PVC Waterstops:
   1. PVC waterstops shall meet COE CRD-C 572 except:
      a. Tensile strength shall exceed 2,000 psi;
      b. Minimum ultimate elongation shall be 300 percent; and

c. Shall be extruded virgin polyvinylchloride with no scrap, reclaimed material, or pigment, and
d. Shall be either the flat ribbed type or wire reinforced flat ribbed type

2. Flat Ribbed Type Waterstop:
a. Construction and Contraction Joints *:* 3/8-inch thick by 6 inches wide. Type R638 by Vinylex Corporation, Style 679 by Sika Greenstreak, Type FR-6380 by Paul Murphy Plastics Company or equivalent.
b. Containment curbs: 3/16 inch by 4 inches wide. Type R4-316T by Vinylex Corporation, Style 781 by Sika Greenstreak, Type FR-4316 by Paul Murphy Plastics Company, or equivalent.
c. Expansion Joints: 3/8-inch thick by 9 inches wide with a center bulb. Type RLB938 by Vinylex Corporation, Type 696 by Greenstreak Plastics Products, Type CR-9380 by Paul Murphy Plastics Company or equivalent.

B. Surface applied waterstops (hydrophilic rubber type):
1. Hydrotite CJ-1020-2K-ADH by Sika Greenstreak
2. De Neef Swellseal Joint by GCP Applied Technologies
3. Adeka Ultra Seal MC 2010
4. Or equivalent

C. Waterstop Caulk (single component polyurethane water-swelling sealant):
1. Leakmaster LVZ by Sika Greenstreak
2. De Neef Swellseal WA by GCP Applied Technologies
3. Adeka Ultraseal P-201
4. Or equivalent

D. Epoxy bonding agent:
1. Two or three-part water-based epoxy
2. Acceptable products:
a. Armatec 110 EpoCem by Sika Corporation
b. Duralprep A.C. by Euclid Chemical Company
c. Epobond by Laticrete/L&M Construction Chemicals, Inc.
d. MasterProtect P 8100 AP by Master Builders
e. or equivalent.

E. Cementitious or latex bonding agent:
1. Cementitious, grout paint: 1 part portland cement, 1 part fine sand, water for consistency of thick paint.
2. Latex bonding agent:
a. Minimum 48-hour open time.
b. Full performance achieved with concrete applied while agent is tacky or after it has dried, without requiring rewetting.
c. Eucoweld 2.0 by Euclid Chemical.

F. Bond Breaker: Thompson's Water Seal or equivalent, or form release agent (as specified in Section 03100).

2.2 STORAGE OF MATERIALS

A. Protect materials from ground and the elements.
B. Store embedded items on skids.
C. Store PVC waterstops in a location that is protected from sunlight, precipitation,

soiling, etc. Keep surface applied waterstops dry.

D. Remove defective materials, as determined by the Engineer, from site immediately. Do not store on site.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Contractor shall coordinate the installation and securing of all embedded accessories.

B. All embedded accessories shall be secured prior to concrete placement. Embedded accessories shall not be placed during or after concrete placement.

3.2 WATERSTOPS

A. Waterstops shall be continuous throughout and around all corners and intersections. For PVC waterstops, use factory fabricated intersections such as corners, tees, and crosses. Bending waterstop around corners will not be acceptable except with Engineer's written approval only if the waterstop can be positioned with a minimum of 3" side clearance to all reinforcement.

B. PVC waterstop splices in the field shall be straight butt type. Splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at 380°F in accordance with the manufacturer's recommendations. Unacceptable field splices include the following:

1. Tensile strength less than 80% of the parent section.
2. Misalignment of centerbulbs and ribs more than 1/16 inch, or that reduces cross section by more than 15%.
3. Visible porosity, bubbles, or inadequate bonding. If while prodding the joint with a penknife the knife breaks through the outer portion of the weld into a bubble.
4. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle, including bond failure greater than 1/16-inch depth.
5. Combined misalignment and bond failure with net cross section reduction of more than 15%.
6. Charred or burnt material.
7. Edge welded tee intersections.

C. All waterstops shall have 2 inches of concrete cover where designated to terminate.

D. Center PVC waterstop in joint and secure in correct position with hog rings or grommets spaced 12 inches apart along both edges of waterstop and wired to adjacent reinforcement prior to concrete placement.

E. Pressure wash or otherwise clean PVC waterstop of all dried concrete splatter from previous concrete placements.

F. Hold PVC waterstop rigid with split bulkhead forms at all joints.

G. Installation of surface applied waterstops:

1. Surfaces to receive surface-applied waterstop shall be cleaned of all debris.
2. Apply primer in accordance with manufacturer's recommendations and install surface-applied waterstop.
3. Surface applied waterstops shall be positioned such that the concrete edge distance on each side of the waterstop is equal to or exceeds the manufacturer's minimum requirements.

4. Protect waterstop from submerged or extended contact with water prior to concrete placement.
5. Hydrophilic rubber waterstops are to be applied using integral adhesive backing or held in place with concrete nails. For areas that can be kept dry prior to concrete placement, hydrophilic rubber waterstops can be pressed into a continuous bead of waterstop caulk.

H. Waterstop caulk shall be applied in a minimum 3/8" diameter continuous bead to cleaned concrete surface in accordance with the manufacturer's recommendations. Protect from contact with water.

I. Place concrete uniformly to avoid displacing waterstop.

J. Thoroughly vibrate concrete around waterstop to avoid honeycombing and voids in concrete and to insure complete contact between waterstop and concrete.

3.3 JOINTS

A. Install PVC waterstops in joints in all liquid containing structures and below grade walls adjacent to interior spaces, unless otherwise shown on the Drawings. The waterstop shall extend the entire length of the joint and shall be positioned across the center of the joint.

B. Install PVC waterstops in all joints at containment curbs unless otherwise shown on the Drawings.

3.4 TOLERANCES

A. Tolerances shall conform to all requirements of ACI SPEC-117.

END OF SECTION

SECTION 03155

CONCRETE POST-INSTALLED ANCHORS AND REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Epoxy adhesive anchorage of reinforcement

B. Epoxy adhesive and expansion anchors are specified herein but shall be provided and installed under the specification sections wherein the items requiring such anchors are specified.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI CODE-355.2 – Qualification of Post-Installed Mechanical Anchors in Concrete

B. ACI CODE-355.4 – Qualification of Post-Installed Adhesive Anchors in Concrete

C. ASTM C881/C881M – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

1.4 QUALITY ASSURANCE

A. Expansion and epoxy adhesive anchors shall meet the following requirements:

1. Expansion anchors shall be qualified for use in cracked concrete in accordance with ACI CODE-355.2.
2. Epoxy adhesive anchors shall be qualified for use in cracked concrete in accordance with ACI CODE-355.4.
3. Epoxy adhesive anchors shall be qualified in accordance with ACI CODE-355.4 requirements for sensitivity to installation direction.
4. Epoxy adhesive anchors shall be installed by personnel certified by an applicable certification program that includes written and performance tests in accordance with ACI/CRSI Adhesive Anchor Installation Certification program.

1.5 SUBMITTALS

A. Submit product data for epoxy adhesive anchors. Data shall include:

1. Material properties of anchors and epoxy adhesive
2. ICC-ES AC308 report
3. Allowable and ultimate loads of the anchor system
4. Storage requirements
5. Installation requirements including:
   a. Drilling method (diamond drill bit shall be prohibited)
   b. Drill bit diameter and depth of hole for each size anchor
   c. Hole cleaning procedure and required condition of hole

d. Requirements for discarding initial discharge to ensure proper mixing
e. Hole filling procedure
f. Time period when anchor cannot be contacted or otherwise disturbed
g. Gel and cure times as a function of temperature
h. Installation temperature requirements for cartridges and base material

PART 2 - PRODUCTS

2.1 EXPANSION ANCHORS

A. Approved for use in cracked concrete in accordance with ACI CODE-355.2.
B. Stainless steel AISI Type 316.
   1. Hilti Kwik-Bolt TZ or Hilti HSL, by Hilti Fastening Systems
   2. Trubolt+ Wedge Anchor by ITW Red Head
   3. Power Stud+ by Powers Fasteners
   4. Strong-bolt 2, by Simpson Strong Tie Co.
   5. Or equivalent

2.2 EPOXY ADHESIVE ANCHORS

A. Includes epoxy anchor systems and epoxy adhesive for threaded rods and steel reinforcement.
B. Approved for use in cracked concrete in accordance with ACI CODE-355.4.
C. Materials:
   1. Anchor: AISC Type 316 Stainless Steel threaded rod with washer and nut.
   2. Adhesive:
      a. Epoxy adhesive for anchoring to concrete shall be a two-component solid epoxy-based system supplied in manufacturer's standard side-by-side cartridge and dispensed through manufacturer's standard static-mixing nozzle. Except for gel times, epoxy adhesive shall conform to ASTM C881. The Grade, Class and Type of epoxy shall be that which is appropriate for the intended use.
      b. Epoxy adhesive shall pass the creep test requirements of ICC-ES AC308.
      c. Acceptable manufacturers:
         i. SET-XP or ET-HP by Simpson Strong Tie Co., Inc.,
         ii. HIT-RE 500-V3 or HIT HY-200 by Hilti, Inc.,
         iii. or equal.
D. Embedment depth for reinforcement: Unless otherwise indicated on the Drawings, the embedment depth shall be per the manufacturer's requirements such that:
   1. The tension design strength in cracked concrete conditions is at least 40 percent of the yield strength of the bar.

PART 3 - EXECUTION

3.1 EXPANSION ANCHORS AND EPOXY ADHESIVE ANCHORS

A. Anchors shall be installed by qualified personnel trained to install expansion and adhesive anchors.
B. Anchors shall be installed in strict accordance with the Manufacturer’s Printed Installation Instructions (MPII).

C. Each installer shall at all times have in their possession the MPII.
D. Adhesive anchors shall be installed in concrete having a minimum age of 21 days at time of installation.
E. All adhesive anchor cartridges shall have the expiration date clearly visible. Material past its expiration date shall not be used and shall be immediately removed from the site.
F. Embedded reinforcement shall be located with proper equipment prior to drilling to ensure that each drilling location does not coincide with existing reinforcement. Drilling through reinforcement shall be prohibited.
G. If existing reinforcement is encountered while drilling, offset the drill hole by a maximum of 2-inches. The new relocated hole shall be in the same line as the line of drilled holes. All offset holes shall be a minimum of 4-inches from a free concrete edge. Maintain the original spacing locations of the remaining dowels as indicated on the Drawings.
H. Diamond drill bits shall not be permitted. Hammer drills shall be used.
I. The initial material extruded from each adhesive anchor cartridge shall be discarded in accordance with the manufacturer's instructions to ensure that all material is properly mixed.
J. Depth stop shall be used to ensure correct drilling depth. Drilled holes shall be blown out with air, thoroughly wire-brushed with a repeated back and forth movement, blown out, thoroughly wire-brushed, and blown out again, unless otherwise recommended by manufacturer. Adhesive shall be injected starting from the bottom of the hole, and slowly withdrawn as filling progresses to prevent air pockets.
K. Anchored reinforcement shall remain completely undisturbed between manufacturer's specified gel time and the full cure time. Zero load shall be applied during this time.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete deformed reinforcement bars and accessories
B. CMU deformed reinforcement bars

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Vertical and horizontal deformed masonry reinforcement excluding dowels embedded in concrete: Section 04200 - Unit Masonry.

1.4 REFERENCES

A. ACI SPEC-117 – Specifications for Tolerances for Concrete Construction and Materials
B. ACI SPEC-301 - Specifications for Concrete Construction
C. ACI MNL-66 – ACI Detailing Manual
D. ASTM A615/A615M – Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
E. ASTM A706/A706M – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
F. AWS D1.4/D1.4M – Structural Welding Code – Reinforcing Steel
G. Concrete Reinforcing Steel Institute – 10MSP, Manual of Standard Practice
H. Concrete Reinforcing Steel Institute - Placing Reinforcing Bars

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 and ACI SPEC-117 as modified herein.

1.6 SUBMITTALS

A. Submit shop drawings for concrete and masonry reinforcement prior to fabrication, showing bar bends, details and placement and certified copies of Mill Test Reports for the reinforcement. Conform to ACI SP-66. Details shall include:
    1. Sizes, dimensions, and locations for reinforcement and supports
    2. Bending diagrams and schedules
    3. Splices
    4. Cover and clearances
    5. Class designation and details for bar supports
    6. Pertinent reinforced concrete details with dimensions and elevations

7. Embedded items furnished by other trades and/or under other sections of the specification that are to be cast in concrete where interference with reinforcement may occur
8. Show reinforcement on: Plan views of slabs, wall elevations and sections, beam elevations and details. Provide plan details at wall intersections and openings.

B. Shop drawing submittal for masonry reinforcement shall include a statement from Project mason that they reviewed the reinforcement shop drawings and provided any necessary input.

C. For conduit to be encased in concrete structures submit a conduit layout plan under Section 16050. The conduit layout plan shall be reviewed with no exceptions taken by the Engineer prior to submission of reinforcement shop drawings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT AND ACCESSORIES

A. Reinforcement and accessories includes all bars, anchorages, stirrups, reinforcement dowels, ties, tie-wire, chairs and other steel supports, and spacers, as noted on the Drawings, specified herein, and as required for the proper completion of the Work.

B. Bars: ASTM A615/A615M or ASTM A706/706M; Grade 60; deformed new materials. Cold bent in accordance with CRSI 10MSP.

C. Tie wire: ASTM A1064/A1064M, annealed.

D. Bolsters, chairs, spacers and other supports to properly position reinforcement shall conform to the “Bar Support” recommendations of CRSI 10MSP and shall be of adequate strength and design to prevent displacement of reinforcement and discoloration of concrete. Where concrete surfaces are exposed to view, weather and/or moisture supports shall be Class 1 Plastic, Plastic Protected, or epoxy coated. Supports for bottom reinforcement for slabs placed on soil or on a mud mat with no more than 3 inches of cover shall be Class 3 chairs with integral plates or precast concrete blocks not less than 4 inches square.

2.2 FABRICATION OF REINFORCEMENT

A. Conform to CRSI Code of Standard Practice-Fabrication.

B. Cold bend bars.

C. Bend bars around revolving collar of recommended size.

2.3 EPOXY ANCHORAGE

A. Epoxy anchorage for steel reinforcement is specified in Section 03155.

2.4 STORAGE OF MATERIALS

A. Protect materials from ground and the elements.

B. Store reinforcement and all other embedded items on skids.

C. Remove defective materials, as determined by the Engineer, from site immediately. Do not store on site.

PART 3 - EXECUTION

3.1 REINFORCEMENT

A. Conform to the CRSI Code of Standard Practice.

B. Protect reinforcement from contact with form release agent. Form release agent that contacts reinforcement shall be thoroughly removed.

C. Install reinforcement supports and spacers in slabs, beams, walls, columns, and all other concrete members as required to maintain specified clear cover.

D. Maintain specified tolerances.

E. Do not weld reinforcement unless the Engineer takes no exceptions - in writing. When permitted, welding shall be in accordance with AWS D1.4/D1.4M.

F. Splicing reinforcement:

1. Reinforcement bars: Splices shall be located as shown on the Drawings. Where not shown, splices shall be located away from areas of maximum stress, and shall be reviewed, with no exceptions taken, by the Engineer. Minimum splice lengths shall be as indicated on the Drawings.

G. Reinforcement shall be securely tied at intersections with tie wire or clips in a manner that will keep all metal away from exposed concrete surfaces.

H. Cutting, heating, and bending of reinforcement embedded in the concrete will not be allowed.

I. All reinforcement within an area of a continuous concrete placement shall be installed, supported, and secured before beginning concrete placement.

3.2 EMBEDDED ITEMS

A. Contractor shall coordinate the installation and securing of all embedded items such as steel dowels and all other required embedded items indicated in the Contract Documents.

B. Contractor shall coordinate number and layout of masonry dowels with the mason prior to installation.

C. All embedded items shall be secured prior to concrete placement. Embedded items shall not be placed during or after concrete placement.

3.3 PLACING CONCRETE

A. Notify Engineer and Independent Testing Laboratory 24 hours minimum prior to each placement.

B. All reinforcement within the area of one day’s concrete placement shall be tied in place, and observed by the Engineer, prior to commencing concrete placement.

C. Assure placement and proper location of all embedded items.

3.4 TOLERANCES

A. Tolerances shall conform to all requirements of ACI SPEC-117.

3.5 DEFICIENT CONCRETE

A. Deficient concrete includes concrete containing reinforcement that does not meet the requirements of the Contract Documents for material, size, quantity, strength, position, or arrangement.

B. Deficient concrete may be subject to rejection and replacement at no additional cost

to the Owner as determined by the Engineer.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast-In-Place Concrete

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. AASHTO T 26 – Standard Method of Test for Quality of Water to Be Used in Concrete
B. ACI SPEC-301 - Specifications for Concrete Construction
C. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary
D. ASTM C33/C33M – Standard Specification for Concrete Aggregates
E. ASTM C40/C40M – Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
F. ASTM C87/C87M – Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
G. ASTM C88/C88M – Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
H. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete
I. ASTM C114 – Standard Test Methods for Chemical Analysis of Hydraulic Cement
J. ASTM C131/C131M – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine
K. ASTM C150/C150M – Standard Specification for Portland Cement
L. ASTM C260/C260M – Standard Specification for Air Entraining Admixtures for Concrete
M. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete
N. ASTM C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine
O. ASTM C595/C595M – Standard Specification for Blended Hydraulic Cements
P. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
Q. ASTM C989/C989M – Standard Specification for Slag Cement for Use in Concrete and Mortars
R. ASTM C1240 – Standard Specification for Silica Fume Used in Cementitious Mixtures
S. ASTM C1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates

(Mortar-Bar Method)

T. ASTM C1293 – Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction

U. ASTM C1567 – Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Method)

V. ASTM C1602/C1602M – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

W. ASTM C1603 – Standard Test Method for Measurement of Solids in Water

X. ASTM D516 – Standard Test Method for Sulfate Ion in Water

Y. ASTM E329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 as modified herein.

1.5 SUBMITTALS

A. Submit Concrete Mixture designs including:
   1. Proportions for all ingredients, 28-day design compressive strength, water to cementitious materials ratio, admixture dosages, slump, air content and density.
   2. Cement Manufacturer's Certificates of conformance with ASTM C150/C150M or C595/C595M taken during the last 90 days.
   3. Supplementary Cementitious Materials: Source and test reports with certificates of conformance with ASTM C618 for fly ash and ASTM C989/989M for slag cement for actual material to be used in the Work taken during the last 90 days.
   4. Fine and coarse aggregate data shall include test results from within the last 90 days, except test results for soundness, abrasion, and alkali reactivity shall be from within the last 12 months:
      a. Sources
      b. Specific Gravity
      c. Sieve analyses per ASTM C33/C33M, including fineness modulus of fine aggregate
      d. Organic impurities per ASTM C40/C40M (fine aggregate)
      e. Aggregate reactivity (fine and coarse aggregate), one of the options provided in Part 2
      f. Soundness per ASTM C88/C88M tested with magnesium sulfate (fine and coarse aggregate)
      g. Abrasion per ASTM C131/C131M or ASTM C535 (coarse aggregate)
   5. Product data and Safety Data Sheets for concrete admixtures
   6. Field performance and/or laboratory test reports meeting the criteria specified in ACI SPEC-301, Section 4, by testing agencies meeting ASTM E329:
      a. Field test data used to determine the standard deviation used for establishing the required average design strength, and field test data documenting that the proposed concrete proportions will produce an average compressive strength equal or greater than the required average compressive strength, shall be from within the previous 12 months.
      b. Laboratory trial batch data shall be from with the previous 12 months.

1.6 PRE-CONCRETE MEETING

A. Engineer shall hold meeting after the concrete mixture design has been reviewed by the Engineer and more than 14 days prior to the first concrete placement to review concrete procedures.

B. Meeting Minutes: Engineer shall record minutes of meeting and distribute to attending parties, within 10 business days of meeting.

C. Attendance: General Contractor shall coordinate the attendance of the following parties: Contractor; concrete supplier; concrete subcontractor; admixture manufacturer and concrete pumping contractor. Engineer shall coordinate the attendance of the following parties: Structural Engineer, Independent Testing Agency, and Engineer's Resident Project Representative.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Each cementitious material shall be furnished from one source throughout the Project.

B. Portland cement: ASTM C150/C150M; Type II.

C. Blended cements: ASTM C595/C595M (MS) types, excluding Type IS (≥70) and Type IT (S ≥70). .

D. Supplementary Cementitious Materials:

1. Slag Cement: ASTM C989 - Grade 100 or 120.
2. Silica Fume: ASTM C1240.
3. Fly Ash: ASTM C618 - Type F, and alkali content not to exceed 4.0%.

E. Aggregates:

1. Prohibited: crushed hydraulic cement concrete and recycled aggregate.
2. Fine aggregate
   a. Shall consist of washed inert natural sand, free from mineral or other coatings, soft particles, clay, loam, organic or other deleterious materials conforming to the requirements of ASTM C33/C33M and the following requirements:

SIEVE NO.	PERCENT PASSING
4	95 to 100
8	80 to 100
16	50 to 85
30	25 to 60
50	5 to 30
100	0 to 10
200	0 to 3.0

   The Fineness Modulus shall be between 2.3 to 3.1. The percentage retained between any two consecutive sieves shall not exceed 45%.
3. Coarse aggregate

a. Shall consist of a well graded crushed stone or a washed gravel conforming to the requirements of ASTM C33/C33M and the following requirements:

	PERCENT PASSING			
SIEVE	NO. 8 (3/8")	NO. 67 (3/4")	NO. 57 (1")	NO. 467 (1 1/2")
1-½ inch	-	-	100	95-100
1 inch	-	100	95-100	-
¾ inch	-	90-100	-	35-70
½ inch	100	-	25-60	-
3/8 inch	85-100	20-55	-	10-30
No. 4	10-30	0-10	0-10	0-5
No. 8	0-10	0-5	0-5	-
No. 16	0-5	-	-	-
No. 50	-	-	-	-

4. Fine Aggregate testing: Perform the following tests on samples of the fine aggregate:
   a. Organic Impurities (ASTM C40/C40M):
      i. Color of supernatant liquid above test sample tested in accordance with ASTM C40/C40M shall not be darker than standard (Organic Plate No. 3/Gardner Color Standard No. 11).
      ii. Use of a fine aggregate failing when tested in accordance with ASTM C40/C40M is not prohibited if when tested in accordance with ASTM C87/C87M the relative strength at 7 days is not less than 95%.
   b. Soundness (ASTM C88/C88M):
      i. Fine aggregate sample tested in accordance with ASTM C88/C88M for five cycles using magnesium sulfate (not sodium sulfate) shall have a weighted average loss not greater than 15%.
   c. Alkali Reactivity – Evidence of a satisfactory service record in lieu of testing for alkali reactivity is not permitted. Use one of the following options:
      i. Test aggregate in accordance with ASTM C1293. Aggregate having an expansion less than 0.04% at 1-year is acceptable for use.
      ii. Test aggregate in accordance with ASTM C1260. Aggregate having an expansion less than 0.10% at 16 days is acceptable for use.
      iii. Test concrete mixture with the aggregates and cementitious materials combination submitted, in accordance with ASTM C1293. Aggregates in mixtures having an expansion of less than 0.04% at **2-years** are acceptable for use. (This option also satisfies coarse aggregate requirements.)
      iv. Test concrete mixture with aggregates and cementitious materials combination submitted, in accordance with ASTM C1567. Aggregates in mixtures having an expansion less than 0.10% at 16 days are acceptable for use. (This option also satisfies coarse aggregate requirements.)

v. Test aggregate in accordance with ASTM C1293 at 1-year. If the coarse and fine aggregates are of different reactivity, the level of protection shall be based on the more reactive aggregate.
   (1) For (moderately reactive) aggregate with expansion greater than or equal to 0.04% and less than 0.12%:
      (a) Alkali content contributed by the portland cement shall not exceed 3.0 lbs per cubic yard of concrete, ***or***
      (b) If alkali content of the portland cement is less than 0.70%, a minimum amount of supplemental cementitious material shall be provided as follows: 25% fly ash or 35% slag cement, or
   (2) For (highly reactive) aggregate with expansion greater than or equal to 0.12% and less than 0.24%:
      (a) Alkali content contributed by the portland cement shall not exceed 3.0 lbs per cubic yard of concrete, ***and***
         (i) If alkali content of the portland cement is less than 0.70%, a minimum amount of supplemental cementitious material shall be provided as follows: 25% fly ash or 35% slag cement, or
   (3) The use of aggregate with expansion greater than or equal to 0.24% shall not be permitted.

vi. Test aggregate in accordance with ASTM C1260 at 16 days if ASTM C1293 aggregate test data is not available. If the coarse and fine aggregates are of different reactivity, the level of protection shall be based on the more reactive aggregate.
   (1) For (moderately reactive) aggregate with expansion greater than or equal to 0.10% and less than 0.30%:
      (a) Alkali content contributed by the portland cement shall not exceed 3.0 lbs per cubic yard of concrete, ***or***
      (b) If alkali content of the portland cement is less than 0.70%, a minimum amount of supplementary cementitious material shall be provided as follows: 25% fly ash or 35% slag cement, or
   (2) For (highly reactive) aggregate with an expansion greater than or equal to 0.30% and less than 0.45%:
      (a) Alkali content contributed by the portland cement shall not exceed 3.0 lbs per cubic yard of concrete, ***and***
         (i) If alkali content of the portland cement is less than 0.70%, a minimum amount of supplemental cementitious material shall be provided as follows: 25% fly ash or 35% slag cement, or
   (3) The use of aggregate with expansion greater than or equal to 0.45% shall not be permitted.

5. Coarse Aggregate testing: Perform the following tests on samples of the coarse aggregate:
   a. Abrasion (ASTM C131/C131M or ASTM C535):

i. Coarse aggregate shall be tested in accordance with either ASTM C131/C131M (aggregate smaller than 1 1/2") or ASTM C535 (aggregate larger than ¾").
ii. Loss of the mass of the coarse aggregate by abrasion shall not exceed 50%.

b. Soundness (ASTM C88/C88M):
i. Coarse aggregate sample tested in accordance with ASTM C88/C88M for five cycles using magnesium sulfate (not sodium sulfate) shall have a weighted average loss not greater than 18%.

c. Alkali Reactivity:
i. Test coarse aggregate according to the same requirements specified above for testing of fine aggregate. Evidence of a satisfactory service record in lieu of testing for alkali reactivity is not permitted.

F. Water:
1. Potable from municipal water supply.
2. Nonpotable water that meets ASTM C1602/C1602M and the following requirements:
a. Chlorides as Cl: 1000 ppm - tested by ASTM C114 or by #4500, Argentometric Method from "Standard Methods for the Examination of Water and Wastewater".
b. Sulfate as SO4: 1500 ppm – tested by ASTM D516 or ASTM D4130.
c. Equivalent alkalies (Na2O + 0.658 K2O): 300 ppm total alkali – tested by ASTM C114.
d. Total inorganic solids by mass: 5000 ppm – tested by ASTM C1603.
e. Organic solids by mass: 300 ppm – tested by AASHTO T 26.
f. pH: 4.0 to 9.0 – tested by AASHTO T 26.
g. Presence of oil: none to slight – by visual observation.
3. Use of residual and wash water, including such water present in mixer drums prior to commencement of batching, shall not be permitted.

G. Admixtures:
1. Low Range Water Reducing: ASTM C494/C494M Type A.
2. High Range Water Reducing (superplasticizer): ASTM C494/C494M Type F.
3. Water Reducing and Retarding: when ambient temperature is above 70°F, replace water reducing admixture in whole or in part with water reducing and retarding admixture meeting ASTM C494/C494M Type D.
4. Air Entraining: ASTM C260, vinsol resin based.
5. Accelerating: non-chloride accelerator meeting ASTM C494/C494M Type C or E.
6. Not permitted: Calcium chloride, thiocyanates or admixtures containing chloride ions.
7. All admixtures used for each mixture design shall be from one single manufacturer, except for cementitious waterproofing.

2.2 CONCRETE CLASS

A. Class A: Reinforced structural concrete
B. Class A without coarse aggregate: Sand Cement Slurry
C. Class B: Concrete fill, pipe encasements, concrete pavement
D. Class C: Interior (non-structural) slabs-on-ground, electrical duct banks, mud slabs

2.3 CONCRETE MIXTURE DESIGN

A. Concrete class (where f'c is the specified design compressive strength at 28-days and w/cm is the water to cementitious materials ratio):
   1. Class A: f'c = 5,000 psi, max w/cm = 0.40, min w/cm = 0.38
   2. Class B: f'c = 4,000 psi, max w/cm = 0.45, min w/cm = 0.42
   3. Class C: f'c = 3,500 psi, max w/cm = 0.50, min w/cm = 0.45

B. Nominal maximum aggregate size:
   1. Coarse aggregate shall conform to the grading given in Table 3 of ASTM C33/C33M for sizes (i.e., nominal maximum aggregate sizes) No. 467 (1 ½"), No. 57 (1"), No. 67 (3/4"), No. 7 (1/2"), and No. 8 or No. 89 (3/8").
   2. Nominal maximum aggregate size shall be as follows:
      a. 1 ½": All slabs placed on ground, foundation mats and footings, and walls that are at least 15 inches thick, except where the clear spacing between reinforcement bars is less than 2 inches.
      b. ¾": All other locations, except as specified elsewhere or upon written approval of the Engineer.
      c. Concrete Fill:
         i. ½": minimum thickness less than 2 ¼ inches,
         ii. ¾": minimum thickness from 2 ¼ inches to less than 6 inches,
         iii. 1 ½": minimum thickness of 6 inches or greater
      d. Electrical Ductbanks: 3/8"
      e. Mud slab: 3/8", ½" or ¾"

C. Supplementary cementitious materials may be included as a percentage of total cementitious materials weight as follows. (Supplemental cementitious materials in ASTM C595/C595M cement shall be included in determination of percentages.)
   1. Portland cement: not less than 50%.
   2. Slag cement: if used, not less than 25% nor greater than 35%.
   3. Fly ash: if used, not less than 15% nor greater than 25%.
   4. Silica fume: if used, not less than 5% nor greater than 10%.
   5. Fly ash + slag + silica fume: no more than 50%.
   6. Fly ash + silica fume: no more than 35%.

D. The slump shall be 4" with a 1" plus or minus tolerance at the point of delivery, without use of a high range water reducer. When a high range water reducer is used, the slump shall be as stated above before it is added, and a maximum of 8" at the point of delivery after it is added.

E. Water:
   1. The amount of water carried on the aggregate and the effect of admixtures is included in the water content. The amount of water carried on the aggregate shall be determined periodically by test and the amount of free water on the aggregate shall be subtracted from water added to the mixture.
   2. Maximum amount of water: that required to produce a plastic mixture of the strength and water to cementitious materials ratio specified and the required density, uniformity and workability. Consistency of the mixture: that required for the specific placing conditions and methods.

F. High Range Water Reducing admixtures shall be used for all concrete to be pumped or with a specified water to cementitious ratio below 0.50. High range water reducer shall be added either at the concrete batch plant or on site to obtain the slumps as indicated above.

G. Concrete shall be furnished from one supplier and batch plant during the project.

2.4 SELECTION OF CONCRETE PROPORTIONS

A. The concrete producer shall select the concrete mixture proportions on the basis of past field performance or the use of trial mixtures, both in accordance with ACI SPEC-301, Section 4, "Concrete Mixtures".

B. Adjustments to required average strength (f'cr):
   1. Adjustments in the required average strength may be made during the progress of the work to compensate for either high or low average compressive strengths.
   2. When a minimum of fifteen 28-day compressive strength tests from this project are available, the average strength and standard deviation shall be computed.
   3. Should these determinations indicate an excessive compressive strength with a low standard deviation as determined by the Engineer, modification of the concrete mixture may be made to achieve a lower average strength based upon a new standard deviation.
   4. Should these determinations indicate a lower average strength than anticipated, the Engineer will require corrective measures to be taken immediately.

2.5 STORAGE OF MATERIALS

A. Protect materials from ground and the elements.

B. Maintain cement in dry condition.

C. Remove defective materials, as determined by the Engineer, from site immediately. Do not store on site.

PART 3 - EXECUTION

3.1 PRE-BATCHING

A. Mixer drums shall completely discharged (drums backed out) prior to commencement of batching.

3.2 FAILURE TO MEET STRENGTH REQUIREMENTS

A. The strength of the concrete in place will be considered substandard if any one of the following results occur (where a strength test is defined as the average of two 6"Ø x 12" cylinders or three 4"Ø x 8" cylinders):

1. The average any three (3) consecutive strength tests at 28 days is less than the specified strength (f'c).
2. A compressive strength test result falls below the specified strength (f'c) by more than 500 psi.

B. Concrete which fails to meet the strength requirements as outlined above will be reviewed by the Engineer. The Engineer will determine whether the substandard concrete will be accepted, rejected or additional tests performed.

C. When substandard concrete occurs as defined in Part A, the Engineer will require corrective measures to be taken immediately to increase the average of subsequent strength tests. In addition, the Engineer may require cores drilled in the area of question in accordance with Section 03305. If the core tests are inconclusive or impractical to obtain, load tests may be required, and their results evaluated in accordance with ACI CODE-318. If the average of the three cores is less than 85% of the specified strength or if one core is less than 75% of the specified 28-day strength, then that portion of the structure shall be strengthened by a method proposed by the Contractor and no exceptions taken by the Engineer or replaced by the Contractor at no additional cost to the Owner.

3.3 DEFICIENT CONCRETE

A. Concrete work will be considered deficient if it does not conform to strength and material durability requirements (including water to cementitious materials ratio), location, elevation, dimension, shape, alignments, and/or appearance as required in the Contract Documents. Specific examples of deficient concrete include (but are not limited to):
   1. Concrete members cast in the wrong location.
   2. Concrete that includes residual, wash, and other water, including such water present in mixer drums prior to commencement of batching.
   3. Concrete work not formed in accordance with Section 03100.
   4. Concrete containing reinforcement that does not meet the requirements of Section 03200.
   5. Concrete not placed in accordance with Section 03320.
   6. Concrete surfaces not finished in accordance with Section 03350.
   7. Concrete exposed to view with defects that adversely affect the appearance of the specified finish. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete may be rejected. Examples include:
      a. Non-uniform appearance including texture and color
      b. Excessive visible repairs of structural defects
   8. Concrete not cured in accordance with Section 03390.
   9. Concrete work in hot weather not in accordance with Section 03341.
   10. Concrete work damaged from accidents, poor construction practices, or fire.

B. Deficient concrete may be subject to rejection and replacement at no additional cost to the Owner if the Engineer deems necessary.

END OF SECTION

SECTION 03305

CONCRETE TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Testing performed by an Independent Testing Agency

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

B. Refer to Section 01150A, Measurement and Payment for payment of concrete testing.

1.3 REFERENCES

A. ASTM C31/C31M- Standard Practice for Making and Curing Concrete Test Specimens in the Field

B. ASTM C39/C39M- Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C. ASTM C42/C42M- Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

D. ASTM C138/C138M – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

E. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic-Cement Concrete

F. ASTM C172/C172M- Standard Practice for Sampling Freshly Mixed Concrete

G. ASTM C1064/C1064M – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

H. ASTM C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

I. ASTM E329- Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.4 QUALIFICATIONS

A. Testing Agency shall conform to concrete testing requirements of ASTM E329 and ASTM C1077.

B. Key personnel must be qualified in concrete quality assurance.

C. Perform concrete field quality control testing with personnel certified as an ACI Concrete Field Testing Technician, Grade 1 according to the American Concrete Institute (ACI).

1.5 SUBMITTALS

A. Testing Agency will submit one copy each of all test reports to each of the following: Engineer, Resident Project Representative, Contractor, and concrete supplier. Reports shall indicate the following information:

Project	Contractor
Placement location	Concrete supplier

Technician	Cylinder Nos
Date cast	Cylinder weights
Date picked up	Date of breaks
Design strength	Break type
Air temp	Break load
Concrete temp	Break strength
Initial slump	Truck Arrival Time
Final slump	Truck Unload Time
Field density	Lab/Field-cured
Air content	Cylinder size
Cure box min/max temps	

B. Testing Agency will submit reports within 5 days of testing or inspection.
C. Testing Agency will notify the Engineer within 24 hours if tests indicate deficiencies.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 CAST-IN-PLACE CONCRETE

A. An independent, accredited and certified testing agency (Testing Agency), selected and paid for by the Contractor and directed by the Engineer and/or Resident Project Representative, shall test Class A concrete for strength, slump, and field density as indicated herein. Contractor is responsible for all costs associated the Testing Agency work on the project including labor, equipment, tools, supplies, and tests for the duration of the project.
B. On the Project site the Contractor shall provide a designated location and a source of electrical power for curing box provided by Contractor's Testing Agency for proper initial curing and storage of concrete test cylinders as required by ASTM C31/C31M. Contractor to coordinate the location with the Resident Project Representative and Testing Agency. Curing box shall be of suitable size, prevent the loss of moisture from the specimens, and be automatically heated/cooled to maintain a temperature of between 60°F and 80°F, which shall be recorded with a maximum-minimum thermometer, as manufactured by Engius, Thermocure, or similar.
C. The General Contractor shall notify the Resident Project Representative of proposed upcoming concrete placements as follows. (The Resident Project Representative will notify the Testing Agency.)
    1. On a weekly basis.
    2. For specific placements - a minimum of 24 hours in advance.
D. At the Project site, for every truck before starting concrete placement, from a test sample taken from the beginning of the discharge: measure concrete temperature and perform slump, air content and field density tests. This testing shall be successfully completed prior to placing the concrete.
    1. Perform tests after the addition of any water that was held back during batching.
    2. If concrete is not pumped, take test sample from the discharge end of the truck. If the concrete is pumped, take test sample from the discharge end of the pump hose.

3. Before taking test sample, discharge ¼ cubic yard, minimum, of concrete into a container (which can be placed after successful testing). Then take test sample.
4. Upon the Engineer's approval, once slump loss due to pumping is established, correlated acceptance limits for sampling and testing at the truck may be permitted.
5. When the pumpline configuration is changed significantly, sampling and testing shall again be performed at the discharge end of the pump hose until new acceptance limits at the truck are properly correlated.

E. In addition, perform slump, and field density tests for each test sample when cylinders are made for strength tests.

F. All test samples for casting of cylinders shall be taken from the middle of the truck mixer load (not from first 10% or last 10%), and at the discharge end of the pump hose when pumped.

G. Make (4) standard test cylinders measuring 6"Ø x 12" or (7) test cylinders measuring 4"Ø x 8" for each class of concrete as specified in 3.1.A placed in any one day at the following frequency:
1. For each 100 cubic yards of each concrete placement, and
2. For each placement that is less than 100 cubic yards

H. Concrete cylinders shall be tested as follows:
1. 6" Ø x 12" cylinders:
   a. Test (1) cylinder at 7 days; (2) cylinders at 28 days
   b. Hold one cylinder for later testing (if required)
2. 4" Ø x 8" cylinders:
   a. Test (2) cylinders at 7 days; (3) cylinders at 28 days.
   b. Hold two cylinders for later testing (if required)

I. Perform temperature, slump, and field density tests and make additional cylinders at other times when directed by the Resident Project Representative.

J. Samples taken for concrete testing are to be disposed of, and not used in the work.

K. Additional testing and sampling required due to deficient results or improper curing shall be paid for by Owner. The cost of resampling and retesting will be determined by Engineer, and Owner/STP Operator as to whether it will be eligible for payment under the Material and Testing Allowance as noted in Section 01150, Measurement and Payment.

L. Contractor shall provide site access to Testing Agency personnel at all times.

M. Testing Agency shall transport lab-cured cylinders to testing laboratory within 48 hours of casting, but not less than 8 hours after final set.

3.2 ADDITIONAL TESTS

A. Testing Agency shall provide additional testing of in-place concrete that does not comply with the requirements of the Contract Documents or is considered substandard as directed by Engineer. Additional tests may consist of non-destructive testing, cores drilled from the area in question or load tests. Costs of additional testing will be paid by Contractor. The cost of the additional testing will be by the Contractor.

B. When the concrete strength is substandard as defined in Section 03300, concrete core specimens shall be obtained and tested from the affected area. A minimum of three (3) cores shall be taken for each sample in which the strength requirements were not

met. The drilled cores shall be obtained and tested in conformance with ASTM C42/C42M. Engineer will determine the size and location of the required core samples.

C. Field-cured cylinders may be cast and tested by the Testing Agency as required in the Contract Documents or at the request of the Contractor. The costs of preparing and testing field-cured cylinders shall be borne by the Contractor. If field-cured cylinders are to determine in-place concrete strength to facilitate an accelerated schedule for subsequent concrete placements, or backfilling or leakage testing:
   1. The Contractor shall notify the Engineer and Testing Agency 48 hours in advance of the concrete placement. The Engineer will determine at that point if the results of the field-cured cylinders may be used to determine the in-place concrete strength. The Contractor shall notify the Engineer as to when the field-cured cylinders will be tested and for what purpose.
   2. A minimum of two 6"Ø x 12" cylinders or three 4"Ø x 8" cylinders shall be cast for each separate test the Contractor requests.
   3. The field-cured cylinders shall be left in the field and located such that they are exposed to the identical environmental conditions as the concrete structure.
   4. The Engineer shall determine if the strengths indicated by the field-cured cylinder tests are adequate for their intended purpose.

END OF SECTION

SECTION 03320

CONCRETE PLACEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Placement

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 PRODUCTS INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. For items embedded in concrete refer to Section 03100, par. 1.3.

1.4 REFERENCES

A. ACI SPEC-301 - Specifications for Concrete Construction

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 as modified herein.

B. The Contractor shall require a quality assurance representative from the concrete supplier be on site for a minimum of the first three concrete placements, and thereafter as necessary, to oversee any permitted field adjustments of delivered concrete including slump, water, water reducer, high range water reducer, air entrainment, and any other issues that arise.

1.6 SUBMITTALS

A. For conduit to be encased in concrete structures submit a conduit layout plan under Section 16050. The conduit layout plan shall be reviewed with no exceptions taken by the Engineer prior to submission of reinforcement shop drawings.

1.7 PRE-CONCRETE MEETING

A. Engineer shall hold meeting after the concrete mixture design has been reviewed by the Engineer and more than 14 days prior to the first concrete placement to review concrete procedures.

B. Meeting Minutes: Engineer shall record minutes of meeting and distribute to attending parties, within 10 business days of meeting.

C. Attendance: General Contractor shall coordinate the attendance of the following parties: Contractor; concrete supplier; concrete subcontractor; admixture manufacturer and concrete pumping contractor. Engineer shall coordinate the attendance of the following parties: Structural Engineer, Independent Testing Laboratory and Engineer’s Resident Project Representative.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Contractor shall coordinate the installation and securing of all embedded items such as anchor rods, pipes, conduit, pipe hanger inserts, embedded angles, concrete accessories under Section 03150 Concrete Accessories, and all other required embedded items indicated in the Contract Documents.

B. All embedded items shall be secured prior to concrete placement. Embedded items shall not be placed during or after concrete placement.

C. Pipes or conduits for embedment within a slab, wall, or beam, other than those merely passing through, shall satisfy the following:

1. Shall not be larger in outside diameter than one-third (1/3) the thickness of the slab, wall, or beam.
2. Shall not be spaced closer than 3 diameters on center.
3. Shall not significantly impair the strength of the concrete.
4. Shall not be embedded in structural concrete slabs less than 6 inches thick.
5. Only two conduits or pipes shall cross at any point. The sum of the outside diameter of the crossing pipes or conduits shall not exceed one-third (1/3) of the concrete thickness.
6. Conduits shall not be located between the bottom of reinforcement and bottom of concrete slab or beam.
7. Aluminum conduits shall not be embedded in concrete.
8. Conduits shall be installed such that there will be NO cutting, bending, and/or displacement of reinforcement from its proper location.
9. Conduits and/or pipes shall not pass through a waterstop in slabs, beams, or walls.
10. Conduits shall not be installed prior to review of conduit layout plan with no exceptions taken by the Engineer.
11. Voids cast into concrete slabs and walls for pipes or conduits and subsequently filled with concrete or grout shall not be installed unless reviewed with no exceptions taken by the Engineer.

3.2 PLACING CONCRETE

A. Notify Engineer and Independent Testing Laboratory 24 hours minimum prior to each placement.

B. All reinforcement within the area of one day's concrete placement shall be tied in place, and observed by the Engineer, prior to commencing concrete placement.

C. For each concrete placement, the Contractor shall coordinate proper timing of consecutive mixer truck deliveries with the concrete supplier to prevent interrupting continuous placements and to avoid delays in discharging trucks.

D. All concrete delivery trucks at each placement shall be tested as specified in Section 03305.

E. Ensure placement and proper location of all embedded items.

F. Provide concrete Delivery Slip prepared at batch plant with each truck load of concrete showing the information listed under Submittals in Section 03300.

G. Water: water added after batching shall be carefully monitored as follows:
   1. Slump adjustment: not permitted at wash down, “slump rack”, or by any other means between the time of batching to the point of delivery at the Project site.
   2. Water added after arrival at Project site: accurately metered and recorded on the delivery ticket. The Engineer’s Resident Project Representative shall be notified prior to the addition of water.
   3. No additional water shall be added to the concrete on site that will increase the water to cementitious materials ratio above that specified. If additional water is to be added on site, it shall be held back during batching from the quantity specified in the mixture design. The amount of water held back shall be clearly indicated on the concrete delivery slip, and the addition of more water than indicated shall be cause for non-compliance and rejection of the concrete truck.

H. Place concrete from mixing truck to final location quickly and without segregation.

I. Place all concrete from the delivery truck within 90 minutes of addition of water to cement, or cement to aggregate, whichever occurs first. When air temperature is 90°F and above, this time shall be reduced to 60 minutes. These times may be exceeded only upon review with no exceptions taken by the Engineer, and only if all tests for air content, slump and temperature are also within specified limits.

J. Standing water shall be removed from all forms and excavations and the Work shall be kept dry during concrete placement. No water shall be thrown on, allowed to flow over, or rise upon the concrete until the concrete surface has reached its final set and is rigid.

K. Runways shall be provided for wheeled concrete handling equipment. Runways shall not be supported upon placed reinforcement.

L. Concrete truck chute shall conform to the following:
   1. Minimum slope: 3 horizontal to 1 vertical. Maximum slope: 2 horizontal to 1 vertical. Between these limits the chute slope shall be such to ensure continuous flow without segregation.
   2. Provide baffle at end of chute to prevent segregation. If the end of the chute is more than 3 feet above the surface of deposit, a spout is to be used. The spout is to be kept full of concrete with the end kept as near as practical to the surface of the deposit.
   3. The chute shall be steel or steel lined. Aluminum chutes are not permitted. Sections of the chute shall have the same slope throughout.
   4. The chute is to be thoroughly flushed with water before and after each use with the water discharged outside the forms.

M. Freefall from concrete truck discharge chute, pump hose and hopper hose: 4 feet maximum.

N. The accumulation of concrete on the forms and/or reinforcement above the level of placement shall be avoided. The splashing of concrete upon formwork that is set for a subsequent concrete placement shall be prevented due to the resulting marks on the finished concrete.

O. Concrete placements shall be carried out in a continuous operation until the placement of the entire section between construction joints is complete. Place against plastic concrete only.

P. Do not place partially hardened concrete. Re-tempering is not permitted.

Q. Compacting and vibrating concrete:
   1. Consolidate each layer by mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping as required. The depth of each layer shall not exceed the smaller of 20 inches and the depth that can be properly vibrated with the equipment used. When deposited in multiple layers, the vibrator shall penetrate the preceding layer approximately 6 inches to blend layers. Ensure that initial setting of the previous layer doesn't occur prior to placement of subsequent layer.
   2. Do not use vibrator to move fresh concrete within the forms. Insert vibrator at approximately 18-inch intervals, and over-vibration resulting in segregation shall be prevented.
   3. Concrete shall be thoroughly consolidated around reinforcement, embedded items and into corners of forms.
   4. Ensure that vibrator is kept several inches clear of waterstops.
   5. Where internal vibration is impractical, the use of form vibrators will be considered, and will be allowed only with the review with no exceptions taken by the Engineer. When allowed, the vibrator shall be placed so that motion is horizontal.
   6. Vibratory screeds are acceptable for slabs up to 8 inches thick, however internal vibration is required in areas of load-transfer dowels and electrical conduit. Internal vibration is required for slabs thicker than 8 inches.

R. Pumping: The inside diameter of pipes and hoses used to convey the concrete shall be a minimum of three times the maximum size aggregate of the mixture. In order to minimize altering the concrete properties, long vertical sections at the end of the pump line are prohibited. A horizontal hose run, a hose loop, or a slide gate at the end of the hose is to be used to reduce loss of entrained air.

S. Thoroughly moisten subgrade materials prior to placing slabs on grade.

T. Place one inch of Sand Cement Slurry prior to placing concrete at the bottom of all walls greater than or equal to 8 feet in height.

U. Provide concrete pads and foundations for all equipment as shown on Drawings or as required by the equipment manufacturer. Set anchor bolts for equipment with templates at correct elevations using manufacturer's shop drawings reviewed by the Engineer with no exceptions taken unless otherwise indicated. All equipment pads shall be sized by the Contractor and equipment supplier except as otherwise indicated on the Drawings.

V. Contractor shall coordinate concrete truck wash-out area with Owner.

3.3 PRE-EXISTING CONCRETE SURFACE PREPARATION

A. When placing concrete against pre-existing concrete, clean surface of all contamination and debris, and roughen by steel shot-blasting, abrasive (sand) blasting, or high-pressure (minimum 15,000 psi) water-jetting (hydrodemolition). Use of scabblers, scarifiers, bush hammers, or pneumatic hammers greater than 15 pounds is not permitted due to resulting substrate bruising, except if followed by steel shot-blasting, abrasive blasting, or high-pressure water-jetting.

3.4 PLACEMENT OF CONCRETE FILL AND PADS ON CONCRETE SUBSTRATE

A. For pre-existing concrete substrate prepare surface as specified above.

B. For new concrete horizontal substrate, provide scratched finish (SF) specified in Section 03350 Concrete Finishing. For new concrete vertical substrate, prepare joint as specified below under JOINTS.
C. Clean substrate with brooms, water jets, or air jets.
D. Using cementitious bonding agent (grout paint) specified in Section 03150:
   1. The prepared substrate shall be water-saturated and allowed to dry to a saturated surface-dry condition immediately prior to placement of concrete.
   2. Immediately before placing concrete fill, broom cementitious bonding agent into the damp concrete surface, and do not allow it to set prior to placement of concrete.
E. Using latex bonding agent specified in Section 03150:
   1. Substrate shall be dry.
   2. Apply two coats and as recommended by the manufacturer.
   3. Place concrete within open time of bonding agent specified by manufacturer.
F. Using epoxy bonding agent specified in Section 03150:
   1. Substrate shall be dry or saturated surface dry as recommended by the manufacturer for maximum bond.
   2. Apply in accordance with manufacturer's instructions.
   3. Place concrete within open time of bonding agent specified by manufacturer.
G. Apply finish in accordance with schedule in Section 03350. For tanks provide FF.

3.5 JOINTS

A. Unless noted otherwise, prepare construction joints as follows:
   1. Horizontal joints: remove laitance immediately after initial set and roughen surface in an acceptable manner that exposes the aggregate uniformly and doesn't leave laitance or loose aggregate. After the concrete has set to a stiffness that precludes laitance removal by shovels or scrapers, the Contractor shall remove it and create a roughened surface by high-pressure (minimum 15,000 psi) water-jetting or other effective method. The use of pneumatic hammers is not permitted.
   2. Vertical joints: the surface shall be thoroughly cleaned of laitance and form release agent by high-pressure water-jetting or wire-brushing followed by air blasting.
   3. Before concrete is placed against set concrete, the surface shall be thoroughly wetted with standing water removed. Horizontal construction joints shall be in a saturated surface dry condition: saturated for a minimum of 6 hours, with standing water removed.

3.6 PROTECTION

A. Protect concrete against hot weather as specified in Section 03341.
B. Do not compact soil, or if applicable, drive piles or blast ledge within 100 feet of concrete until it has attained 33% of its 28-day design strength.
C. Protect concrete from load-induced stresses during the curing period.
   1. Setting forms on slabs on ground shall not commence until a minimum of 3-days after placement, and 5-days when gang forms are used. Placement of concrete walls upon slabs on ground shall not commence until after the 7-day curing period.

D. Protect concrete from damage due to construction activity and traffic.
E. Protect concrete against premature loads until the concrete has been in place for 14 days and the 28-day design strength has been attained (unless otherwise indicated). Premature loads may include but are not limited to:
   1. Backfilling
   2. Loading elevated slabs
   3. Construction of CMU walls on elevated slabs
   4. Installation of equipment on elevated slabs
   5. Tightness testing

3.7 DEFICIENT CONCRETE

A. Deficient concrete includes concrete work not placed in accordance with the requirements of the Contract Documents.
B. Deficient concrete may be subject to rejection and replacement at no additional cost to the Owner if the Engineer deems necessary.

END OF SECTION

SECTION 03341

HOT WEATHER CONCRETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast-In-Place Concrete in hot weather.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI SPEC-301 - Specifications for Concrete Construction

1.4 ENVIRONMENTAL CONDITIONS

A. Hot weather is defined as job-site conditions that accelerate the rate of moisture loss or rate of cement hydration of freshly mixed concrete, including an ambient temperature of 80°F or higher, and an evaporation rate that exceeds 0.2 pounds per square-foot per hour.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 as modified herein.

1.6 SUBMITTALS

A. Submit methods to be used to protect the concrete during hot weather placements as defined herein. The Engineer's review shall be for information only as the Contractor is responsible for the means and methods of protection of concrete placed during hot weather.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PLACING CONCRETE IN HOT WEATHER:

A. Temperature of concrete when placed shall not exceed 95°F. When the air temperature is 90°F and above, procedures to cool mixture ingredients shall be employed. These include:
   1. Providing shaded storage for aggregate,
   2. Frequent sprinkling or fog spraying of coarse aggregate,
   3. Using chilled batch water and/or ice.

B. Forms and reinforcement shall be sprinkled with cold water just prior to concrete placement. When possible, placement of slabs should be scheduled to minimize problems associated with direct sunlight and/or drying winds.

3.2 DEFICIENT CONCRETE

A. Deficient concrete includes concrete work in hot weather that doesn't meet the requirements of the Contract Documents.

B. Deficient concrete may be subject to rejection and replacement at no additional cost to the Owner if the Engineer deems necessary.

END OF SECTION

SECTION 03350

CONCRETE FINISHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Finishing

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI SPEC-301 – Specifications for Concrete Construction
B. ACI PRC-302.1 - Guide for Concrete Floor and Slab Construction
C. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness

1.4 SUBMITTALS

A. Submit product data and Safety Data Sheets for specified items. Indicate the intended use and location for all products.
B. Submit procedures for finishing vertical surfaces.
C. Submit all requested information prior to the pre-concrete meeting described in Section 03300.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301, except as modified herein.
B. All finishing materials shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) Compliance.
C. Contractor performing flatwork finishing of concrete slabs shall provide at least one (1) flatwork finisher certified as an ACI Concrete Flatwork Finisher.

PART 2 - PRODUCTS

2.1 FINISHING MATERIALS

A. Slab Sealer:
    1. Silane or Siloxane based 96% chloride ion screen.
    2. Do not apply to surfaces cured with curing compounds.
    3. Acceptable products:
        a. Baracade Silane 100 C by Euclid Chemical
        b. Certi-Vex Penseal 244 100% by ChemMasters/Vexcon
        c. Intraguard by WR Meadows
        d. Or equivalent.

B. Slab Hardener:
   1. Siliconate/silicate-based penetrating liquid hardener/densifier/sealer: clear, odorless, chemically reactive, waterborne solution of inorganic siliconate/silicate materials.
   2. Acceptable products:
      a. Euco Diamond Hard, Euclid Chemical
      b. FGS Hardener Plus, L&M Construction Chemicals
      c. Chemisil Plus, by ChemMasters
      d. Liqui-Hard Ultra by WR Meadows
      e. Or equivalent

C. Evaporation Retardant:
   1. Water based polymer liquid evaporation retardant.
   2. Acceptable products:
      a. E-CON by L&M Construction Chemicals
      b. Eucobar by Euclid Chemical
      c. SikaFilm by Sika Corporation
      d. MasterKure ER 50 by Master Builders/BASF
      e. Starseal Assist by Vexcon
      f. Spray Film, by ChemMasters
      g. Or equivalent"

PART 3 - EXECUTION

3.1 FINISHES

A. Repair all defects in accordance with Section 03010 prior to finishing formed surfaces.

B. Except where covered by backfill, clean all concrete surfaces and adjoining work stained by concrete leakage.

C. Finish concrete surfaces in accordance with the schedule herein.

3.2 SLABS AND FLATWORK FINISHES

A. Screed to bring concrete surface to proper contour and elevation.

B. Highway straightedge, bull float or darby float the concrete surface immediately after screeding.

C. Allow bleeding process to complete and for all bleed water to evaporate. Slabs shall not be finished while bleed water is on the surface. Means to accelerate drying such as applying dry cement, sand, and other materials shall be prohibited.

D. The specified evaporation retardant may be used to control plastic shrinkage cracking. Conditions that may warrant its use include high temperature, low humidity, high winds, and direct sunlight. Apply in strict conformance with the manufacturer's recommendations. Do not work into concrete surface.

E. After completion of the above listed procedures, provide one of the concrete finishes listed below as indicated in the Schedule of Finishes:
   1. (FF) Float Finish: Float the surface with magnesium or cast aluminum float or with a power finishing machine. Floating shall begin when the water sheen has evaporated and when the slab has stiffened sufficiently to allow proper operation of a power-driven float. Hand floating with wood, aluminum or

magnesium floats shall be used at locations inaccessible to a power float. Tolerances shall be for a conventional surface in accordance with ASTM C117.

2. (LTF) Light Trowel Finish: Provide Float Finish. Hand trowel with a minimum number of passes to provide a sealed surface free of trowel marks. Do not apply an excessive number of trowel passes. Tolerances shall be for a conventional surface in accordance with ASTM C117.
3. (LBF) Light Broom Finish: Provide FF or WFF as indicated above. While plastic draw a soft-bristled broom, over the concrete in long even strokes with downward pressure. Broom transverse to traffic or at right angles to the slope of the slab.
4. (SF) Scratch Finish: Roughen the surface with stiff brushes or rakes before final setting. Remove laitance and loose aggregate.

F. All slabs shall be true to the gradient and elevations shown on the Drawings. Slabs shall be pitched to drains as indicated on the Drawings. In accordance with ACI 117, using a 10-foot straight edge placed anywhere on the slab, the gap under the straightedge and between support points shall not exceed the following:
   1. Conventional slab surface: maximum gap of ½-inch for 90% of samples, and maximum gap of ¾-inch for 100% of samples. A conventional slab surface shall be provided except where moderately flat or flat surface is specified.

3.3 VERTICAL SURFACE FINISHES

A. Surface tolerance classes indicated herein are specified in ACI 117 and include abrupt surface irregularities that are measured within 1-inch of the irregularity, and gradual surface irregularities measured as the maximum gap between the concrete and the near surface of a 5-foot straight-edge, measured between contact points. All repairs shall be in accordance with Section 03010.

B. Surface Finish-1.0 (SF-1.0):
   1. Patch voids larger than 1 ½ inches wide or ½ inch deep.
   2. Projections exceeding 1 inch in height shall be removed.
   3. Except when taper tie system specified in Section 03300 is used, form tie holes need not be patched.
   4. Repair surface and structural defects as indicated in Section 03010.
   5. Surface tolerance Class D with formed surface irregularities not more than 1 inch.

C. Environmental Surface Finish-1.0 (ESF-1.0):
   1. Patch voids larger than 1 ½ inches wide or ¼ inch deep.
   2. Projections exceeding ½ inch height shall be removed.
   3. Patch form tie holes.
   4. Repair surface and structural defects as indicated in Section 03010.
   5. Surface tolerance Class C with formed surface irregularities not more than ½ inch.

D. Environmental Surface Finish-2.0 (ESF-2.0):
   1. Patch voids larger than ¾ inch wide or ¼ inch deep.
   2. Projections exceeding ¼ inch in height to be removed.
   3. Patch form tie holes.
   4. Repair surface and structural defects as indicated in Section 03010.

5. Surface tolerance Class B with formed surface irregularities not more than ¼ inch.

E. Environmental Surface Finish-3.0 (ESF-3.0):
1. The concrete surface shall be of uniform color, texture.
2. The arrangement of the form facing material shall be orderly and symmetrical, with the number of seams kept to the minimum.
3. Surfaces to subsequently receive a grout-cleaned rubbed finish (GCRF) shall receive an abrasive or high-pressure water blast to fully expose air voids prior to finishing.
4. Patch voids larger than ¾ inch wide or ¼ inch deep.
5. Projections exceeding 1/8 inch in height to be removed.
6. Patch form tie holes.
7. Repair surface and structural defects as indicated in Section 03010.
8. Surface tolerance Class A with formed surface irregularities not more than 1/8 inch.

F. Grout-Cleaned Rubbed Finish (GCRF):
1. Provide an ESF-3.0 finish as specified above.
2. The wall surface shall have all loose dirt, scale, etc. removed.
3. The surface shall be wetted and allowed to soak the surface. The surface being worked on shall not be in the sun while finishing. Curing in the sun is acceptable.
4. The grout mixture shall be one-part portland cement and 1½ parts sand (by volume) and enough water to produce the consistency of thick paint matching the color of the surrounding concrete. After the materials are mixed, let set for at least 15 minutes.
5. The sand and portland cement shall be obtained from the concrete plant where the concrete was obtained and shall be the same sand and the same cement as used in the concrete.
6. Scrub grout into voids and remove excess grout. This is not a parge coat. The entire surface shall be rubbed and all voids filled.

3.4 MISCELLANEOUS CONCRETE SURFACES

A. Curbs: Provide steel trowel finish to top surface. Strip forms immediately after 24 hours and apply an ESF-3.0 finish to vertical surfaces.

3.5 SLAB SEALER

A. Except if otherwise specified in Section 03390 Concrete Curing, exterior elevated slabs and slabs-on-ground, and garage slabs, shall receive specified slab sealer
B. Exterior equipment pads, stairs, sidewalks, and drives shall receive specified slab sealer or curing and sealing compound specified in Section 03390.
C. Apply in strict conformance with manufacturer recommendations. The following requirements are minimum and more stringent requirements required by the manufacturer shall be adhered to.
1. Cure concrete as specified in Section 03390. Let concrete age for a minimum of 30 days prior to application of slab sealer.
2. Clean surface of oil, grease, dirt, and foreign materials as recommended by the manufacturer.

3. Apply when slab temperature is between 40°F and 80°F.
4. Apply in a minimum of 2 coats or more if recommended by the manufacturer. Each successive coat shall be applied perpendicular to the previous coat.

3.6 SLAB HARDENER

A. Interior floor slabs shall receive hardener specified herein,or the curing, sealing and hardening compound specified in Section 03390.
B. Apply in strict conformance with manufacturer recommendations.
C. Apply in a minimum of two coats or more if recommended by manufacturer. Each successive coat shall be applied perpendicular to the previous coat.

3.7 SCHEDULE OF FINISHES

A. Concrete surfaces "exposed to view" shall be defined as those exposed to view upon completion of the Work, whether or not a painted finish is specified. Surfaces which will be covered by fill, such as exterior faces of walls, shall not be considered exposed to view. Interior surfaces of tanks and channels to receive a cover (including grating), or that are more than one foot below the design water level, shall not be considered exposed to view.
B. Finish concrete surfaces according to the following schedule:

SCHEDULE OF FINISHES	
Location	**Finish**
WALLS AND VERTICAL SURFACES	
Exterior surfaces exposed to view from top of walls to 6” below grade	ESF-3.0
Foundation walls not exposed to view, except as otherwise specified	ESF-1.0
Interior surfaces	GCRF
Curbs	GCRF
SLABS, BEAMS, AND CONCRETE FILL	
Buildings	
Interior slabs	LTF
Equipment pads	FF
Other Exterior Slabs	
Exterior slabs-on-ground	LBF
Exterior stairs, platforms, sidewalks, and drives	LBF

END OF SECTION

SECTION 03390

CONCRETE CURING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Curing

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ACI SPEC-301 –Specifications for Concrete Construction
B. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
C. ASTM C309 – Standard Specification for Liquid Membrane - Forming Compounds for Curing Concrete
D. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.4 SUBMITTALS

A. Submit product data and Safety Data Sheets for specified items. Indicate the intended use and location for all products.
B. Submit curing methods. Submittal shall be in a table format indicating each structure and how each of its individual components will be cured.
C. Include timing and procedures for application, maintenance requirements, and duration.
D. Submit all requested information prior to the pre-concrete meeting described in Section 03300.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI SPEC-301 except as modified herein.
B. All curing materials shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) Compliance.

PART 2 - PRODUCTS

2.1 CURING MATERIALS

A. Curing compounds shall not be used for tanks or liquid retaining or resisting structures; moist cure is required.
B. Curing and Sealing Compound:
    1. Acrylic water-based compound
    2. Conform to ASTM C309 Type 1 and ASTM C1315 Type 1 Class A, minimum 25% solids.
    3. Acceptable products:
        a. Super Diamond Clear VOX by Euclid Chemical

b. StarSeal 1315 by ChemMasters/Vexcon
c. Vocomp 25 by WR Meadows
d. Dress & Seal WB 25 by L&M Construction Chemicals
e. Or equivalent.

C. Dissipating Resin Curing Compound:
1. Conform to ASTM C309 Type 1
2. Film must break down in two to four weeks.
3. Acceptable products:
a. Kurez-DR by Euclid Chemical Company
b. Certi-Vex Enviocure 100, by ChemMasters/Vexcon
c. Res-Cure-DS by Nox-Crete
d. Or equivalent.

D. Curing, Sealing and Hardening Compound:
1. Acrylic water-based compound
2. Conform to ASTM C309 Type 1, Class A&B
3. Acceptable products:
a. Starseal EF Medium Gloss by ChemMasters/Vexcon
b. Seal Cure-30 by WR Meadows
c. MasterKure HD200WB by Master Builders
d. Or equivalent.

E. Curing Water: Water shall be potable from a municipal water supply. The temperature of the curing water shall not be lower than 20°F cooler than the surface temperature of the concrete at the time the water and concrete come in contact.

F. Curing Blanket: Cellulose fabric sheets with an impervious layer on one side.
1. Conform to ASTM C171
2. Acceptable products:
a. Conkure by Raven Industries
b. UltraCure NCF by Sika Industries
c. CB Series Synthetic Curing Blankets by Eagle Industries
d. Or equivalent.

G. Curing Paper: ASTM C171, regular or white waterproof paper.

PART 3 - EXECUTION

3.1 CURING

A. Curing shall begin immediately following the initial set of concrete or after slab surface finishing has been completed when it will not mar, erode, or stain the concrete surface and shall continue after form removal. All concrete shall be cured to attain strength and durability by one of the following methods for a minimum of 7 consecutive days immediately after placement.
1. Moist Cure
a. Ponding or continuous sprinkling. Intermittent wetting and drying is not an acceptable curing method.
b. Application of curing paper kept continuously wet. Use wet methods for the first 24 to 30 hours. Lap side joints of paper 4 inches minimum and end joints 6 inches minimum. Tape joints or weigh down paper to prevent displacement. Repair any and all tears during the curing period. Apply

paper no earlier than 24 hours, and no later than 30 hours, after finishing. The slab surface shall be maintained in a wet condition beneath the paper at all times.

2. Curing compounds
   a. Curing compounds shall not be used on surfaces to receive toppings, concrete fill, bonded finishes, coatings, sealers, chemical hardeners, waterproofing, dampproofing, or GCRF as specified in Section 03350. Moist curing methods shall be used.
   b. Apply in strict conformance with manufacturer recommendations.
   c. Apply in a minimum of two perpendicular coats.
   d. When using dissipating resin curing compounds, allow curing compound to chemically break-down, and remove residuals and other foreign material, prior to applying sealers and other materials.
   e. For slabs, apply immediately following the disappearance of the surface water sheen after the final finishing pass. For formed concrete, apply immediately after form removal.

B. Moisture loss from surfaces placed against wooden or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed.

C. All exposed concrete (tops of walls) within vertical forms shall begin curing, such as with soaker hoses, within 24 hours of placement, regardless of the duration that the forms will remain in place.

D. After form removal of vertical elements, the concrete shall be cured for the balance of time remaining as specified above.

E. For curing during hot weather also see the requirements of Section 03341.

END OF SECTION

SECTION 03604

NON-SHRINK GROUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cementitious non-shrink grout
B. Epoxy non-shrink grout

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM C33/C33M - Specification for Concrete Aggregates
B. ASTM C109/C109M - Test Method for Compressive Strength of Hydraulic Cement Mortars
C. ASTM C827 - Test Method for Changes in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
D. ASTM C1107/C1107M - Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
E. CRD-C611 - Test Method for Flow of Grout Mixtures
F. CRD-C621 - Specification for Non-Shrink Grout

1.4 SUBMITTALS

A. Submit product data and Safety Data Sheets for products to be used.
B. Submit test data when required.
C. Submit manufacturers installation instructions for products used.
D. Submit a list of at least five (5) similar installations of the product during the last 5 years.

1.5 QUALITY ASSURANCE

A. The grout manufacturer shall be ISO 9001 certified and have been in business of manufacturing similar products for over ten (10) years. The manufacturer shall maintain a strict quality assurance program, offer technical services and provide a representative at the jobsite for product training, prior to product installation, upon written request.
B. Conform to Army Corps of Engineers Specification CRD-C621 and ASTM C1107/C1107M (Grades B or C).
C. Grouts shall exhibit non-shrink characteristics when tested according to ASTM C827.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver in original sealed packages or containers, labeled with the manufacturer’s identification, printed instructions and batch code.
B. Store in dry conditions above freezing and below 90°F.
C. Keep unused portions of opened containers dry and warm.

D. Store aggregate covered and protected from the elements.

1.7 ENVIRONMENTAL CONDITIONS

A. Do not place grout when exposed to precipitation.
B. Place grout when temperature of substrate and ambient air are above 40°F and below 90°F.
C. Place grout outside these limits when approved by heating substrates, enclosing work, shading, cooling or other measure to mitigate adverse weather conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cementitious grout: consists of premeasured, prepacked flowable cement based grouting material with aggregate requiring only the addition of water.
B. Epoxy grout: consists of premeasured, prepacked epoxy based grouting material consisting of an epoxy resin, hardener and specially blended aggregates. The ratio of the weight of aggregate to the weights of the combined resin and hardener (fill ratio) shall be maintained.
C. Aggregates: ASTM C33/C33M fine aggregate, washed.
D. Pea Stone: ASTM C33/C33M coarse aggregate, size number 8 (max. size 0.375 inches), washed.
E. Water: Potable, from municipal water supply.
F. Epoxy resins shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other volatile and hazardous diluents are not permitted.
G. Utilize proper grout for the intended application as recommended by the manufacturer.

2.2 TESTS

A. All grouts shall achieve a minimum 28 day strength of 6,000 psi according to ASTM C109/C109M.
B. Grouts when tested by flow cone according to CRD-C 611 shall take more than 20 seconds to flow as a maximum limit on fluidity.
C. Test grout when requested.

2.3 ACCEPTABLE PRODUCTS

A. Cementitious Grout
    1. Five Star Grout - Five Star Products, Inc
    2. Masterflow 928 - BASF / Master Builders
    3. NS Grout - Euclid Chemical Company
    4. Crystex - L&M Construction Chemical, Inc.
    5. Harris Construction Grout – A.H. Harris & Sons, Inc.
    6. Or equal
B. Epoxy Grout
    1. HP Epoxy Grout - Five Star Products, Inc.
    2. Masterflow 648 CP Plus - BASF / Master Builders
    3. E3-HP - Euclid Chemical Company
    4. Epogrout 758 - L&M Construction Chemicals, Inc.

5. Or equal

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Unless otherwise indicated, Follow manufacturer's written instructions.
B. Concrete surfaces shall be a minimum 28 days old.
C. Completely remove all loose concrete, aggregate, dust, laitance, dirt, oil, grease and other contaminants by bush-hammering, chipping, brushing, concrete cleaners or degreasers.
D. Use acceptable mechanical means to obtain clean, sound and rough concrete surfaces, exposing coarse aggregate. Blow surfaces clean of dust and debris using oil-free compressed air.
E. Surface moisture:
   1. Cementitious grout: Soak concrete surfaces thoroughly for a minimum of 8 hours with potable water. Concrete shall be saturated and free of standing water at time of grout placement.
   2. Epoxy grout: Do not pre-soak concrete surfaces prior to grout placement. Surfaces shall be visibly dry.
F. Follow manufacturer’s cold and hot weather grouting procedures to maintain all materials and surfaces that contact grout within acceptable temperature ranges. Heat the substrate and surrounding environment to a minimum of 40° F.

3.2 FORMS

A. Formwork shall be constructed of rigid nonabsorbent materials, securely anchored, watertight and strong enough to resist forces developed during grout placement.
B. Formwork shall be constructed so that the grout is placed across the shortest distance whenever possible. The clearance between formwork and baseplate shall be sufficient to allow for headbox. The clearance for remaining sides shall be one to three inches.
C. Height of formwork shall extend a minimum of one inch above the highest point to be grouted.
D. All formwork shall be coated with a form release agent or plastic sheeting for easy removal. Care should be taken not to contaminate grouting surfaces where bond is required.

3.3 MIXING

A. Provide an adequate number of mortar mixers in good operating condition for uninterrupted placement. Do not exceed one-half the maximum capacity of the mortar mixer.
B. Cementitious grout:
   1. Pre-wet mortar mixer directly prior to mixing. Empty excess water.
   2. Start by adding the minimum amount of premeasured potable water to mixer. While mixing, slowly add grout and mix to a uniform consistency.
   3. Mix thoroughly for approximately four to five minutes. To achieve desired consistency, add remaining water as necessary. Do not exceed maximum water content as stated on product packaging or add an amount that will cause segregation.

4. For pours requiring aggregate extension, add clean, damp coarse aggregate before final water adjustment.
5. Do not mix more material than can be placed within the working time of the grout. Do not retemper the mix by adding additional water.

C. Epoxy grout:
1. Combine resin and hardener into pail containing resin. Mix thoroughly by hand with a paddle or by slow speed mixer until a uniform color (no streaks) is obtained. Avoid air entrapment while mixing. Immediately pour all mixed liquids into mortar mixer. While mixing at a slow speed, slowly add aggregate and mix only until aggregate is completely wet.
2. Do not mix more material than can be placed within the working time of the grout.

3.4 PLACING

A. Pouring (Cementitious and Epoxy Grout):
1. A headbox or similar device is required for a continuous pour to avoid air pockets under baseplate. All grouting shall take place from one side to the other, maintaining contact with the bottom of the plate at all times.
2. When pouring through grout holes, placement shall proceed continuously with a headbox until the grout has risen in the next hole. Maintain head pressure at initial hole so that grout stays in contact with the bottom of the baseplate at all times.
3. Commence grouting at the next hole with an additional headbox. Continue process, alternating headboxes until grouting is complete.
4. When pouring into the headbox, grout shall be introduced in a manner to avoid air entrapment. Care must be taken during grouting to keep the headbox at least half full of material to ensure even grout flow. If necessary to assist the flow, a plunger may be used. This procedure shall continue until the grout rises above the bottom edge of the baseplate on the opposite side.
5. Throughout the pour, forms shall be constantly checked for leaks. All leaks shall be sealed immediately.

B. Pumping (Cementitious Grout):
1. The type and size of pump and discharge line used are dependent on the parameters of each installation. Contact the pump and grout manufacturers for recommendations.
2. Pumping raises the grout temperature and shortens the working time while reducing its consistency. Keep mix temperature as cool as necessary.
3. The grout shall be mixed to a consistency that will not segregate while pumping.
4. The grout shall be passed through a #4 screen prior to placement into the pump hopper.
5. Before pumping, determine the working time under jobsite conditions. Pumpability shall be determined by field testing.
6. The pump shall be positioned to minimize the pumping distance. Keep the discharge line as close to horizontal as possible. All hose connections must be watertight.
7. Immediately prior to pumping, the pump and lines shall be primed with a priming slurry leaving hopper empty to prevent overwatering.

8. Once the pumping has begun, it is important not to use any of the priming slurry from the discharge lines. Grout shall not be used until a uniform consistency is obtained at the discharge nozzle.
9. Provide an adequate volume of mixed grout to keep the pump hopper at least half full. The grout shall be placed into pump hopper in a manner to prevent air entrapment.
10. The discharge nozzle shall be withdrawn only while pumping, keeping it submerged within the grout at all times.
11. When a pump is needed to transport grout and the nozzle cannot be inserted into the cavity being grouted, a headbox is required. The headbox will allow the pour to be continuous, avoiding air pockets under the plate. The grout shall be discharged from the nozzle into the headbox in a manner to avoid air entrapment. The headbox shall be kept at least half full at all times.
12. All grouting shall take place from one side of the plate to the other. Maintain contact with the bottom of the plate at all times to maximize the effective bearing area (EBA).
13. When pouring through grout holes, placement shall proceed continuously until the grout has risen in the next hole. Maintain head pressure at initial hole so that grout stays in contact with the bottom of the baseplate at all times. Commence grouting at the next hole with an additional headbox. Continue process, alternating head boxes until grouting is complete.

C. Dry pack (Cementitious Grout):
1. A dry-pack consistency is achieved when the mixed grout can be squeezed into a ball by hand without crumbling. Only enough water should come to the surface to moisten the hands.
2. Use a ram with a square cut end and hammer to evenly compact the grout against solidly braced backing boards, combining each layer (approximately 1/2 inch thick) to the previously placed layer over its entire surface.
3. Each placed layer shall be visually inspected for placement uniformity.
4. Striking force should be sufficient for compaction of the grout without affecting plate alignment.
5. Placement shall be continuous until grouting is complete.

3.5 FINISHING AND CURING

A. Finishing:
1. Cut grout back from bottom of baseplate to the foundation at approximately a 45° angle. Formwork can be removed for cutback when grout offers stiff resistance, or when cut with a steel trowel, stands up without support. Epoxy grout may be finished flush with the edge of the base plate.
2. Provide smooth finish to exposed grout surfaces.
3. Grout shall not be allowed to remain above the bottom edge of the baseplate.

B. Curing:
1. Cementitious grout shall be moist cured for a minimum of three days. Epoxy grout does not require curing agents.
2. Cementitious Grout shall be protected from excessive evaporation with wet rags prior to set.

3. Grout shall be protected from wind, rain, and vibration until a minimum compressive strength of 1000 psi is achieved.
4. Maintain temperature above 45° F until a minimum compressive strength of 1000 psi is achieved.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Masonry Units
B. Mortar
C. Reinforcement and Anchorage
D. Accessories
E. Modifications and/or Repairs to Masonry

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 - Cast-in-Place Concrete: Deformed bar reinforcing in masonry.
B. Section 05500 - Metal Fabrications: Installation of steel lintels and embedded plates.
C. Section 08110 - Steel Doors and Frames: Placement of jamb anchors and grouting of steel frames.
D. Section 15092 - Pipe Sleeves and Seals: Installation of pipe sleeves.

1.4 REFERENCES

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary
B. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement
C. ASTM A153 - Specification for Zinc-Coating (Hot Dip) on Iron and Steel Hardware.
D. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
E. ASTM A641 - Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
F. ASTM C90 - Loadbearing Concrete Masonry Units
G. ASTM C91 - Masonry Cement
H. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
I. ASTM C140 - Sampling and Testing Concrete Masonry Units
J. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
K. ASTM C150 - Portland Cement
L. ASTM C207 - Hydrated Lime for Masonry Purposes
M. ASTM C270 - Mortar for Unit Masonry
N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
O. ASTM C476 - Grout for Masonry
P. ASTM C1019 - Standard Method of Sampling and Testing Grout.
Q. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry

R. ASTM C1623 - Standard Specification for Manufactured Concrete Masonry Lintels
S. ASTM D1056 - Expansion Joint
T. ASTM D2240 - Test Method for Rubber Property - Durameter Hardness
U. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
V. ASTM E447 - Compressive Strength of Masonry Prisms
W. NCMA TEK 17-02A - Precast Concrete Lintels for Concrete Masonry Construction
X. TMS 402-13/ACI 530-13/ASCE 5-13- Building Code Requirements for Masonry Structures
Y. TMS 602-13/ACI 530.1-13/ASCE 6-13.1 Specification for Masonry Structures.

1.5 SUBMITTALS

A. Submit product data for each item under provision of Section 01340.
B. UL Certification that the components meet the fire rating or UL system indicated on the Drawings.
C. Hot Weather Construction Procedures as specified.
D. Mortar and Grout Mix Design.
E. Submit sieve analyses for mortar and grout aggregates taken within the last 3 months if field mixing mortar and grout components.
F. Submit compressive strength of the masonry block units tested by the masonry supplier or an Independent Testing Lab within the last 30 days in accordance with ASTM C140. The number of test units shall consist of 6 specimens of each size used on the Project.
G. Submit deformed bar reinforcing for masonry in accordance with Section 03300 – Cast in Place Concrete.
H. Submit shop drawings of precast concrete lintels and architectural precast concrete detailing each different item required on the project.
I. Mortar Color Selection - Submit mortar samples for color selection in all colors available from the manufacturers full range for color selection by Architect.
J. Submit masonry contractor's qualifications.

1.6 QUALITY ASSURANCE

A. All testing shall be conducted by an Independent Testing Laboratory retained and paid for by the Contractor.
B. Independent Testing Laboratory shall submit one copy each of all test reports to the Engineer, Resident Project Representative and Contractor.
C. Independent Testing Laboratory shall submit reports within 5 days of testing or inspection.
D. Independent Testing Laboratory shall telephone the Engineer, Resident Project Representative and Contractor within 24 hours if tests indicate deficiencies.
E. General Contractor shall notify the testing laboratory 48 hours in advance of when the prism samples will be made by the Project Mason.
F. A "Set" of test samples shall be defined as all of the following:
    1. Three ungrouted prisms
    2. Three grouted prisms
    3. Four mortar specimens

4. Four grout specimens

G. Frequency of testing:
   1. Construct one set of samples at the beginning of masonry construction for verification of conformance with the Contract Documents and quality control procedures.
   2. Construct one set of samples during construction for every 150 lineal feet of load bearing masonry wall for each floor of each building.
   3. Construct a minimum of one test set per building regardless of the lineal footage.

H. Conformance of the masonry block strength to the Contract Documents shall be by Masonry Prisms as outlined in ACI 530.1. Engineer shall determine compliance based on the results of the prism tests outlined in Part 1.6.L.

I. Project Mason shall construct masonry prisms in accordance with ASTM C1314 unless otherwise indicated as follows:
   1. Nominal prism dimensions shall be 8-inches by 8-inches by 16-inches high and consist of a half-height block on the bottom, a full height block in the middle and a half-height block on the top with full mortar beds.
   2. Masonry prisms shall be cured as follows:
      a. Build each prism in an opened, moisture-tight bag large enough to enclose and seal the completed prism. Construct prisms on a flat, level base. Min-max thermometers shall be placed in the bags.
      b. The prisms shall be left in the field and located such that they are exposed to the identical environmental conditions as the masonry walls. The prisms shall remain at this location until they are ready for testing.

J. Project Mason shall provide and mix the mortar and the Independent Testing Laboratory shall construct and cure mortar specimens in accordance with ASTM C109. All mortar used for the test specimens shall be that which has been submitted with no exceptions taken by the Engineer

K. Project Mason shall provide and mix the grout and the Independent Testing Laboratory shall construct and cure grout specimens in accordance with ASTM C1019. All grout used for the test specimens shall be that which has been submitted with no exceptions taken by the Engineer.

L. Independent Testing Laboratory shall test masonry prisms, mortar specimens and grout specimens as follows:
   1. Masonry prisms:
      a. Test masonry prisms in accordance with ASTM C1314.
      b. Test set of grouted and ungrouted prism at 28 days.
   2. Mortar specimens:
      a. Test mortar specimens in accordance with ASTM C109.
      b. Test one specimen at 7 days and one set of specimens at 28 days. The spare specimens may be used for an additional test or potential future test.
   3. Grout specimens:
      a. Test grout specimens in accordance with ASTM C1019
      b. Test one specimen at 7 days and two specimens at 28 days. The spare specimens may be used for an additional test or potential future test.

M. Additional testing required as a result of deficient results shall be paid for by the

Contractor.

N. Source limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

O. Source limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.7 QUALIFICATIONS

A. Masonry Subcontractor: Company specializing in performing the work of this Section with a minimum of five years of experience.

1.8 PRE-MASONRY CONFERENCE

A. Prior to commencing with work of this Section, a meeting shall be held at the project site with Masonry Subcontractor, General Contractor, Owner's Representative, Resident Project Representative and independent testing laboratory. The General Contractor shall record discussions and agreements and furnish a copy to each participant. Provide at least ten working days advance notice to participants prior to convening conference.

B. The meeting shall be held after the mockup panel has been completed and the 7-day results or the first set of tests are available.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials off the ground, under cover and in a dry location.

B. Store aggregates such that grading and other required characteristics can be maintained, and contamination avoided.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 01050.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: Normal weight hollow concrete masonry units, ASTM C90.

B. Open top concrete masonry channel bond beam and lintel block: ASTM C90.

C. Knock out block: Concrete masonry units with cuts in webs down approximately two thirds the height of the block for creating reinforced bond beams at locations other than lintels, ASTM C90.

D. Bullnosed Concrete Masonry Units: ASTM C90.

E. Compressive strength of the masonry shall meet the following minimum strengths:

1. Prisms:
    a. Ungrouted: 2,000 psi
    b. Grouted: 2,000 psi
2. Concrete masonry units net area compressive strength = 2,000 psi

F. All units indicated for use in fire rated assemblies shall be tested and approved for the hour ratings indicated on the Drawings.

2.2 REINFORCEMENT AND ANCHORAGE

A. Unless noted otherwise, all masonry reinforcing shall be ASTM A153, hot dipped galvanized with a minimum thickness of 1.5 oz./ft. of wire and ASTM A123 for all other shapes.
B. Single wythe joint reinforcement: Ladder type; cold-drawn steel conforming to ASTM A82, nine (9) GA. side rods with nine gage cross ties.
C. Rebar Positioner: Rebar positioner shall be nine gage hot dip galvanized, 1¼ "deep bends to diagonally lock into CMU cores.

2.3 ACCESSORIES

A. Preformed Control Joints: Rapid Control Joint Rubber Compound Durometer 70-80, ASTM D2240, Regular Tee.
B. Cleaning Solutions: Provide an acid based cleaner designed for cleaning mortar smears and construction dirt off of masonry surfaces. Provide product suitable for masonry color and type to be cleaned with a pH of less than 1.0.

2.4 MORTAR AND GROUT MATERIALS AND MIXES

A. Acceptable Manufacturers
    1. Amerimix
    2. Quickcrete
    3. SpecMix
    4. Or equal
B. Mortar:
    1. Mortar used in the concrete blocks shall conform to ASTM C270 (Type S) with a minimum 28-day compressive strength of 1800 PSI when tested in accordance with ASTM C109.
    2. The mortar materials shall have the following properties:
        a. Material Standard for Aggregate Type: ASTM C144 (Fine Aggregate).
        b. Material Standard for Portland Cement: ASTM C150.
        c. Material Standard for Hydrated Lime: ASTM C207.
        d. Material Standard for Masonry Cement: ASTM C91.
        e. Material Standard for Mortar: ASTM C270.
        f. Material Standard for Mortar Cement: ASTM C1329.
C. Grout:
    1. Grout for all masonry components shall conform to ASTM C476 and have a minimum compressive strength of 2,500 psi at 28 days when tested in accordance with ASTM C1019.
    2. The grout materials shall have the following properties:
        a. Material Standard for Portland Cement: ASTM C150.
        b. Material Standard for Aggregate Type: ASTM C404 (Fine Aggregate).

2.5 MORTAR COLOR AND ADMIXTURES

A. Pre-measured mineral pigment; color as selected by Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Verify items provided by other sections of work are properly sized and located.
C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
D. Request inspection of spaces to be grouted.
E. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied in other sections.
B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
C. Install mortar and grout to requirements of the specific masonry sections.
D. Work grout into masonry cores to eliminate voids.
E. Do not displace reinforcement while placing grout. Reinforcement shall remain centered in the width of the cell.
F. Remove grout spaces of excess mortar.
G. Cover and protect the top of the masonry walls at the end of each workday and during inclement weather. Cover partially completed masonry when construction is not in progress.
    1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
    2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
H. Stain Prevention: Prevent grout, mortar and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar and soil that come in contact with such masonry.
    1. Protect base of walls from rain-splashed mud and mortar splatter by covering spread on ground and over wall surface.
    2. Protect sills, ledges and projections from mortar droppings.
    3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
    4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

3.3 MORTAR MIXING

A. Mix mortar using a mechanical mortar mixer to ensure homogeneity and workability. Observe mixing times of 4-5 minutes, consistent from batch to batch.
B. Use clean, potable water; add the maximum amount consistent with optimum workability.
    1. Maintain a uniform proportioning.
    2. At the end of the day, thoroughly rinse the mixer to avoid contamination of future mortar.

C. Cure mortar a minimum of 28 days.
D. Retemper mortar by adding additional mixing water only to replace water lost due to evaporation.
   1. Do not retemper colored mortars.
   2. Retemper no more than once and only within two hours of mixing.
E. Use mortar within two hours after mixing at temperatures of 80 degrees F, or 2½ hours at temperatures under 50 degrees F.
F. Use care when mixing to provide a consistent mixture.

3.4 GROUT MIXING
A. Comply with manufacturer's printed instructions and the following:
B. Material should be mechanically mixed.
C. Do not mix more material that can be placed in 15 minutes. Do not re-temper with additional water.
D. Do not use anti-freeze compounds to lower freezing point of grout.

3.5 COURSING
A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness to provide a neat, uniform appearance.
C. Lay concrete masonry units in running bond unless indicated otherwise on the drawings. Course one unit and one mortar joint to equal eight inches. Form concave mortar joints to provide a neat, uniform appearance where exposed to view.
D. Place concrete masonry units of uniform surface pattern and do not place units with large voids or bug holes that can't be filled with block filler.
E. Build wall in tiers with a maximum height of 4-feet then grout prior to continuing with next tier.

3.6 PLACING AND BONDING
A. Lay hollow masonry units with face shell bedding on head and bed joints.
B. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
C. Remove excess mortar which has splashed or been smeared on finished surfaces with stiff bristle brushes as work progresses.
D. Place full mortar bed around each core that is to be grouted.
E. Interlock intersections and external corners.
F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
G. Perform jobsite cutting of masonry units with electrically operated carborundum saws to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges. Do not break units with hammers or other tools.
H. Isolate masonry partitions from vertical structural framing members with a control joint.
I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
J. Install bullnose concrete masonry units at all external corners, doors and window jambs as detailed on Drawings.

K. Remove any sharp edges on finished concrete masonry unit surfaces prior to the application of block filler.
L. Use Ivany or open top channel blocks for bond beams.
M. Use open top channel blocks for masonry lintels.

3.7 JOINT REINFORCEMENT AND ANCHORAGES

A. Install horizontal joint reinforcement as shown on Drawings.
B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place joint reinforcement continuous in first joint below top of walls.
D. Lap joint reinforcement ends minimum six inches.
E. Embed anchors attached to structural steel members. Embed anchorages in every second block joint.
F. Install horizontal joint reinforcing at 16" on center at all interior masonry walls.
G. Reinforce wall intersections with strap anchors or prefabricated Tee joint reinforcing 16 inches on center.

3.8 LINTELS

A. Install lintels over openings as shown on Drawings.
B. Install reinforced unit masonry lintels over openings exceeding 16 inches, where steel or precast concrete lintels are not scheduled. Provide reinforcing as required to span the opening.
C. Use full length reinforcing bars only.
D. Support and secure reinforcing bars from displacement. Maintain position within ½ inch of dimensioned position.
E. Place and consolidate grout fill without displacing reinforcing.
F. See the Structural Drawings for the minimum bearing on each side of opening.
G. Use "A" type blocks to tie vertical reinforcing into the horizontal reinforcing at masonry lintels.
H. Allow masonry lintels to attain specified strength before removing temporary supports.

3.9 GROUTED COMPONENTS

A. Reinforce channel bond beam and lintel block with two bars, placed continuously, size as shown on the Drawings.
B. Support and secure reinforcing bars from displacement. Vertical reinforcing shall be centered in the width of the core.
C. Place and consolidate grout fill without displacing reinforcing.
D. At bearing locations, fill masonry cores with grout for a minimum 24 inches either side of opening unless otherwise indicated on the drawings.
E. All cells to receive epoxy or expansion anchors shall be grouted solid.
F. Grouting:
    1. Request the Engineer to inspect the cells. Allow three days' advance notice of inspection.
        a. Provide cleanout opening no less than four inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit.

b. Clean out masonry cells with high pressure water spray. Permit complete water drainage.

2. After cleaning and cell inspection, seal openings with masonry units.
3. Place grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
4. Limit grout lift to 48 inches, stop each lift at least one inch below the top of a masonry unit and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.10 PLACING REINFORCING STEEL

A. Mason shall coordinate dowel placement and coordinate vertical reinforcing splices for constructability.
B. Install reinforcing before laying masonry. Installation shall be done per the Masonry Reinforcing Shop Drawing marked "No Exceptions Taken".
C. Prior to placing grout, clean all reinforcement of loose, flaky rust; scale; grease; mortar; grout; or other coating which might destroy or reduce its bond with grout. The details of reinforcement shall conform to ACI 315. Do not bend or straighten reinforcing. Do not use bars with kinks or bends not shown on the Drawings. Placement of reinforcement shall be inspected by the Engineer prior to placing grout.
D. Position vertical bars accurately at the centerline of the reinforced wythe within a tolerance of 1/2 inch. Maintain a minimum clearance between the bars and masonry units of 1/2 inch and between parallel bars of one diameter of the reinforcement. Hold vertical reinforcing in place using metal supports, centering clips, spacers, or caging-devices located near the ends of each bar and at intermediate intervals of not more than 160 diameters of the reinforcement. Wire column and pilaster ties in position around the vertical steel, laying ties in mortar joints will not be permitted.
E. Stagger splices in adjacent bars. Lay bars a minimum of 48 diameters of the reinforcement or two feet whichever is greater. Welded or mechanical connections shall develop the full strength of the reinforcement.
F. Vertical reinforcing shall extend into the bond beam located at the top of the wall. The open top channel block shall be drilled to accommodate the vertical reinforcing.

3.11 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control joints. Stop control joint under the bond beam at the top of the wall. Rake and caulk the control joint at the top bond beam.
B. Joints shall extend through intermediate reinforcing and bond beams.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Form control joints as detailed on Drawings.

3.12 BUILT-IN WORK

A. As work progresses, build in metal door and glazed metal frames, plates and other items furnished by other sections.
B. Build in items plumb and level.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or batt insulation as shown on the Drawings.
D. Do not build in organic materials subject to deterioration.

3.13 TOLERANCE

A. Maximum variation from alignment of columns and pilasters: 1/4 inch.
B. Maximum variation from unit to adjacent unit: 1/8 inch.
C. Maximum variation from plane of wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
D. Maximum variation from plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum variation from level coursing: 1/8 inch in three feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
F. Maximum variation of joint thickness: 1/8 inch in three feet.
G. Maximum variation from cross sectional thickness of walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, grounds and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 QUALITY CONTROL

A. Inspect all units prior to releasing masonry for painting.
B. Remove and replace all defective masonry units including those that are loose, chipped, broken, stained or otherwise damaged or if units do not match adjoining units including those with large voids and bug holes that can’t be filled by block filler. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
C. Replace defective mortar. Match adjacent work.

3.16 CLEANING

A. Clean work under provisions of Section 01710.
B. Remove excess mortar and mortar smears.
C. Remove any sharp edges and protrusions.
D. Clean soiled surfaces of unpainted surfaces with cleaning solution.
E. Use non-metallic tools in cleaning operations.

3.17 HOT WEATHER CONSTRUCTION PROCEDURE

A. When the ambient temperature exceeds 90 degrees F:
    1. Lightly wet the mortar bedding surface areas.
    2. Keep mortar moist, and do not string out on the wall so far ahead of units being placed that drying will take place prior to placement of units.
    3. After the units are in place, a very light fog spray shall be applied sufficient times during the first 24 hours for proper curing.

B. Provide a High/Low thermostat within the enclosure or at the work.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Structural Steel Shapes
B. Fasteners
C. Welding
D. Bolt and Weld Inspections
E. Galvanizing

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. Performance of Hot-Dip Galvanized Steel Products - American Galvanizer's Association
B. ASTM A6/A6M - Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
C. ASTM A36/A36M - Specification for Carbon Structural Steel
D. ASTM A53/A53M - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
E. ASTM A108 - Specification for Steel Bar, Carbon and Alloy, Cold-Finished
F. ASTM A123/A123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron & Steel Products
G. ASTM A153/A153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
H. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
I. ASTM A500/A500M - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
J. ASTM A572/A572M - Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
K. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
L. ASTM A992/A992M - Specification for Steel for Structural Shapes for Use in Building Framing
M. ASTM B6 - Specification for Zinc
N. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
O. ASTM B244 - Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments
P. ASTM D523 - Standard Test Method for Specular Gloss

Q. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
R. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
S. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
T. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
U. ASTM D3359 - Standard Test Methods for Measuring Adhesion by Tape Test
V. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test
W. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
X. ASTM F436 - Specification for Hardened Steel Washers
Y. ASTM F844 - Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
Z. ASTM F3125/F3125M - Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
AA. AWS D1.1/D1.1M - Structural Welding Code-Steel - American Welding Society
BB. AWS QC1 – Standard for AWS Certification of Welding Inspectors
CC. American Institute of Steel Construction- Manual of Steel Construction
DD. American Institute of Steel Construction: ANSI/AISC 303 – Code of Standard Practice for Steel Buildings and Bridges
EE. American Institute of Steel Construction: ANSI/AISC 360 – Specification for Structural Steel Buildings
FF. Research Council on Structural Connections - Specification for Structural Joints Using ASTM A325 or A490 Bolts (“RCSC Specification”)
GG. SSPC Steel Structures Painting Council
HH. SSPC-SP1 Solvent Cleaning
II. SSPC-SP2 Hand Tool Cleaning
JJ. SSPC-SP3 Power Tool Cleaning
KK. SSPC-SP4 Flame Cleaning of New Steel
LL. SSPC-SP5 White Metal Blast Cleaning
MM. SSPC-SP6 Commercial Blast Cleaning
NN. SSPC-SP7 Brush Off Blast Cleaning
OO. SSPC-SP8 Pickling
PP. SSPC-SP9 Weathering and Cleaning
QQ. SSPC-SP10 Near-White Blast Cleaning

1.4 SUBMITTALS

A. Copies of the Drawings in whole or in part will not be accepted as shop drawings.
B. Mark numbers on the fabricated pieces of steel shall be the same mark numbers used on the detailed shop and erection drawings.
C. Submit complete shop drawings showing the following information:
    1. Plan layouts showing building grid lines, dimensions, piece designations, and other pertinent information.

2. Elevations, sections, and details showing general arrangement of pieces with piece designations, dimensions, connections, and other pertinent information.
3. Details of each piece with designation, length, bolt holes, bolts, copes, welded components, and welds with AWS symbols.
4. Bill of Materials for all pieces including:
    a. Piece designation
    b. Quantity
    c. Description
    d. Length
    e. Material and grade
    f. Finish
    g. Weight

D. Submit product data where required.
E. Submit the following qualifications:
    1. Steel Fabricator: AISC Certification
    2. Steel Erector: AISC Certification
F. Submit qualifications of galvanizing plant.
G. Submit Certificate of Compliance from hot-dipped galvanizing plant stating that hot-dipped galvanizing is in accordance with Specification.
H. Submit mill test reports for structural steel shapes, bolts, nuts, and washers.

1.5 QUALITY ASSURANCE

A. The fabricator shall participate in the AISC Quality Certification Program and shall be certified as an AISC-Certified Plant, Standard for Steel Building Structures (STD).
B. The erector shall participate in the AISC Quality Certification Program and shall be certified as an AISC-Certified Steel Erector.
C. All work shall conform to ANSI/AISC 303 and ANSI/AISC 360
D. Mill materials shall meet the tolerances specified in ASTM A6/A6M.
E. All welding shall conform to AWS D1.1/D1.1M.
F. Galvanizer Qualifications: Galvanizer shall have demonstrated a minimum of ten years' experience in the successful application of galvanized coatings specified in this specification in the facility where the work is to be performed and who will apply the coatings within the same facility. All galvanizing shall be performed by a single plant that is a member of the American Galvanizers Association.
G. All welders shall be certified in accordance with the requirements of the AWS D1.1/D1.1M with the following information:
    1. Type of welding for which the welder is qualified
    2. Welding position for which the welder is qualified
    3. Code and procedure for which the welder is qualified
    4. Date qualified
    5. Name of the firm and person certifying the qualification tests

1.6 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of products.
B. Unload material as soon as it is delivered and carefully handle and stack to prevent corrosion, deformation and damage. Structural steel shapes shall be carefully stored on substantial pallets, dunnage, or other supports and spacers. Supports shall be free

from earth and properly drained, preventing splatter from dirt and other foreign matter.

C. Protect products from damage prior to, during and after installation.

D. All ASTM F3125 Grade F1852 and galvanized Grade A325 bolt assemblies shall be assembled and shipped in the same container.

E. Provide protective storage for all fastener components. Fastener components removed from protective storage shall be protected from dirt and moisture in closed containers at the site of installation. Fastener components shall not be cleaned or modified from as-delivered condition, and if they accumulate rust or dirt shall not be incorporated into the work, and shall be removed from the site.

F. Remove damaged materials from the site.

PART 2 - PRODUCTS

2.1 MATERIALS Structural steel shapes and plates:

1. Wide flange beams ("W" shapes) - ASTM A992/A992M
2. ASTM A36/A36M
3. Channels (“C” and “MC” shapes) - ASTM A36/A36M
4. Angles (“L” shapes) – ASTM A36/A36M
5. Plates - ASTM A572/A572M

B. Fasteners

1. High Strength Bolts: ASTM F3125 Grade A325 Type 1, Style Heavy Hex Head Unfinished Bolts: ASTM A307
3. Nuts: ASTM A563 Heavy Hex
4. Washers: ASTM F436 (ASTM F3125 Bolts); ASTM F844 (ASTM A307 Bolts)
5. Plate Washers: ASTM A572/A572M, Grade 50

C. Threaded Rods: ASTM A36/A36M

D. Welding Rods: AWS D1.1/D1.1M (E70XX Electrodes)

E. Finish:

1. Shapes: Hot-Dipped Galvanized: ASTM A123/A123M
2. Fasteners: ASTM A153/A153M

PART 3 - EXECUTION

3.1 FABRICATION

A. Unless otherwise specified, structural steel shall be fabricated in accordance with the requirements of AISC 303 and AISC 360. All members shall fit closely together and shall be straight and true, and the finished work shall be free from burrs, bends, twists, and open joints.

B. All bolt holes shall be provided as required and shall be punched, sub punched and reamed, or drilled in accordance with AISC 360. Holes shall not be made or modified by thermal cutting.

C. Holes shall be 1/16 inch larger than the nominal bolt diameter, except holes for cast-in-place anchor bolts which shall be 5/16 inch larger than the nominal bolt diameter and as otherwise shown on the Drawings.

D. The use of oversize or slotted holes not shown on the Drawings shall be subject to

prior review by the Engineer.

E. Except as otherwise indicated on the drawings, gusset plates shall have a minimum thickness of 3/8 inch.
F. Sheared and thermal cut edges shall be true to line and free from rough corners and projections.
G. Re-entrant cuts/corners shall be filleted to a radius of not less than ½ inch.
H. Welding shall be done in a sequence which minimizes distortion and shrinkage.
I. Fabrication holes, notches, etc. not required by nor shown on the Drawings shall be subject to prior review by the Engineer.

3.2 CONNECTIONS (GENERAL)

A. All steel framing connections not detailed on the Drawings shall be either shop-welded, field-bolted or all field-bolted connections designed by the fabricator subject to the provisions of the design drawings, specifications and AISC 360. Connections shall be one of the following:
   1. All-bolted double angle connections (Table 10-1)
   2. Bolted/welded double-angle connections (Table 10-2)
   3. Bolted/welded shear end-plate connections (Table 10-4)
   4. Single-plate connections (Table 10-9)

B. The axes of axially loaded members which meet at a point shall intersect at the point (unless otherwise indicated).
C. Except as otherwise shown, where three or more members are joined, their centroidal lines of action shall meet at a common point, and there shall be no eccentricity.
D. Accessory material not indicated on the design drawings, intended to be left in place on the completed structure by the erector, shall be indicated on the shop drawings. Where so indicated by the Engineer on the shop drawings, such items shall be removed before acceptance of the completed work.
E. At the time of connecting, all contact surfaces shall be free from loose or non-adherent rust, loose mill scale, oil, grease, dirt, mud, and any foreign matter, coating, or defect that may adversely affect the connection.

3.3 CONNECTIONS (BOLTED)

A. All high strength bolted connections shall conform to the RCSC Specification.
B. All connections shall have a minimum of two bolts and the minimum bolt size shall be ¾ inch (unless otherwise indicated).
C. Bolts shall be of proper length, and the end of the bolt shall be at least flush with the outer face of the nut. Bolts projecting more than 5/8-inch beyond the face of the nut in exposed work shall be cut off close to the nut as directed by the Engineer.
D. All bolts shall have washers between the tightened element and the structural member. Beveled washers shall be used where flange slope exceeds 1:20.
E. High strength bolts or nuts once tightened shall not be loosened then re-used. Care shall be taken not to damage the threads of high strength bolts during installation. Joints shall be properly aligned and drifted and holes reamed, if required, to permit bolts to be slipped into place by hand. No burning is allowed for hole adjustment.
F. Snug-Tightened Connections:

1. Snug-Tightened condition shall be defined as that tightness attained with a few impacts from an impact wrench or the full effort of an ironworker using an ordinary spud wrench to bring the connected elements into firm contact.
2. All bolts identified as Snug-Tightened shall be tightened to a Snug-Tight condition with either spud wrenches or pneumatic impact wrenches.
3. All bolted connections shall be Snug-Tightened N-type bearing connections unless otherwise indicated on the Drawings.

G. Finger-Tightened Connections:
1. 1. Where connections are indicated to be "finger-tight", the connection is to first be snugged up to ensure that all plies are in contact. The nuts shall then be backed off between one-half and one turn to permit the intended movement of the connection. The bolts shall be provided with double nuts to prevent loosening.
2. This type of connection applies to both steel and stainless steel bolts.

H. The entire high strength bolting operation, including all materials and equipment used and personnel employed, shall be under the direct supervision of and shall be the direct responsibility of the steel erector, but subject to the review of the Engineer.

I. All nuts, protruding ends of the bolts and base metal shall be match-marked after tightened using white ink or non-water soluble paint.

J. An Independent Testing Firm (hereafter referred to as "Inspector"), selected and paid for by the Contractor, will inspect the bolted connections in accordance with Section 9 of the RCSC Specification as follows:
1. Snug-Tightened Connections: The Inspector will visually inspect the Snug-Tightened bolted connections. The visual inspections shall consist of the following (in accordance with Section 9.1 in the RCSC Specification):
   a. Verification that the proper components were used in the connection.
   b. Verification that the plies of connecting elements have been brought into firm contact.
   c. Additional non-destructive tests as required by the Engineer.
2. After inspection, if the joint is satisfactory it shall be marked by the Independent Testing Firm with a symbol which indicates that the work is completed and is satisfactory. If the joint is unsatisfactory, it shall be repaired or removed and replaced with a new bolted connection to the Engineer's satisfaction.
3. If it is discovered that bolts marked as approved by the Inspector are not in compliance with the requirements of this section and the referenced specification, codes, or authorities, the erector's bolting and inspecting procedures shall be revised as required by the Engineer before any of the remaining bolts are installed.
4. The Engineer reserves the right to inspect and test all bolted connections. The costs for this additional testing will be borne by the Owner.

3.4 CONNECTIONS (SHOP AND FIELD WELDING)

A. Welding shall be only for the connections and assemblages shown on the drawings or specified herein, and shall be performed in the shop, except where specifically noted to be performed in the field.

B. All welding shall be done only by certified welders using welding procedures and welding equipment in accordance with AWS D1.1/D1.1M. Welders employed on the

work shall be experienced structural welders, previously qualified by tests and prescribed in AWS D1.1/D1.1M, using the base metals and electrodes specified herein.

C. Welding materials and workmanship shall conform to AWS D1.1/D1.1M. All welds shall be considered Prequalified if they conform to the Prequalified joints specified in Chapter 3 of AWS D1.1/D1.1M.

D. Welding electrodes shall conform to the requirements of AWS D1.1/D1.1M and shall be the E70XX series.

E. Welding shall be by the manual shielded metal arc process. If the fabricator wishes to use other processes, full details of materials, equipment, and procedures shall be submitted to and approved by the Engineer before any welding, other than as specified herein, is performed. All welds shall be free of undercut, unfilled craters, and cracks, and shall have smoothly faired contours. Flux and loose scale shall be removed from previous weld bead before succeeding bead is laid. Exposed welds shall be ground smooth.

G. All temporary (tack) welds shall meet all the specified requirements as the final welds. Tack welds that will be incorporated into the final weld shall be cleaned and thoroughly fused with final weld. Defective, cracked or broken tack welds shall be removed before final welding. Tack welds not incorporated into the final weld shall be removed.

H. No welding shall be performed during the following weather conditions:
   1. If the welded surfaces are wet or are exposed to rain,
   2. High wind velocity. A temporary wind shelter may be used in order to reduce the wind directly exposed to the weld to a maximum of 5 mph,
   3. Other inclement conditions that will hamper good workmanship.

I. Welds other than those indicated on the design drawings may be used only if reviewed and no exceptions are taken by the Engineer.

J. When welding is unsatisfactory or indicates inferior workmanship, the welds shall either be repaired or removed and rewelded. Where requirements prescribe the removal of part of the weld or a portion of the base metal, such removal shall be by machining, grinding, chipping or machining. All weld repairs shall be proposed by the General Contractor and reviewed by the Engineer with No Exceptions Taken. Defective or unsound welds shall be corrected as follows:
   1. Dimensional repairs:
      a. Fillet weld too small – Remove the weld and reweld to the proper size
      b. Crown height too low (groove weld) – Add more weld to the proper height using stringer beads
      c. Surfacing or overlay weld height too low – Add more weld to the proper height using stringer beads
   2. Excessive welds: Overlap, excessive convexity or excessive reinforcement: Reduce to size by removal of excess weld metal with a cutting or grinding machine.
   3. Cracks in weld or base metal (Centerline, Heat affected zone (HAZ) or Transverse cracking): The extent of the crack shall be verified by acid etching, Magnetic Particle (MT) or Liquid Penetrant (PT) methods. Remove only the amount of weld to eliminate the crack with a cutting or grinding machine.

Remove weld to 2 inches beyond each end of the crack. Add more weld to the proper height using stringer beads

4. Incomplete penetration (root side of butt welds) – Remove weld with a cutting or grinding machine. Add more weld to the proper height using stringer beads
5. Porosity – Remove individual pores with a rotary tool. Remove multiple and linear pores by grinding. Inspect weld by RT or UT to ensure that the porosity has been completely removed. Add new weld
6. Lack of fusion/Cold lap – Areas of weld (fillet or butt welds) that have not fused with base metal. Remove weld by grinding or routing. Inspect weld by PT to determine if weld is removed.
7. Undercut – Small cavity that is melted into the base metal adjacent to the toe of a weld that is not subsequently filled by weld metal. Remove by grinding or routing. Add additional weld into the base metal to match the adjacent weld.
8. Spatter – Particles of molten weld metal that solidify on the base metal outside the welded joint. Remove by grinding or routing.
9. Base metals distorted from welding: Straighten by mechanical means or by application of a limited amount of localized heat.

K. Where work performed subsequent to the making of a deficient weld has rendered the weld inaccessible or has caused new conditions which would make the correction of the deficiency dangerous or ineffectual, the original conditions shall be restored by removal of welds or members or both before making the necessary corrections, or else the deficiency shall be compensated by additional work according to a revised design approved by the Engineer.

L. In the event that faulty welding or its removal for rewelding, shall so damage the base metal that in the judgment of the Engineer its retention is not in accordance with the intent of the Drawings and Specifications, the Contractor shall remove and replace the damaged material at no additional cost to the Owner.

M. An Independent Testing Firm (hereafter referred to as "Inspector"), selected and paid for by the Contractor, will perform inspection of the welding operation and welds. The inspector shall be an AWS Certified Welding Inspector in accordance with the provisions of AWS QC1. The following weld inspections will be performed by the Inspector:

1. Verification inspection of the welding materials and procedures and the welder's qualifications,
2. Visual inspection of all shop and field welds at the jobsite,
3. Ultrasonic Testing (UT) of all complete penetration welds
4. Magnetic Particle (MT) of 10% of all fillet welds. The number and locations of fillet welds to be tested will be determined by the Engineer.
5. Additional testing, such as Liquid Penetrant Testing (PT), Dye Penetrant Testing (DP), MT or UT may be performed at the discretion of the Independent Testing Firm.
6. Acceptance of welds shall be based on Chapter 6 of the AWS D1.1/D1.1M.

3.5 STEEL ERECTION AND INSTALLATION

A. Erection of structural steel shall be in accordance with AISC 303, AISC 360, and the requirements of all other applicable regulatory agencies and industry standards.

B. General Contractor shall verify elevations of concrete, masonry or steel bearing

surfaces and locations of anchor rods, bearing plates, and other embedded items. Notify the steel erector that the anchor rods are ready for the start of steel erection.

C. Leveling plates and loose base and bearing plates shall be promptly grouted after they are set and checked for line and grade.

D. Installation of grout for the leveling plates and loose base and bearing plates shall be performed in accordance with Specification Section 03604. No load shall be applied to grout until five days after the plate has been grouted.

E. All unmatched holes in shop assembly of field connections shall be reamed and the pieces match marked before disassembly. Drift pins shall be used only for bringing members into position and not to enlarge or distort holes. Any piece weakened by reaming to compensate for eccentricity to a point where the strength of the joint is impaired shall be rejected and a new and satisfactory piece shall be provided by the Contractor at their own expense. Slotted holes and washers shall be provided for truing up steel requiring accurate alignment.

F. Where no camber is indicated, any minor camber resulting from rolling or shop assembly shall be upward.

G. The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted upon any member of the structural framing.

H. Steel work shall be adequately and safely supported and braced as required to prevent distortion or damage to the frame work due to wind, erection or other forces until the permanent supports and braces as shown on the Drawings are installed. All temporary material and all traces thereof shall be completely removed before acceptance of the work.

3.6 GALVANIZING

A. All galvanizing processes, materials and systems described herein are based on Duncan Galvanizing, Everett, MA. Equivalent systems by other galvanizing plants will be permitted provided they meet the requirements of the Specification.

B. Provide hot-dipped galvanizing coatings to all structural steel and hardware as indicated on the Drawings. Galvanizing coating shall consist of one of the following products:
   1. Duragalv
   2. Colorgalv
   3. Approved equal

C. Duragalv
   1. Duragalv coating shall consist of a zinc rich galvanized coating surface without additional finishes.
   2. Hot-dip galvanize all fabricated items in accordance with ASTM A123 and hardware items in accordance with ASTM A153.
   3. Prior to galvanizing, drill vent and drain holes in hollow steel shapes as required by the galvanizer.
   4. Galvanizing process shall consist of the following steps:
      a. Degreasing - Immersed the steel in an acid degreasing bath or caustic solution in order to remove the dirt, oil, and grease from the surface of the steel. After degreasing the steel is rinsed with water.

b. Pickling – Immerse the steel in an acid tank filled with either hydrochloric or sulfuric acid, which removes oxides and mill scale. Once all oxidation has been removed from the steel, it is again rinsed with water.
c. Fluxing - Immerse the steel in an acid tank filled with a combination of zinc chloride and ammonium chloride. The flux shall clean the steel of all oxidation developed since the pickling of the steel and to create a protective coating to prevent the steel from any oxidizing before entering the galvanizing kettle.
d. After being immersed in the Degreasing, Pickling, and Fluxing tanks, the surface of the steel shall be completely free of any oxides or any other contaminants that might inhibit the reaction of the iron and liquid zinc in the galvanizing kettle.
e. Galvanizing – The galvanizing process shall include the following steps:
    i. Immerse the steel in a galvanizing kettle containing liquid zinc.
    ii. The zinc shall be at least 98% pure and shall be heated to a temperature ranging from 820°F - 860°F, at which point the zinc is in its liquid state.
    iii. The steel products shall be immersed into the galvanizing kettle and remain in the kettle until the temperature of the steel has reached the temperature required to form a hot-dip galvanized coating.
    iv. Once the inter-diffusion reaction of iron and zinc is completed, the steel product is withdrawn from the zinc kettle.
    v. Excess zinc shall be removed by draining or vibrating.
    vi. The finished product shall be inspected by using a variety of simple physical and laboratory tests may be performed to determine thickness, uniformity, adherence and appearance.

5. Fill vent holes after galvanizing, if applicable, and grind smooth.
6. Galvanize items after assembly when possible.
7. Galvanizing shall provide a visually acceptable coating and shall be free of lumps, globules, sharp edges or heavy deposits which will interfere with intended use or aesthetic appearance of materials. The Galvanized surface shall exhibit a rugosity (smoothness) of 4 rug or less (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1-micron increments.
8. Warranty: Provide galvanizer's warranty stating the following:
    a. All hot-dip galvanized surfaces shall be free from corrosion and defects that compromise resistance to corrosion for a period of 20 years under normal uses and exposures defined as those known to be conditions that a hot-dip galvanized surface can protect without corroding and identified in "Performance of Hot-Dip Galvanized Steel Products".
    b. If hot-dip galvanized surfaces exhibit corrosion or other defects within the warranty period, the galvanizer shall repair such areas by removing corrosion and defects, properly preparing the surface, and applying zinc repair coating specified in this section. Repairs shall be performed within 30 days of notification by the Owner, at no additional cost to the Owner.

D. Colorgalv
   1. Colorgalv coating shall consist of a zinc rich galvanized coating surface with an additional factory applied architectural coating.
   2. Apply Duragalv coating to the steel as specified above.
   3. Apply polyamide epoxy primer within 12 hours after galvanizing at the same galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer.
   4. Finish coat shall be factory-applied color-pigmented architectural finish. Apply finish coating at the galvanizer's plant, in a controlled environment meeting applicable environmental regulations and as recommended by the finish coating manufacturer.
   5. Coatings shall be certified VOC compliant and conform to applicable regulations and EPA standards.
   6. Apply the galvanizing, primer, and coating within the same facility and provide single-source responsibility for galvanizing, priming and finish coating.
   7. Clean galvanized surface to create an acceptable profile for coatings. Galvanizer shall certify that performance will be met without blast cleaning and coating will be applied within 12 hours of galvanizing at the galvanizer's plant. If blasted, galvanizer shall certify that rugosity standards are met.
   8. Primer shall meet or exceed the following performance criteria:
      a. Abrasion Resistance: ASTM D 4060 (CS17 Wheel, 1,000 grams load) 1 kg load, 200 mg loss.
      b. Adhesion: ASTM D 4541, 1050 psi.
      c. Corrosion Weathering: ASTM D 5894, 13 cycles, 4,368 hours, 10 per ASTM D 714 for blistering; 7 per ASTM D 610 for rusting.
      d. Direct Impact Resistance: ASTM D 2794, 160 in. lbs.
      e. Flexibility: ASTM D 522, 180 degrees' bend, 1-inch mandrel, Passes.
      f. Pencil Hardness: ASTM D 3363, 3H.
      g. Moisture Condensation Resistance: ASTM D 4585, 100 degrees F, 2000 hours, Passes no cracking or delamination.
      h. Dry Heat Resistance: ASTM D 2485, 250 degrees F.
      i. Accelerated Weathering: QUV- ASTM D 4587 QUV A 5000 Hours: Passes.
      j. Salt Fog Resistance: ASTM B 117, 5,600 hours No cracking or blisters.
   9. Topcoat shall meet or exceed the following performance criteria:
      a. Abrasion Resistance: ASTM D 4060, CS17 Wheel, 1,000 cycles 1 kg load, 87.1 mg loss.
      b. Adhesion: ASTM D 4541, 1050 psi.
      c. Direct Impact Resistance: ASTM D 2794, greater than 28 in. pounds.
      d. Dry Heat Resistance: ASTM D 2485, 200 degrees F (93 C).
      e. Salt Fog Resistance: ASTM B 117 9,000 hours, Rating 10 per ASTM D 714 for blistering, Rating 9 per ASTM D 610 for rusting.
      f. Flexibility: ASTM D522, 180 degrees' bend, 1/8-inch mandrel, Passes.
      g. Pencil Hardness: ASTM D 3363, F.

h. Moisture Condensation Resistance: ASTM D 4585, 100 degrees F, 1000 hours, No blistering or delamination.
i. Xenon Arc Test: ASTM D 4798, Pass 200 hours.
j. Corrosion Weathering: ASTM D 5894, 21 Cycles, 7056 Hours: Rating 10 per ASTM D714 for blistering. Rating 9 Per ASTM D 610 for Rusting.
k. Thermal Shock: ASTM D 2246, 15 cycles, Excellent.

10. Topcoat shall exhibit a rugosity (smoothness) of 4 rug or less (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments.
11. Warranty: Provide galvanizer's standard warranty stating that finished galvanized and coated surfaces will be free from 10 percent or more visible rust for 20 years.

E. Galvanizing Thickness
1. The minimum thickness of zinc coating (in ounces/square foot) on steel shapes shall conform to Table 1 below:

Table 1 - Zinc Coating Thickness (oz/sf)				
	Metal Thickness (in)			
Steel Shape	1/16-1/8	1/8-3/16	3/16-1/4	>1/4
Shapes and Plates	1.0	1.7	2.0	2.3
Strips and Bars	1.0	1.7	2.0	2.3
Pipe and Tube	1.0	1.7	1.7	1.7

2. The minimum thickness of zinc coating (in ounces/square foot) on steel fasteners shall conform to Table 2 below:

Table 2 - Zinc Coating Thickness (oz/sf)		
Fastener	Average of Specimen	Individual Specimen
Class A – Castings: Malleable Iron and Steel	2.0	1.8
Class B – Rolled, pressed and forged articles		
B1 - 3/16 inch and over in thickness and over 15 inches in length	2.0	1.8
B2 - Under 3/16 inch in thickness and over 15 inches in length	1.5	1.25
B3 – Any thickness and 15 inches and under in length	1.3	1.1
Class C - Fasteners over 3/8 inch diameter. Washers 3/16 inch and ¼ inch thick	1.25	1.0
Class D - Fasteners 3/8 inch and under in diameter, rivets and nails. Washers under 3/16 inch in thickness	1.0	0.85

F. Touch up and repair: After erection, touch-up all damaged galvanized and coated surfaces and field welds as follows:

1. Unless otherwise indicated, all touch up and repairs to galvanized surfaces shall be in strict accordance with the manufacturer's recommendations.
2. Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil, grease and corrosion.
3. Areas to be repaired shall be power disc sanded to bright metal. To ensure that a smooth reconditioned coating can be effected, surface preparation shall extend into the undamaged galvanized coating.
4. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A780. Galvanizing repair paint shall have 80 percent zinc by weight.
5. The paint shall be spray applied in multiple coats until a dry film thickness of 4-6 mils minimum has been achieved. Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.
6. Repair Paint:
    a. ZIRP by Duncan Galvanizing
    b. Zinc-Clad 4100 by Sherwin-Williams
    c. Series 90G-1K97 Tnemec-Zinc by Tnemec
    d. Or equivalent

END OF SECTION

SECTION 05310

METAL DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal roof deck.
B. Fasteners and accessories.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
B. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
C. ASTM A1008/A1008M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
D. ASTM C423/C423M - Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
E. ASTM D746/D746M - Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
F. ASTM D1056/D1056M - Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
G. ASTM D1149/D1149M - Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
H. ASTM E84/E84M - Test Method for Surface Burning Characteristics of Building Materials
I. AISI D100-08 - Cold-Formed Steel Design Manual – American Iron and Steel Institute
J. AISI S200-12: North American Standard for Cold-Formed Steel Framing – General Provisions – American Iron and Steel Institute
K. AISI S201-12: North American Standard for Cold-Formed Steel Framing – Product Data – American Iron and Steel Institute
L. AISI S202-11: Code of Standard Practice for Cold-Formed Steel Structural Framing – American Iron and Steel Institute
M. ANSI/SDI QA/QC-2011 Standard for Quality Control and Quality Assurance for Installation of Steel Deck
N. ANSI/SDI RD-2010 Standard for Steel Roof Deck
O. AWS D1.1/D1.1M Structural Welding Code - Steel - American Welding Society
P. AWS D1.3/D1.3M Structural Welding Code - Steel Sheet - American Welding Society

Q. Diaphragm Design Manual - Steel Deck Institute
R. Roof Deck Design Manual - Steel Deck Institute

1.4 DESIGN

A. Properties of metal deck sections shall comply with AISI D100 and with the specifications of the Steel Deck Institute.
B. Design loads: Metal deck shall be designed to support the loads indicated on the Drawings.
    1. Concentrated loads shall not be suspended directly from metal roof deck. Process, Mechanical, Electrical, Plumbing and other braces (including seismic bracing) shall not be attached to the roof deck. Additional framing will be required to distribute these loads so as not to exceed the allowable Collateral load shown on the Drawings.
    2. Concentrated loads greater than 50 pounds shall not be suspended from the composite metal floor deck. Process, Mechanical, Electrical, Plumbing and other braces (including seismic bracing) designed to carry a concentrated load greater than 50 pounds shall not be attached to composite metal floor deck. Additional framing will be required to distribute these loads so as not to exceed the allowable Collateral load shown on the Drawings.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit specifications and installation instructions.
C. Submit plan and details including:
    1. Deck panel layout
    2. Deck lengths
    3. Details of side laps
    4. Markings of deck units indicating types and gauges
    5. Deck profile dimensions for each deck type
    6. Locations of framing members
    7. Sizes and locations of openings in deck units requiring deck reinforcement
    8. Details at perimeter edges and openings, including pour stops
    9. All connections to the framing members
    10. Details at bearings showing length of bearing, laps, and pour stops
    11. Mechanical fastener data sheets
    12. Additional collateral loads from ceiling, light fixtures, ducts, utilities and other concentrated loads showing means to distribute concentrated loads as described in 1.4

1.6 COORDINATION

A. Coordinate size, location, and details of all penetrations with Drawings, other trades and details of equipment supplied.

1.7 QUALITY ASSURANCE

A. The deck installation Contractor shall follow AWS D1.3 and shall be responsible for inspection and testing of WPS (Welding Procedure Specification) qualification tests and welder performance testing as described in AWS D1.3, including providing a

Procedure Qualification Record.

B. The deck installation Contractor shall comply with the quality procedures of ANSI/SDI QA/QC-2011.

C. Installed deck is subject to inspection and testing. Defective work shall be replaced by the Contractor at no additional cost to the Owner.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver deck units to the project site in a dry and undamaged condition.

B. Protect steel deck from corrosion, deformation, and other damage during delivery, storage and handling.

C. Remove damaged material from site.

D. Deck shall be stored off the ground on pallets or platforms with one end elevated to provide drainage and shall be protected from the elements with a waterproof covering, ventilated to avoid condensation.

E. Deck bundles must be stacked so there is no danger of tipping, sliding, rolling, shifting or material damage. The maximum uniform storage load on the deck units shall not exceed the design live load.

F. Deck bundles placed on the framing members must always be placed near a main supporting beam at a column or wall. Bundles shall not be placed on unbolted framing members or on unattached and unbridged joists. The structural frame must be properly braced to receive the bundles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Deck

1. Vulcraft
2. CMC, Inc.
3. Canam
4. New Millenium
5. Or equivalent

2.2 MATERIALS

A. Steel Deck:

1. Roof deck shall conform to the requirements of ANSI/SDI RD-2010 Standard for Steel Roof Deck.
2. All deck and accessories that will be galvanized shall be formed from cold rolled steel sheets conforming to ASTM A653/A653M with a minimum yield stress of 33 ksi. Galvanized coating shall conform to ASTM A653/A653M with a G90 (0.90 oz/SF).
3. All steel deck and accessories that will be painted shall be formed from cold rolled steel sheets conforming to ASTM A1008/A1008M with a minimum yield stress of 33 ksi

2.3 DECK UNITS

A. Roof Deck: as shown on the Drawings.

2.4 ACCESSORIES

A. Cover Plates - Galvanized steel plates with a minimum thickness of 0.0358 inches (20 GA). Plates shall be minimum 6 inches wide x 10 feet long.
B. End Closures Plates – Sheet metal minimum 0.0295 inch (22 GA) thick. Same material and thickness as metal deck
C. Adjusting plate – Plates shall match material, thickness and profile of deck unit.
D. Rubber closure strips – Vulcanized, closed cell, synthetic rubber strips that match the configuration of the roof deck. Rubber shall conform to ASTM D1056/D1056M (Grade 2A1)
E. Reinforcing Channel: Prefabricated galvanized steel channels with a minimum thickness of 0.0358 inches (20 GA). Channels shall be either 1.5” or 3” deep x 10 feet long.
F. Reinforcing Plate at Openings:
    1. Openings greater than 6” and less than 8 inches - Fabricated galvanized steel plates with a minimum thickness of 0.0474 inches (18 GA)
    2. Openings greater than or equal to 8” and less than or equal to 12 inches - Fabricated galvanized steel plates with a minimum thickness of 0.0598 inches (16 GA)
G. Screws – All screws shall be self-drilling and self-tapping “TEK” screws. Screws shall be the Hex Washer Head style and be made of zinc plated steel, unless otherwise noted, with bonded sealing washers below the screw head

PART 3 - EXECUTION

3.1 INSTALLATION – METAL DECK

A. Deck panels shall be laid in strict accordance with the manufacturer's instructions, and the shop drawings. Where possible deck sheets shall extend longitudinally over three (3) or more spans.
B. Deck panels shall be placed on structural supports and adjusted to final position with ends aligned and supports leveled. Attach deck panels securely to the supports immediately after placement in order to form a safe working platform.
C. Support of concentrated collateral loads such as suspended ceiling, light fixtures, ducts, utilities or other concentrated loads shall not be permitted from roof deck, and if greater than 50 pounds shall not be permitted from floor deck without a means of distributing the loads.
D. Bearing lengths shall be as follows:
    1. On structural steel framing support members provide 3-inch minimum bearing at discontinuous ends or as indicated on the Drawings. Deck shall be continuous over interior supports. Align and level on supports.
E. Deck shall be cut to required lengths so that end joints occur at supporting members. Joints shall be lapped a minimum of 2 inches for roof deck, and shall be butted, not lapped, for floor deck. All end laps of deck shall be 2 inches minimum. Gaps up to 1 inch shall be permitted at butted ends.
F. Ends of roof deck shall be fastened after the next sheet is placed and shall be through both sheets to support as specified. Deck shall be either screwed or welded, to all supporting steel to accommodate diaphragm action as indicated on the Drawings.

G. Openings in deck – All openings in the metal deck shall be field cut. The General Contractor shall coordinate the work of the trades involved to ensure proper provision for the support and attachment of deck around openings. Openings shall be reinforced as follows:
   1. Openings less than 6 inches in diameter or largest side length and no greater than 2 webs removed – Additional reinforcing not required.
   2. Openings greater than or equal to 6" and less than or equal to 12 inches – Provide reinforcing plate. Size of plate shall be a minimum 12" greater than the opening on all sides such that the plate spans across a minimum 3 flutes.
   3. Openings greater than 12 inches – Provide framing as indicated on the Drawings. If additional framing is not indicated on the Drawings provide the minimum framing indicated below:
      a. Span of framing member less than 3'-0" – C8x11.5.
      b. Span of framing member greater than or equal to 3'-0" and less than 6'-0" – C10x15.3.
      c. Main framing shall be installed perpendicular to the deck span such that the deck bears on the top flange. Secondary framing installed parallel with the deck span with additional framing welded to the top flange to provide positive bearing as required.

3.2 INSTALLATION – ACCESSORIES

A. End Closure Plates – Provide end closures to close ends at exposed edges of eaves and openings through decks.
B. Cover Plates – Provide cover plates over deck where deck changes direction.
C. Adjusting Plates – Provide adjusting plates, or segments of deck units, in locations too narrow to accommodate full size units. Plates shall be factory cut to proper size.
D. Rubber Closure Strips – Provide rubber closure strips at open, uncovered ends and edges of roof deck and in voids between roof decking and tops of walls and partitions to provide a watertight closure.
E. Reinforcing Channel: Install below all unsupported metal deck edges where bottom flute does not bear on the longitudinal support member.
F. All accessories shall be fastened to support members or metal deck by arc spot welds or #12 TEK screws at 12 inches unless otherwise indicated.

3.3 PROTECTION

A. Protect installed metal deck panels against damage during construction.
B. Deck panels subjected to heavy or repeated traffic, concentrated loads, impact loads or wheel loads shall be protected by planking or other means to avoid overloading or damaging the deck.
C. Upon completion of deck installation, all burn holes shall be repaired with galvanized sheet metal. All welds shall be touched up with cold galvanizing compound specified herein, and in accordance with the manufacturer's instructions.

D. The surface of the deck shall be clean, free of dirt and debris, and in proper condition to receive roofing or concrete. The underside of all deck shall be left in a clean condition, free from dirt and foreign matter.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Non-welded mechanical aluminum guards and handrails
B. Aluminum shapes
C. Aluminum grating treads
D. Aluminum grating
E. Aluminum weirs and baffles
F. Concrete anchors (post installed)
G. Fasteners

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
B. ASTM B209/B209M – Standard Specification for Aluminum and Aluminum - Alloy Sheet & Plate
C. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
D. ASTM B244 - Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments
E. ASTM B308/B308M – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
F. ASTM D523 - Standard Test Method for Specular Gloss
G. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test
H. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test
I. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
J. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs
K. ASTM F594 – Standard Specification for Stainless Steel Nuts
L. SSPC Steel Structures Painting Council
M. SSPC-SP6 Commercial Blast Cleaning
N. Aluminum Association Near-White Blast Cleaning
O. Aluminum Association Aluminum Design Manual (2010)
P. Aluminum Association Aluminum Standards and Data (2009)
Q. AWS D1.2/D1.2M Structural Welding Code – Aluminum -American Welding Society
R. OSHA Occupational Safety and Health Standards, 29 CFR Part 1910

1.4 DESIGN REQUIREMENTS

A. Aluminum Grating Stairs, Platforms, and Walkways: 100 PSF live load or as indicated on the Drawings; Treads - 100 PSF live load and non-simultaneous load of 300lb over 4"x4" area in center of tread.

B. Aluminum Grating: Live Loads indicated on the Drawings.

1.5 SUBMITTALS

A. Photocopies of Drawings in whole or part will not be accepted as shop drawings.

B. Submit complete shop drawings showing the following information:

1. Plan layouts showing building grid lines, dimensions, piece designations, and other pertinent information.
2. Elevations, sections, and details showing general arrangement of pieces with piece designations, dimensions, connections, and other pertinent information.
3. Details of each piece with designation, length, bolt holes, bolts, copes, welded components, and welds with AWS symbols.
4. Bill of Materials for all pieces including:
   a. Piece designation
   b. Quantity
   c. Description
   d. Length
   e. Material and grade
   f. Finish
   g. Weight

C. Submit product data in accordance with the provisions of Section 01340.

D. Submit statement that non-welded mechanical aluminum guards and handrails meet OSHA loading requirements for guards.

E. Submit statement that manufactured guard and handrail mounts meet OSHA loading requirements.

1.6 QUALITY ASSURANCE

A. Conform to the Aluminum Design Manual for the design, fabrication, and erection of aluminum shapes.

B. Conform to AWS D1.2/D1.2M for welding of aluminum.

1.7 COORDINATION

A. The Contractor shall coordinate with the work of other Sections. Verify at the site both the dimensions and the work of other trades adjoining items before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.8 FIELD MEASUREMENTS

A. Field measurements shall be taken at the site to verify or supplement indicated dimensions and conditions and to ensure proper fitting of all items.

1.9 DELIVERY, STORAGE, HANDLING

A. Coordinate delivery of products.

B. Protect products from damage prior to and after installation.
C. Remove damaged material from the site.

PART 2 - PRODUCTS

2.1 NON-WELDED MECHANICAL ALUMINUM GUARDS AND HANDRAILS

A. Material:
   1. Rails: Nominal 1½" schedule 40, Aluminum Alloy 6061-T6 or 6063-T6
   2. Posts: Nominal 1½" schedule 80, Aluminum Alloy 6061-T6
   3. Toe plate: ¼" x 4" plate or extruded formed shape, Aluminum Alloy 6061-T6
   4. Miscellaneous plates: Aluminum Alloy 6061-T6
   5. Flush type mechanical connections and splice sleeves: Aluminum Alloy 6061-T6
   6. Fasteners, rivets, self-tapping screws and machine bolts; Stainless Steel AISI Type 316.

B. Fabrication:
   1. All holes shall be drilled and countersunk.
   2. Fasteners shall be flush with rail surface.
   3. Cuts shall be squared and free of burrs.
   4. Provide for thermal expansion and contraction.
   5. Post spacing not to exceed 4'-0" on center.
   6. Terminate rails and guards with smooth radius end lops with no irregularities, exposed mitered edges or post end caps.
   7. All guards labeled as "removable" shall be fabricated in sections no greater than 8'-0" in length or in shorter lengths as practical for the given guard layout.

C. Finish:
   1. Clear anodized (AA M12C22A41) in accordance with the Aluminum Association after fabrication.
   2. All railing and posts shall be plastic wrapped. The plastic wrap shall be removed after all adjacent construction is completed.

D. Manufacturer:
   1. All materials and fabrication shall be by a single manufacturer.
   2. Tabco 2500 by Rocky Mountain Railings
   3. Thompson Fabricating Company
   4. Or equal

E. Toe Plates:
   1. Provide toe plates on all railing sections (except at stair stringers) unless otherwise noted on the drawings.
   2. All toe plates shall be attached to all guard posts.
   3. Toe plates shall be continuous and connected together with splice plates. Corners shall be connected together with angles.
   4. Provide support for extended ends as indicated on the Drawings.

2.2 ALUMINUM SHAPES

A. Material: Aluminum Alloy 6061-T6: ASTM B308/B308M.
B. Welding: filler alloy 5356.
C. Finish: Mill.

2.3 ALUMINUM GRATING TREADS Material: Aluminum Alloy 6063-T6 (ASTM B221), or Aluminum Alloy 6061-T6 (ASTM B308/B308M).

B. Provide grooved nosing.
C. Treads shall be fabricated from load banded non-skid serrated bar grating.
D. Tread thickness:
   1. For tread widths 3'-0" and under: 1-1/2" thick treads
   2. For tread widths greater than 3'-0": 1-3/4" thick treads

2.4 ALUMINUM GRATING

A. Material: Aluminum Alloy 6063-T6 (ASTM B221) or Aluminum Alloy 6061-T6 (ASTM B308/B308M).
B. Finish: mill
C. Type:
   1. Rectangular bar grating with non-skid serrated surface.
   2. Bearing bars:
      a. Thickness and depth shall be as indicated on the Drawings.
      b. Spaced at 1-3/16" on center with recessed cross bars at 4" center.
D. Grating sections:
   1. Provide grating sections in the largest size as practical but no greater than 40 pounds for sections intended to be removable.
   2. Grating sections for elevated platform walking surfaces where the grating will not be removed may be provided in larger sections.
   3. All edges of grating, including bearing and non-bearing edges and around all penetrations, shall be banded by welding a continuous bar to the ends of each bearing bar.
   4. Provide sections to allow grating removal without disturbing items penetrating grating. Edges of grating sections shall be aligned with centerlines of pipes penetrating grating.
E. Provide a minimum of 2 stainless steel saddle clips and hardware for anchorage per each section of grating.
F. Maximum gap between adjacent grating sections and between edges of grating and support members: 0.25 inches
G. Manufacturers:
   1. Barnett Bates – Type 19-4
   2. Ohio Grating – Type 19-SG-4
   3. Or equivalent

2.5 ALUMINUM WEIRS AND BAFFLES

A. Material: Aluminum alloy 6061-T6 (ASTM B209/B209M)
B. Finish: Mill

2.6 FASTENERS

A. Concrete anchorage:
   1. Expansion and Epoxy Anchors are specified in Section 03155.
B. Bolted Joints:
   1. Aluminum Fabrications: Stainless Steel ASTM F593 & F594 Alloy Group 2 (Type 316)

C. Provide all fasteners with nuts, flat washers and lock washers of the same material as the anchors or bolts. Provide beveled washers for sloped surfaces.
D. Provide a minimum of 2 fasteners per connection.

PART 3 - EXECUTION

3.1 FABRICATION

A. All miscellaneous metal members shall fit closely together and shall be straight and true, and the finished work shall be free from burrs, bends, twists, and open joints.
B. Tolerances:
   1. Squareness: 1/8-inch maximum difference in diagonal measurements.
   2. Maximum Offset between faces: 1/16-inch.
   3. Maximum misalignment of adjacent members: 1/16-inch.
   4. Maximum Bow: 1/8 inch in 48 inches.
   5. Maximum Deviation from Plane: 1/16 inch in 48 inches.
C. All holes, angles, supports, and braces shall be provided as required.
D. Except as otherwise indicated on the drawings, gusset plates shall have a minimum thickness of 3/8 inch.
E. Sheared and thermal cut edges shall be true to line and free from rough corners and projections.
F. Re-entrant cuts/corners shall be filleted to a radius of not less than ½ inch.
G. Holes shall be punched, subpunched and reamed, or drilled in accordance with AISC "Specifications for Structural Steel." Holes shall not be made by torch cutting.
H. Holes shall be 1/16 inch larger than the nominal bolt diameter, except holes for cast-in-place anchor bolts which shall be 5/16 inch larger than the nominal bolt diameter and as otherwise shown on the Drawings.
I. The use of oversize or slotted holes not shown on the Drawings shall be subject to prior review by the Engineer.
J. Bent plate shall be in accordance with AISC "Minimum Radius for Bending."
K. Column ends bearing upon base and cap plates and beam ends with end plates shall be saw-cut or milled to true surfaces and correct bevels.
L. Column caps and base plates and beam end plates shall have full contact when assembled.
M. Welding shall be done in a sequence which minimizes distortion and shrinkage.
N. Fabrication holes, notches, etc. not required by nor shown on the Drawings shall be subject to prior review by the Engineer.

3.2 CONNECTIONS (GENERAL)

A. All aluminum framing connections not detailed on the Drawings shall be bolted connections designed by the fabricator subject to the provisions of the design drawings, specifications and the referenced Aluminum Design Manual. All connections shall consist of a minimum of 2 – L3x3x1/4 angles with 2 – ¾ inch diameter AISI Type 316 bolts between each angle and framing member.
B. The axes of axially loaded members which meet at a point shall intersect at the point (unless otherwise indicated).
C. Except as otherwise shown, where three or more members are joined, their centroidal lines of action shall meet at a common point, and there shall be no eccentricity.

D. Accessory material not indicated on the design drawings, intended to be left in place on the completed structure by the erector, shall be indicated on the shop drawings. Where so indicated by the Engineer on the shop drawings, such items shall be removed before acceptance of the completed work.

E. At the time of connecting, all contact surfaces shall be free from loose or non-adherent rust, loose mill scale, oil, grease, dirt, mud, and any foreign matter, coating, or defect that might adversely affect the connection.

3.3 CONNECTIONS (BOLTED)

A. All bolted connections shall conform to the following:
   1. Stainless steel bolts with aluminum framing – Aluminum Design Manual by the Aluminum Association.

B. All connections shall have a minimum of two bolts and the minimum bolt size shall be ¾ inch (unless otherwise indicated).

C. Bolts shall be of proper length, and the end of the bolt shall be at least flush with the outer face of the nut. Bolts projecting more than 5/8-inch beyond the face of the nut in exposed work shall be cut off close to the nut as directed by the Engineer.

D. All bolts shall have washers between the tightened element and the structural member. Beveled washers shall be used where flange slope exceeds 1:20.

E. All bolts or nuts once tightened shall not be loosened then re-used. Care shall be taken not to damage the threads of high strength bolts during installation. Joints shall be properly aligned and drifted and holes reamed, if required, to permit bolts to be slipped into place by hand. No burning is allowed for hole adjustment.

F. Snug-Tightened Connections:
   1. Snug-Tightened condition shall be defined as that tightness attained with a few impacts from an impact wrench or the full effort of an ironworker using an ordinary spud wrench to bring the connected elements into firm contact.
   2. All bolts identified as Snug-Tightened shall be tightened to a Snug-Tight condition with either spud wrenches or pneumatic impact wrenches.
   3. All bolted connections shall be Snug-Tightened N-type bearing unless otherwise indicated on The Drawings.
   4. This type of connection applies to both steel and stainless steel bolts.

G. Epoxy anchors shall be tightened to 80% of the epoxy manufacturers recommended maximum torque using a calibrated torque wrench.

3.4 CONNECTIONS (WELDING ALUMINUM)

A. Structural welds shall be made by qualified welders and shall conform to AWS D1.2/D1.2M.

B. All aluminum welding shall be done by the inert gas shielded arc or fluxless resistance techniques.

C. Welded assemblies to be anodized shall be designed so that faying surfaces are free-rinsing and will not trap anodizing solutions.

D. Where at all possible, welds in assemblies to be anodized shall be located so as to conceal visible discoloration in the heat-affected zone.

E. Where weld metal must be exposed after anodizing, filler alloys shall be selected to closely match the composition of the base metal. Follow parent metal manufacturer's recommendations for such filler alloys.

F. Where weldments are to be made on materials that have been previously anodized, the area of fusion shall be free of the anodic film prior to welding. Parts to be so welded shall be masked during anodizing or sanded clean in the weld areas. Only weldments that will be concealed may be so made. Crazing or discoloring of the anodic coating in the weld area will not be acceptable in exposed areas.

G. Weldments on exposed finished surfaces shall be ground and/or polished to match and blend with finish of adjacent parent metal.

H. Dirt, grease, lubricant, or other organic material shall be removed by vapor degreasing or suitable solvent prior to welding.

I. Where welding is done in proximity to glass or finished surfaces, such surfaces shall be protected from damage due to weld sparks, spatter, or tramp metal.

J. When welding is unsatisfactory or indicates inferior workmanship as determined by the Engineer, corrective measures shall be required. Where requirements prescribe the removal of part of the weld or a portion of the base metal, such removal shall be by machining, grinding, chipping or machining. All weld repairs shall be proposed by the General Contractor and reviewed by the Engineer with No Exceptions Taken.

K. Joints rejected because of welding defects may be repaired only by re-welding. Defective welds shall be removed by chipping or machining. Flame cutting shall not be used.

3.5 ERECTION AND INSTALLATION

A. All metals shall be properly located, aligned, leveled and plumbed. All items embedded in or connected to other substrates shall be properly coordinated and installed.

B. General Contractor shall verify elevations of concrete, masonry or other bearing surfaces and locations of anchor rods, bearing plates, and other embedded items. Anchor rod templates shall be used to set anchor rods.

C. Columns and base plates shall be set and accurately plumbed and leveled.

D. Installation of grout for the column base plates shall be performed under Section 03604. Structural grouting shall be non-shrink and conform to the requirements of Section 03604. No load shall be applied to grout until five days after the plate has been grouted.

E. Where no camber is indicated, any minor camber resulting from rolling or shop assembly shall be upward.

F. The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted.

G. Coat surfaces of the following metals in contact with masonry, concrete, grout or dissimilar metals with Polyamide Epoxy Primer:
   1. Aluminum

H. Guards:
   1. Splice pipe rails in field with internal sleeves fastened at one end and free at the other end.
   2. Install railing in accordance with manufacturer’s recommendations.
   3. Provide smooth end loops to all cut guards.
   4. Provide expansion sleeves in guards for continuous runs greater than 20 feet in length.

3.6

3.6 CLEANING

A. Clean surfaces of all work of this section as well as the areas in the vicinity.

3.7 PROTECTION

A. Protect installed work from:
   1. Splatter or debris from adjacent construction.
   2. Excess construction loading and use.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary enclosures.
B. All rough lumber, including wood nailers, posts, plates, blocking, strapping, and lumber bases for mechanical and electrical equipment
C. Rough hardware, such as nails, bolts, screws, clips, as required to install rough carpentry work.
D. Lumber Preservatives

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. American Wood Protection Association (AWPA) u1 - Use Category System - User Specification for Treated Wood.
B. Plywood shall conform to American Plywood Association APA Grade trademark and Product Standard PS-l.

1.4 QUALITY ASSURANCE

A. All lumber except as otherwise specified herein shall:
    1. Be new, dressed 4 sides (S4S), clean, and free from warping and other defects.
    2. Conform to U. S. Department of Commerce Simplified Practice Recommendations R-l6 for sizes and use Classifications.
    3. Have a moisture content not exceeding l9 percent when delivered to the project.
    4. National Forest Products Association - "National Design Specification for Wood Construction - 2005 including Design Values for Wood Construction".
B. Plywood shall conform to American Plywood Association APA Grade Trademark and Product Standard PS-1.

1.5 SUBMITTALS

A. Submit product data under provision of Section 01340.
B. Submit hardware and hangers indicated on the Drawings.
C. Submit each type of fastener to be used with the location for use.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store all materials in an elevated dry location, protected by waterproof coverings. Do not store within the building until masonry, concrete, and other such wet work has been completed and allowed to dry.

PART 2 - PRODUCTS

2.1 LUMBER TREATMENTS

A. Preservative Treatments: All dimension lumber, wood blocking and nailers which will be embedded in or in contact with concrete and masonry or concealed by roofing, flashing and the air barrier system and any wood indicated on the drawings as preservative treated (PT) shall be treated with waterborne preservatives in accordance with AWPA Standard U1 to the requirements of Category 2 (UC2).

B. Brush Preservative Treatment: Brush coat all end cuts after cutting with treatment equal to above. Apply in two heavy coats on all surfaces prior to installation of lumber.

2.2 BLOCKING

A. All dimensional lumber to be Spruce-Pine-Fir No. 2 or better unless indicated otherwise on the Structural Drawings.

B. All preservative treated dimensional lumber to be southern yellow pine, No. 1 or better, unless indicated otherwise.

C. Furring and other lumber less than l-l/2 inches in thickness to be No. 2 spruce or Douglas fir.

D. Blocking less that 1-1/2" in thickness to be exterior grade plywood.

2.3 HANGERS

A. Joist hangers, wood construction connectors, nail plates, straps and ties, and other fasteners as indicated on Drawings.

2.4 ANCHORS

A. Expansion anchor, anchor bolts, epoxy anchors, and other anchors shall be as shown on the Drawings and as specified in Section 05500. For other non-specified conditions the following minimums shall apply:

1. Nailers and blocking in excess of 7/8 inch thick - 3/4-inch diameter galvanized steel anchor bolts or expansion bolts, as applicable.
2. Furring, strapping and blocking 7/8 inch thick or less attached to concrete or masonry- 5/16 inch diameter galvanized steel anchor bolts or expansion bolts.
3. Secure other non-specified lumber with galvanized steel fasteners, of a type most suitable for the application.

2.5 FASTENERS

A. Hardware and fasteners in contact with pressure treated lumber shall be stainless steel or coated fasteners specifically intended for preservative treated wood.

PART 3 - EXECUTION

3.1 TEMPORARY BRACING

A. Provide and maintain, until such time as permanently built into the structure, all temporary bracing for walls, door frames, sills, and other work requiring bracing and which is not specified as being provided under other SECTIONS of the specifications.

3.2 PROTECTION

A. Do such work as is necessary to cover and protect all finishes and other work from damage during construction.

3.3 BLOCKING

A. Fasten blocking to concrete and masonry with specified bolts, as shown on Drawings or as specified above. Space bolts not over 32 inches on center. Stagger lines of bolts on nailers wider than nominal 3-1/2 inch width. Use not less than two (2) bolts per piece of nailer length. Counterbore nailers so that nut and ends of bolts are recessed below top surface. Install wood shims behind nailers and blocking against masonry, as required, to ensure completely true surface.

END OF SECTION

SECTION 07500

MEMBRANE ROOFING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of roofing and new work on existing roofing
   1. Rigid Insulation to match existing
   2. TPO Roofing to match existing
B. Roofing Vapor Barrier
C. Cover Board
D. Roofing Board
E. Insulation Adhesive
F. Membrane Roofing
G. Roof Top Mounted Guard Rails
H. Aluminum Fascia
I. Blocking

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. Underwriter's Laboratory (UL)
B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
D. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
E. ASTM D297 - Test Method for Rubber Products.
F. ASTM D412 - Test Methods for Rubber Properties in Tension.
G. ASTM D471 - Test Method for Rubber Property - Effect of Liquids.
H. ASTM D573 - Test Method for Rubber - Deterioration in an Air Oven.
I. ASTM D624 - Test Method for Rubber Property - Tear Resistance.
J. ASTM D746 - Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
K. ASTM D1149 - Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber.
L. ASTM D1621 - Test Method for Compressive Properties of Rigid Cellular Plastics
M. ASTM D1622 - Test Method for Apparent Density of Rigid Cellular Plastics
N. ASTM D2240 - Test Method for Rubber Property - Durometer Hardness.
O. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface Interior Coatings in an Environmental Chamber.
P. ASTM D4434 – Standard Specification for Poly (Vinyl Chloride) Sheet Roofing.

Q. ASTM D4637 - Standard Specifications for EPDM sheet used in single ply roof membrane.
R. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials
S. ASTM E96 - Test Method for Water Vapor Transmission of Materials.
T. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
U. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces .
V. ASTM F2659 – Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and Other Floor Slabs and Screeds Using a Non-Destructive Electronic Moisture Meter.
W. CAN/ULS-5770 - Long Term Thermal Resistance (LTTR) of Closed-Cell Thermal Insulation Foams.

1.4 PERFORMANCE REQUIREMENTS

A. Provide labeled materials which have been tested and listed by UL for application indicated, with the following rating for roof slopes shown, "Class A" rated materials.
B. Certified Test Results: Test reports from an independent testing laboratory, attesting that products meet the specified test requirements.
C. The completed installation shall be inspected and approved by a representative from the roofing manufacturer. All deficiencies noted in this inspection shall be corrected at no additional cost to the Owner.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit specifications, installation instructions, and general recommendations for roofing system provided.
C. Submit Shop Drawings of roofing configuration, insulation layout, anchorage, penetrations and large scale details.
D. Submit average R-Value achieved with roof insulation configuration.
E. Submit certification that the roof system and installation resists the wind loads indicated on the structural drawings.
F. Submit a letter from the manufacture that lists each component of the roof assembly with the manufactures recommended installation.
G. Submit a letter from the manufacturer verifying that they have reviewed the project and indicating that the completed installation will qualify for the warranties specified.
H. For aluminum flashing and trim, submit samples of actual material indicated for the work in all colors and textures available from manufacturers full range for color selection by Architect.
I. Submit details of aluminum flashing and trim.
J. Submit proof that all concrete decks have been tested for moisture prior to installation of the vapor barrier in accordance with ASTM F2659.
K. Submit a copy of the Roof Inspection Report(s).

1.6 QUALIFICATIONS

A. Manufacturers: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.
B. Installer: Installer shall be certified in writing by the manufacturers as a licensed or approved installer of the system specified.
C. Work on existing roofs shall be done by a Contractor who is certified by the manufacturer of the existing roof system.

1.7 QUALITY ASSURANCE

A. Field measurements shall be taken prior to fabrication to assure symmetry and verify as built conditions.
B. All sheet metal flashing and trim shall be fabricated and installed in accordance with the recommendations in the SMACNA - Architectural Sheet Metal Manual.
C. All materials shall be installed with concealed starter cleats and splice plates to accommodate thermal movement. Exposed through nailing or face nailing is not allowed.
D. Hem all exposed edges.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to the installation of roofing and associated work, a meeting shall be held at project site with installers, manufacturers, installers of related work, the General Contractor and Owner's representative. General Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least 72-hours' advance notice to participants prior to convening pre-roofing conference.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Manufactured roofing materials shall be delivered in manufacturer's original unopened containers or wrapping with labels intact and legible.
B. Store and protect materials from damage and weather in accordance with the manufacturer's instructions. Keep materials clean and dry. Store material on raised platforms and cover top, sides and bottom.
C. Adhere to the special precautions of the manufacturer or as required by the general conditions, whichever is most stringent.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.11 WARRANTY

A. Membrane Manufacturers Total System warranty period shall be for 15 years after date of acceptance for materials and workmanship.
B. Installers guarantee period shall be for two (2) years after date of acceptance.
C. Insulated Scuttles: Manufacturer shall guarantee against defects in material or workmanship for a period of five years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Membrane and Insulation Systems
   1. Firestone
   2. Johns Manville
   3. Carlisle
   4. Versico
   5. Or Equal

B. Aluminum Flashing and Trim
   1. Firestone Metal products
   2. Metal Era
   3. W.P. Hickman Co.
   4. Petersen Aluminum Corporation
   5. Or equal

2.2 RIGID INSULATION

A. Rigid insulation - Rigid polyisocyanurate foam insulation laminated to a black glass reinforced mat facer, tapered where required and as shown on the drawings.
B. Compressive Strength - 20 psi ASTM D1621.
C. Foam Core Density - Nominal two pounds per cubic foot.
D. Flame Spread - 25, ASTM E84.
E. Moisture Vapor Transmission - 1.0 per inch, ASTM E96.
F. Thickness: As required to match existing.

2.3 COVER BOARD

A. High density polyisocyanurate cover boards with glass-reinforced facers.
B. Panel Width: 48 inches.
C. Thickness: ½ inches.
D. R-Value: R-2.5.
E. Compressive Strength: 100 psi.

2.4 ROOFING BOARD

A. Glass mat faced roof boards with a non-combustible, water resistant, silicone-treated gypsum core in accordance with ASTM C1177.
B. Panel Width: 48 inches.
C. Thickness: ½ inches.

2.5 VAPOR BARRIER

A. Vapor Barrier shall be the roofing membrane manufacturer’s standard vapor barrier system designed for the proposed roofing system. Provide adhesive as required for roof deck type. For concrete decks, provide adhesive that will resist future vapor drive.

2.6 ADHESIVE

A. Adhesive as recommended by the roofing manufacture and compatible with all roofing components.

B. Warrantee on the insulation adhesive shall be the same length as the specified roofing system warranty.

2.7 MEMBRANE

A. Type: Plasticized polyvinyl chloride (PVC), reinforced, ultraviolet resistant at new roofs
B. Type: thermoplastic polyolefin (TPO) at existing. To be field verified.
C. Size: Maximum sheet size permitted by application and job conditions.
D. Thickness: 60 mils.
E. Color: White.
F. Flashing: Flashing sheet as recommended by the membrane manufacturer.

2.8 ACCESSORIES

A. Prefabricated roof flashing as detailed on the Drawings.
B. Membrane Bonding Adhesive: Adhesive as recommended by the membrane manufacturer.
C. Provide manufacturers standard materials to ensure a complete installation and warranty.
D. Termination Bars - Rigid Aluminum Stock with Stainless Steel Fasteners.
E. Splice Tape - For use in lap splicer 6-inches wide.
F. Russ Strip - Reinforce Universal Securement strip as recommended by the manufacture.

2.9 ROOF TOP MOUNTED GUARD RAILS

A. Guard rail system shall be Bluewater Safety Rail 2000, Edge Fall Protection SRC 360, Garlock Railguard 200, or equal.
B. Guard rails shall meet all OSHA regulations 29CFR1910.23 for permanent guardrails.
C. System shall not penetrate the roofing membrane.
D. Railings shall be 42" high with an intermediate rail.
E. Bases shall manufacturer’s standard movable, non-penetrating weighted base to provide stability to the system.
F. Provide pins for securing railings to the bases.
G. All materials shall have a powder coated finish in a custom color as selected by the Engineer.

2.10 METAL FLASHING AND TRIM

A. Fascia - Factory fabricated .063-inch aluminum snap on gravel stop style fascia with a continuous 24-gauge G-90 galvanized steel cant dam and compression strip. Provide splice plates with matching color to control thermal movement. Carlisle SecureEdge 200 Snap-on, Johns Manville Fascia System 200, Metal Era System 200, or equal.

PART 3 - EXECUTION

3.1 REMOVAL OF ROOFING AND WORK ON EXISTING ROOFING

A. Field verify existing roofing prior to modifications.
B. Remove existing roofing, flashing, blocking and nailers at areas indicated on the drawings.
C. All work on the existing roof shall be as detailed and in accordance with the roofing manufacturers printed standards.
D. All work shall be made watertight at the end of each workday.
E. Protect the existing roof from damage and maintain the watertightness of the building.

3.2 EXAMINATION

A. Comply with manufacturers' instructions for preparation of substrate. Clean substrate of dust, debris and other substances detrimental to roofing work.
B. Wood blocking at perimeter shall be installed prior to the start of roofing work. No voids greater than ¼ inch is permitted.
C. There shall be no voids between adjacent boards of insulation in excess of 1/4 inch.
D. Report unsatisfactory conditions to the contractor in writing. Beginning work is presumed as acceptance of all conditions as satisfactory.
E. Prior to the installation of the air barrier, verify that all concrete decks are sufficiently cured and dry. Test slabs in accordance with ASTM F 1869 or F2170. Tests must meet ASTM F1869 Moisture Vapor Emission Rate - less than 4 pounds per 1,000 s.f. in 24 hours or ASTM F2170 Relative Humidity less than 75%.

3.3 BLOCKING

A. Install all blocking concealed by roofing system and as shown on the drawings.

3.4 COVER BOARD INSTALLATION

A. Apply vapor barrier on all decks.
B. Install vapor barriers as recommended by the manufacturer.
C. Install Cover Board per the manufacturer’s installation instructions.

3.5 ADHERED PVC MEMBRANE INSTALLATION

A. Installation shall be in compliance with the manufacturer’s installation instructions.
B. Remove all crimp rings from roof drains and save for reinstallation.
C. Apply adhesive direct to substrate, rate may vary depending on porosity of substrate. Do not allow adhesive to skin-over or surface-dry prior to installation of membrane.
D. All membrane overlaps shall be hot-air welded. The membrane shall be clean and dry prior to hot-air welding.
E. Field membrane overlaps for automatic machine-welding shall be 3-inches in width. A minimum of 4-inches wide overlap is required when hand-welding details.
F. 1-inch wide cross-section samples of welded seams shall be taken at least two

times a day, once in the morning and once in the afternoon.

3.6 ROOF TOP GUARD RAILS

A. Install roof top guard rail system where indicated on the Drawings.
B. Provide self-closing swing gate.
C. Provide a separator sheet or additional membrane at each base.

3.7 MANUFACTURER'S FIELD SERVICES

A. A manufacturer's technical representative shall be present at the start of the roofing installation.
B. Upon completion of the membrane system, a manufacturer's representative will make a thorough inspection of the installation to determine that the roof system has been applied according to specifications and manufacturers standards.
C. Upon completion of work on the existing roof, a manufacturer's representative will make a thorough inspection of the work to determine that it complies with the manufacturer's standards and specifications.

3.8 INSTALLATION OF SHEET METAL FLASHING AND TRIM

A. Installation of all materials in this Section shall be in strict accordance with the manufacturer's printed instructions.
B. Ensure a watertight installation at all points where prefabricated items meet the roofing.
C. Install cleats, formed fascia and continuous closure as shown on the Drawings. Anchor as recommended by Manufacturer.
D. Set fascia flange in sealant as recommended by the roofing materials manufacturer.
E. Fabricate and place all copper sheet metal work in accordance with the best practices specified in the "Modern Application of Sheet Copper in Building Construction" Handbook and the following additional requirements. Install flashing and sheet metal work in lengths not to exceed 8 feet and free from longitudinal joints. Coat all flashing in contact with dissimilar metal and asphalt paint. All joints in copper flashing shall be pre-tinned, locked, and soldered. Form expansion joints in running flashing work by joining ends of the sheets together with a 3-inch loose lock, filled with plastic cement. Install expansion joints every 24 feet in straight runs. Provide felt insulation between any ductwork and copper at contacts. Clean all copper using caustic soda hot water solution where metal is exposed. Tool solder work reasonably smooth. Other non-specified flashings - fabricate flashings to profiles indicated, using as large sheets as practicable.

3.9 CLEANING

A. Remove debris, scraps, containers, rubbish, and other trash resulting from installation of the roofing system from job site each day.
B. Remove debris from project site.
C. Leave work areas in clean condition.

END OF SECTION

SECTION 07920

JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparing sealant substrate surfaces.
B. Sealant and backing.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM C790 - Recommended Practices for Use of Latex Sealing Compounds.
B. ASTM C920 - Specification for Elastomeric Joint Sealant
C. ASTM C834 - Specification for Latex Sealing Compounds
D. FS-TT-S-227 - Sealing Compound: Elastomeric Type, Multi-Component
E. FS-TT-S-230 - Sealing Compound: Elastomeric Type, Single Component
F. FS-TT-S-001543 - Sealing Compound: Silicone Rubber Base
G. Sealing and Waterproofers Institute - Sealant and Caulking Guide Specification

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit manufacturer's installation instructions.
C. Submit Joint Sealant Schedule indicating each specific item/location to be sealed with the following information:
    1. Joint sealant application/location.
    2. Joint sealant manufacturer and product name.
    3. Joint design including width and depth of joint sealant and backer rod or bond-breaker size and location.
    4. Primer required for each substrate.
    5. Solvent cleaner for each substrate type.
D. Submit samples of actual material indicated for the work in all colors and textures available from manufacturers full range for color selection by Architect.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years' experience.
B. Applicator Qualifications: Company specializing in applying the work of this Section with minimum five years' experience.
C. Compatibility: Verify sealants used are compatible with joint substrates.
D. Joint Tolerance: Compliance with the manufacturer's limitation is required.
E. Conform to Sealant and Waterproofers Institute requirements for installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

B. VOC Standards - All sealants shall be in accordance with all applicable State and Federal VOC standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work in this Section with related sections.

1.8 WARRANTY

A. Installer to provide five-year warranty to include coverage of installed sealants, caulking and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyurethane Sealant: Typical horizontal and vertical joints up to 1-inch at openings, control joints in masonry, penetrations through walls and ceilings, etc.
   1. Moisture cured, single component, polyurethane-based, non-sag elastomeric, paintable sealant, ASTM C920, Grade NS.
   2. Max joint size: 1-inch.
   3. Movement capability: 35% joint movement.
   4. Products:
      a. Bostik 915 Polyurethane Sealant
      b. Sika Sikaflex 1A
      c. Tremco Dymonic 100
      d. Or equal

B. Self-leveling Polyurethane Sealant: Self-leveling sealant for horizontal joints in concrete.
   1. Multi-component, self-leveling, polyurethane sealant, ASTM C920, Grade P.
   2. Max joint size: 1-inch.
   3. Movement capability: 25% joint movement.
   4. Products:
      a. Pecora DynaTrol II-SG
      b. Sika Sikaflex 1C-SL
      c. Tremco Vulkem 445SSL
      d. Or equal

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; as recommended by sealant manufacturer.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit

application.

2.3 COLORS

A. As selected by engineer from manufacturers full range of color options.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.
B. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.
B. Remove loose materials and foreign matter which might impair adhesion of sealant.
C. Verify that joint backing and release tapes are compatible with sealant.
D. Perform preparation in accordance ASTM C790 for latex base sealants.
E. Protect elements surrounding the work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in strict accordance with manufacturer's instructions.
B. Measure joint dimensions and size materials to achieve required width/depth ratios.
C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
D. Install bond breaker where joint backing is not used.
E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot apply within these temperature ranges.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
G. Tool joints concave.

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01710.
B. Clean adjacent soiled surfaces.
C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION

SECTION 08110

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Steel Doors.
B. Steel Frames.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
B. ANSI/NAAMM/HMMA 867-06 - Guide Specifications for Commercial Laminated Core Hollow Metal Doors and Frames.
C. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
D. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
E. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
F. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
G. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
H. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
I. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
J. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
K. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
L. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
M. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
N. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimens.
O. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.
P. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure

Differentials.

Q. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
R. NFRC 102 – Procedure for Measuring the Steady State Thermal Transmittance of Fenestration Systems.
S. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.
T. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit the following sections concurrently:
   1. Section 08110 - Hollow Metal Doors and Frames
   2. Section 08710 - Finish Hardware
C. Submit a complete door and frame schedule, scale details of door and frame construction, indicating all gauges, reinforcing, cutouts, anchors and anchor clips.
D. Do not fabricate hollow metal work without final shop drawing review.
E. Submit manufacturers certification that door and frame hardware reinforcing gauges comply to ANSI/SDI 100.
F. Submit verification that all existing dimensions and conditions have been field verified.
G. Submit compliance with ASTM E1886 and ASTM E1996.

1.5 QUALITY ASSURANCE

A. Conform to requirements of SDI-100.
B. Doors and frames shall be factory fabricated. All field modifications shall be approved by the Engineer.
C. Exterior doors and frames shall conform to the requirements of ASTM E1886 and ASTM E1996.

1.6 QUALIFICATIONS

A. Sections 08110 - Hollow Metal Doors and Frames and 08710 - Finished Hardware shall be provided by a single supplier.

1.7 PACKAGING

A. Doors shall be fully wrapped in corrugated cardboard, single faced paper 42-pound with a 26-pound liner medium "B" flute, protecting all surfaces of the door. Flute shall be run the full height of the door.
B. Wood strips, 3/8 inches, 2 inches commercial grade, finished one side for marking, extending 1/2 inch beyond the top and bottom of the door shall be temporarily applied to the edges of the door.
C. The corrugated cardboard and wood strip shall be held firmly in place by three (3) 3/8 inch by 18 GA steel bands on each door.
D. Wood strips shall be marked clearly giving door type, size, hand lock preparation, and mark number. The metal banding shall not interfere with the marking.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver doors, frames and windows to the job site in manufacturer's unopened packaging.
B. Store doors and frames upright in a protected area on wood runners or skids and covered with vented plastic.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Curries
B. Mesker
C. Steel Craft
D. Or equal

2.2 DOOR CONSTRUCTION

A. Doors: 16-gauge stretcher level steel, A60 galvannealed face sheets.
B. 1/8-inch bevel in two inches on hinge and lock edge.
C. Seams shall be continuously welded and ground smooth.
D. Top and bottom 16 gauge, cold-rolled steel reinforcing channels spot welded within door.
E. Mortise and reinforce doors for finish hardware in accordance with template. Requirements are furnished under finish hardware.
F. Hinge reinforcement - 12 gauge, channel shape.
G. Lock face, flush bolts, surface mounted closers - 14 gauge
H. All other surface mounted hardware - 14 gauge.
I. Provide flush top cap sealing against water on all exterior doors.
J. Prepare exterior door bottoms to receive door bottoms.
K. Doors shall have, rigid polystyrene foam board, bonded to the inside of both faces. The strength developed on the laminated assembly shall be 1500 PSF in compression and a shear strength of not less than 2500 PSF. R-6.37 minimum.
L. Any additional modifications to specified door construction, as required by Underwriters Laboratories and National Board of Fire Underwriters, to meet required fire rating, shall be performed at the factory, and doors must bear the U.L. seal for each rating so required.

2.3 FRAME CONSTRUCTION

A. Frames: 14 gauge, A60 galvannealed.
B. All frame joints installed in masonry shall be continuously welded and ground smooth. Where galvanized coating has been burned or damaged, touch up with a cold galvanizing compound. All joints in frame shall be watertight.
C. Hinge, Lock and Strike Reinforcement - 10 Gauge
D. Door Closer Reinforcement - 14 Gauge
E. Floor Clips - 18 GA minimum
F. Frame Anchors - Provide minimum three anchors per jamb as required for the adjoining wall construction; a base angle and one anchor for every 2 vertical feet. Provide anchors of not less than 7-gauge steel or 3/16-inch diameter wire adjustable. Provide existing wall type anchors at concrete, all existing openings and where

indicated on the drawings.

G. Frame Splines - Same as frame

H. Reinforcement, stiffeners, and base angle clips shall be welded to inside surfaces of frames.

I. Locate hardware cutouts and reinforcing from templates obtained from the hardware supplier. Weld sheet steel dust covers over all cutouts in frames to prevent contact of mortar with reinforcing and lock strikes.

J. Turn edges of frames to form retainers for anchors.

K. Before shipping, provide removable angle spreaders securely fastened to bottom of each jamb; do not remove until frames are secured in place.

2.4 FINISHING

A. Clean all surfaces of doors, frames, anchors and related items specified hereunder, by hot or cold phosphate treatment standard with the manufacturer. Following cleaning, apply one coat of rust-inhibitive prime paint and bake on. Prime all surfaces, including those which will be inaccessible after erection.

B. The finished work shall be strong and rigid, neat in appearance, and free from warp and buckle. Miters shall be well formed and in true alignment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install frames in accordance with Steel Door Institute.

B. Provide insulation in frames at exterior frames.

C. Install doors in accordance with Door Hardware Institute.

D. Coordinate with wall construction for anchor placement.

E. Erect all frames in accordance with the final shop drawings and frame schedule.

F. Provide rigid temporary bracing for door frames as required to ensure maintenance of positioning and remove only after frames have been permanently anchored.

G. Coordinate installation of glass and glazing.

H. Receive, store, and be responsible for hardware as furnished under Section 08710, Finish Hardware.

I. Fit all hinged doors to their respective openings.

J. Fit all hardware accurately, from templates supplied with hardware, apply securely, and adjust carefully.

K. Prior to Substantial Completion of the Contract, and before building is occupied, inspect entire building with the Engineer and see that each piece of finish hardware is undamaged and in perfect order and that the proper key for each lock is identified.

3.2 TOLERANCES

A. Maximum diagonal frame distortion: 1/16 inch measured with straight edge, corner to corner.

3.3 ADJUSTMENTS

A. Adjust hardware for smooth and balanced door movement.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finish Hardware for all doors
B. Keying to coordinate with the Owner's existing master key system.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ANSI A115 - Standards for Door and Frame Preparation
B. ANSI A156 - Standards for Finish Hardware
C. Other Applicable Life Safety and Building Codes.
D. NFPA 80 - Fire Doors and Windows
E. ANSI A117.1 - American National Standard, providing accessibility and usability for physically handicapped people.
F. ADA - Americans with Disabilities Act.
G. BHMA – Builders Hardware Manufacturer’s Association
H. UL – Underwriters Laboratories

1.4 SUBMITTALS

A. The finish hardware supplier shall submit for review a complete and detailed finish hardware schedule using a vertical typewritten format. The finish hardware schedule shall contain a listing of the name of each manufacturer and the product listing for the series included in the hardware schedule.
B. Submit the following sections concurrently:
    1. Section 08110 - Hollow Metal Doors and Frames
    2. Section 08710 - Finish Hardware
C. Provide catalog cuts on specified hardware.
D. It shall be the responsibility of the finish hardware supplier to obtain from the owner or the owner's representative, a detailed keying schedule listing the respective key symbol and location for the locksets having the corresponding key symbol.
E. The finish hardware supplier shall make available to the general contractor a detailed list of template numbers and templates required for each of the door manufacturers that require templates.
F. Submit the finished hardware suppliers field report indicating that the finished hardware has been installed and is working properly. The report shall note all deficiencies and conditions required to correct them. Refer to "Field Quality Control" as specified herein.

1.5 QUALITY ASSURANCE

A. The hardware supplier shall have in their employ an architectural hardware consultant (AHC) or a person with equivalent number of years required for AHC qualifications. This person shall be recognized as having the ability to be fully responsible for the scheduling, detailing and execution of this section of the specifications and related items. This qualified consultant shall be responsible for processing all submissions, correspondence, technical matters related to the finish hardware and its application specified in this section.

B. All door hardware shall comply with the Americans with Disabilities Act, ANSI A117.1 and applicable state accessibility codes.

1.6 QUALIFICATIONS

A. Sections 08110 - Steel Doors and Frames and 08710 - Finished Hardware shall be provided by a single supplier.

1.7 DELIVERY, STORAGE AND HANDLING

A. The finish hardware shall be delivered to the job site and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.

B. All finish hardware shall have the necessary screws, bolts and other fastenings required for correct installation of each item. The cylinders, locksets, exit devices, door closers, shall be clearly marked with the respective individual door or heading number.

C. After the hardware has been installed and prior to the acceptance of the building by the Owner, it shall be the General Contractors responsibility to properly protect the hardware and the hardware finish from all dents, scratches, defacing that may occur during the construction period. Hardware that is considered damaged or scratched during the construction period shall be replaced by the General Contractor at no cost to the owner or hardware supplier. Hardware items with paint on them shall be cleaned and/or replaced by the General Contractor at no charge to the owner.

1.8 WARRANTY

A. The finish hardware specified for this project shall be guaranteed against defects in material and workmanship for a minimum one (1) year from date of completion and acceptance of this building unless otherwise specified below. In addition, door closers and exit devices shall carry a minimum guarantee of five (5) years from date of completion and acceptance of this building. Mortise locksets shall have a minimum ten (10) year limited warranty. Two (2) year limited warranty on electrified locks. Door closers shall have a minimum twenty-five (25) year limited warranty.

B. If an item of hardware is found to be defective by reasons of defects in material and workmanship, it shall be replaced by the hardware supplier at no charge to the owner. The installation of the replacement item shall be the responsibility of the General Contractor if within the building guarantee period specified under general conditions, or by the Owner if beyond the building guarantee period.

1.9 MAINTENANCE SERVICE

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hinges
   1. Hager
   2. Ives
   3. McKinney
   4. Stanley
   5. Or equal

B. Exit Devices
   1. Sargent
   2. Von Duprin
   3. Precision
   4. Or equal

C. Door Closers
   1. Sargent
   2. LCN
   3. Dorma
   4. Or equal

D. Kick Plates
   1. Burns
   2. Rockwood
   3. Trimco
   4. Or equal

E. Thresholds
   1. National Guard Products
   2. Reese
   3. Pemko
   4. Or equal

F. Weather Stripping
   1. National Guard Products
   2. Pemko
   3. Reese
   4. Or equal

2.2 HINGES

A. All hinges for this project shall be stainless steel, ball bearing type, and shall meet or exceed requirements of ANSI A5112.

B. The following is a guide for hinge size and type required for this specification:

1-3/4 inch Doors up to 3'0" wide	Stanley	FBB191-4 1/2 inches
	Hager	BB1191-4 1/2 inches
	McKinney	TB2314-4 1/2 inches
	Ives	5BB1-4 1/2 inches
1-3/4 inch Doors over 3'0" wide	Stanley	FBB199-4 1/2 inches
	Hager	BB1199-4 1/2 inches
	McKinney	T4B3386-4 1/2 inches
	Ives	5BB1HW-4 1/2 inches

1. The width of hinges shall be sufficient to clear all trim.
2. Hinges of foreign manufacture shall not be considered acceptable for this project.

C. Two hinges shall be provided for each door leaf up to and including five feet (5'0") in height. An additional hinge shall be required for each additional two and one half feet (2'-6") or fraction thereof in height.

D. All exterior doors, and any interior doors so indicated in hardware sets, shall be furnished with non-removable pins (NRP).

E. Refer to finish section for hinge finish.

2.3 EXIT DEVICES

A. All exit devices for this project shall be of the same series and design and shall be manufactured by one manufacturer.

B. Exit devices shall be certified to meet or exceed the requirements of ANSI/BHMA A156.3 Grade 1.

C. Exit devices shall comply with UL10C positive pressure requirements.

D. All exit devices shall have a 14-gauge, stainless steel continuous horizontal mounting rail with a 16-gauge, stainless steel touch pad with a Lexan touch pad protection plate and shall be of the same design, and of similar configuration, for all doors throughout.

E. The chassis shall be a solid cast pressure formed almag or non-ferrous alloy and shall be mounted directly to the door with four (4) wood screws, machine screws, or, through bolted where required for positive attachment for wood fire rated doors.

F. All exit devices for this project shall have the chassis, end cap, and horizontal mounting rail, mount directly to, and flush with, the door surface. No gaps or space shall be permitted between the back of the horizontal mounting rail and the door surface. If required, a continuous solid stainless steel or bronze dull chrome plated spacer bar shall be used to fill the space between the back of the devices and the door surface.

G. The chassis cover shall be 16-gauge, cold formed stainless steel, fastened to the solid cast pressure formed chassis, by four (4) Phillip head machine screws, at the side of the chassis cover.

H. The rail assembly shall be 14-gauge, heavy wrought stainless steel. The rail assembly shall consist of a stainless steel case with a 16-gauge, heavy wrought stainless steel touch pad with a Lexan touch pad protection plate.

I. The end cap shall be a high impact resistant black lexan, fastened to the rail assembly by means of two, stainless steel Phillip head machine screws.

J. The touch pad shall retract the latch bolt by means of a sliding motion of the touch pad towards the lock stile, activating the lever arm for easy operation and reduced friction.

K. All exit devices, regardless of function, except for fire rated devices, shall have one-point cylinder dogging. The cylinder for cylinder dogging shall be a six (6) pin cylinder keyed to the building master key system as specified under Section, "Keying"

L. Trim for exit devices shall be one of the following as specified:
   1. Cast stainless steel lever handle with cast escutcheon.

M. Exit devices, meeting all of the specification requirements set forth above, Precision 2100 Series, Sargent 8800 Series, Corbin Russwin 5200 Series, Von Duprin 9800 Series, or equal.

N. Provide rim exit devices for single doors and mortise lock devices with open back strike and vertical rod devices for pairs of doors.

O. The following is a list of the functions referred to under hardware sets (1, 2, 3) and the model numbers of the acceptable manufacturers:

TYPE	PRECISION	SARGENT	VON DUPRIN	CORBIN RUSSWIN
R-1 (Exit Only)	2101	8810	98EO	5201
R-2 (Night Latch)	2103	8804	98NL	5230
R-3 (Key Lock)	2108	8813	98L	5208
R-4 (Passage)	2114	8815	98LBE	5214

2.4 KEYING

A. Provide cylinder housings to accept permanent cores conforming to the Owner's existing key system and following requirements:
   1. Provide construction cores with construction master keying for use during construction. The temporary construction cores are to be returned to the hardware supplier.
   2. Contractor to provide permanent cores keyed by the factory to the Owner's requirements. The Owner or Owner's security agent shall install permanent keyed cores upon completion of the project.
   3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware.
   4. Provide keys as follows
      a. Six keys per each lock and/or cylinder type.
      b. Six master keys.
   5. Deliver all keys and permanent cores from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.

2.5 DOOR CLOSERS

A. All door closers for this project shall be the product of one manufacturer and shall have heavy cast cases with full cover and be full rack and pinion type construction, non-handed and non-sized with adjustable back-check effective at 70 degrees for both standard and parallel arm mounting.

B. The closers shall meet or exceed the requirements of ANSI/BHMA A156.4, Grade 1.

C. The following products will be acceptable:

Manufacturer	Model
Dorma	8900
LCN	4111/4011
Sargent	280

D. At areas and routes accessible to persons with disabilities, provide closers that meet all state and federal regulations.

E. The hardware contractor shall insert in the hardware schedule, beside each door listing, the required degree of opening for each door. If the door swing is over 140 degrees, parallel arm type closers shall be used. Door closers mounted on corner brackets, or top jamb application, shall not be permitted.

F. Door closers with Cush-N-Stop arms shall be provided for all exterior, out-swing doors and other openings as specified under hardware sets. They shall have heavy forged steel parallel arms and soffit plates attached to the frame by six (6) screws. The forged steel arm shall have a positive stop bracket with an adjustable tension hold-open feature controlled with a slotted screw permitting adjustment from no hold-open to full restraint of door movement, Cush-N-Stop hold open function. The hold open feature does not apply to fire doors.

G. Where door closers are noted to require delayed action feature, provide closers as specified herein, but having a separate delayed action valve, to permit adjustment of delayed action cycle. When adjusted, the door closer shall close at a controlled rate of speed, through the delayed action cycle range.

H. The installing contractor shall be responsible for proper installation of door closers in accordance with degree of opening indicated on hardware schedule. Adjustment of all valves, for proper control of closing speed, latching speed, delayed action, back check, and spring power adjustments, shall be the responsibility of the installing contractor as set forth in Part III Execution.

I. Where top rail of door is insufficient in height to mount the closer directly to the rail, drop brackets shall be provided.

2.6 KICK PLATES

A. Kick plates shall be .050-gauge solid stainless steel 8-inches (6-inches at full glass doors) high by 1- 1/2 inches less door width for single doors and 1 inch less door width for pairs of doors.

B. Kick plates shall be applied on the push side of all doors for which kick plates are scheduled.

2.7 THRESHOLDS

A. General: Provide thresholds at all exterior doors and at other doors as indicated in the hardware schedule and on the drawings.
B. Length: Full width of door opening.
C. Anchorage: Anchor thresholds with no less than four (4) machine screw anchors for lengths 3’-0” and shorter. Provide an additional anchor for each 6” longer than 3’-0”. Provide nonferrous solid brass or stainless steel screws.

2.8 WEATHER STRIPPING

A. General: Provide weather stripping at all exterior doors and at other doors as indicated in the hardware schedule and on the drawings.
B. Finish: The finish for the exposed continuous aluminum weather stripping brackets, shall be natural anodized aluminum finish.
C. Head and Jamb Weatherstripping (HM Doors): At all exterior hollow metal doors and at other hollow metal doors as indicated in the hardware schedule, provide an extruded aluminum perimeter seal with neoprene gasketing material (weather-stripping) for head and jambs. The neoprene seals shall be an airfoil design to permit full and positive closure between door and jamb. The continuous aluminum brackets shall be applied on the stop with stainless steel sheet metal screws at the corner of the rabbet located so as to provide full closure at the head and jamb perimeters. Where the door comes in contact with the frame, the maximum projection for the continuous aluminum weather stripping brackets shall be no more than ¼-inch:
    1. NGP 135NA
    2. Pemko 303APK
    3. Reese 678
    4. Or equal
D. Door Bottoms (HM Doors): Provide a door bottom at all hollow metal doors indicated to have weather stripping. The door bottom seal shall be concealed in the bottom of the door and shall be a flexible synthetic vinyl that will not take a formal set, nor break or flake in cold weather. The door bottom seal shall extend the full width of the door and shall also extend below the door bottom and compress against the top of the threshold, for complete closure. The door bottom seal shall be fastened to the recessed channel with 3 or 4 screws through the seal or the seal chassis. Concealed door bottoms must be installed before the door is in place:
    1. NGP 12V
    2. Pemko 208AV
    3. Reese DB591
    4. Or equal

2.9 FINISH

A. With the exceptions of door closers, plates, coordinators, thresholds and weather stripping, all hardware items shall be furnished in satin stainless steel finish 32D.

B. Exceptions are as follows:

Door Closers:	Sprayed Aluminum
Thresholds:	Natural Anodized Aluminum
Weather stripping:	Natural Anodized Aluminum

PART 3 - EXECUTION

3.1 INSPECTION

A. It shall be the General Contractor's responsibility to inspect all door openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

3.2 PREPARATION

A. All doors and frames, requiring field preparation for finish hardware shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturer's templates and instructions.

3.3 INSTALLATION

A. All materials shall be installed in a workmanlike manner following the manufacturer's recommended instructions.

B. Exit devices shall be carefully installed so as to permit friction free operation of crossbar, touch bar, thumb latch, lever or knob. Latching mechanism shall also operate freely without friction or binding.

C. Door closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be as shown on the instruction sheets and required by the finish hardware schedule.

D. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.

E. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

3.4 FIELD QUALITY CONTROL

A. Upon completion of the installation of the finish hardware, it shall be the responsibility of the finish hardware supplier to visit the project and to examine the hardware for each door on which they have provided hardware and to verify that all hardware is in proper working order. Should they find items of hardware not operating properly, they should make a report, in writing, to the general contractor, advising of the problem and the measures required to correct the problem.

3.5 ADJUSTING

A. The adjustments for all door closers shall be the contractor's responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the corrected delayed action cycle or hydraulic back check cushioning of the door in the opening cycle. All valves must be properly adjusted at the time of installation.

B. Each door closer has adjustable spring power capable of being adjusted, in the field, from size 2 through 6. It shall be the contractor’s responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closer.

3.6 CLEANING

A. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

3.7 PROTECTION

A. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the engineer and owner, the general contractor shall remove the protective material exposing the hardware finish.

3.8 INSTRUCTIONS AND TOOLS

A. It shall be the responsibility of the finish hardware supplier to provide installation and repair manuals and adjusting tools, wrenches, etc., for the following operating products:
   1. Locksets (all types)
   2. Exit devices (all types)
   3. Door closers

3.9 HARDWARE SET NUMBERS

A. The Hardware Sets listed below indicate the items of hardware required for each opening. It is the bidder’s responsibility to accurately furnish the proper quantities, items, sizes, weights and functions as required by the plans and this specification. If an opening has, through error, been omitted from the following hardware set numbers listings, it shall be the bidders responsibility to supply hardware of equivalent quality and quantity, as that which is specified for a comparable opening.

HDWR # 1

Each leaf shall have: Hinges, Exit Device R-3, Closer with Cush-n-Stop, Kickplate, Weather-stripping, Threshold.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of the following surfaces of new items unless specified elsewhere to be prefinished. This includes pre-primed surfaces.
   1. Painting of all submerged surfaces.
   2. Painting of all exposed interior surfaces.
   3. Painting of all exposed exterior surfaces.

B. Painting of existing items:
   1. Existing floors, walls and ceilings to receive surface preparation and field painting are indicated on the drawings and in the specifications.
      a. All previously painted items located within floors, walls and ceilings indicated to be painted will also receive surface preparation and field painting.
   2. Any other existing items on the drawings or in this specification indicated to be painted will receive surface preparation and field painting.

C. This Section also includes:
   1. All surfaces of ferrous metal fabrications built into concrete and masonry shall be shop primed or receive a primer coat in accordance with this section. All surfaces exposed to view shall receive intermediate and finish coats.
   2. Pipe, pump and valve identification markers.
   3. Motors and equipment which are pre-finished shall receive an intermediate coat for compatibility if required and shall receive one finish coat to provide a color matching the system color indicated in the pipe identification schedule.
   4. Paint all items modified or relocated in the existing facility.

D. Definitions:
   1. Submerged surfaces are defined as:
      a. Those surfaces which are below the maximum water surface level as indicated on the drawings, and/or extend 3-feet above the maximum water surface for uncovered tanks.
      b. All surfaces contained within covered tanks.
      c. The full height of all partially submerged items such as sluice, slide and weir gates, piping, etc.
      d. All surfaces contained within underground vaults, structures and manholes such as valve pits, dry wells, etc.
   2. Exposed interior surfaces shall be non-submerged surfaces exposed to view that are enclosed and/or protected in such a manner that they cannot be exposed to UV light or weather conditions.
   3. Exposed exterior items shall be all other surfaces which don’t fall under the definition of “submerged” or “exposed interior surfaces”.

E. Items not requiring surface preparation and field painting under this section:

1. Items and equipment that are specifically specified to receive the manufacturer's standard primer and finish coats in the factory, except as noted for color and touch-up painting.
2. Copper, bronze, brass, chromium plate, nickel, stainless steel, aluminum or monel metals (unless otherwise noted).
3. Unprimed galvanized metals not indicated to be painted shall remain unfinished.
4. Face brick, decorative CMU, architectural precast concrete and tile.
5. Concrete slabs and walls unless indicated elsewhere to be painted, stained, or receive secondary containment coatings.
6. Underside of exposed metal decks unless indicated elsewhere to be painted.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.
B. ASTM D 2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
D. DASTM D6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Products for Painting
E. Federal Test Method No. 141 - Method 6141, Stain Removal.
F. ANSI A13.1 - Scheme for the Identification of Piping Systems.
G. SSPC - Steel Structures Painting Council.
H. SSPC-PA1, "Standard for Shop, Field, and Maintenance Painting."
I. SSPC-PA2, "Measurement of Dry Paint Thickness with Magnetic Gauges."
J. SSPC-SP1, "Solvent Cleaning."
K. SSPC-SP2, "Hand Tool Cleaning."
L. SSPC-SP3, "Power Tool Cleaning."
M. SSPC-SP6, "Commercial Blast Cleaning."
N. SSPC-SP7, "Brush Off Blast."
O. SSPC-SP10, "Near-White Blast Cleaning."
P. SSPC-SP16, "Brush Blast Cleaning of Non Ferrous Metals"
Q. SSPC-PA Guide 3, Standard "A Guide to Safety in Paint Application," latest revision.
R. VOC Standards - All coatings shall be in accordance with all applicable State and Federal VOC Standards.
    1. OSHA 29 CFR 1925.55 Gases, Vapors, Fumes, Dusts and Mists.
    2. Ozone Transportation Commission (OTC) 2005 VOC Regulation.
S. OSHA 29 CFR 1926.62 Lead.
T. SSPC - Guide 61 (COH) Guide for Containing Debris Generated during Paint Removal Operations.
U. SSPC - Guide 71 (DIS) Guide for Disposal of Lead-Contaminated Surface Preparation Debris.

V. SSPC Publication 91-18 Industrial Lead Paint Removal Handbook.
W. USEPA 40 CFR Part 261 Identification and Listing of Hazardous Waste.
X. USEPA 40 CFR Part 262 Standards Applicable to Generators of Hazardous Waste.
Y. USEPA 40 CFR Part 263 Standards Applicable to Transporters of Hazardous Waste.
Z. USEPA 40 CFR Part 268 Land Disposal Restrictions.
AA. USDOT 49 CFR Parts 173, 178 and 179.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01340 including tested performance characteristics.
B. Submit manufacturer's color chips showing the full range of colors available for each type of finish coat material specified.
C. Submit schedule on manufactures letter head with list of items to be coated, type and manufacturer of shop coating and type of field coating, including primers, details on surface preparation methods, application procedures and dry mil thickness.
D. Submit a letter from the manufacturer certifying that the products submitted are applicable for the applications indicated.
E. Submit coating manufacturer's certification that the proposed coatings meet all state and federal VOC regulations.

1.5 QUALITY ASSURANCE

A. The Contractor shall obtain the services of a painting contractor with 5 years experience on similar projects.
B. All materials used on work shall be exactly as specified in brand and quality. No claim by the Contractor as to unsuitability or unavailability of any material specified, or their unwillingness to use same, or their inability to produce first class work with same, will be entertained unless such claims are made in writing and submitted to the Engineer at least seven (7) days prior to the date established for receipt of General Bids.
C. Before purchasing materials for the work, the Contractor shall submit to the Engineer a list of the products they propose to use, and the list shall be reviewed by the Engineer with a status of no exceptions taken before commitment for materials is made.
D. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer.
E. Include on label of all containers:
    1. Manufacturer's name
    2. Type of paint
    3. Manufacturer's stock number
    4. Color
    5. Instructions for reducing, where applicable
    6. Label analysis
    7. Shelf life dates
F. Field Quality Control:

1. Contractor shall request review by the Engineer, of first finished room, space or item of each color, texture and method of applications, prior to proceeding with additional painting.
2. Use first acceptable room, space or item as the project standard for each color scheme.
3. For spray application, when applicable, paint a surface not smaller than 100 square feet as the project standard.
4. Repainting of materials failing to meet the requirements of the Specifications or Drawings, shall be performed by the Contractor, at no additional cost to the Owner.
5. The number of coats and total mil thickness specified in the paint schedule are minimums. If the specified minimum film thickness is not achieved, additional coats shall be applied to achieve the total film thickness specified.

G. Paints submitted shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) compliance, and be in accordance with OTC 2005 Standards.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver coating materials in sealed containers with labels legible and intact.
B. Store only acceptable project materials on the project site.
C. All painting materials shall be stored and mixed in a single location coordinated with the Engineer. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. The Contractor shall carry all necessary water to the mixing room, and shall dispose of all waste outside of the building in a suitable receptacle.
D. Restrict storage location to paint materials and related equipment and supplies.
E. Keep storage location neat and clean.
F. Remove all soiled and used rags, waste and trash from the storage location and building at the end of each work day.
G. Repair all damage to the storage location, caused by painting materials and equipment at no additional cost to the Owner.
H. Comply with all applicable health and fire codes and regulations including safety precautions recommended by the manufacturer. Storage space shall be provided with a suitable fire extinguisher fully charged at all times.
I. Heat shall be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F at all times.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems shall be applied.
B. Do not apply coatings in areas where dust is being generated.
C. Do not apply coatings when the air or material surface temperature is below 50 degrees Fahrenheit and unless the temperature is at least 5 degrees Fahrenheit above the dew point.
D. Do not apply interior coatings until building is weather tight and conditioned.
E. Do not apply exterior coatings in frosty, damp or rainy weather or while surfaces are

exposed to hot sunlight.

1.8 EXTRA MATERIALS

A. For all materials with a shelf life of greater than 12 months, provide one gallon of each type and each color of touch-up paint shall be provided to the Owner by the Contractor in unopened containers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. PPG
B. Sherwin Williams
C. Tnemec Company, Inc.
D. Or equal

2.2 MATERIALS

A. Refer to the paint schedule in Part 3 for specific products and application.

2.3 COMPONENTS

A. All finish coats shall be compatible with shop prime coats.
B. Turpentine shall be pure spirits of turpentine.
C. Shellac shall be four pounds and shall meet the U.S. Government specifications as issued by the Bureau of Commerce.
D. When items are primed in the mill or shop as part of the painting contract, use the materials specified in every case for such surfaces and use in accordance with manufacturer's directions for first or priming coat.

2.4 MIXING AND TINTING

A. Deliver paints and enamels ready-mixed to project site.
B. Accomplish job mixing and job tinting only when required.
C. Mix only in mixing pails placed in suitably sized nonferrous or oxide resistant metal pans.
D. Use only tinting colors recommended by the manufacturer for the specific type of finish.
E. Fungicidal agents, when applicable, shall be incorporated into the paints and stains by the manufacturer.
F. Mix and prepare paints in strict accordance with Manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Part 3.2, Surface Preparation.
B. Immediately notify the Engineer in writing when a surface to be finished cannot be put into an acceptable condition.

C. Do not proceed with surface preparation or coating application until conditions are suitable.
D. The Contractor shall be responsible for and shall rectify, at no additional cost to the Owner any unsatisfactory finish resulting from the application of coatings on surfaces not in acceptable condition.

3.2 SURFACE PREPARATION

A. At a minimum, all surfaces must be prepared and cleaned in accordance with the manufactures written specifications and pertaining to the intended substrate to be coated. The contractor must be fully read and understand all of these requirements and all other required product recommendations prior to commencing any work.
B. Concrete and Masonry:
    1. Clean all dust, dirt, oil and efflorescence from surfaces.
    2. Repair cracks and concrete defects in accordance with Specification Section 03346 prior to installing coating system. Finished concrete surface to have a smooth, uniform texture.
    3. Etch dense and smooth concrete, or concrete that has had a hardener applied, with a five percent solution (by weight) of muriatic acid.
    4. Ensure concrete masonry units have a smooth, uniform texture and are free of voids and bug holes in the surface prior to installing coating systems.
    5. Fill concrete masonry unit surfaces with block filler in sufficient thickness to produce a final result which shall fill all voids and pin holes.
    6. Allow surfaces to thoroughly dry prior to application of first coat.
C. Ferrous Metal Surfaces (Items not shop primed):
    1. All submerged ferrous metals shall be sandblast cleaned in accordance to SSPC-SP10 immediately prior to priming.
    2. All other ferrous metals shall be sandblast cleaned in accordance to SSPC-SP6 immediately prior to priming.
    3. Remove dirt, oil and grease by washing surfaces with mineral spirits.
    4. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
    5. Feather edges of sound existing paint by grinding, if necessary.
    6. Clean and touch up weathered, worn or damaged shop coats of paint with the specified primer.
    7. Restore shop coats of paint with identical materials if removed for welding and fabrication.
D. Galvanized metals indicated to be painted:
    1. Solvent clean in accordance with ASTM D6386.
    2. Surfaces shall receive SSPC-SP-16 and shall be surfaced prepared in accordance with ASTM D6386.
    3. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
    4. Restore shop coats of paint with identical materials if removed for welding and fabrication.
E. Previously Coated Surfaces (including existing items and new items that are shop primed):

1. The areas of the coated surface that are blistered, eroded, brittle or otherwise failed shall be completely removed before beginning the specified surface preparation.
2. The areas where the existing coating is intact shall be sanded to dull the finish.
3. Before applying the new coating over an existing coating, a test section must be done to ensure compatibility of the new and old coatings.
4. All other existing coatings shall be prepared as recommended by the manufacturer and as specified in this section.
5. Ferrous metals arriving at the job site with shop primers other than the polyamide epoxy or rust inhibitive primers specified shall be provided with an intermediate coat as necessary for compatibility with specified topcoats.
6. Special attention shall be paid to the potential for epoxy shop and intermediate coats to chalk upon exposure to sunlight. The Contractor shall follow the manufacturer's required surface protection/covering and surface preparation recommendations before any intermediate or top coats can be applied over chalked surface. Epoxy primers and intermediate coats shall be top coated no later than 45 days after the application of the epoxy coating. If topcoats are to be applied later than 45 days, the following surface preparation shall be provided:
    a. The existing finish shall be etched by sanding with 80 grit paper or cloth.
    b. Surfaces shall be pressure washed with 3000 to 5000 pounds of pressure.
    c. The Engineer, at their discretion, can require the Contractor to conduct adhesion tests of the topcoats.
7. The following shall be the minimum surface preparatory for existing surfaces that are to be painted, unless indicated otherwise:
    a. Existing submerged ferrous metals.
        i. Clean
        ii. Sandblast in accordance with SSPC-SP10.
    b. Non-submerged ferrous metals.
        i. Clean
        ii. Sandblast in accordance with SSPC-SP6.
    c. Existing concrete floors and all surfaces to receive secondary contaminant coatings.
        i. Clean
        ii. Sand or shot blast to remove existing coatings and to provide an anchor profile for the new coating.
    d. Existing Concrete and Masonry
        i. Clean
        ii. Scrape existing paint to a sound surface.
        iii. Sand with 80 grit paper or cloth to provide anchor profile for new coating.
        iv. Pressure wash all existing epoxy coated surfaces.

3.3 APPLICATION

A. Workmanship:
   1. Employ skilled workmen to insure workmanship of the highest quality.
   2. Materials shall be applied only by craftsmen experienced in the use of the specific products involved.

B. General Requirements:
   1. Apply all coatings under adequate illumination.
   2. Perform no work in the rain, dew, or fog, when the temperature is below 50 degrees Fahrenheit and at least 5 degrees Fahrenheit above the dew point, or before the other coats have thoroughly dried.
   3. Do not apply coatings until the material surfaces are thoroughly dry.
   4. Apply coatings with suitable brushes, rollers or spraying equipment.
      a. The rate of application shall not exceed that as recommended by the coating manufacturer for the surface involved.
      b. Keep brushes, rollers and spraying equipment clean, dry and free from contaminates and suitable for the finish required.
      c. Make each coat a different tint from that of the preceding coat, with final coat tinted to the exact shade selected by the Engineer. Lightly sand surfaces between each coat of gloss and semi-gloss finishes, and wipe clean.
   5. Comply with the recommendation of the product manufacturer for drying time between succeeding coats. Contractor shall follow the manufacturer's specific curing requirements for rust inhibitive primer shop coats prior to allowing top coating.
   6. Sand and dust between each coat to remove defects visible from a distance of five feet.
   7. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints and skipped or missed areas.
   8. Inspection:
      a. Do not apply additional coats until the completed coat has been inspected by the Engineer.
      b. Only inspected and reviewed coats will be considered in determining the number of coats applied.
   9. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
   10. Make edges of coatings adjoining other materials or colors clean and sharp with no overlapping.
   11. Apply primer on all work before glazing.
   12. Refinish entire wall where portion of finish has been damaged or is not acceptable.
   13. Runs on face are not permitted. PROTECTION

A. Furnish and lay drop cloths in all rooms and areas where painting and finishing is being done to adequately protect flooring and other work from damage during the prosecution of the painting work.

B. Remove all canopies of lighting fixtures, all electric switch plates, and similar equipment, set them carefully away, and cover adequately, protect the fixtures, etc.;

replace the canopies, plate, etc. in as good condition as when found.

C. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

D. Correct and refinish all interior and exterior surfaces in the existing facility affected by the new work. Materials and their application shall be as required to most closely match the existing finishes and as specified in this Section.

3.5 CLEANING

A. At the completion of the work of this Section, remove all paint spots and oil or grease stains, caused by this work from floors, walls, fixtures, hardware and equipment, leaving their finishes in a satisfactory condition. Remove all materials and debris and leave the site of the work in a clean condition so far as this work is concerned.

3.6 FINAL INSPECTION

A. Protect all painted and finished surfaces against damage until the date of final acceptance of the work. The Engineer will conduct a final inspection of all painters' work. As part of the final inspection the Contractor shall demonstrate compliance with the specified film thickness with appropriate paint gauges. The Contractor shall be required to repaint, refinish, or retouch any areas found which do not comply with the requirements of this Section.

3.7 PAINT SCHEDULE, GENERAL

A. The following product model and coatings system numbers are listed below to establish the standard of quality. Equivalent products from other manufactures will be accepted provided they meet or exceed the performance of the listed products.

B. Surface preparation shall be as specified within this specification section, as noted below and as required per manufacturer recommendations.

C. When applying coats over epoxy coatings that have been in place for more than 45 days, prepare surface in accordance with the “Surface Preparation” section of this specification.

D. When applying coats over previously painted items in an existing facility, verify the products specified below are compatible with the existing coatings. If specified coatings are not compatible, prepare surface in accordance with the “Surface Preparation” section of this specification and provide a bonding primer that is compatible with the existing and specified coatings.

E. All film thicknesses are listed as dry film thicknesses and are the minimum required.

3.8 PAINT SCHEDULE, SHOP FINISHED ITEMS

A. For shop coated items specified to receive field coats, contractor to verify if proposed field coatings are compatible with shop coatings and provide a letter of findings to Architect for review prior to field coats.

B. If field coatings are not compatible with the shop coatings, contractor to provide to a letter to Architect from the painting manufacturer listing an intermediate coat that is compatible with the shop coatings and the finish coat specified below.

C. For items delivered to the site with a shop primer, the primer coat specified below is

not required if the finish coats specified below are compatible with the shop primer otherwise the intermediate coat approved by the manufacturer is required prior to the finish coat.

D. For items delivered to the site prefinished and requiring a finish coat in the field for color, if the finish coat specified below is not compatible with the prefinished coat, the intermediate coat approved by the manufacturer is required prior to the finish coat.

E. Shop primed hollow metal doors and frames shall receive the primer coat listed below, regardless of compatibility.

3.9 PAINT SCHEDULE, ARCHITECTURAL COATINGS

A. General: This section covers painting of architectural items including but not limited to, walls, floors, ceilings, hollow metal doors and framessteel framing.

B. Exterior Masonry Surfaces: 2 finish coats over a primer.
   1. Surface Preparation: Clean and Dry
   2. Primer:
      a. Tnemec: Series 130 Envirofill at 100 SF/Gallon
      b. Sherwin-Williams: Loxon Acrylic Block Surfacer at 8 to 9 mils
      c. PPG: Perma-Crete LTC Concrete Block & Masonry Surfacer/Filler 4-100 at 9 to 12 mils
   2. Two Finish Coats:
      a. Tnemec: Series 180 WB Tneme-Crete at 7 to 9 mils
      b. Sherwin-Williams: Loxon XP Waterproofing Masonry Coating at 6 to 9 mils
      c. PPG: Perma-Crete Pitt-Flex Elastomeric Coating 4-110 at 6 to 8 mils

C. Interior Masonry Surfaces: 2 finish coats over a primer
   1. Surface Preparation: Clean and Dry
   2. Primer:
      a. Tnemec: Series 130 Envirofill at 100 SF/Gallon
      b. Sherwin-Williams: Heavy Duty Block Filler at 8 to 10.5 mils
      c. PPG: Amercoat 400BF
   3. Two Finish Coats:
      a. Tnemec: Series 1028/1029 Enduratone at 2 to 3 mils
      b. Sherwin-Williams: Pro Industrial Acrylic Coating at 3 to 4 mils
      c. PPG: Pitt-Tech Plus 90-1110 at 3 to 4 mils

D. Metals: Metal items including but not limited to hollow metal doors and frames, steel bollards, etc., 2 finish coats over a primer.
   1. Surface Preparation: Per Manufacturer’s Specifications
   2. Primer:
      a. Tnemec: Series 1 Omnithane Gray at 2.5 to 3 mils
      b. Sherwin-Williams: Pro Insdustrial Pro-Cryl Universal Acrylic Primer at 3 mils
      c. PPG: Pitt-Tech Primer at 2.5 to 3 mils
   3. Two Finish Coats:
      a. Tnemec: Series 1028/1029 Enduratone at 2 to 3 mils
      b. Sherwin-Williams: Pro Industrial Acrylic Coating at 3 to 4 mils

c. PPG: Pitt-Tech Plus 90-1110

E. Electrical Conduit: Painting of surface mounted electrical conduit exposed to view.
   1. Conduit Painting Schedule:
      a. Electrical Room: Not painted.
      b. Above Finish Ceiling: Not painted.
      c. All Other Rooms and Areas: Painted.
   2. Same color and finish as surface conduit is mounted to.

F. Galvanized metal fabrications built into concrete and masonry: Items including but not limited to steel beams, plates, etc., 1 primer coat on surfaces in contact with concrete or masonry.
   1. Surface Preparation: ASTM D6386 Solvent Cleaning Followed by SSPC-SP16
   2. Primer:
      a. Tnemec: Series 1 Omnithane Gray at 2.5 to 3 mils
      b. Sherwin-Williams: SW Recoatable Epoxy Primer at 4 to 6 mils
      c. PPG: Durathane MCZ

3.10 PAINTING SCHEDULE, INDUSTRIAL COATINGS

A. General: This section covers painting of the piping and equipment systems including but not limited to, valves, levers, valve handles, fittings, stands, supports, hangers, pumps, motors and appurtenances.

B. Enclosed Ferrous Metals and Submerged Metals other than metals in locations with potable water or in high H2S environments: Two finish coats over a primer.
   1. Surface Preparation: SSPC-SP10 Near White Metal Blast Cleaning
   2. Primer:
      a. Tnemec: Series V69 Tneme-Epoxoline 11 at 3 to 5 mils
      b. Sherwin-Williams: Dura-Plate 235 Epoxy at 5.0 –6.0 mils
      c. PPG: N/A
   3. Two Finish Coats:
      a. Tnemec: Series V69 Tneme-Epoxoline 11 at 3 to 5 mils
      b. Sherwin-Williams: Dura-Plate 235 Epoxy at 5.0 –6.0 mils
      c. PPG: Amercoat 240 at 6-8

C. All portions of submerged metals subjected to UV Exposure: Provide 1 additional finish coat as indicated in this section in addition to the primer coat and 2 finish coats specified.
   1. Finish Coat:
      a. Tnemec: Series 1095 Endura-shield at 3 to 4 mils
      b. Sherwin-Williams: Hi-Solids Polyurethane 250 at 3 to 4 mils
      c. PPG: Amershield VOC

D. Weather Exposed Ferrous Metal Piping and Equipment: Two finish coats over a primer.
   1. Surface Preparation: Per Manufacturer’s Specifications
   2. Primer:
      a. Tnemec: Series V69 Tneme-Epoxoline 11 at 3 to 5 mils
      b. Sherwin-Williams: Macropoxy 646 Epoxy at 5.0 –6.0 mils
      c. PPG: Amerlock 2/400
   3. Two Finish Coats:

a. Tnemec: Series 1095 Endura-shield at 3 to 4 mils
b. Sherwin-Williams: Hi-Solids Polyurethane 250 at 3 to 4 mils
c. PPG: Amershield VOC

E. PVC Pipe and PVC Conduit: One finish coat over a primer.
1. Surface Preparation: Clean & Dry - Scuffed Up with Medium Grit Sandpaper
2. Primer:
a. Tnemec: Series 151-1051 Elasto-Grip at 1.0 to 1.5 mils
b. Sherwin-Williams: Extreme Bond Bonding Primer at 1 mils
c. PPG: PPG Hydrosealer primer at 2 mils
3. Finish Coat:
a. Tnemec: Series 1028/1029 Enduratone at 2 to 3 mils
b. Sherwin-Williams: Pro Industrial Acrylic Coating at 3 to 4 mils
c. PPG: Pitt Tech Plus 90-1110

3.11 PIPING IDENTIFICATION SCHEDULE

A. Pipe Coating
1. All pipes, whether concealed or exposed to view shall be painted a separate color as scheduled in the PIPE IDENTIFICATION SCHEDULE below or as otherwise directed by the Engineer.
2. Pipe supports consisting of pipe rings, clamps, clevises, U bolts, pipe rollers, saddles, etc., shall be painted with the same color as that of the pipe.
3. Wall supported pipe hangers consisting of brackets, standoffs, etc., shall be painted with the same color as that of the wall.
4. Ceiling/roof supported pipe hangers consisting of thread rods, beam clamps, etc., shall be painted with the same color as that of the ceiling.
5. Floor supported pipes consisting of stanchions shall be painted with same color as that of the pipe.

B. Pipe Markers
1. Markers shall be corrosion resistant laminated plastic bound to the pipes with nylon fasteners or shall be "coil-fit." Stickers are not acceptable. Markers and flow direction indicators shall be manufactured by Seton, Brimar Industries, or equivalent.
2. Pipes with diameters less than 1-1/4 inch shall have marker hung from pipe with nylon fasteners.
3. Lettering size shall be in accordance with the following:

SIZE OF LEGEND LETTERS

Outside Diameter of Pipe or Covering	Minimum Length of Marker	Size of Letters
In	In	In
Up to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

4. Adjacent to each marker there shall be an arrow indicating flow direction.
5. Marker location shall be in accordance with the American National Standard Institute Scheme for Identification of Piping Systems (ANSI A13.1). Markers shall be placed adjacent to all valves and/or flanges; adjacent to all changes in direction on all pipe branches; and where all pipes pass through walls or floors on each side of wall/floor. On straight runs of piping, markers shall be placed at no less than 10 foot intervals. Where pipes are located above or below the normal line of vision, the lettering shall be placed below or above (as appropriate) the horizontal centerline of the pipe.
6. Color of markers shall be as scheduled in the PIPE IDENTIFICATION SCHEDULE below or as otherwise directed by the Engineer.

C. Valve Status Indication Arrows
1. Valve status indicator alignment arrows shall be provided on the indicator and scale sides of all interior hand wheel, chain and lever operated valves. Arrow heads shall appear aligned when the valve is in the full-open position. Arrow heads shall be painted on with stencils, or a color contrasting with the color of the valve. Arrow heads shall be minimum of 3/4-inch in smallest dimension. Valve position indicators shall be aligned to be visible from normal working levels.

D. Refer to Specification Sections 11000, 15100, 15400 and 15600 for Equipment and Valve Identification requirements.

PIPE IDENTIFICATION SCHEDULE

SYSTEM NAME/ MARKING	TAG	PIPE COLOR (1)	PIPE MARKERS (2)
Water			
Utility Water	UW	Green	White on Green
Industrial Water	IW	Gray	White on Green
Drains			
Drains	DR	Black	White on Green
Condensate Drain	CD	Non-Painted	White on Green
Residuals			
Return Sludge	RSL	Medium Brown	Grey on White
Waste Sludge	WSL	Dark Brown	Grey on White
Scum	SC	Brown	Grey on White
Sump Pump Discharge	SPD	Black	Grey on White

NOTES:
(1) Stainless steel piping shall not be painted, but shall receive the pipe markings indicated.
(2) Pipe markers colors notations are defined as follows (ANSI/ASME A13.1-2015):
White on Red = White lettering on Red background (fire quenching fluids)
Black on Orange = Black lettering on Orange background (toxic or corrosive fluids)
Black on Yellow = Black lettering on Yellow background (flammable and oxidizing fluids)
White on Brown = White lettering on Brown background (combustible fluids)
White on Green = White lettering on Green background (potable, cooling, boiler and other waters)
White on Blue = White lettering on Blue background (compressed air)
White on Grey = White lettering on Grey background (residuals)

White on Purple = White lettering on Purple background (irritant)
White on Black = White lettering on Black background (user defined)
Black on White = Black lettering on White background (user defined)

END OF SECTION

SECTION 09905

SHOP COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and application of shop coatings on materials, equipment, and piping indicated in the various specification sections relating thereto, and as specified herein, including primers and topcoats for materials, equipment and piping that are finished at the point of manufacturer or fabrication.

B. Examine the various Sections of the Specifications and be thoroughly familiar with all provisions regarding shop coatings.

1.2 PREFINISHED ITEMS NOT REQUIRING PAINT OR FINISH

A. Copper, bronze, brass, chromium plate, nickel, stainless steel, aluminum or monel metals, except surfaces in contact with or embedded within concrete or masonry, unless otherwise specified elsewhere.

1.3 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.4 REFERENCES

A. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.

B. ASTM D 2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

D. Federal Test Method No. 141 - Method 6141, Stain Removal.

E. SSPC - Steel Structures Painting Council.

F. SSPC-PA1, “Standard for Shop, Field, and Maintenance Painting”.

G. SSPC-PA2, “Measurement of Dry Paint Thickness with Magnetic Gauges”.

H. SSPC-SP1, “Solvent Cleaning”.

I. SSPC-SP6, “Commercial Blast Cleaning”.

J. SSPC-SP10, “Near-White Blast Cleaning”.

K. SSPC-SP16, "Brush Blast Cleaning of Non Ferrous Metals"

L. SSPC-PA Guide 3, Standard “A Guide to Safety in Paint Application”, latest revision.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01340.

B. As a minimum, the following shall be included in the submittal package for all items, products, material or equipment, as specified.

1. Submit data on the proposed shop coatings, details on surface preparation methods, application procedures and dry mil thickness.
2. Submit a minimum of three (3) color charts for all factory top coats for color selection by Engineer.

3. Submit coating manufacturer's certification that the proposed shop coatings are applicable for the applications indicated.
4. Submit coating manufacturer's certification that proposed shop coatings are compatible with field coatings, as specified in Section 09900.
5. For potable water applications, submit coating manufacturer's certification that the proposed shop coatings comply with ANSI/NSF Standard 61.

1.6 QUALITY ASSURANCE

A. All Shop Coatings shall meet the requirements of the materials section and shall be guaranteed by the manufacturer to be compatible with the field coatings, as specified in Section 09900. The Contractor shall coordinate this requirement during the Shop Drawing Phase.
B. All Shop Coatings shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) compliance.PRODUCTS

2.1 MATERIALS

A. Refer to Part 3 - EXECUTION for specific products and applications.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Definitions
   1. Submerged surfaces are defined as:
      a. Those surfaces which are below the maximum water surface level as indicated on the drawings, and/or extend 3'-0" above the maximum water surface for uncovered tanks.
      b. All surfaces contained within covered tanks.
      c. The full height of all partially submerged items such as sluice gates, slide gates, weir gates, piping, etc.
      d. All surfaces contained within underground structures, vaults and manholes such as valve pits, drywells, etc.
   2. Enclosed surfaces are those non-submerged surfaces enclosed and/or protected within a building in such a manner that it cannot be exposed to UV light or weather conditions.
   3. Weather exposed surfaces are all other conditions including buried items which do not fall into the definition of submerged or enclosed surfaces, as noted above.
B. Ferrous Metal
   1. All submerged ferrous metals shall be sandblast cleaned in accordance to SSPC-SP10, near white, immediately prior to priming.
   2. All other ferrous metals, Enclosed and Weather exposed surfaces, shall be sandblast cleaned in accordance to SSPC-SP6, commercial grade, immediately prior to priming.
   3. Remove dirt, oil and grease by washing surfaces with mineral spirits.
   4. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
C. Galvanized Metal (nonferrous metals indicated to be painted):
   1. Solvent clean in accordance with ASTM D6386.

2. Surfaces shall receive SSPC-SP-16 and shall be surfaced prepared in accordance with ASTM D6386.
3. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
4. Restore shop coats of paint with identical materials if removed for welding and fabrication.

3.2 APPLICATION

A. Equipment

1. Motors, speed reducers and similar parts shall have a surface preparation in accordance with the manufacturer standard coating requirements and suitable for weather exposed use. The minimum coating system shall be 3 coats of polyamide epoxy at a minimum of 3 mils per coat. Other coatings must be approved by the Engineer.
2. Items finished at the point of manufacture (shop primed and painted), such as submersible pumps and other similar surfaces, shall receive manufacturer's standard coating of baked, powder epoxy enamel, suitable for the intended service.
3. All equipment casing openings requiring protection shall have a water repellent tape and vapor phase inhibitor treated paper.
4. All other ferrous surfaces shall be factory primed except ferrous surfaces obviously not to be painted such as gears, exposed machined or bearing surfaces, enclosed machined or bearing surfaces, lubricated contact surfaces moving under load, thread connections to be field connected and other similar items. Surfaces not to be painted shall be given a heavy shop coat of grease or other suitable rust resistant coating per manufacturer's recommendations. The minimum priming system shall be a coat of a single component metal primer with good corrosion and rust protection, rated for exterior exposure and with ability to be topcoated with acrylics, epoxies and urethanes.
5. These coatings shall be maintained as necessary to prevent corrosion during all periods of storage and erection, until final acceptance by the Owner.

B. Pipe, Fittings and Valves

1. The exterior surfaces of all ductile iron pipe and fittings buried shall receive the standard factory applied asphaltic coating (in accordance with AWWA C151).
2. The exterior surfaces of buried valves and miscellaneous piping appurtenances shall be prepared in accordance with the manufacturer's recommendations and at a minimum shall receive a shop coat of fusion bonded epoxy coating.
3. The exterior surfaces of ductile iron pipe, fittings and valves submerged, enclosed or weather exposed shall receive a factory applied shop primer. The minimum priming system shall be a coat of a single component metal primer with good corrosion and rust protection, rated for exterior exposure and with ability to be topcoated with acrylics, epoxies and urethanes.
4. Machined surfaces shall be cleaned and coated immediately after being machined, with a suitable rust resistant coating per manufacturer's recommendations.
5. All other ferrous surfaces shall be factory primed except ferrous surfaces obviously not to be painted. Ferrous surfaces not to be painted shall receive a

heavy shop coat of grease or other suitable rust resistant coating per manufacturer's recommendations. The minimum priming system shall be a coat of a single component metal primer with good corrosion and rust protection, rated for exterior exposure and with ability to be topcoated with acrylics, epoxies and urethanes.

6. These coatings shall be maintained as necessary to prevent corrosion during all periods of storage and erection until final acceptance by the owner.

END OF SECTION

SECTION 10440

PORTABLE FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Portable fire extinguishers
B. Wall Brackets

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops.
B. National Fire Protection Association (NFPA) 10 - Portable Fire Extinguishers.
C. Underwriters Laboratories (UL) 299 - Dry Chemical Fire Extinguishers.

1.4 SUBMITTALS

A. General: Submittals shall be in accordance with specification Section 01340.
B. Schedule: Indicate type, size, location, quantity and mounting heights.
C. Product Data: Include data on extinguishers, brackets, operational features, materials, finishes, and anchorage.
D. Closeout Submittals: Maintenance Data: Include test, refill, or recharge schedules and re-certification requirements.

1.5 QUALITY ASSURANCE

A. Provide fire extinguishers complying with UL 711 and NFPA 10.
B. Conform to applicable accessibility code for locating extinguishers.
C. Manufacturer's certification that product meets or exceeds products specified.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Amerex Corp.
B. JL Industries
C. Larsen’s
D. Or equal

2.2 MATERIALS

A. Extinguishers:
   1. Multi-purpose dry chemical type, UL 299, heavy duty steel tank, Class 10A:120B:C, 20-pound nominal capacity with a working temperature of -65 to 120 degrees F.

B. Brackets:
   1. Manufactures standard brackets, sized to accommodate extinguisher.

2.3 ACCESSORIES

A. Mounting Hardware: Type best suited to application.

2.4 FINISHES

A. Brackets: Baked enamel, black color.
B. Extinguishers: Baked enamel, red color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount at locations shown on the Drawings.
B. Install brackets in accordance with manufacturer's instructions, Place an extinguisher on each bracket.
C. Set plumb, level, and rigid.
D. Identification: Provide wall markers for bracket mounted fire extinguishers in readily visible location above extinguishers. Markers to be painted metal or decals complying with NFPA Standard No. 10 for fire classification of extinguisher.
E. Charging of Extinguishers:
   1. Dry Chemical extinguishers: Deliver to project fully charged. Weigh each extinguisher at time of installation to prove fully charged condition and have witnessed by the Engineer.
   2. If discharged for any reason, refill at no additional cost to the Owner during construction period.

END OF SECTION

SECTION 11000

EQUIPMENT - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test all equipment specified herein and as shown on the Drawings.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 01010 – Summary of Work (construction sequencing requirements that affect number and duration of equipment startups and certifications)
   2. Section 01340 – Submittals
   3. Section 01600 – Delivery, Storage and Handling
   4. Section 01800 – Equipment Startup, Certification and Operator Training.
   5. Section 09905 – Surface Preparation and Shop Coatings

1.3 QUALITY ASSURANCE

A. Provide only equipment of proven reliability manufactured by reputable manufacturers.

B. Acceptable manufacturers are listed in each equipment item section in this Division and are intended to indicate the type and quality of materials expected. Refer to the General and Supplemental Conditions for the manner in which “or equals” and “substitutes” will be evaluated.

C. Certificates, patents, licenses or other required legalities, when applicable, are specified in each Section of this Division.

D. The Specifications and Drawings direct attention to certain required features and performance of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish the equipment complete in all details and ready for operation for the intended purpose.

E. These Specifications are intended to provide standard equipment of a recognized manufacturer meeting all the requirements of the Specifications. Due to differences in such prefabricated equipment of various manufacturers, submit complete shop drawings, cut sheets, specifications, etc. to the Engineer to review for compliance with the Contract Documents prior to ordering any equipment. If the equipment differs materially from the dimensions given on the Drawings, submit complete drawings showing elevations, dimensions etc. for the installation. If Engineer's acceptance is obtained for alternate equipment, make any needed changes in the structures, piping or electrical systems necessary to accommodate the equipment at no additional cost to the Owner.

F. Workmanship shall be first class in all respects.

1.4 SUBMITTALS

A. Provide shop drawings and samples as specified in the General Conditions and Section 01340 of the Construction Contract. Equipment Systems Manufacturers shall integrate all required shop drawings into a common package.

B. Catalog Data: Submit manufacturer's literature and illustrations for all equipment to be installed, including dimensions, construction details, shop painting details, and materials by generic name.

C. Installation Instructions: Submit complete sets of manufacturer's instructions for each equipment item, including equipment storage requirements.

D. Complete Operation and Maintenance Manuals in compliance with Specification Section 01340.

E. Certificates: Submit manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements. Submit equipment performance testing results as required by these specifications. Should the proposed equipment not comply with all the specification requirements, all deviations from the specification requirements shall be listed.

F. Submit all requirements for interface with controls and/or equipment furnished in Divisions 13 and 16. Submit wiring diagrams as required to accurately depict all such interface requirements to ensure proper operations of each system or item of equipment.

G. Provide certified bearing life calculations on all equipment bearings.

H. Specific submittal requirements may be defined in individual sections in this Division.

I. Guarantees/Warranties as specified below.

J. Attention is directed to the fact that the Drawings are based upon a particular piece of equipment.

K. If the equipment to be provided requires an arrangement differing from that indicated on the Contract Drawings, the Contractor shall prepare and submit for review, detailed mechanical drawings showing all necessary changes. Such changes shall be at no additional cost to the Owner.

L. Contractor shall provide a Submittal Certification from each individual Equipment Manufacturer certifying that the Equipment Manufacturer has:

1. Reviewed the Contract Documents, the intended installation by the Contractor, and the intended functional and operational conditions;
2. Determined all conditions to be acceptable; and
3. Found no conditions which would cause the warranty to be void; or the equipment to function improperly, or not meet the performance requirements.

The submittals will not be reviewed without the inclusion of these noted certifications. Process Equipment Manufacturer Submittal Certification Form is provided in Section 01340.

M. Proposed equipment/valve identification tag information.

1.5 GUARANTEE/WARRANTIES

A. The Contractor shall provide the Owner with a Guarantee/ Warranty for the entire project in accordance with Article 6.19 (Contractor's General Warranty and Guarantee) and Article 13.07 (Correction Period), and as referenced, of the General

Conditions (Section 00 72 00). No shop drawings submittals are required for this item.

B. Any specified extended warranties (i.e. those which run longer than the Contract Correction/ Warranty Period) shall be prepared in the name of the Owner and shall become effective after the completion of the Correction/ Warranty Period. The Contractor will be required to handle warranty problems during the Correction/ Warranty Period. Extended warranties shall meet the requirements specified in the relevant Section. Proposed extended warranty language shall be submitted to the Engineer for review as a part of the Shop Drawing process.

C. Equipment that is supplied by a system supplier and is intended to function as a complete and integrated system shall be warranted accordingly.

D. Any part of a mechanical equipment system that shows undue or excessive wear, or that fails due to normal operational conditions during the Correction/ Warranty Period, shall be considered as evidence of defective material or defective workmanship, and it shall be replaced with equipment or parts to meet the specified requirements at no cost to the Owner.

1.6 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01600 for additional requirements.

B. Coat all machined surfaces subject to corrosion with an easily removable rust preventive compound prior to shipment.

C. Ship fabricated assemblies in the largest sections permitted by carrier regulations, properly labeled for field erection.

D. Deliver equipment in manufacturer's original, unopened and undamaged packages, unless mounted on equipment assembly.

E. Contractor shall store and maintain all equipment in strict accordance with the manufacturer's written short term and long term storage requirements.

F. Store in a manner to protect items with epoxy shop coatings from exposure to UV light which can cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with coating manufacturer’s recommendations. This includes protection from UV light after installation while awaiting covering or filling of tanks, or prior to field painting for items scheduled to be top-coated.

G. Should damage occur, immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no costs to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN OF EQUIPMENT

A. All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without undo wear under the specified operating conditions.

B. All parts of mechanical equipment shall be amply proportioned for all stresses which may occur during operations, and for any additional stresses which may occur during fabrication and erection. Iron castings shall be tough, close-grained gray iron casting, Class 30, in accordance with ASTM A48, latest revision. Structural steel shall conform to ASTM A36.

C. Where galvanizing of materials is required, refer to Division 5, Specification Sections 05120 and 05500, for materials galvanizing requirements.

D. Mechanical equipment, including drives and electrical motors, unless otherwise noted, shall be supplied and installed in accordance with Occupational Safety and Health Act (OSHA) requirements. The Contractor's attention is drawn to the requirements for equipment guards. The noise level of equipment, drives and motors, unless otherwise noted, shall not exceed 90 dBA measured 3 feet from the unit under free field conditions.

E. All equipment and machinery furnished under this Contract shall be the latest improved design suitable for the service specified. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of maintenance, renewals and repairs. The design and construction of all equipment and machinery shall be such as to permit operation with minimum wear, vibration and noise when properly installed.

F. Ample room for erecting, repairing, inspecting and adjusting of all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.

G. All equipment of identical size, type and service shall be the product of the same manufacturer.

H. All equipment selected shall suit the general arrangement of the space in which it is to be installed.

I. Unless otherwise specified, electrical SCR controller units shall be furnished with the driven equipment, mounted and factory aligned, where applicable. Wiring of motors and controls shall be in accordance with the requirements of Division 16 and other applicable portions of the Specifications. Electrical variable frequency drives shall be furnished and installed by the electrical contractor, unless otherwise noted as specified in Division 16.

J. Suitable provisions shall be made for easy access for service and replacement parts.

2.2 BOLTS, ANCHOR BOLTS AND NUTS

A. Furnish all necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.

B. All bolts, anchor bolts, nuts, washers, lock washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated below or specified elsewhere.

1. Galvanized steel in accordance with Division 5 unless otherwise indicated below or specified elsewhere.
2. Stainless steel hardware (minimum of Type 304, unless otherwise indicated) is required in all corrosive atmospheres, exterior areas, and/or areas with NEMA 4X or NEMA 7 rating.
3. Stainless steel hardware (minimum of Type 316, unless otherwise indicated) is required in all submerged applications, including but not limited to the wetwells, headworks, dewatering rooms, chemical rooms, clarifiers, aeration basins, splitter structures, equalization or storage tanks, high chlorine conditions, etc. For additional description and definition of submerged surfaces refer to Specification Section 09900.

C. Expansion bolts shall have malleable iron and lead composition elements of the required number of units and size.

D. Unless otherwise specified, stud, tap, and machine bolts shall be of the best-quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to AN Standard B 1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).

E. Anchor bolts, epoxy anchors, and expansion bolts shall be set accurately. If anchor bolts are set before the concrete has been placed, they shall be carefully held in suitable templates of acceptable design. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates at least 4 in. by 4 in. by 3/8 in. or shall have square heads and washers and be set in the concrete forms with suitable pipe sleeves, or both. If anchor or expansion bolts are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.

F. All anchors shall be designed and supplied by the equipment manufacturer. Anchors include, but are not limited to, anchor rods, epoxy anchors and expansion anchors. All anchor designs shall include the following:

1. Anchors shall be designed for all applicable loads and load combinations in accordance with the Building Code applicable to the Project as by the equipment manufacturer. Equipment dynamic loads shall also be included with the other loads.
2. Anchor design shall include the quantity, material, finish, diameter, type, spacing and concrete embedment depth of anchors. Design of epoxy and expansion anchors shall be based on cracked concrete.
3. Expansion anchors are not permitted for exterior applications, wet service conditions, or dynamic loads. Cast-in anchor rods or epoxy anchors shall be used in these applications.
4. All anchors shall be installed with the required embedment depth. If anchors are fully developed in the concrete equipment pad and are not embedded in the slab, the anchorage capacity of the pad to the slab shall be verified by the Engineer prior to placement of the pad.
5. Anchors shall be no less than 3/8” diameter.
6. Concrete strengths are as follows:
   a. New concrete:
      i. Class A: f’c = 5,000 psi
      ii. Class B: f'c = 4,000 psi
      iii. Class C: f’c = 3,500 psi
   b. Existing concrete: f’c = 3,000 psi
7. Epoxy and Expansion Anchors shall conform to Specification Section 03300. Anchor rods shall conform to Specification Section 05500 and 05120.
8. Anchors shall be shown on the equipment shop drawings, with all the required information indicated.

2.3 FOUNDATIONS, INSTALLATION AND GROUTING

A. The Contractor shall furnish the necessary materials and construct suitable concrete foundations for all equipment installed by the Contractor, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.

B. All such equipment shall be installed by skilled mechanics and in accordance with the instructions of the manufacturer.

C. In setting pumps, motors, and other items of equipment customarily grouted, the Contractor shall make an allowance of at least 1 in. for grout under the equipment bases. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the completed work. Unless otherwise permitted, all grout shall be a suitable non-shrink grout.

D. Grout shall be mixed and placed in accordance with the recommendations of the manufacturer. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

E. Where such procedure is impracticable, the method of placing grout shall be as permitted by the Engineer. After the grout has hardened sufficiently, all forms, hoppers, and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary. All foundation and grout exposed surfaces shall be given a burlap-rubbed finish and painted with at least two coats of the epoxy-based paint specified for concrete.

F. If threaded rod with lower support nuts are used to secure the equipment in place temporarily during concrete equipment pad placement, the support nuts shall be removed prior to grouting so that the threaded rod anchor bolts are not supporting the equipment and the top nuts can be tightened to secure the equipment directly to the large bedding surface provided by the non-shrink grout and concrete equipment pad. Equipment foundations shall be designed to absorb equipment vibration and transmit forces to building structure or ground. Contractor shall demonstrate that this has been completed to the RPR prior to grouting.

2.4 ELECTRIC MOTORS

A. Unless otherwise specified or permitted by the Engineer, all electric motors furnished and installed by the Contractor shall conform to the requirements hereinafter set forth.

B. All equipment motors and appurtenances (e.g., switches, instruments, etc.) shall meet the area classification and NEMA requirements as listed on Drawing E-1.

C. All motors shall be specifically designed for the installation orientation required by the equipment submitted (i.e., horizontal motor design for horizontal installation, vertical motor design for vertical installation). Universal motors shall not be allowed.

D. Ratings of Motors

1. Every motor shall be of sufficient capacity to operate the driven equipment under all load and operating conditions without exceeding its rated nameplate current or power or its specified temperature limit.
2. When the horsepower rating is specified for a motor, the motor furnished shall meet the requirements of the output specified. When the horsepower rating is

not specified, the motor shall have sufficient capacity to operate the driven equipment as given in the Detailed Specifications.

3. All electric motors shall be UL recognized.
4. Motor shall have a service factor of 1.15, unless otherwise specified.

E. Type of Motors

1. All motors shall be NEMA Design B, and shall have starting characteristics and ruggedness as may be necessary under the actual conditions of operation and, unless otherwise specified, shall be suitable for full-voltage starting.
2. Motors shall be manufactured by General Electric Co., Reliance, Toshiba, Siemens, or be an equivalent product, that meets all the requirements herein.
3. All motors shall have Class F insulation with temperature rise in accordance with NEMA Standards for Motors and Generators and based on a maximum ambient temperature of 40 deg. C.
4. Motors Installed in Class I/ Division 1 Hazardous Locations:
   a. Motors shall be explosion-proof (XP) rated for Class I/ Division 1/ Group C and D rated for hazardous locations and shall meet the requirements of the National Electric Code and other safety codes pertaining thereto.
   b. Motors shall include integral high temperature thermostats or similar device with a high temperature interlock to shut down the motor and auxiliary contact to activate an alarm condition.
   c. Thermostats shall be normally closed, hermetically sealed and rated a minimum of 0.5A at 120 VAC. The thermostats shall be set so that the temperature of the motor will not exceed the auto-ignition temperature for a Class I/ Division 1/ Group C and D location.
5. Motors Installed in Class I/ Division 2 Hazardous Locations:
   a. Motors shall be either explosion-proof (XP) rated for Class I/ Division 1/ Group C and D or Class I/ Division 2 Group C and D locations. Motors may be TEFC rated; however, TEFC motors used in hazardous areas shall be non-sparking type (brushless) and shall have non-sparking cooling fans. All motors shall meet the requirements of the National Electric Code and other safety codes pertaining thereto.
   b. Motors shall include integral high temperature thermostats or similar device with a high temperature interlock to shut down the motor and auxiliary contact to activate an alarm condition.
   c. Thermostats shall be normally closed, hermetically sealed and rated a minimum of 0.5A at 120 VAC. The thermostats shall be set so that the temperature of the motor will not exceed the auto-ignition temperature for a Class I/ Division 2/ Group C and D location.
6. All motors shall be NEMA Premium Efficiency type. The nominal and/or minimum guaranteed efficiency shall be printed on the motor nameplate.
   a. All fractional motor efficiency values shall conform to the Small Motor Rule, unless exempted, and shall be as indicated in NEMA MG-1-2018 Tables 12-19, 12-20, and 12-21, latest accepted edition.
   b. All integral motor efficiency values shall conform to the Integral Horsepower Motor Final Energy Rule, unless exempted, and shall be as

indicated in NEMA MG-1-2018 Table 12-12, latest accepted edition, unless exempted, as indicated below:

Nominal Full Load Motor Efficiencies						
	Open Motors			Enclosed Motors		
HP	3600 rpm	1800 rpm	1200 rpm	3600 rpm	1800 rpm	1200 rpm
1	77.0*	85.5	82.5	77.0	85.5	82.5
1.5	84.0	86.5	86.5	84.0	86.5	87.5
2	85.5	86.5	87.5	85.5	86.5	88.5
3	85.5	89.5	88.5	86.5	89.5	89.5
5	86.5	89.5	89.5	88.5	89.5	89.5
7.5	88.5	91.0	90.2	89.5	91.7	91.0
10	89.5	91.7	91.7	90.2	91.7	91.0
15	90.2	93.0	91.7	91.0	92.4	91.7
20	91.0	93.0	92.4	91.0	93.0	91.7
25	91.7	93.6	93.0	91.7	93.6	93.0
30	91.7	94.1	93.6	91.7	93.6	93.0
40	92.4	94.1	94.1	92.4	94.1	94.1
50	93.0	94.5	94.1	93.0	94.5	94.1
60	93.6	95.0	94.5	93.6	95.0	94.5
75	93.6	95.0	94.5	93.6	95.4	94.5
100	93.6	95.4	95.0	94.1	95.4	95.0
125	94.1	95.4	95.0	95.0	95.4	95.0
150	94.1	95.8	95.4	95.0	95.8	95.8
200	95.0	95.8	95.4	95.4	96.2	95.8
250	95.0	95.8	95.4	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	95.8	96.2	96.2	95.8	96.2	95.8
500	95.8	96.2	96.2	95.8	96.2	95.8

F. General Design of Motors

1. Motors shall comply with the latest NEMA Standards for Motors and Generators, unless otherwise specified. Motors shall not run beyond nominal full speed rpm.
2. Motor windings shall be braced to withstand successfully the stresses resulting from the method of starting. The windings shall be treated thoroughly with acceptable insulating compound suitable for protection against moisture and slightly acid or alkaline conditions.
3. Bearings shall be of the self-lubricating type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant.
4. Bearings for open motors shall be of the sleeve or ball type, as specified under the respective items of mechanical equipment. Bearings for totally enclosed and explosion-proof motors shall be of the ball type. The exception to this shall

be belt-drive applications in which case the motor manufacturer shall determine if roller bearings are required in lieu of ball bearings due to higher radial loads.

5. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected in operation.
6. Vertical motors of the open type shall be provided with drip hoods of acceptable shape and construction. When the drip hood is too heavy to be easily removed, provision shall be made for access for testing.
7. All motors installed above or within potable water storage tanks shall use food grade lubrication that is NSF approved.

G. Wound-Rotor Induction Motors

1. Wound-rotor motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detailed Specifications.
2. Motors shall be of the wound-rotor, induction type suitable for speed control by rotor resistance.
3. The collector rings shall be constructed of hard composition metal of sufficient conductivity and ample contact surface. The rings shall be mounted accurately and securely on the shaft by means of acceptable insulating construction. The leads to the collector rings shall be fastened to and insulated from the shaft in a suitable manner.
4. The collector rings and brushes for the wound-rotor induction motors shall be suitable for operation in an atmosphere containing moisture.
5. The brushes shall be of the electrographite type, or other suitable type, of sufficient hardness and conductivity and shall have ample contact surfaces. Brush holders shall be provided with adjustable, spring-tension devices. Brushes shall be connected to the holders with tinned, flexible, copper-wire pigtails so arranged that no appreciable current shall be carried through the sliding contacts or springs. Brushes shall operate without noise or chattering. Rings and brushes shall be located on top of the motor, and shall be easily accessible for inspection and maintenance.

H. Synchronous Motors

1. Synchronous motors shall comply in all respects with the latest NEMA Standards for Motors and Generators, and AN Standard C50 for Rotating Electrical Machinery.
2. Synchronous motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detail Specifications.
3. The temperature rise (based on a cooling temperature not exceeding 40 deg. C. and an altitude not exceeding 3,300 ft.) in the various parts of the motors, when operating continuously at rated voltage, frequency, and power factor, shall conform to the applicable requirements of the above- mentioned NEMA Standards.
4. Synchronous motors shall be manufactured by General Electric Co., or be an equivalent product.

I. Single-Phase Motors with Auxiliary Devices

1. Single-phase motors requiring switching devices and auxiliary starting resistors, capacitors, or reactors shall be furnished as combination units with such auxiliaries either incorporated within the motor housings or housed in

suitable enclosures mounted upon the motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

J. Motor Terminal Boxes and Leads
   1. Motors shall be furnished with oversize conduit terminal boxes to provide for making and housing the connections and with flexible leads of sufficient length to extend for a distance of not less than 4 inches beyond the face of the box. The size of cable terminals and conduit terminal box holes shall be as permitted by the Engineer. An acceptable type of solderless lug shall be furnished. Totally enclosed and explosion-proof motors shall have cast-iron terminal boxes.

K. Special Motors
   1. Hoists and other devices complying with special safety codes shall be furnished complete with their control equipment and with all accessories and safety devices for code-approved, safe, and efficient operation.

L. Premium Efficiency Motors – "For Use with Variable Frequency Drives"
   1. Motors other than inverter duty rated type which are used on variable frequency drive equipment shall have an insulation system that is inverter grade to meet NEMA MG1-2018, latest accepted edition, Class F insulation system with a Class B temperature rise at a 1.15 service factor. Motors shall be wound with inverter duty wire and shall be multi-dipped and baked in a polyester, Class H varnish.
   2. Nameplate on motor shall be stamped indicating motor is "Certified for Use with VFDs".
   3. Motors of the sizes indicated below and operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings to ground.
      a. Motors between 25 HP and up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end.
      b. Motors over 100 HP shall be provided with an insulated or hybrid bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or Contractor and shall be installed in accordance with the manufacturer's recommendations.
      c. Grounding rings may be external or internal to the motor for open drip proof motors (ODP), totally enclosed fan cooled (TEFC) and totally enclosed non-ventilated (TENV). Grounding rings shall be internal to the motor for all Class 1/ Division 1 and Class 1/ Division 2 motors. Grounding rings shall not interrupt or alter the motor design flame path.
      d. Grounding rings shall be AEGIS or equal.

M. Premium Efficiency Motors – "Inverter Duty Rated"
   1. Inverter Duty Rated motors which are used on variable frequency drive equipment shall meet the following requirements:

a. Motor shall be suitable for operation over entire speed range indicated without causing motor overheating at any condition.
b. Forced ventilation type inverter duty rated motors with a separate external continuously operating fan shall not be acceptable.
c. Motors installed in Division 1 hazardous (classified) location shall be identified as acceptable for variable speed when used in Division 1 locations.
d. Motor shall have Class F insulation with a Class B temperature rise at a 1.0 service factor (non-sinewave power) and 40°C ambient conditions per NEMA MG1-2018, latest accepted edition.
e. Motor shall be wound with inverter duty wire and phase paper and shall be multi-dipped and baked in polyester, Class H varnish.
f. Nameplate on motor shall be stamped indicating motor is "Inverter Duty Rated".

2. Motors of the sizes indicated below and operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings to ground.
a. Motors between 25 HP and up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end.
b. Motors over 100 HP shall be provided with an insulated or hybrid bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or Contractor and shall be installed in accordance with the manufacturer's recommendations.
c. Grounding rings may be external or internal to the motor for open drip proof motors (ODP), totally enclosed fan cooled (TEFC) and totally enclosed non-ventilated (TENV). Grounding rings shall be internal to the motor for all Class 1/ Division 1 and Class 1/ Division 2 motors. Grounding rings shall not interrupt or alter the motor design flame path.
d. Grounding rings shall be AEGIS or equal.

N. Submersible Motors
1. Motors which are rated for submersible use shall be of the highest efficiency in the industry for this type of motor and horsepower rating.
2. When used in conjunction with variable frequency drive equipment, the submersible motor shall be rated for inverter duty with Class H insulation.

2.5 DRIVE COUPLINGS

A. Couplings shall be all metal, flexible, designed for both angular and parallel misalignment, provided with a guard, and provided with a means for lubrication.
B. Close-coupled connections shall have machined shouldered joints for motor and pump motor support.
C. High torque couplings shall be all metal gear couplings with external grease fittings. A service factor of 1.50 shall be used based on the motor nameplate rating.
D. Drive couplings for mixers which differ from the above referenced all metal type,

which are standard integral parts of a mixer manufacturer's assembly may be permitted, with review and approval of the Engineer.

2.6 BELT DRIVES

A. V-belt drives shall be provided with front removable guards (refer to Section 2.12), not requiring disturbing of the sheaves.
B. Capable of upsize and downsize sheaving.
C. Design shall be based upon minimum 1.5 service factor, unless specified elsewhere.

2.7 MECHANICAL-TYPE VARIABLE-SPEED DRIVE UNITS: (WHEN APPLICABLE)

A. Type as specified in equipment specification sections and as shown on the Drawings.
B. The variable-speed transmission shall be a self-contained drive which shall consist of a totally enclosed constant-speed motor, a housing on which the motor is mounted and which encloses an adjustable, heavy duty V-belt drive between two variable-pitch pulleys and the output shaft.

2.8 SCR CONTROLLERS

A. Each SCR controller shall be a completely solid state assembly consisting of an electronic switching amplifier, silicon controlled full wave rectifier and associated circuitry.
B. Bridge and gate trigger circuitry shall employ printed circuit boards.
C. Any required power transformers shall be supplied as appropriate.
D. The SCR units shall be heavy duty type suitable for handling the full current rating of the motors and brief acceleration current.
E. The assembly shall be mounted on a heat sink but insulated therefrom.
F. Power supply to the SCR controllers shall be 115 volts, single phase, 60 Hz.
G. Each unit shall be factory wired and tested with all leads brought out to terminal strips to facilitate connections to the motors and local control stations.
H. Each SCR unit shall include the following features:
    1. Full wave rectification.
    2. Power cube containing all power semi-conductors in a single component.
    3. Armature contactor with auxiliary normally open and normally closed contacts.
    4. Circuit breaker to provide overload protection.
    5. Surge suppressers to protect semi-conductors from line surges and transients.
    6. Adjustable current limit.
    7. Adjustable IR compensation.
    8. Voltage level and current capacities shall meet the requirements of the connected equipment (i.e. 90V DC output for 90V DC motors).

2.9 GEAR REDUCTION UNITS

A. Gears of gear reduction units shall be made of highest quality alloys treated for hardness and severe service. All gear reduction units on equipment shall be selected for Class II or more severe service as classified by the American Gear Manufacturers Association.
B. Unless otherwise specified, the complete reduction unit shall be fully enclosed in a heavy cast-iron or fabricated steel housing with gears running in oil. All bearings shall be of the anti-friction type.

C. The actual and rated horsepower, torque, overhang capacity, or bearing capacity of each reduction unit shall be not less than the horsepower rating of the drive motor, nor less than that which will be encountered under full load or under the most severe loading conditions of the equipment. The Engineer may reject any gear reduction unit that does not meet the above requirements. The manufacturer of gear reduction units shall be long established with a good reputation.

D. Unless otherwise specified, all gear reduction units shall be helical or spiral bevel helical combinations. The planetary gear units and worm gear type units may be used only where specified. Class of service shall be Class II or heavier, as determined by the manufacturer or as directed by the Engineer.

E. The equipment manufacturer shall furnish the Engineer with complete engineering information, catalog data, design features, loading capacities, and mechanical efficiency ratings for every gear reduction unit incorporated in the work.

2.10 LUBRICATION FITTINGS

A. All lubrication fittings shall be brought to locations that are readily accessible to operators from normal operating walkways or platforms. Equipment lubrication fittings shall be extended to outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards, floor plating or other obstruction, and to eliminate creating falling hazards by unusual elevations. Fittings shall be buttonhead type. Lubrication fittings shall be mounted together wherever possible.

B. Pressure grease-lubricated fittings shall be the "Zerk Hydraulic" type or the "Alemite" type.

C. Housings of grease-lubricated bearings shall be automatically exhausted to the atmosphere to prevent excessive greasing.

D. Oil drains shall be piped to a location outside the equipment frame for ease of draining. Provide ball valve for positive shutoff. Pipe shall be type-L copper or galvanized steel.

2.11 SPARE PARTS AND SPECIAL TOOLS

A. For each type of equipment furnished, the Contractor shall provide spare parts, as specified on the respective sections of the Division, and a complete set of all special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, maintenance, and disassembly of such equipment.

B. Tools shall be high-grade, smooth, forged, alloy, tool steel. Grease guns shall be lever type.

C. Special tools are considered to be those tools which because of their limited use are not normally available, but which are necessary for the particular equipment.

D. All spare parts and special tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts and special tools until completion of the work, at which time they shall be delivered to the Owner.

E. Spare parts shall be appropriately labeled and containerized, and shall be properly packaged for long-term storage.

F. If the Contractor utilizes a spare part to remedy an issue during the Contract work (through Final Completion) they shall replace the spare part at no additional cost to

the Owner.

2.12 EQUIPMENT DRIVE GUARDS

A. All equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal or rigid fiberglass OSHA approved guards enclosing the drive mechanism. Guards shall be securely installed but shall be removable with quick open latches.
B. Guards shall be constructed of galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members, unless otherwise specified.
C. Guards shall be secured in position by steel braces or straps which will permit easy removal for servicing the equipment.
D. The guards shall conform in all respects to all applicable safety codes and regulations.

2.13 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis.
B. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

2.14 NAMEPLATES

A. Each piece of equipment shall be provided with a substantial nameplate of noncorrodible metal, securely fastened in place and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate.
B. An enlarged paper copy of all the nameplate data on equipment and motors shall be provided in the Shop Drawings and Operation and Maintenance Manuals.

2.15 SURFACE PREPARATION AND SHOP COATINGS

A. Provide surface preparation and shop coatings in accordance with Specification Section 09905.

2.16 ELECTRICAL CONTROLS

A. Additional controls for various items of equipment are specified under Division 13 and/or Division 16, as indicated on the Drawings, and as specified. Due to potential differences in electrical requirements for equipment of various manufacturers, the Contractor shall coordinate the electrical requirements of the equipment supplied with the work specified in Division 13 and/or Division 16.
B. Provide auxiliary contacts as required for remote status and alarm conditions. Contractor shall coordinate each piece of equipment. Refer to the Electrical and Instrumentation Drawings.
C. Electrical controls for all equipment shall comply with the requirements of Division 16 and the National Electric Code, including provisions to allow each piece of equipment to be locked out/tagged out for maintenance or repairs.
D. Control panels shall be constructed in conformance with UL 508A and bear the UL 508A seal confirming the construction. UL inspection and seal application can be

accomplished at the panel fabrication facility or by field inspection by UL inspectors. Obtaining the UL seal and any inspections shall be provided at no additional cost to the Owner.

2.17 GAUGES

A. General:

1. Unless otherwise indicated, gauge assemblies shall be complete with 1/2-inch brass pipe and fittings, 1/2-inch ball valve with bronze body, stainless steel ball, Teflon seats and a tee with a brass test cock with female outlet end all arranged to allow field checking with a 4½-inch test gauge. Gauge assembly piping and valves for chemical feed systems shall be compatible with the chemicals being handled.
2. All gauges shall be equipped with snubbers or other protective throttling device(s) to dampen workings and pointer. If single snubber does not correct pulsing, provide additional snubbers in series.
3. All gauges provided are to be from the same manufacturer.
4. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.
5. The ranges of the gauges shall be suitable for any range of pressure that can occur during operation.
    a. Suction gauges shall be compound-type, having a range of -15 feet to 0 feet to +30 feet of water.
    b. Discharge gauges shall be selected at the nearest standard range which provides a top limit above the pump shutoff head or pump relief valve setting. Discharge gauges shall read in feet of water.

B. Process Liquid Applications:

1. Gauges shall be round black case, 4½-inches diameter, 1/2-inch NPT bottom male threaded connections, glycerin filled, stainless steel rack and pinion movement, black micro-adjusted rezeroing pointers, rack and pinion movement, black micro-adjusted rezeroing pointers, and black figures with white plastic dials and a threaded ring. Gauges shall have an accuracy of 1/2 percent of scale range.
2. Gauges shall be furnished for the suction and discharge nozzle of each pump and where called for on the Drawings or within other Specification Sections.
3. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.

C. All Other Applications (Chemical, Process Water, Seal Water, Air)

1. Gauges shall be round black case, 2-1/2-inch, ¼-inch NPT stem mount, glycerin filled, polycarbonate window, stainless steel bourdon tube and rack and pinion movement, black anodized aluminum micro-adjusted rezeroing pointers, white aluminum dial with black lettering. Gauges shall have an accuracy of 1.5% of full range. For chemical feed systems, all materials of construction shall be compatible with process chemical.
2. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.

D. Diaphragm Seals
   1. Gauges shall be provided with factory-mounted protective diaphragm assembly and snubber. Diaphragm assembly shall be cleanout type, which will allow cleaning of the lower diaphragm assembly without breaking the seal or refilling and shall not require recalibration of the gauge.
   2. The diaphragm shall be 316 stainless steel with a 316 stainless steel housing (process and instrument flanges) and shall be fitted with a bleed screw on the instrument flange, and flushing connection on the process flange. Connecting bolts and nuts shall be 316 SS. Other diaphragm materials will be considered for acceptance on a case-by-case basis when dictated by chemical compatibility, or as specified below.
      a. Sodium Hypochlorite: PVC/ Teflon or Hastelloy C-276
   3. The diaphragm shall be rated for gauge operating pressure range. Provide a locking plate or lock-wire to prevent turning of the assembly and to maintain the factory calibration.

E. Process Isolator Diaphragm Ring Seal: Shall be provided for all gauges on wastewater sludge, chemical slurries, grit and polymer applications, as specified in other Division 11 Specifications, and as shown on the Drawings. All other gauge applications shall be provided with a diaphragm seal as specified above
   1. Provide a wafer-style pressure isolation flange to isolate the connected gauge from the process fluids.
   2. The ring shall be constructed of 316 stainless steel meeting ANSI B16.5 Class 150 standards.
   3. The pressure shall be transferred from an elastomeric ring embedded around the inside diameter of the flange to a ½" NPT port on the outside of the flange with isolation needle valve.
   4. All nipples, valves and fittings will be 316 stainless steel.
   5. Liner material:
      a. Wastewater/Sludge Application: NBR, natural rubber or EDPM
      b. Polymer Applications: NBR
   6. Fill fluid: Silicon (10Cst)
   7. Pressure gauge: per this section
   8. The pressure gauge and diaphragm seal shall be factory assembled and tested.
   9. Manufacturers:
      a. Ashcroft Type 80 Iso-Ring
      b. Red Valve Series 48
      c. Or equal

F. Gauges Assemblies shall be manufactured by:
   1. Ametek U.S. Gauge Division
   2. Ashcroft
   3. Trerice
   4. or equal.

G. Contractor shall provide a gauge schedule listing all gauges, functions, locations, scales, etc., as part of the shop drawing submittal package.

2.18 EQUIPMENT AND VALVE IDENTIFICATION TAGS

A. All new process equipment and valves shall be identified by a color-coded identification valve tag provided and installed by the Contractor. The tags shall be provided with identifying numbers and letters to match those as shown on the Drawings. Contractor shall submit a complete list of proposed Identification Tag information and it shall be reviewed/confirmed with the Engineer and Owner through the submittal process prior to ordering any tags. In general, tag information shall match the information provided on the Drawings.

B. All identification tags shall be provided with sufficient lengths of chain for attachment to the respective equipment and/or valve.

C. Tags shall conform to the following specifications:

1. The tags shall be 2.5-inch diameter, 1/16" thick, rigid, multi-layered sandwich laminate with contrasting inner and outer colored acrylic plastic layers. Top hole size is 5/32" for hanging tags.
2. Tags shall be available in 7 different outside colors. Owner and Engineer shall select up to 4 different colors for the project.
3. Tags shall have up to three lines engraved on a side and eight characters per line of identification information. Tags shall be engraved one side.
4. Tags shall be secured to valves with nylon cable ties or adjustable metal bead chain. Securing method shall be selected by the Owner and Engineer.
5. Tags secured to equipment shall be fastened to a flat visible surface by a minimum of two SS screws or SS pop rivets.
6. Tags shall have a service temperature of -40°F to 175°F
7. Manufactured by Seton Name Plate Corporation, New Haven, CT, Brimar Industries, Garfield, NJ or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall carefully inspect receiving structures and anchor supports for defects in workmanship prior to equipment arrival.

B. Contractor shall carefully inspect all equipment for:

1. Damage in shipping.
2. Defects in workmanship and materials.
3. Tightness of all nuts and bolts.

C. Inspection shall include, but not be limited to, the following as applicable:

1. Soundness (without cracked or damaged parts).
2. Correctness of setting, alignment, and relative arrangement of various parts.
3. Adequacy and correctness of packing, sealing and lubricants.
4. Completeness in all details, as specified.

D. Field Quality Control

1. As part of the equipment cost, the Contractor shall provide the services of a duly authorized Manufacturer's representative to assist the Contractor with equipment adjustment, start-up, and necessary testing to prove that the equipment is in proper and satisfactory operating condition.
2. On completion of the work, the Manufacturer's representative shall provide written certification that the equipment conforms to the requirements of the

Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void, as outlined in the equipment certification form provided in Section 01800.

3. As part of the startup services, the Manufacturer's representative shall provide the Owner's personnel with training in the proper operation and maintenance of all associated equipment. The equipment training certification form provided in Section 01800 shall be used for this purpose.
4. When the work is substantially complete the Contractor will be required to demonstrate, to the satisfaction of the Engineer, the ability of all equipment to operate as intended without defect including binding, vibration, jamming, overheating, etc.

3.2 PREPARATION

A. Provide all required adhesives, sealants, insulation, lubricants, waterproofing, fireproofing or other protection specified in each Section of this Division.

3.3 INSTALLATION

A. Contractor shall install equipment in accordance with Manufacturer's requirement. Manufacturer(s) shall work with the Contractor to ensure that the equipment has been properly installed.
B. Do not install equipment until all defects or inadequacies in receiving structure have been corrected to meet Specifications.
C. Erect and lubricate equipment in strict accordance with the manufacturer’s instruction. Installation shall include all oil and grease required for proper operation.
D. All equipment mechanisms shall withstand all stresses that may occur during fabrication, erection, and intermittent or continuous operation.
E. Contractor to furnish and install supports as indicated on the Drawings, and as required by the equipment manufacturer.
F. Thoroughly clean all equipment and appurtenant piping to remove all dirt, grease, mill scale, and other foreign matter and touch up factory finish to the satisfaction of the Engineer.

3.4 STARTUP AND TESTING

A. Test and adjust all equipment in accordance with the general requirements of Specification Section 01800, and the specific requirements of the various Division 11 Specification Sections.
B. Demonstrate the equipment's ability to operate without overloading jamming, excessive vibration, etc. during normal operation conditions.
C. Demonstrate the equipment's ability to meet all the performance requirements specified for the equipment system to make a complete operational system, suited for its intended use.

3.5 EXISTING EQUIPMENT RELOCATION

A. All relocated equipment shall be reconditioned and serviced prior to operation in the new locations. Equipment shall be cleaned, rust removed, re-primed and painted in accordance with Section 09900, balanced, lubricated, oiled, calibrated and properly wired and plumbed to provide the intended service. Start-up of relocated equipment shall be done in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 11310

PUMPS - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, install, test and place into satisfactory operation pumping equipment and appurtenances as shown on the Drawings, as specified herein and as required for a complete installation.
2. Contractor will perform pump tests in the Engineer's presence to indicate that pump capacity and discharge head conform to specifications in Pump Schedule in this Division. Pump efficiency will be tested as part of the factory performance testing. Results will be provided to the Engineer.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 11000 – Equipment – General (and as referenced)

1.3 QUALITY ASSURANCE

A. In accordance with the requirements of Section 11000.

B. All pumping equipment shall be designed, constructed, installed and tested in accordance with the best practice, methods and the standards of the Hydraulic Institute.

C. All rotodynamic pumps shall be tested in accordance with ANSI/HI 14.6. If an acceptance grade is not specified for a specific rotodynamic pump, the pump must meet the default acceptance grade based on the intended service outlined in ANSI/HI 14.6 Table 14.6.4.

D. For potable water pumps, all components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.

E. Additional performance requirements are outlined in pump specifications.

1. Pumps shall meet all performance requirements listed in this specification, and associated specifications.
2. In the event that the pump(s) equipment fails to meet the performance requirements specified, the Engineer shall have the right to require the Manufacturer to modify or replace the pumping equipment to enable said system to meet the performance requirements specified.
3. A second test, and any subsequent tests as may be necessary to ensure compliance with the Specifications shall be performed at no additional cost to the Owner.
4. All costs arising from project delays caused by failure to meet the performance requirements specified herein shall be borne by the Manufacturer and shall be

responsible to the Contractor for any liquidated damages incurred due to any delay in passing all factory testing.

F. Only pumping units having wire-to-water efficiencies within a reputable manufacturer's equipment range of efficiencies will be accepted.

1.4 SUBMITTALS TO THE ENGINEER

A. In accordance with the requirements specified in Section 01340 and 11000. Submit such shop drawings, manufacturer's literature, short-term and long-term storage requirements, and operations and maintenance manuals.

B. Submit the following information for all pumps specified:

1. Manufacturer's rating curves showing the following pump characteristics for each unit of flow:
   a. Total dynamic head.
   b. Brake horsepower.
   c. Efficiency.
   d. Required net positive suction head.
   e. Allowable suction lift.
2. Variable speed units:
   a. Variable speed curves with at least five speeds plotted from maximum RPM to minimum RPM required to obtain the minimum pump flows at the heads indicated in the pump schedule.
3. Literature, layout drawings and typical specification describing pumping equipment, showing all important details of construction and dimensions.
4. Maintenance instructions shall be furnished to indicate operation, assembly, disassembly and troubleshooting.
5. Mechanical seal drawing shall be furnished indicating service conditions, materials of construction, and basic interface dimensions.
6. Literature and Layout Drawing for the pump seal water system supply and drain piping.
7. Literature, Schedule and Layout Drawing for pump Gauge assemblies.

C. After fabrication and prior to shipment, shop test completed pump and motor assemblies indicated in the Pump Schedule for performance in accordance with the Hydraulic Institute Standards and submit certified copies of the pump and motor performance data furnished.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with the requirements of Section 11000. Manufacturer shall deliver equipment to the project site where and when directed by the Contractor.

1.6 WARRANTY

A. In accordance with the requirements of Section 11000.

PART 2 - PRODUCTS

2.1 PUMPING SYSTEM

A. General:

1. Pump:
   a. Pump type and use are specified in Pump Schedule in this Section.
   b. See the Specification Section noted in the Pump Schedule for additional information for each specific pump type.
   c. Pump shall be suitable for intended purpose as specified and as shown on Drawings.
   d. Pumps designated for a certain function shall be supplied by same manufacturer.
   e. Pumps for all functions need not be supplied by the same manufacturer.
   f. All parts shall be designed and proportioned to have liberal strength, stability and stiffness to perform required function.
   g. Provide ample room and fittings for inspection repairs and adjustments.
   h. Pump base accurately aligned, sized and rigidly anchored into position in accordance with Drawings.
   i. Anchor bolts, plates, nuts and washers shall be SAE bolt steel of ample size and strength for purpose intended, furnished and installed by Contractor in accordance with manufacturer's instructions.
   j. Provide adaptor flanges, as necessary, to match piping system.
   k. Brass or stainless steel name plates providing manufacturer's name, rated capacity, total dynamic head, operating speeds and other pertinent data shall be attached to pump equipment.
2. Motors:
   a. Refer to requirements in Section 11000.
   b. Type specified in the Pump Schedule in this Division.
   c. All motors shall be of nationally known manufacturer and conform to NEMA standards and specifications.
   d. Maintain sufficient capacity to operate pump throughout designated operating range without exceeding name plate rating for current and power.
   e. Vertical motors provided with radial keyways to absorb thrust caused by the shafting.
3. Mechanical Seals (unless otherwise indicated).
   a. General:
      1) Mechanical seals shall be constructed of materials which will not be subject to attack by the contacting liquids and shall be suitable for temperatures to which they are subjected.
      2) Seal wearing face materials shall be solid construction only; no overlays, deposited castings or sprayed on coatings are permitted.
      3) Seal face materials shall be as specified below.
      4) Elastomeric parts such as O-rings, friction rings, etc. shall be made of fluorocarbon (Viton, Fluorel, Kalrez, Kel-F, etc.), unless otherwise specified.

5) Springs should be manufactured from anti-corrosive materials such as Hastelloy C or Elgiloy and preferably located out of the pumped fluid.
6) Metal hardware shall be constructed of 316 SS.
7) Stuffing boxes for mechanical seals on pumps for contaminated water service (sludge, grit, wastewater, scum, reclaimed water, etc.) shall be drilled and tapped for connection of a clean water purge supply.
8) The Contractor shall coordinate with the pump manufacturer and seal manufacturer to determine if the pumps will be shipped with the mechanical seals installed. If the pumps are shipped with the seals installed the pump manufacturer's or seal manufacturer's qualified factory trained field representative shall inspect the seal prior to startup and certify that the installation is such that nothing would nullify the warranty. If the pumps are shipped without the seals installed, the seals shall be installed on site by the pump or seal manufacturer's representative at the project site.
9) Acceptable Manufacturers are:
   (1) John Crane
   (2) A. W. Chesterton Company
   (3) or equal.

b. Mechanical Seal Arrangements:
1) Component type, single mechanical seal with elastomer bellows or coil springs - Seal faces shall be silicon carbide against silicon carbide or tungsten carbide against tungsten carbide per manufacturer recommendation. To reduce flush water usage, provide a flow restriction bushing or active throat bushing between the seal and the impeller. Seal model equal to a John Crane Type 1 or 2 depending upon the fit in the pump housings.
2) Cartridge-type, single mechanical seal with elastomer bellows or coil springs - Seal faces shall be silicon carbide against silicon carbide or tungsten carbide against tungsten carbide per manufacturer recommendation. To reduce flush water usage, provide a flow restriction bushing or active throat bushing between the seal and the impeller. Seal model equal to a John Crane Type 5610 or 5611, or Chesterton Type 150 or 155.
3) Split-type, single mechanical cartridge seals - Seal faces shall be silicon carbide against silicon carbide, or tungsten carbide against tungsten carbide per manufacturer recommendation. To reduce flush water usage, provide a flow restriction bushing or active throat bushing between the seal and the impeller. Model John Crane Type 3740, Chesterton 442 or 442C, or equal.
4) Component-type, double mechanical seals with elastomer bellows or active throat bushing - Inboard seal faces shall be silicon carbide against silicon carbide. Outboard seal faces shall be carbon against silicon carbide. Tungsten carbide may be substituted for silicone

carbide. Bellows shall be Buna-N. Model John Crane Type 1, Type 2, or equal.

5) Cartridge-type, double mechanical seal - Inboard seal faces shall be silicon carbide against silicon carbide. Outboard seal faces shall be carbon against silicon carbide. Tungsten carbide may be substituted for silicone carbide. Model John Crane Type 5620 or 5625, Chesterton Type 250, or equal.

6) Seals for submersible pumps shall be as specified in the respective sections.

7) Pump seals materials and construction for clean/potable water applications must comply with NSF-61 standards for potable water services.

4. Pump Shaft Packing:
   a. When pump shaft packing in indicated in the Pump Schedule, the packing shall be compatible with the fluids being pumped and as recommended by the pump manufacturer.
   b. Provide a replaceable shaft wear sleeve.
   c. Provide lantern ring when a cooling fluid is used. Active throat bushings shall be utilized to reduce flushing water requirements.
5. Mechanical Seal and Shaft Packing Flush/Cooling Water Systems shall be provided with all valves, fittings and appurtenances as indicated on the Drawings. Seal Water Systems consist of the following:
   a. Supply piping and drainage piping when applicable.
      1) Supply and drainage piping and fittings shall be Type L copper pipe with threaded, sweat or crimp compression connections, or 316 SS tubing with crimp compression fittings.
      2) Unions shall be provided to for disassembly of components.
      3) Flexible metallic or reinforced flexible PVC tubing/hose may be used as the last section of piping to the seal, to facilitate connection and removal with end connections, but must be suitable for the pressure rating with minimum 2.0 safety factor.
      4) Drain piping shall be provided from packing drip reservoirs and base plate gutters to discharge into gutters, sumps or floor drains, as indicated on the Drawings and as approved by the Engineer
   b. Pressure Regulating Valves:
      1) Pressure regulating valves shall be provided for locations shown on the Drawings.
      2) Pressure regulating valves shall be direct operating for dead end service, and shall be self-contained with 125 lb. bronze body.
      3) Pressure regulating valves shall be fully adjustable, spring loaded, diaphragm actuated with stainless steel seats, composition discs, and integral strainers.
      4) Pressure regulating valves shall have sealed spring cages and corrosion-resistant adjusting and cage screws for sizes less than 1 inch.
      5) Maintenance of pressure regulating valves shall not require removal

of the valve from the line.

6) Pressure regulating valves shall be capable of 300 lb. initial pressure, with an adjustable reduced pressure range from 25 to 75 lbs or as required to have seal water pressure exceed the maximum pump internal pressure at the seal to pumped fluid interface.
7) Pressure regulating valves shall have an internal removable and cleanable fine strainer.
8) Pressure regulating valves shall have a 2.5" SS pressure gauges upstream and downstream of the regulator.
9) Acceptable manufacturers: Watts Regulator, N. Andover, MA, Series U5B.
10) Adjust pressure regulation valves to provide flow and pressure to each pump type manufacturer's recommendations for packing and single and mechanical seals. Typically, 5 to 20 psi higher than pump internal pressure at the seal interface with pumping fluid.

c. Ball Valves: Refer to Section 15107
d. Check Valves: Refer to Section 15110
e. Seal Water System Flow Controllers shall be provided, where indicated on the Process Drawings.
   1) Provide a combined seal water visual flow meter with
      1) integral clog resistant flow rate adjustment valve,
      2) pressure gauge,
      3) flow meter tube cleaning mechanism,
      4) alarm sensor electrical proximity flow switch,
      5) and mounting plate
   2) Acceptable manufacturers
      a) ESKO: Model ESF Seal Water Meter
      b) John Crane: Safematic Safeunit
      c) AES Seals: Flowtrue.
      d) Chesterton: Flow Guardian SP50
   3) Technical Specifications below are for the ESKO model. Alternate materials of construction are acceptable. When a double mechanical seal is specified use units specific for double seals.

a)	Flow range	0-50 GPH
b)	Body material:	Delrin (POM)
c)	Metering tube	Polysulphone (PSU)
d)	Metallic parts	SS316 and SS304
e)	O-ring seals	Viton
f)	Maximum pressure	435 psi at 120F
g)	Maximum temperature flow tube)	212°F / 100°C (POM body / PSU
h)	Connections options	3/8" hose barbs,1/2" hose barbs 3/8" OD straight tubes 3/8" compression fittings 1/4" NPT female or male threads

Contractor to determine what type of connections best fit the installation. Flexible nylon reinforced high pressure tubing is acceptable to run between the Seal Water Controller and the seal connection.

i) Gauge Pressure range 20 PSI above shut off discharge pressure

j) Alarm 10-55 VDC 150 mA (IG 5919) or 20-250VAC/DC 300 mA (IG0374)

4) Images of the ESKO ESF, John Crane Safeunit and AES Seal Flow true are below.



f. Pressure switches. Provide pressure switches on seal water systems to monitor seal water pressures, as indicated on the Drawings. Pressure switch shall monitor the seal water pressure using pressure switches provided under Div 13. Switches shall be set for a normal operating range when pump is operating, and when the seal water pressure drops below or exceeds that range an alarm will be sent to the SCADA system.

6. Pump and Seal Water Gauges:
   a. Provide 4 inch process gauges assemblies, one suction gauge assembly and one discharge gauge assembly per process pump, as detailed on the Process Drawings Gauge Assembly detail, unless otherwise specified. Gauges shall be provided in accordance with Section 11000.
   b. Provide 2.5” seal water pressure gauges as indicated on the seal water schematic on Process Drawings
7. Lifting Cable:
   a. Each pump shall be equipped with a stainless steel lifting cable of adequate lifting capacity for the pumps supplied. The cable length shall be adequate to extend a minimum of 15-feet above the top of the tank or wet well to allow connection to lifting equipment. Terminate upper end of cable with a swag ball end for easy connection to the portable hoist.
   b. Install a stainless steel hook bolt below the top of the tank within reach of the access hatch for storage of the excess cable.
8. Pump Winch Assembly: Provide pump winch assemblies and bases as shown on Drawings, and as specified in Section 14321.
9. Surface Preparation and Shop Coatings
   a. Provide surface preparation and shop coatings in accordance with Specification Section 09905.
10. Field Coatings
   a. Provide field coatings in accordance with Specification Section 09900.

11. Spare Parts:
    a. Spare parts shall be delivered at the same time as the equipment to which they pertain.
    b. The Contractor shall properly store and safeguard such spare parts until Substantial Completion of the work, at which time they shall be delivered to the Owner.
    c. Parts shall be packaged in individual suitable containers labeled with the part number, name and quantity.

2.2 PUMP SCHEDULE

A. Stated pump capacity (flow, head, NPSHr, efficiency, and power) listed below are also considered the guarantee values per ANSI/HI 14.6 for all rotodynamic style pumps.

B. Return Sludge Pumps
    1. Location: North RAS Pump Station, Lower Level
    2. NFPA 820 Classification: Unclassified
    3. NEMA Rating: 4X
    4. Function: Pump sludge from secondary clarifiers to the Raw Sewage Channel.
    5. Number of Units: Five (RSLP-6, RSLP-7, RSLP-8, RSLP-9, RSLP-10)
    6. Type: Dry pit submersible pump, non-clog impeller (Section 11319A)
    7. Performance Criteria:
        a. High head operating point must be 8,000 GPM @ 72.0 Feet TDH
        b. Pump must be able to operate at full speed under low head conditions without running off the pump curve or overloading the motor.
        c. The NPSH margin (NPSHa/NPSHr) must be greater than 1.2 at no less than 50 Hz under low head conditions.

Return Sludge Pumps System Curves				
	High Head System Curve		Low Head System Curve	
Flow	Head (Feet)	NPSHa (Feet)	Head (Feet)	NPSHa (Feet)
0	12.8	50.1	2.4	50.2
2,000	17.6	49.1	4.7	49.1
4,000	29.3	46.5	10.3	46.6
6,000	47.8	42.4	18.9	42.5
8,000	72.4	36.9	30.5	37.2
10,000	102.9	30.3	44.8	30.5
12,000	139.0	22.1	61.8	22.7

    8. Max Speed: 900 RPM
    9. Seal: Plug-in type double mechanical seal
    10. Drive: Variable frequency drives provided with local and remote controls capable of variable speed operation as specified.
    11. Motor: Fully enclosed Premium Efficiency Submersible, 200 HP Maximum, 460V, 3-phase, 60 Hz, with cooling jacket, rated for C1D2 environment.

12. Control: Control shall be as specified in Division 13.
13. Remarks: Pump shall be able to pass a 3-inch solid Capable of safely pumping sludge at 1% solids. Flygt Model NT3400/746 530mm, ABS/Sulzer Model XFP400R-CH3 530mm, or equivalent.

C. North RAS Pump Station Sump Pumps
1. Location: North RAS Pump Station Pump Room
2. NFPA 820 Classification: Unclassified
3. NEMA Rating: 4X
4. Function: Pump wash down water and drainage to the North Battery Final Settling Tanks.
5. Number of Units: Two (SP-3, SP-4)
6. Type: Submersible pump (Section 11319)
7. Performance Criteria:
   a. Operating point must be 100 gpm @ 40.0 Feet TDH
8. Max Speed: 1,800 RPM
9. Seal: Plug-in type double mechanical seal
10. Drive: Constant Speed
11. Motor: Fully enclosed Premium Efficiency Submersible, 5 HP Maximum, 460V, 3-phase, 60 Hz.
12. Control: Control shall be as specified in Division 13.
13. Flygt Model NP 3102 MT 3~ Adaptive 464, Sulzer Model XFP80C-CB1.4-PE35/4, or equivalent.
14. Remarks: Pump impeller diameter of 162 mm.

PART 3 - EXECUTION

3.1 EXAMINATION, PREPARATION AND INSTALLATION

A. In accordance with the requirements of Section 11000 and the manufacturer's written instructions.

3.2 START UP AND TESTING

A. In accordance with the requirements of Section 01800 and 11000.

B. Contractor is responsible to provide to the Engineer, pump manufacturer's certification that pump testing has been performed in accordance with ANSI/HI 14.6 and that each pump meets the pump test acceptance grade specified above in Section 2.2 Pump Schedule.

C. Perform all adjustments necessary to place equipment in satisfactory working order and to meet performance testing requirements. If equipment fails to meet performance requirements, the Contractor shall modify or replace the equipment at no additional cost to the Owner.

3.3 CLEANING AND FIELD COATINGS

A. In accordance with the requirements of Section 09900 and 11000.

3.4 TRAINING AND WARRANTY PERIOD SUPPORT

A. In accordance with the requirements of Section 01800.

END OF SECTION

SECTION 11319

SUBMERSIBLE NON-CLOG CENTRIFUGAL PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test submersible non-clog centrifugal pumps, and all appurtenances necessary to make a complete and operable system as indicated in the Specifications and as shown on the Drawings.

B. Performance Requirements: Each pump shall be capable of continuously pumping waste activated sludge (WAS) from the WAS Storage Tank to the gravity belt thickeners at all flow and head conditions indicated in the pump schedule in Section 11310, and along the pump curve.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 11000 – Equipment – General (and as referenced)
   2. Section 11310 – Pumps General

1.3 QUALITY ASSURANCE

A. In accordance with the requirements of Section 11000.

B. All system components specified herein shall be furnished by a single Manufacturer who regularly engages in the production of this type of equipment. The Manufacturer shall be responsible for the performance and warranty of the entire system provided under this section. The Contractor shall be responsible for the satisfactory operation of the entire system.

C. Qualifications of Manufacturers: The Manufacturer shall have a minimum of 10 years of experience in the design and manufacture of the specified equipment. Products shall have proven reliable in similar installations over a reasonable number of years.

D. Acceptable Manufacturers:
   1. Flygt Corporation, Norwalk, CT
   2. Sulzer USA, Meriden, CT
   3. Or equivalent.

1.4 SUBMITTALS

A. In accordance with the requirements specified in Section 01340, 11000 and11310 and as specified herein. Submit such shop drawings, manufacturer's literature, short-term and long-term storage requirements, and operations and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with the requirements of Section 11000. Manufacturer shall deliver equipment to the project site where and when directed by the Contractor.

1.6 WARRANTY

A. In accordance with the requirements of Section 11000.

B. The Contractor shall obtain a 5 year (10,000 hour) prorated warranty from the pump manufacturer, in the name of the Owner, against defects in workmanship and materials, covering parts and labor. The terms of the warranty shall be from the date of substantial completion as determined by the Engineer. The terms of the warranty shall be as follows:

1. 0-18 months (3000 hours) - 100%
2. 19-39 months (6500 hours) - 50%
3. 40-60 months (10,000 hours) - 25%

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All pumps designated for a certain function shall be supplied by the same manufacturer.
2. All parts shall be designed and proportioned to have liberal strength, stability, and stiffness to perform required functions.
3. Exposed hardware shall be stainless steel.
4. Provide ample room and fittings for inspection, repairs and adjustments.
5. The submersible non-clog sewage pumps shall be capable of pumping wastewater at the conditions indicated in the Pump Schedule in Section 11310 and shall conform to the requirements specified. The pump shall have a wide suction and shall easily pass 3-inch solids or stringy matter.

B. Pump Support System

1. Pumps shall be mounted on a substantial guide rail system, with slide away coupling base/discharge elbow.
2. The lower guide holders shall be integral with the discharge connection and shall be anchored to the wet well floor by means of 316 stainless steel anchors.
3. The upper guide holder, intermediate guide holder and 2” guide rails shall be 304 stainless steel. Provide fixed intermediate guide rail bracket on all installations 15-feet or greater.
4. Pump base accurately aligned, sized, and rigidly anchored in position in accordance with the manufacturer's requirements and recommendations and allow for complete removal of each pump.
5. Sealing of pump to discharge connection shall be by means of metal to metal contact.
6. No portion of the pump shall bear directly on the floor.
7. There shall be two non-sparking guide rails per pump which shall be a minimum of 2-inch diameter 304 stainless steel pipe.
8. Slide-away coupling shall be designed so that when pump is idle, it may be removed for service or inspection and then returned to service without entering the WAS Storage Tank to unbolt or unlock the connection between the pump and piping.

C. Pump Casing:
   1. Constructed of gray cast iron, Class 30 (ASTM A48) of ample thickness, capable of prolonged resistance to the abrasive action of solids or foreign matter contained in the liquid passing through the pump.

D. Discharge Nozzles: Minimum size and type indicated in the Pump Schedule.

E. Impeller:
   1. Impeller shall be enclosed or semi-enclosed, non-clog, symmetrical, dynamically balanced and made of gray cast iron, Class 30 (ASTM A48).
   2. Impeller vanes shall have a well rounded leading edge and thick hydrofoil shape and the waterways shall be smooth contours and well-rounded entrances.
   3. The impeller hub shall not have ports for the reduction of thrust on the impeller.
   4. Impellers shall be key seated and securely attached to shaft by a streamlined locknut or equally efficient method, capable of withstanding a pump reversal to full runaway speed, but still permit easy removal.
   5. Supply impeller wear ring.

F. Shaft: The pump-motor shaft shall be stainless steel, accurately machined.

G. Seal (See Section 11310): The pump shaft seal shall be of the plug-in double mechanical type, with pump seal leak detection system as specified hereinafter.

H. Motor:
   1. Submersible non-clog sewage pump motor ratings shall be as specified in the preceding Pump Schedule, Section 11310.
   2. Squirrel-cage, induction, shell type design housed in an oil-filled or air-filled, water tight chamber, NEMA Design B.
   3. Motors shall have normal starting torque and low starting current.
   4. Motors shall maintain sufficient capacity to operate pump throughout designated operating range without exceeding name-plate rating for current and power.
   5. Pump motors shall be furnished with ball bearings.
   6. Vertical motors shall be provided with radial keyways to absorb thrust caused by the shaft.
   7. The motor shall be fitted with heavy lifting eyes, each capable of supporting the entire weight of the pump and motor.
   8. An electric sensing probe shall be mounted in the seal chamber, and be connected to a red signal light on the VFD, to detect any water leakage past the outer seal.
   9. A heat sensor thermostat shall protect motor against excess heat in compliance with its U.L. rating. Sensor shall reset automatically at the motor when motor cools. Heat sensor overload alarm light shall be manually reset at the VFD.
   10. Provide suitable VFDs in accordance with Division 16.
   11. Controls are specified in Section 13440. Refer to the Instrumentation and Electrical Drawings.

2.2 SPARE PARTS:

A. In accordance with the requirements of Section 11000.

B. Provide the following spare parts:
   1. Two complete sets of pump seals and gaskets per each type pump.
   2. Any special tools required to service the equipment.

PART 3 - EXECUTION

3.1 EXAMINATION, PREPARATION AND INSTALLATION

A. In accordance with Specification Section 11000.

3.2 START-UP AND TESTING

A. In accordance with Specification Sections 01800 and 11000.

3.3 CLEANING AND FIELD COATINGS

A. In accordance with the requirements of Section 09900 and 11000.

3.4 TRAINING AND WARRANTY PERIOD SUPPORT

A. In accordance with the requirements of Section 01800.

END OF SECTION

SECTION 11319A

DRY PIT SUBMERSIBLE NON-CLOG CENTRIFUGAL PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test dry pit submersible non-clog centrifugal pumps, and all appurtenances necessary to make a complete and operable system as indicated in the Specifications and as shown on the Drawings.

B. Performance Requirements: Each pump shall be capable of continuously pumping return activated sludge (RAS) from the clarifiers to the raw sewage channels at all flow and head conditions indicated in the pump schedule in Section 11310, and along the pump curve.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 11000 – Equipment – General (and as referenced)
2. Section 11310 – Pumps General

1.3 QUALITY ASSURANCE

A. In accordance with the requirements of Section 11000.

B. All system components specified herein shall be furnished by a single Manufacturer who regularly engages in the production of this type of equipment. The Manufacturer shall be responsible for the performance and warranty of the entire system provided under this section. The Contractor shall be responsible for the satisfactory operation of the entire system.

C. Qualifications of Manufacturers: The Manufacturer shall have a minimum of 10 years of experience in the design and manufacture of the specified equipment. Products shall have proven reliable in similar installations over a reasonable number of years.

D. Acceptable Manufacturers:

1. Flygt Corporation, Norwalk, CT;
2. Sulzer USA, Meriden, CT
4. Or equivalent.

1.4 SUBMITTALS

A. In accordance with the requirements specified in Section 01340, 11000 and11310 and as specified herein. Submit such shop drawings, manufacturer's literature, short-term and long-term storage requirements, and operations and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with the requirements of Section 11000. Manufacturer shall deliver equipment to the project site where and when directed by the Contractor.

1.6 WARRANTY

A. In accordance with the requirements of Section 11000.

B. The Contractor shall obtain a 5 year (10,000 hour) prorated warranty from the pump manufacturer, in the name of the Owner, against defects in workmanship and materials, covering parts and labor. The terms of the warranty shall be from the date of substantial completion as determined by the Engineer. The terms of the warranty shall be as follows:

1. 0-18 months (3000 hours) - 100%
2. 19-39 months (6500 hours) - 50%
3. 40-60 months (10,000 hours) - 25%

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All pumps designated for a certain function shall be supplied by the same manufacturer.
2. All parts shall be designed and proportioned to have liberal strength, stability, and stiffness to perform required functions.
3. Exposed hardware shall be stainless steel.
4. Provide ample room and fittings for inspection, repairs and adjustments.
5. The dry pit submersible non-clog sewage pumps shall be capable of pumping wastewater at the conditions indicated in the Pump Schedule in Section 11310 and shall conform to the requirements specified. The pump shall have a wide suction and shall easily pass 3-inch solids or stringy matter.

B. Base:

1. The pump shall be mounted on a substantial, cast-iron or structural steel pedestal base and shall be provided with a cast-iron suction elbow, complete with handhole. The base shall be designed to support the assembled weight of the pump and driver.

C. Pump Casing:

1. Constructed of hard closed grain cast iron Class 30 (ASTM A48-Latest Rev.) of ample thickness, capable of prolonged resistance to the abrasive action of solids or foreign matter contained in the liquid passing through the pump.
2. Casing designed to allow back pull-out of impeller without disconnecting suction and/or discharge piping.
3. Casing tested under a hydrostatic head of at least 75 psi or 125 percent of the rated shutoff head, whichever is greater.
4. High point of casing fitted with an air vent and the low point with a drain.
5. Ample and convenient access to the impeller and interior parts provided by means of handholes or removable plates and covers.

D. Handholes: Covers designed for easy removal with interior surface shaped to continue the contour of the casing to which they are attached so as to maintain efficiency and to prevent the lodgment of solids.

E. Suction and Discharge Nozzles:

1. Minimum size as shown on the Pump Schedule in Section 11310.
2. Drilled and tapped for installation of pressure gages.

3. Connection flanges faced and drilled in accordance with the 125 lb. ANSI Standard A21.10.
4. A 90 degree suction elbow shall be supplied with a handhole in the elbow to allow access to the suction elbow and impeller in accordance with 2.1, C above.

F. Impeller:
1. Constructed of cast iron (ASTM A48, Class 30) or stainless steel (ASTM A743 Grade CA-6NM).
2. Enclosed, symmetrical, balanced type with a minimum of vanes or blades, with a wide suction that will easily pass 3-inches solids and stringy matter.
3. Wiper blades are not acceptable.
4. Vanes shall have smooth contours and well-rounded entrances.
5. Impeller hub shall NOT have ports which cause thrust reduction on the impeller.
6. Impeller shall be key seated and securely attached to shaft by a streamline locknut or equally efficient method, capable of withstanding a pump reversal to full runaway speed, but still permit easy removal.
7. Provide a means to adjust wearing ring clearance.
8. Impeller shall be dynamically balanced to meet Hydraulic Institute vibration limits.

G. Shaft:
1. Constructed of high grade, alloy forged steel or stainless steel and accurately machined.
2. Alloy steel shafts shall be protected from wear and from contact with sewage by removable stainless steel sleeve that extends through the mechanical seal and "0" ring gasket.

H. Wearing Rings:
1. Constructed of stainless steel and providing minimum 0.25 inches of wear.
2. Installed on the impeller and in the pump casing at the suction side.
3. Replaceable.

I. Seal:
1. Provide two separate tandem-mounted mechanical seals with the upper and lower seals mounted to rotate in the same direction.
2. Upper seals shall be completely immersed in an oil bath sealing the oil chamber and motor housing. Materials shall be carbon rotating face, Ni-resist stationary face. Silicon carbide is also acceptable.
3. Lower seals shall have mating faces immersed in the pumped fluid sealing the pump volute and oil chamber. Materials shall be Tungsten carbide rotating and stationary faces. Silicon carbide is also acceptable. Provide a stainless steel cover extending completely over the lower seal spring.
4. Springs: Type 316 stainless steel.

J. Elastomers: Viton.

K. Dry Pit Submersible Motor:
1. Dry pit submersible motor shall be as specified in this section and Sections 11000 and 11310.
2. Completely sealed and jacketed squirrel-cage induction, shell-type design housed in an oil-filled or air-filled, watertight chamber, NEMA Design B, moisture resistant Class H insulation.

3. Motor jacket shall be sealed to the motor housing with O-rings. Provide a self-cleaning means to internally pump a portion of the pumped liquid for cooling the motor. Motor jacket shall have a means to purge air and pumped fluid from the motor jacket. All mating surfaces shall be machined and sealed with O-rings. Alternatively, pump motors may be cooled by an internal closed loop cooling system utilizing a high coefficient heat transfer fluid. Heat transfer fluid shall be environmentally safe.
4. Motor shall have normal starting torque and low starting current.
5. Motor shall be capable of 10 starts per hour at maximum speed.
6. Bearings:
   a. Frame shall contain housings for two sets of grease lubricated ball bearings with a minimum L-10 life of 100,000 hours.
   b. Outboard ball bearings shall be double-row, combination radial and thrust bearing type. Inboard bearings shall be single-row, radial.
   c. Mounted in dust-and-moisture-proof enclosures.
   d. Means provided in bearing cases to prevent excessive greasing.
7. Moisture sensing probes shall be mounted in seal chambers to detect any leakage past seals.
8. Thermostat shall protect motor against excess heat in compliance with its U.L. rating. Sensor shall reset automatically when motor cools below setpoint.
9. Power and control cable leads shall enter at the top of the motor and shall allow for field connection without soldering. All cable leads shall be double-sealed to prevent cable wicking. Cable sealing system shall withstand an external pressure of 1200 psi and a cable pull test in accordance with U.L. Standards. Cables shall be of sufficient length to extend from pump motor to a junction box above pump room elevation as indicated. Cable size shall be in accordance with NEC specifications.
10. Provide an integral lifting eye/attachment capable of lifting the entire pump and driver assembly.
11. Motors shall conform to UL quality assurance specifications and be manufactured by an ISO-9001 company.

2.2 SURFACE PREPARATION AND SHOP COATINGS

A. In accordance with the requirements of Section 09905 and 11000.

2.3 SPARE PARTS

A. In accordance with the requirements of Section 11000.
B. Provide the following spare parts:
   1. Two complete sets of pump seals and gaskets per each type of pump.
   2. One complete set of any special tools required to service the equipment.

PART 3 - EXECUTION

3.1 EXAMINATION, PREPARATION AND INSTALLATION

A. In accordance with the requirements of Section 11000 and the manufacturer's written instructions.

3.2 START-UP AND TESTING

A. In accordance with the requirements of Section 01800 and 11000.

B. Manufacturer or Manufacturer's Representative shall demonstrate that manufacturer provided controls (i.e., seal fail, motor over temperature) function as per the manufacturers written requirements and Division 13 requirements, prior to equipment being put into service.

3.3 CLEANING AND FIELD COATINGS

A. In accordance with the requirements of Section 09900 and 11000.

3.4 TRAINING AND WARRANTY PERIOD SUPPORT

A. In accordance with the requirements of Section 01800.

END OF SECTION

SECTION 11351

CIRCULAR CLARIFIER SLUDGE COLLECTION EQUIPMENT (SUCTION HEADER TYPE - SECONDARY)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test circular clarifier mechanisms of the center feed, peripheral effluent launder type of the quantity, size(s) and location(s) indicated on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 11000 – Equipment – General (and as referenced)

1.3 CLARIFIER SYSTEM FUNCTION:

1. To effectively promote the flocculation and settling of solids for the conditions specified below.
2. To effectively promote even distribution of influent and loading to the whole tank volume and minimize short circuiting and solids carry over into the effluent launders.
3. To efficiently collect floating surface scum and materials and remove them from the surface of the tank.

B. Sludge Collection Mechanism equipment shall include:
   1. Stationary center influent column with anchor bolts and influent ports.
   2. Access walkway and center platform with handrails.
   3. Energy Dissipating Inlet (EDI) and influent feed well.
   4. Rotating drive cage, rake arms with rotating suction header to remove settled sludge and direct this sludge to center collection drum.
   5. A multistage speed reducing center drive unit to rotate the rake arms with torque control monitoring and display system.
   6. Scum skimmer arms, scum beaching ramp and scum trough with flushing system.
   7. Feed-well and clarifier surface scum and foam suppression spray water system.
   8. Corrosion protection for all ferrous materials.
   9. V-notch effluent weir plates, scum baffles, gaskets and attachment hardware.
   10. All hardware to assemble and install all system components including anchor bolts, gaskets, seals required for functional system and all other appurtenances indicated on the Drawings, or required for a complete and operational system.
   11. Lubricants: Manufacturer shall provide all lubricants for the clarifier gear drive. Operational lubricants shall be shipped with the equipment. Contractor shall install operational lubricants when instructed to do so by the Manufacturer.

C. Design Criteria Schedule

1. General Design Criteria Schedule

a.	Number of units	4
b.	Identification	SCL-5, 6, 7, 8
c.	Materials of Construction	Hot Dipped Galvanized Steel
d.	Design Minimum Day Flow (per clarifier)	10.625 MGD
e.	Design Annual Average Flow (per clarifier)	15.25 MGD
f.	Design Peak Hour Flow (per clarifier)	29.875 MGD
g.	Design Minimum Sludge Flow (per clarifier)	6.60 MGD
h.	Design Average Sludge Flow (per clarifier)	9.10 MGD
i.	Design Peak Hour Sludge Flow (per clarifier)	11.40 MGD
j.	Sludge Concentration	0.5 – 1.0 % ODS
k.	Tank Diameter (inside wall)	164 -feet
l.	Side Water Depth (V-notch weir invert to tank floor at wall)	14’-1”
m.	Tank Wall height (top of wall to tank floor at wall)	16’-1”
n.	Tank Bottom Slope	1 ft/84 ft

1.4 QUALITY ASSURANCE

A. In accordance with the requirements of Section 11000.

B. All system components specified herein shall be furnished by a single Manufacturer who regularly engages in the production of this type of equipment. The Manufacturer shall be responsible for the performance and warranty of the entire system provided under this section.

C. Qualifications of Manufacturer: The Manufacturer shall have a minimum of 10 years of experience in the design and manufacture of the specified equipment. The Manufacturer shall have a minimum of 10 similar installations operating for a minimum of 5 years.

D. Acceptable Manufacturers:

1. Evoqua Water Technologies, Waukesha, WI.
2. Walker Process Equipment, Aurora, IL. (Division of McNish)
3. WesTech, Salt Lake City, UT.
4. Ovivo USA, LLC, Salt Lake City, Utah
5. or equivalent.

E. If the equipment submitted requires an arrangement differing from that indicated on the Drawings, the Contractor shall prepare and submit detailed Drawings (i.e., structural, process, instrumentation, electrical, as applicable) showing all necessary changes for review and acceptance by the Engineer. Redesign, coordination and construction changes shall be at no additional cost to the Owner.

1.5 SUBMITTALS

A. In accordance with the requirements specified in Section 01340 and 11000. Submit such shop drawings, manufacturer’s literature, installation lists, short-term and long-term storage requirements, installation requirements, and operations and maintenance manuals. Provide the following information:

1. Certified shop drawings showing the details and materials of construction, dimensions, loads on supporting structures, anchor bolt requirements, weights and lifting points.
2. Complete wiring diagrams detailing all required field connections.
3. Torque overload device data
4. Motor data
5. Gear Reducer Certified Calculations:
   a. Provide calculations indicating the ability of the drive assembly to carry the torques specified herein. These calculations shall be in accordance with AGMA 2001-D04 (January, 2010) or most current version.
   b. These calculations must be by a Professional Engineer that has a current American Gear Manufacturer's Association (AGMA) certification to perform the calculations. This AGMA Engineer may be independent of the equipment supplier or may be an employee.
6. Structural Requirements:
   a. The center column, walkway, bridge, center platform, anchor bolts and all other structural components shall be designed by a Professional Structural Engineer registered in the State where the mechanism will be installed, using loads as specified herein and all other applicable live, dead and operational loads.
   b. Submit a stamped and sealed letter from the Structural Engineer stating that all of the structural components have been designed in accordance with the requirements of this Specification and all other applicable Codes and Standards and will protect the life safety of those accessing the bridge.
7. All drive calculations shall be submitted with the shop drawings.
   a. The load distribution factors Cm and Km shall be calculated in strict accordance to AGMA 2001-D04 requirements using no less than 1.368.
   b. The net face width of the narrower of the two mating surfaces shall be used to calculate the surface durability and strength of the gear.
   c. Full description of all materials, heat treating and tolerance shall be shown in the drive calculations.
8. Hydraulic Submissions
   a. Manufacturer shall submit design calculations to substantiate the suction header design, stamped by a registered Professional Engineer. Refer to Part 2 of this specification.
9. Provide Shop Paint Coating Thickness Measurements.
10. Submit certification from galvanizer that galvanizing is in accordance with Specifications.
11. Field Testing Startup Reports

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with the requirements of Section 11000. Manufacturer shall deliver equipment to the project site where and when directed by the Contractor.
B. Deliver as job progress requires and in the largest sections recommended by the manufacturer.
C. Store in accordance with manufacturer's instructions and prevent damage of any nature.

D. If damage occurs, immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no cost to the Owner.

E. The mechanism shall be lubricated in strict accordance with the instructions of the Manufacturer's field service representative. The required lubricants shall be provided by the Manufacturer and installed by the Contractor when instructed by the Manufacturer.

1.7 WARRANTY

A. In accordance with the requirements of Section 11000.

PART 2 - PRODUCTS

2.1 GENERAL

A. The sludge collector mechanism shall be the center-column drive support, center-feed, peripheral-overflow type with a central driving mechanism.

B. The entire rotating mechanism, including its structural members and one end of the walkway, shall be supported from the center column. The center column also acts as the influent pipe connecting to the buried influent piping under the clarifier base slab.

C. The central driving mechanism, mounted to the top of the center column, shall support and rotate a center cage truss type framework surrounding the center column and extending the height of the center column.

D. The EDI, feed well and scum collection arms shall be attached at the top of the cage.

E. Truss arms shall be attached to the bottom of the cage, and shall support the skimmer.

F. Truss arms shall also support either a single or dual suction header, designed to uniformly withdraw sludge from the tank floor to a sludge manifold. The sludge header shall provide complete floor coverage for optimum sludge withdrawal so that in a single revolution of the tank bottom, it is swept clean.

G. All parts of the equipment shall be amply proportioned for long, continuous, and uninterrupted service.

H. Provision shall be made for easy access for service or replacement of parts.

I. Corresponding parts of multiple units shall be interchangeable.

J. Except as otherwise specified, structural steel plates and shapes shall have a minimum thickness of 1/4 inch and structural bolts a minimum diameter of 1/2 inch.

K. All fasteners shall be 316 SS. All through bolt fastener assemblies shall have the bolt, two flat washers and either aviation style nylon lock nuts or lock washers and standard nuts. All fasteners shall be torqued to the specified value and inspected.

2.2 CENTER COLUMN

A. Center Column Design Criteria Schedule

1. Center Column Diameter 54 inches
2. Center Column Wall thickness 3/8-inch, minimum
3. Inspection cover size 18x18-inches
4. Bolt size and number to match Drive turn table base.
5. Influent Ports Max exit velocity at Peak design flow 4 ft/sec
6. Maximum column top deflection under load (below) 0.5-inches
7. Horizontal load on center column for maximum deflection (above) 500 lbs

B. The center column shall be a vertical structural steel pipe made of rolled welded steel plate with a minimum diameter and plate thickness indicated above. Center column pipe shall conform to one of the following: ASTM A53, ASTM A252, ASTM A333, ASTM A500, ASTM A501, ASTM A618, ASTM A847 or equal. The center column and components shall be hot dipped galvanized.

C. The column shall have a mounting flange at its base, for anchoring it over the inlet well and a drive mechanism mounting plate at the upper end.

D. Rectangular influent ports shall be sized to permit the incoming flow to discharge into the influent well at the maximum velocity indicated above. Center column may be reinforced to make up for the wall sections removed for the influent ports.

E. A bolted inspection cover shall be provided in the center column for access to the interior of the center column located about 3 feet above the base. A 3-inch nipple and plug shall be fitted in the access cover to facilitate draining the center column.

F. The center column shall be designed to support the weight of the mechanism and one end of the walkway, in simultaneous combination with the maximum torque developed by the drive mechanism and eccentric moment at the top of the column from the center platform. The center column shall not deflect laterally more than the distance indicated above when under the load applied horizontally in any direction, at the top of the walkway at the center of the clarifier.

G. Install the center column plumb in order to maintain the proper spacing between the rake arms and scraper plows and tank floor. Provide documentation of installation tolerances.

H. Adjustment shall be by leveling nuts on the anchor bolts for the center column prior to grouting in the column base.

I. Coordination:

1. For replacement clarifier mechanism in existing clarifier tanks with sound, reusable anchor bolts, the Contractor shall provide to the Manufacturer an anchor bolt template of the existing anchor bolts. Contractor to field inspect and verify reuse with the selected equipment manufacturer. The Contractor shall conservatively assume that center column anchor bolts will need to be replaced, however may assess reuse with the selected Manufacturer during construction.

2.3 CENTER DRIVE MECHANISM

A. The center drive mechanism shall be defined as an assembly of equipment consisting of: an electric motor; an assembly of gear reducers to reduce the speed of the motor shaft and increase the output drive torque and typically consisting of a primary drive assembly, intermediate or secondary reducer and final reduction gear; and a ball bearing supported turntable that incorporates the final reduction gear.

B. The center drive mechanism shall completely support and drive the rotating portion of the turntable, drive cage, sludge rake arms, scum arms, the clarifier influent feed well and any EDI attached in the influent well in a constant rotation around the center column in the clarifier tank continuously for minimum 20-year design life.

C. The ball bearing supported turntables shall be constructed using one of the allowable design options listed below.

1. Option 1 - The system shall use a cast iron or cast ductile iron turntable stationary and rotating components. The ball bearing system shall consist of four replaceable strip liners for the bearing race providing 90-degree contact

support with free floating ball bearings. These units shall have either "cast iron units" or "strip liner units". The designation for this type of turntable construction shall be termed "Cast Iron". These units shall be equipped with worm drive type intermediate gear reducers in cast iron housing and gear motor and chain drive primary drive assemblies. Alternately, they can be equipped with helical, planetary or cycloidal intermediate gear drives reducers.

2. Option 2 - The system shall be constructed using welded structural steel or alloy plate and steel forgings. The bearing races are precision machined 180 degree arcs into the forgings using a contoured Goth Arch design with the ball bearings contained within 360 degrees of potential contact surface. These units are referred to as "fabricated units" or "precision ball bearing units". The designation for this type of turntable construction will be termed "Fabricated". These units are provided with helical, planetary or cycloidal reducers for both intermediate and primary gear reducers. Worm gear intermediate drives are also acceptable.
3. All antifriction bearings shall have a B-10 life rating of not less than 50,000 hours, except for the lower bearing of the pinion shaft and the bearing on the drive end of the worm shaft, if required, which shall have a life of 100,000 hours, and the main support bearing which shall have a life of 345,000 hours.
4. The type of turntable design that are acceptable for this project are indicated in the following Schedule.

D. Center Drive Design Criteria Schedule

1. Acceptable Turntable Design: Cast Iron or Fabricated
2. Design Load per foot per rotating rake arm (W): 8 lbs/ft
3. Calculated EPA Normal Continuous Torque ($W \times R^2$): 53,800 ft-lbs
4. Drive AGMA Normal Continuous Torque Capacity (NCTC): 53,500 ft-lbs
5. Alarm Torque (120% NCTC): 64,200 ft-lbs
6. Cutoff Torque (140% NCTC): 64,200 ft-lbs
7. Peak Torque Capacity (200% NCTC): 107,000 ft-lbs
8. Turntable ball bearing raceway minimum diameter: 1.5 -inches
9. Drive motor horsepower 1 HP
10. Rake Arm Tip Speed: 8 fpm

Drive Motor and Torque Switch NFPA 820 classification Class 1, Division 2
Drive motor NEMA enclosure classification NEMA 7 C1/D2
Drive motor power 460VAC, 3ph, 60hz
Drive motor nominal synchronous speed 1800 rpm, SF=1.15
Drive motor classification XP

11. Chain Drive Assembly Minimum Safety Factor 4.0
12. Gear Reducer Service Factor over Motor Hp AGMA Class II, 1.40
13. Drives shall operate in the forward direction only.

Torque Requirements Ratings and Unit Capacity

1. Strength, durability, and life ratings of the intermediate and final reducer component gear parts shall be based on maintaining normal continuous torque output for the 20-year equipment design life.
2. Standard center drive mechanism shall have a minimum AGMA 2001.C95/ AGMA 2001-D04 (January, 2010) Normal Continuous Torque Capacity

(NCTC) that meet or exceed the EPA Normal Calculated Continuous Torque as indicated in the Center Drive Design Criteria Schedule based on 20 years of continuous use, at the loading and rotational speed listed.

3. The strength, durability, and life ratings of the component parts shall be based on this rating.

F. Torque Overload Device A mechanical or electro-mechanical torque overload device shall be furnished as an integral part of each drive.

1. A mechanical or electro-mechanical torque overload device shall be furnished as an integral part of each drive. The mechanical overload device monitors movement of the worm shaft that is proportional to the torque on the shaft.
2. The overload device shall be equipped with limit switches and contacts to activate a remote alarm at the alarm torque, and to stop the drive motor at a shutoff torque noted in the Center Drive Design Criteria Schedule.
3. The overload device shall have a visual indication meter so that the load on the mechanism can be observed by the operators.
4. The overload device shall be totally enclosed and shall be directly mounted to the worm gear housing, and operate on monitoring the movement of a rated compression spring from tooth backlash from the worm to the worm gear.
5. Exposed linkage, moving housings or amperage devices are not acceptable for this type of device.
6. The devices shall be designed to be ventilated so condensation does not form inside and affect visual indicator or corrode electrical contacts.
7. Overload devices shall meet the NFPA Classification identified in the Center Drive Design Schedule.

2.4 "CAST IRON" - TURNTABLE AND FINAL GEAR REDUCER

A. When specified in the Center Drive Design Criteria Schedule the stationary and rotating components of the turntable and final gear reducer shall be constructed of grey cast iron or ductile nodular iron as appropriate for the components.

1. Rough castings shall be precision machined to accept all the components mating to and attached to the turntable assembly.
2. The turntable and final gear reducer shall be constructed using the proper design wall thicknesses to resist full peak torque without any deflection.
3. Before assembly, the turntable base casting shall be thoroughly inspected for seep holes or inclusions and then shall be given a full hydrostatic test to ensure there is no pin hole leakage

B. The turntable stationary base shall be:

1. Bolted to the top of the center column,
2. Designed to support one end of the Access Walkway and Center Platform and the rotating portion of the turntable that supports all the rotating components of the mechanism.
3. Designed so the top of turntable base shall not be a hazardous location and shall provide access for all maintenance activities.

C. The turntable shall contain the final gear reducer, consisting of a spur gear design ring and pinion matched set.

1. The ring gear shall be integrally formed in the turntable's rotating exterior high-test nodular ductile iron or equivalent strength cast-iron, casting.

2. Turntable's rotating exterior casting with integral full depth ring gear shall be designed to support drive cage supporting all the rotating parts of the collector from integrally cast mounting lugs.
3. The rotating exterior ring gear portion of the turntable may be constructed in component parts and rigidly bolted together to facilitate removal of the ring gear from the fixed portion of the turntable to allow field replacement of ball bearing and strip liners without removing the walkway, intermediate, initial gear reducers and motor.

D. The stationary turntable base and rotating ring gear castings shall be precision machined for the installation for renewable ball bearing raceways upon which the rotating ring gear portion of the turntable will ride. The ball raceway shall have four independently removable specialty hardened segmental liners that fit in recesses or grooves machined in the turntable base and rotating ring gear. The ball raceway diameter provided shall ensure stability, and shall be designed for both radial and axial loads.

E. The alloy-steel ball bearings shall run in an oil bath which shall be protected by a felt or neoprene seal and a steel dust shield between the rotating ring gear portion and the stationary base.
1. The oil bath shall be provided with an access opening that is sealed to prevent the entrance of water.
2. All oil bath must have a 2-inch minimum depth below the bottom of the bearing or gear to allow for condensation water storage.
3. An oil dipstick or sight glass shall be provided.
4. Oil bath reservoir shall have an internal drain to remove and replace the final gear reducer oil.
5. System shall be operator friendly and have low potential for spilling oil.
6. Oil bath reservoir shall have an internal sump and drain to remove the water that condensates inside the turntable housing and a method from keeping condensate from the pinion spur gear lower bearing and oil sump. The lower pinion pocket shall not be the collection point for condensation or drain.
7. Lubrication system shall be an immersion splash gear mesh type and oil circulation by pumps will not be acceptable.

F. The spur ring gear shall be driven by a high-strength cast-iron or forged steel pinion spur gear.
1. The pinion shaft and gear shall be one piece forged and machined construction without any coupling, or key ways attaching the gear to the pinion shaft. The gear and shaft shall be one monolithic piece.
2. The pinion gear in the turntable base shall be supported on each side of the ring gear, above and below the ring gear by bearings so there is not an overhung loading condition for the final drive spur gear when engaged with the ring gear.
3. The input end of the pinion spur gear shaft shall be keyed to the bronze output gear of the intermediate gear reducer and shall be overhung design within the intermediate gear reducer.
4. The integral pinion shaft and gear shall be supported by upper and lower taper bearing and is to be precision aligned to the ring gear and designed to limit deflection of the pinion to less than 0.001 inches. The outer race of each bearing

shall be installed in bearing sockets machined into turntable base housing and the intermediate reducer output housing that are indexed together to provide proper precise alignment.

2.5 FABRICATED TURNTABLE AND FINAL GEAR REDUCER

A. When specified in the Center Drive Design Criteria Schedule, the stationary and rotating components of the turntable and final gear reducer shall be fabricated from ASTM A-36 structural steel or alloy steel with minimum modulus of elasticity of $29x\ 10^6$ psi.
   1. Prior to machining all welds shall be tested for weld imperfections, inclusions or voids and shall be ground out and re-welded when found.
   2. All fabricated steel weldments shall be precision machined to accept all the components mating and attached to the turntable assembly.
   3. The turntable and final gear reducer shall be constructed using the proper plate thicknesses to resist full peak torque forces without any deflection.
   4. Before assembly, the turntable components shall be thoroughly inspected and dimensionally checked and then coated for internal and external corrosion protection. After final assembly the entire mechanism shall be painted.

B. The turntable stationary base shall be:
   1. Bolted to the top of the center column,
   2. Designed to support one end of the Access Walkway and Center Platform and the rotating portion of the turntable that supports all the rotating components of the mechanism.
   3. Designed so the top of turntable base shall not be a hazardous location and shall provide access for all maintenance activities.

C. The turntable shall contain the final gear reducer, consisting of a spur gear design ring and pinion matched set.
   1. The ring gear shall be forged from hardened alloy steel with the gear teeth on the inside of the ring. The outside of the ring shall be machined with 180 degree contoured arch bearing race which makes up ½ of the turntable bearing race.
   2. Turntable's rotating fabricated steel assembly that supports the drive cage that in turn supports all the rotating parts of the collector mechanism shall be bolted to the top of the forged ring gear and be driven around the turntable base by the spur gear.
   3. The rotating ring gear with drive cage attachment weldment shall be restrained and rotate against a hardened alloy steel exterior ring with the inside face machined with 180 degree contoured arch bearing race which makes up second ½ of the turntable bearing race. The stationary portion of the race shall be bolted to the turntable base weldment.

D. The stationary turntable base and rotating alloy rings have the precision machined bearing races that will hold the ball bearings, and meet the following criteria:
   1. The machined ball raceways shall be hardened.
   2. The ball bearing raceway shall have a minimum diameter to ensure stability and shall be designed for both radial and axial loads
   3. The ball bearings shall be separated by composite spacers to prevent ball to ball contact.

E. The alloy-steel ball bearings shall run in an oil bath which shall be protected by a

seal and shields between the rotating ring gear portion and the stationary base.

1. The oil bath shall be provided with an access opening that is sealed to prevent the entrance of water.
2. All oil bath must have a 2" minimum depth below the bottom of the bearing or gear to allow for condensation water storage.
3. An oil dipstick or sight glass shall be provided.
4. Oil bath reservoir shall have an internal drain to remove and replace the final gear reducer oil.
5. System shall be operator friendly and have low potential for spilling oil.
6. Oil bath reservoir shall have an internal drain to remove the water that condensates inside the turntable housing and a method from keeping condensate from the pinion spur gear lower bearing and oil sump. The lower pinion pocket shall not be the collection point for condensation or drain.
7. Lubrication system shall be an immersion splash gear mesh type and oil circulation by pumps will not be acceptable.
8. Grease lubrication of gears and bearing is not acceptable.

F. The spur ring gear shall be driven by an integrally high-strength forged steel pinion shaft and spur gear.

1. The pinion shaft and gear must be one-piece construction without any coupling, or key ways attaching the spur gear to the pinion shaft.
2. The pinion gear in the turntable base shall be supported on both sides of the ring gear by bearings so there are no overhung loading conditions for the final drive spur gear for worm gear and cycloidal intermediate reducers. Planetary intermediate gear drives with proven robust shaft and bearing designs may have overhung pinion shaft without a lower bearing provided the pinion shaft has less defection under peak loading than non-overhung design with lower bearing.
3. The input end of the pinion gear and shaft shall be keyed to the output gear of the intermediate gear reducer.
4. The integral pinion shaft and gear shall be supported by upper and lower tapered bearings and is to be precision aligned to the ring gear and designed to limit deflection of the pinion to less than 0.001 inches. The outer race of each bearing shall be installed in bearing sockets machined into turntable base housing and the intermediate reducer output housing that are indexed together to provide proper precise alignment.

2.6 WALKWAY AND CENTER PLATFORM

A. Provide access walkway and center platform as indicated on the Contract Drawings.

1. All materials shall conform to Specification Section 05500 and shall be furnished by the equipment manufacturer.
2. The walkway and platform shall consist of hot dipped galvanized steel framing supports with an aluminum grating walkway surface and side mounted aluminum guard rails and toe plates. Walkway truss members may serve as guard rails if OSHA compliant and designed to meet the IBC guard loads.

B. Walkway and Center Platform Design Criteria Schedule

1. Walkway and Platform Uniform Live Load 100 lbs/sq ft
2. Walkway Additional Concentrated Live Load 300 lbs

At center of walkway span

3. Maximum Walkway Deflection clear span or overhang Clear Span L/360
4. Maximum Grating Deflection clear span Clear Span L/240
5. Design Temperature Range Thermal Expansion -30^{o} to 120^{o}F
6. Clarifier walkway design shall include a design for ice loading in accordance with ASCE 7.

C. The walkway support frame shall consist of the following:
   1. Steel beams or steel trusses laid parallel to support a 3'-0" wide walkway surface.
   2. One end of the walkway shall rest on the tank wall and the other end on the center column as indicated on the Drawings.
   3. The design shall allow for thermal expansion and contraction through a temperature range defined in the Walkway and Center Platform Design Criteria Schedule.
   4. The surfaces of the framing members in contact with the aluminum grating walking surface shall be coated with epoxy paint. Alternatively, neoprene strips or other materials may be used to separate the dissimilar metals following review with no exceptions taken by the Engineer.

D. The center platform support frame shall consist of the following:
   1. Steel beams supported by the center column. The ends of the beams shall be designed as cantilevers without end support.
   2. The surfaces of the framing members in contact with the aluminum grating walking surface shall be coated with epoxy paint. Alternatively, neoprene strips or other materials may be used to separate the dissimilar metals following review with no exceptions taken by the Engineer.
   3. The walkway support at the center column shall not interfere with access to the center drive mechanism or drive unit.
   4. The square center platform shall provide three feet of clearance outside the center column diameter on all sides to provide convenient access to drive mechanism. Platform design shall allow for all required maintenance to be performed from it.

E. Aluminum grating shall be securely fastened on top of or between the beams or trusses to form the walking surface. Aluminum grating shall be 1½" minimum depth and shall have a serrated or striated surface.

F. Aluminum guard rails with toe kick shall be provided on both sides of the walkway and shall extend around the center platform. Guard rail will be in accordance with details provided on the structural drawings and Section 05500. Walkway truss members may serve as guard rails if OSHA compliant and designed to meet the IBC guard loads.

G. The walkway and center platform shall be designed for the loads in the Walkway and Center Platform Design Criteria Schedule. The design of the framing members shall incorporate lateral braces as required. The design shall not assume that the grating provides lateral support for the framing members.

2.7 CENTER CAGE

A. The structural steel center cage shall be fabricated from hot dipped galvanized steel angle and plate stock in a square truss shape with mounting attachments for sludge

collection arm trusses, EDIs, sludge collections well, influent well and scum arms.

B. Center cage shall be hung from lugs on the rotating portion of the turntable base.

C. Center cage shall be sufficiently strong and stiff to support and rotate all rotating portions of the mechanisms including rake arms, influent feed center well with or without an EDI, scum arms and full sludge scraping load.

D. The center cage shall be designed to resist the full momentary peak torque.

2.8 ENERGY DISSIPATING INLET (EDI) ALTERNATIVES

A. An inner rotating energy dispersion well/baffle generating a tangential exit flow shall be located within the larger rotating feedwell.
   1. The dispersion well diameter shall be a minimum: 16 feet
   2. The side depth below water surface shall be: 4 feet
   3. The number of exit ports generating tangential flow shall be: 10
   4. The outlet ports shall have a means of adjustment
   5. The dispersion well shall be fabricated out of a minimum of 3/16-inch plate
   6. The dispersion well/baffle shall be provided with a steel bottom plate to within one inch of the center column.

B. Alternately, flocculation influent baffles may be provided.
   1. Inlet baffles shall promote effective mixing and tapered flocculation.
   2. Flow shall impinge three overlapping vertical target baffles in secession with a series of four increasing port areas.
   3. Design to provide a "Gt" (t in seconds) value in the well not exceeding 6,000 with a velocity gradient "G" within the well not exceeding 60 fps/ft at a minimum water temperature of 10 ºC at maximum influent flow.
   4. Horizontal shelf baffles shall prevent downward movement in flocculation zone.
   5. Baffles shall bolt to center cage and well support beams.

C. Other proven energy dissipating feed well designs to promote flocculation and reduce radial density currents may be submitted to the Engineer for review such as the patented LA-EDI. Clarifier manufacturer shall contact and work with the patent holder to develop site specific design and pay patent holder any required royalty fees. These fees shall be included in the bid cost to the Contractor. Contractor is responsible for insuring that there is no additional cost over the bid cost to the Owner for the use of patented EDIs.

2.9 INFLUENT FEEDWELL

A. Influent Feedwell Design Criteria Schedule
   1. Feedwell Diameter: 50 feet
   2. Feedwell Overall Depth: 6.5 feet
   3. Feedwell top elevation above v-notch weir inverts: 6 inches above
   4. Material of Construction: A-36 Steel, Hot Dipped Galvanized
   5. Wall thickness minimum: ¼ inch

B. The influent feedwell shall be an open-end vertical welded plate steel cylinder shall and supported concentrically on the center drive cage.

C. It shall be stiffened with angles, with minimum L2x2x1/4 at the top and bottom circumference and vertically.

D. The top edge shall be above the liquid level of the tank, but the balance of the

cylinder shall be submerged.

E. Scum ports shall be provided at the water surface with sizing and spacing as recommended by the manufacturer. Flow dissipation baffles shall be provided at the scum ports to prevent direct radial flow out or into the influent feedwell.

F. If a tangential EDI inner energy dispersion well with curved shielded outlet ports is included within the feedwell, the feedwell may have multiple vertical full height anti-rotation baffles attached to the wall perimeter if recommended by the manufacturer.

2.10 ROTATING RAKE ARMS

A. Full radius support truss arms or counter balance truss arms shall be provided depending upon the suction header design and size of the clarifier. Rake/truss arms shall be constructed using hot dipped galvanized structural steel angles in a triangular or box-truss construction and shall be rigidly connected to the center cage with the ability to be adjusted to conform to (be parallel with) the slope of the floor.

B. The trussed rake arms shall be entirely self-supporting or use additional tie rods to the upper portion of the cage as needed. The truss arms may also support the perimeter of the influent feed well.

C. The truss arms shall be designed to resist the full peak torque capacity of the unit without any physical damages.

D. If required in the manufacturer's design, each arm shall be provided with a counterweight box of steel plate fabrication. The Contractor shall add counterweights to the box as required to balance the arms and suction header.

E. Manufacturer shall coordinate the configuration of the suction header design and truss arms outside tip height and distance off the wall with the Contractor in order to provide a minimum clearance of 3 inches between the rake arm and any wall mounted ground water pressure relief valves.

F. Truss arms shall also support skimming arms when a full radius skimming trough is not specified.

2.11 SLUDGE SUCTION HEADER AND ROTATING SLUDGE DRUM

A. Provide two full radius sludge suction headers (sludge inlet manifold) as required by sludge hydraulics, that extend from the clarifier tank perimeter wall to a center sludge collection drum.

B. The function of the suction header is to provide an optimum rapid method for withdrawing sludge uniformly from the complete bottom floor of the clarifier, so that in a single revolution of the tank bottom, it is swept clean of settled sludge.

C. The driving force that is drawing the sludge from the clarifier bottom through the suction header and sludge collection drum is from the suction force generated by the sludge pumps.

D. Suction Header Design

1. The suction header shall be attached via a flanged joint to a center sludge collection drum that is attached to the bottom of the center cage and shall rotate around the center column powered by the center drive mechanism.
2. The suction header shall be supported by the sludge collection drum and from the center cage either by an overhead truss arm extending from the center cage, or by tie rods from the suction header to the center cage.
3. Suction header shall be installed parallel to the clarifier bottom floor slope.

4. The suction header shall be a tapered rectangular or square cross-section.
5. It shall be fabricated from minimum ¼" thick structural steel plate and shapes and hot dipped galvanized.
6. The minimum cross-sectional area shall be at the tank periphery, and the maximum header cross-sectional area, at the tank center.
7. The suction header axis shall be tilted at 45 degrees so the corner diagonals are horizontal and vertical and the top and bottom surfaces are sloped.
8. The sloped top surfaces shall shed settling sludge to minimize buildup and septic sludge conditions.
9. The bottom slope surface facing in the direction of rotation shall have sludge inlet ports.
10. The bottom corner shall have an extended vertical steel blade with an adjustable neoprene squeegee to collect and direct bottom sludge up into the suction ports on the adjacent sloped face.
11. All connection joints of the header assembly shall be gasketed to prevent leakage.
12. The sludge collected in the suction header inlet manifold shall be drawn into the sludge collection drum connected to the sludge header via an open port the shape of the inside of the suction header.
13. The suction header shall be sloped to drain the bottom corner into the sludge collection drum.
14. The suction header shall not induce currents that re-suspend settled solids or cause a major lift in the sludge blanket such that there is a significantly higher concentration of suspended solids escaping into the clarifier launders after the suction header has passed the area.

E. Suction Inlet Orifice Design

1. Sizing and spacing shall be such as to produce uniform sludge pick-up and velocities in each header.
2. Inlet orifice size, spacing and driving head shall be adjusted such that sludge withdrawal is proportional to the relative area of the tank served.
3. Orifices shall be spaced no greater than 30 inches on center.
4. The minimum acceptable orifice diameter shall be 1.875 inches.
5. Calculations shall be submitted to show the derivation of the changing orifice driving head along the length of the header, the tank area served by each orifice, and the respective orifice size, as well as the driving head across the orifice and velocity through the orifice at maximum and minimum sludge flows.
6. Calculations shall reference controlled field test data to validate the flow rate and headloss. Copy of controlled field test data report shall be included with submittals. Field test data from a full scale operating clarifier with similar conditions to those specified herein. Clear water testing and/or laboratory testing is not an acceptable alternative. The test data shall include as a minimum, the following:
    a. Maximum Sludge Flow Rate (mgd);
    b. As-Built Orifice Spacing (inches);
    c. As-Built Orifice Diameter (inches);

d. Actual vs. Predicted headloss at each orifice. The data must validate the pressure profile inside the header substantially matches the shape and magnitude predicted by the engineering computer model; and
e. Dye test results at each orifice validating the profile of calculated orifice flows indicate that larger volumes of sludge are removed at greater distances from the tank center and uniform sludge removal is achieved.

7. Sludge suction header shall be designed for the sludge flow rates and conditions indicated in the General Design Criteria Schedule. Minimum flow velocity suction duct header shall be 0.5 feet per second. Maximum header headloss shall not exceed 1.5 feet at maximum return sludge flow rate.
8. The sludge manifold shall discharge to the rotating sludge collection drum.

F. Rotating Sludge Collection Drum
1. The minimum diameter of the rotating sludge collection drum shall be 7 ft-9 in.
2. The minimum height/depth of the rotating sludge collection drum shall be 3-ft.
3. The rotating sludge drum shall be constructed of a minimum 1/4-inch hot dipped galvanized steel plate.
4. The sludge collection drum shall surround the center column and attach to the bottom of the center cage. It shall rotate with the center cage, suction header and support /balancing truss arms and it shall be sized to prevent short-circuiting of the influent into the concentrated sludge flow and diluting the sludge flow.
5. The sludge collection drum shall be provided with a sludge collection inlet port located at the discharge opening end of the sludge header via a bolted flange connection with gaskets. Sludge shall flow from the sludge header into the interior of the collection drum.
6. Inlet opening shall be smooth to prevent the catching of any debris in the sludge.
7. Neoprene seals shall be provided to seal the drum to the center column.
8. A steel sealing ring shall be attached and grouted parallel to the bottom perimeter edge of the sludge collection drum so that the gap can be effectively sealed against the inflow of sludge.
9. The tank floor slope and sludge withdrawal drum design shall be verified by the clarifier equipment manufacturer.
10. The concentrated settled sludge shall be withdrawn from inside the sludge collection drum/ring via fixed ports through the center column into the sludge suction piping or via a hopper in the clarifier base and then into the sludge suction piping as indicated on the Drawings.

2.12 FEED WELL AND CLARIFIER SURFACE SPRAY WATER SYSTEM

A. Piping, fittings, swivels and nozzles mounted on the clarifier bridge and center platform shall be provided by Contractor. Contractor shall install the complete system and supply piping to the clarifier point of connection indicated on the
B. Provide a feed well and clarifier surface spray water system for re-entraining foam and scum into the mixed liquor in the feed well and for foam and scum suppression on the surface of the clarifier and directing foam and scum toward the scum collection system. The system shall use plant water for spray water.
C. System provided and installed by Contractor shall consist of:
1. SCH 80 PVC piping, fittings and valves

2. A plant water supply header pipe mounted to the side of clarifier bridge walkway that connects to buried site piping. The plant water line shall have buried shut offs and drain valves at clarifier wall.
3. A header pipe mounted on perimeter of center platform support framing.
4. Reducing tees at each nozzle location and bridge hose bibb location indicated on Drawings.
5. Pipe fitting swivel with double unions to allow direction of nozzle to be rotated 360 degrees in the horizontal and vertical direction. See Process Drawing details.
6. Spray nozzles shall be brass construction and be fully adjustable from full stream to 90-degree spray to fog to shutoff.
    a. Provide 1.5-inch size NH NST threads spray nozzles mounted on adjustable 1.5-inch swivel piping system. One to be installed at each corner of the center platform.
    b. Provide ¾-inch size spray nozzles with GHT thread with GHT to NPT brass adaptors mounted to 1-inch swivel piping system along the walkway.
7. Provide hose bibb connection, male cam and groove quick disconnect fitting (mounted facing down) with ball valve shut off above. Provide heavy duty hose rack as indicated on drawings attached to walkway guardrail.
8. All attachment hardware shall be 304SS.

2.13 SKIMMING DEVICE (STANDARD BEACHING PLATE AND TROUGH)

A. Each clarifier shall be equipped with two skimmer arm assemblies spaced about 180 degrees apart. Skimmer assemblies shall continuously move surface scum to the tank periphery and with an articulating end flexible wiper section to transport the concentrated skimmings/scum up a beaching ramp and into a single skimmings/scum trough for flushing to a skimmings/scum collection tank. Assembly shall discharge scum into the trough with a minimum discharge of water.

B. Each skimmers/scum arm assembly shall consist of a hot dipped galvanized structural steel tube, beam, channel or truss extending from and supported by the influent feed well and the top of the sludge scraper rake arms trusses. The articulating end flexible wiper sections shall be cantilevered supported from the skimming arms over skimmings/scum trough and extend to the perimeter launder scum baffle.
    1. Each arm shall have adequate stiffeners and connecting supports with capacity for full adjustment.
    2. Horizontal tie rods from the center wall to the forward face of the skimming arm may be used to provide adjustments for horizontal forces.
    3. Each skimmers/scum arm, or neoprene wiper extensions from the arm, shall extend below the minimum clarifier water surface (bottom of v-notch effluent weir elevation) and above the maximum water surface elevations (top of the v-notch effluent weir elevation) to be able to effectively collect surface scum and direct it into the skimmings/scum trough.
    4. The end of each arm shall include an articulating flexible wiper section to transport the collected skimmings/scum up the beaching plate and also a flexible end wiper to make continuous contact with the perimeter scum baffle.

C. Skimmings/Scum Beaching Ramp and Trough Assembly

1. The assembly shall be a continuously welded water tight fabrication from ¼" steel plate with structural shapes for reinforcement as needed. The assembly shall be hot dipped galvanized.
2. The front side of the assembly shall include a sloped beaching ramp to allow the articulating flexible wiper section to scrape the skimmings collected by the skimming arm up the sloped beaching ramp from the water surface and into the open top of the trough.
3. The open top of the skimmings/scum trough shall be set above the maximum water surface elevation at the clarifier peak hourly flow. Typically set at or slightly above the top of the v-notch weir plate.
4. The outboard end of the trough assembly shall be attached to the clarifier launder wall. The inboard end is supported by the cantilever action of the outboard moment connection to the launder wall and the trough stiffness.
5. The bottom of the trough shall slope continuously down from the inboard end to the outboard end.
6. The bottom or end plate at the lower outboard end shall contain a skimmings/scum drain pipe connection. The drain pipe connection shall be a minimum 6-inch nominal pipe diameter of SCH 40 steel pipe with a plain end designed to connect to skimmings/scum drain pipe penetrating the clarifier side wall using a field attached flexible rubber solid sleeve type coupling provided by installing contractor to fit to the drain piping. Trough shall not be supported by the piping connection.
7. Trough attachment shall be adjustable to be able to level the trough and beaching ramp.
8. The inboard end shall contain provisions for an automatic flushing connection.

D. Articulating end wiper blade section

1. Skimmer arm assembly shall include an articulating, hinged or pivoting scraper blade with wiper blades, and supports.
2. Scraper blades shall be adequately supported from skimming arm and shall be provided with bracing where necessary to maintain rigidity of assembly.
3. Scraper blade shall be hot dipped galvanized structural steel, shall be the width of the scum trough, and shall have grease and oil-resistant synthetic rubber wiper blades securely clamped in position with a non-corrosive material backing plates and 316 SS fasteners.
4. The scraper blade and its hinged or pivoted connections shall be designed so as to assure proper alignment and continuous contact between wiper blades and scum trough approach beaching ramp and the top of the skimmings/scum trough.
5. Suitable means shall be provided to carry scraper blade smoothly over the skimmings/scum trough.
6. The scraper blade wipers and beaching ramp shall be designed to minimize the flow of water and trapped scum to the outboard edge of the beach ramp and escape under the wiper blades back into the clarifier water surface in a high velocity jet that entrains the concentrated scum in the downward flow and into the upward flow directed under the scum baffle and out over the weirs.

7. The end of the scraper blade assembly shall have a rubber wiper blade in continuous contact with the perimeter scum baffle.
8. Scraper blade shall have provision for field adjustment in the vertical plane.
9. Corrosion-resistant materials shall be used for moving parts within the skimming assembly in such manner as to ensure that corrosion will not freeze joints, springs, and other moving or adjustable parts into a fixed position limiting movement.

2.14 SKIMMING/SCUM TROUGH FLUSHING SYSTEM

A. Provide a flushing valve assembly/system to automatically flush the contents of the scum trough into the drain piping upon each pass of the skimming arm.
   1. The flushing system shall utilize clarifier liquid for flushing.
   2. The flushing system shall connect to the clarifier water source through a ball stop type port in the bottom inboard end of the skimmings/scum trough.
   3. Activation shall be though mechanical lever arm and chain, positioned and supported to pivot upon passing of skimmer arm.
   4. Pivot motion will raise a weighted ball stop, allowing flushing water to enter the flush assembly from the clarifier.
   5. Passing of the skimmer arm will allow the pivot arm and ball stop to reseat in the assembly stopping the flow of flushing water.
   6. The amount of liquid entering the flushing assembly will be adjustable by altering the length of pivot rod, and therefore the length of time that the rod contacts the skimmer arm.
   7. The flushing assembly will allow approximately 10 gallons of flushing water to enter the scum trough upon each pass of the skimmer arm.

2.15 SURFACE PREPARATION AND SHOP COATINGS

A. All materials shall be coated with the preparation and installation as specified in Sections 05500, 09900, 09905 and 11000.

2.16 SPARE PARTS

A. In accordance with the requirements of Section 11000.
B. Provide the following spare parts:

   1. One set of oil seals per unit.
   2. One set of skimmer wiper blade neoprene strips per unit.
   3. One sets of seals for the center drive assembly, per unit.
   4. One upper housing oil sight glasses per unit, if used.
   5. One lower housing oil sight glasses per unit, if used.
   6. One set of any wear part on skimmer assembly per unit.
   7. Twelve sets of shear pins if used in the drives mechanism per unit.
   8. Sludge seals on the sludge collector drum for suction header units.
   9. Any special tools required for maintenance of the equipment

PART 3 - EXECUTION

3.1 EXAMINATION, PREPARATION AND INSTALLATION

A. In accordance with the requirements of Section 11000 and the manufacturer's written instructions.

B. Contractor shall arrange for Manufacturer to inspect and adjust the equipment prior to placement of the concrete fill, and to supervise the placement of the concrete fill.

C. Install concrete floor fill in accordance with Division 3, and as shown on the Drawings.

D. Clean any grout from mechanism, central sludge hopper and tank walls.

3.2 START-UP AND TESTING

A. In accordance with Specification Sections 01800 and 11000.

B. After complete installation of the equipment, placement of the concrete grout fill and after adjustments by Manufacturer's factory representative, the Contractor shall torque test each unit (using a load cell scale). This testing shall be under the supervision of the Manufacturer's factory representative, and verify the structural integrity of the mechanism (center column, center cage and rake arms and drive), and demonstrate that the overload shutdown occurs as specified.

1. The torque test shall consist of securing the rake arms by cables to anchor bolts installed by the contractor in the tank floor at locations recommended by the manufacturer. A torque load shall be applied to the scraper arm by means of a ratchet lever and cylinder connected to the cable assembly.
2. The magnitude of the applied load shall be measured by calculating the torque from the distance of the line of action of each cable to the center line of the mechanism. Readings shall be taken at the Calculated EPA Normal Continuous Torque rating, the alarm torque, the cut off or shut off torque and momentary peak torque as indicated in the Center Drive Design Criteria Schedule. The test load shall be applied and noted on the torque overload device.
3. The Manufacturer's factory representative shall certify that the alarm and motor cut-out torque of the drives as calibrated in the Manufacturer's shop are in proper operation to shut down the units as specified.
4. All equipment required for the test shall be provided by the Manufacturer. After the successful test the equipment shall be returned to the equipment Manufacturer.
5. Document that the final installation is in accordance with the Manufacturer's installation instructions.

C. When sewage is available, the Contractor shall operate each unit for at least 48 hours to demonstrate its ability to operate without vibration, jamming or overheating and to perform as specified.

D. Provide, within one year of the warranty start date, one field service inspection trip for each mechanism installed per Section 01800

3.3 CLEANING AND FIELD COATINGS

A. In accordance with the requirements of Section 09900 and 11000.

3.4 TRAINING AND WARRANTY PERIOD SUPPORT

A. In accordance with the requirements of Section 01800.

END OF SECTION

SECTION 13410

INSTRUMENTATION AND PROCESS CONTROL GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. General Requirements and Definitions:

1. A single System Integrator (SI) shall furnish all services and equipment as specified herein and in the following Specification sections:

Section	Title
13440	Instruments
13441	Control Narratives
13442	Programmable Logic Controllers
13444	Control Panels
13445	Communications Network
13460	Fiber Optic Cabling

Additional requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

Section	Title
01010	Summary of Work (construction sequencing requirements that affect number and duration of equipment startups and certifications)
01340	Submittals
01600	Delivery, Storage and Handling
01800	Equipment Startup, Certification and Operator Training

2. The System Integrator (SI) provide all labor, materials, equipment, operations, methods and procedures as indicated in the Contract Documents to achieve a fully integrated and operational system. The SI shall be responsible for integrating hardware into the Division 13 control panels, local control panels, and instruments.
3. Items specifically excluded from the scope of the System Integrator include the following:
   a. Programming and configuration of the Programmable Logic Controllers (PLCs), Operator Interface Terminals (OITs), and the SCADA system as defined in Section 13441 shall be done by the Owners Application Engineering Services Supplier (AESS) under a separate contract. The Contractor shall coordinate with the AESS as outlined herein and in Section 13441.
      i. The AESS shall be Veiola Plant Wide IC.

4. All hardware systems indicated in the Contract Documents shall mean all necessary supervision, labor, equipment and materials required to provide complete, and properly integrated systems.
5. All systems shall be adjusted, tested, inspected and optimized to the satisfaction of the Engineer and Owner prior to being turned over to the Owner.
6. The words "provide", "supply", "supply and install", "install", "furnish" or "furnish and install" shall mean a complete and properly functioning hardware installation performed by the System Integrator unless otherwise noted. The System Integrator shall design and coordinate the Instrumentation & Process Control system for proper operation with related equipment, materials, and labor furnished by others under other sections of these Specifications and with related existing equipment.
7. Refer to Civil, Mechanical, Instrumentation, and Electrical Drawings to coordinate material and equipment locations. Refer to the Process Drawings for locations and connection to primary instrumentation, control valves and process equipment. Refer to the Electrical Drawings for the location of transmitters, control stations, motor drives and centers, variable speed drives, control panels, wiring diagrams, network, and computer equipment.

B. Work Included:
1. Refer to Paragraph 1.1.A.1 for list of specifications.
2. Equipment Control:
3. Application Development:
   a. The AESS, will provide PLC programming, SCADA programming, and IP addresses for all network equipment for equipment control or connection to control, status indication and alarm annunciation of equipment as shown in the Instrumentation Drawings, and described in Section 13441 – Control Loop Descriptions. Programming shall also be in accordance with 13442.
   b. The Contractor, SI, and AESS shall coordinate the schedule the work of this project. Contractor schedule to accommodate the AESS to follow systems through and limit the amount of simultaneous systems being
4. Application Development: Refer to Section Appendix C.
5. Meetings:
   a. The SI shall attend a Pre-Instrumentation meeting with the Contractor, Engineer, and others prior to the submission of any specifications.
   b. The SI shall attend construction meetings as necessary to coordinate construction sequencing.
   c. The AESS shall attend SCADA meetings for SCADA screen development with Owner and Engineer. Refer 13443.
   d. The AESS shall attend construction meetings as necessary to coordinate construction sequencing.
   e. The Contractor, SI, and AESS shall attend a separate construction meeting shall be dedicated specifically for SCADA Testing to include types of test, responsibility and requirements, scheduling, coordination, verification of test results prior to witness testing by the Engineer/Owner, and testing notification requirements.

6. Miscellaneous:
   a. Furnish and install all transducers, media converters, protocol converters, terminals, transformers, interposing or pilot relays (for both new and existing equipment), signal transmitters, signal splitters/boosters, intrinsic safety barriers, power supplies, power supply connections and other miscellaneous instrumentation required to make a complete system for new and existing equipment.
   b. Furnish and install all vendor or manufacturer cables and appurtenances between primary instruments and the transmitters, receiving instruments or destination terminals. All methods, materials and supplies will meet the requirements of Division 16.
   c. Furnish mounting hardware for each instrument. The System Integrator will provide information on the proper installation in accordance with the Manufacturer's requirements for each instrument and shall supervise the installation. Tubing, process taps and an isolation valve will be provided under Mechanical in Division 11 and 15. Coordinate the size and type of connection required. Refer to the Instrument Installation Detail Drawing in the Contract.
7. O&M Documentation:
   a. Provide complete O&M documentation as listed under paragraph 1.4 and other related Division 13 specifications.
8. Demolition:
   a. Remove and/or relocate existing equipment as indicated on the Drawings.
   b. Deliver PLC, OIT, and communications equipment not reused to Owner.
9. Coordination:
   a. Process Instrumentation and Process Control Systems will be provided under Division 11, where specified. The System Integrator shall coordinate with the instrumentation and control systems provided under these sections.
   c. Conduit and wiring (excluding integral or vendor furnished cables and fiber optics) shall be provided and tested under Division 16 and as shown on the Electrical Drawings.
   d. The SI shall provide the control panel drawings as specified in Section 13444 to be used by the Electrical Contractor and shall assist the electrical contractor with termination of field wiring inside the control panel.
   e. The SI shall coordinate with the Electrical Contractor to update all ISA S5.4 or equivalent loop diagrams with actual terminal and wire label information.
   f. Provide manufacturer recommended installation and mounting requirements for each instrument to be connected to process equipment, piping or fittings requiring a process connection such as NPT taps, sample piping and process line insertion. The System Integrator will supervise and provide guidance on proper installation of instrumentation equipment. This shall include manufacturer's recommended mounting installation heights and locations for gas detection sensors, clearances for level sensors per manufacturer's blanking distance, etc.

g. The AESS shall coordinate with Division 11 control panel manufacturers in establishing network communications as required on the Drawings, and the signals required in Section 13441.

h. If the Division 11 provided PLC's communication protocol does not match that of the PLC being provided by the Division 13 System Integrator, the System Integrator shall provide a protocol converter as specified in Section 13445. The System Integrator shall provide communication parameters and network addresses to the Division 11 control panel manufacturer. The Division 11 control panel manufacturer shall coordinate communication and programing requirements with the Division 13 System Integrator prior to programing effort. Any programming and network configuration changes shall be done to provide network communication shall be provided at no cost to the Engineer and Owner.

i. The General Contractor shall coordinate with the System Integrator to maintain project schedule. General Contractor shall notify the SI 5 business days prior to startup activities and give the SI a choice between 2 days for scheduling.

i. The System Integrator shall provide additional programming as described in 13441.

C. Related Work by Others under this Contract:

1. Local control stations (including E-stops, local hand switches, speed pots, and local indicating lights) and equipment control panels (i.e. MCCs, VFDs), indicated on Electrical Drawings.

D. Demonstration of Complete Instrumentation and Process Control System:

1. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated by the Contractor and accepted by the Engineer in writing. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.
2. After the Instrumentation and Process Control System is completed, and when directed by the Engineer, demonstrate the total system operation and make final adjustments to the system. If any system or piece of equipment within a system fails to function properly, rectify such defects or inadequacies and make a final demonstration as directed by the Engineer.
3. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation of each partial or complete system installed under this Contract where noted.
4. Pay all charges or fees, including the cost of any special test equipment, factory engineers, etc., necessary for the proper performance of the specified tests, demonstrations and instructions.
5. All demonstrations and instructions referred to shall be scheduled at the convenience of the Engineer and the Owner and in no case shall be scheduled without at least 72 hours written notice to the Engineer. Testing and certification of equipment shall not be scheduled until all instrumentation and electrical equipment have been installed, calibrated including testing/transmitting of

alarms, status, etc. have been performed in the field in accordance with the Specifications. Once the systems have been tested in the field, the Contractor shall notify the Engineer a minimum of 72 hours before a formal startup and testing of each location. All testing of the equipment or system(s) shall be performed in a single contiguous block of testing dates or as agreed upon by the Engineer.

6. Service calls:
   a. Provide system integrator services of "5" 8-hour working days upon request of the Owner within the first year of operation.
   b. Refer to 13441 for additional programming hours.
   c. Assume one round trip per service day, provide all necessary travel time to the job site to accommodate all service and training days. Unused time shall be issued to the Owner as a credit. Unused trips shall be credited to Owner at half rate.

E. Removals, Relocations and Rearrangements:
   1. Examine the existing site for the work of all trades, which will influence the cost of the work under Division 13. This work shall include removals, relocations and rearrangements relating to the work of all trades which may interfere with, disturb or complicate the performance of the work under Division 13; and relating to the work involving systems, equipment and related service lines which shall continue to be utilized as part of the finished project.
   2. Provide in the bid a sufficient amount effort to include all removals, relocations, rearrangements and reconnections herein specified, necessary or required to provide approved operation and coordination of the combined new and existing systems and equipment.

1.2 QUALITY ASSURANCE

A. All materials provided under this Contract shall be equal in quality, appearance and performance to that specified herein and shall be subject to the approval of the Engineer. Verify the availability of all materials proposed to be used in the execution of the work prior to submitting same for the Engineer's approval. Supply chain issues or the discontinuance of production of any material or product after approval has been granted shall not relieve the Contractor from furnishing an Engineer approved alternate of comparable quality, function, and design without additional cost.

B. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements. Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.

C. Materials and equipment with any chipset furnished under this Contract shall be purchased and supported by the manufacturer or by an authorized manufacturers representative.
   1. A certificate of authenticity or manufacturers manifest shall be provided at Engineers request.

D. Material and equipment furnished under this Contract shall acceptable for use by all applicable government agencies (E.g. EPA, DHS, etc.) for use with critical infrastructure (E.g. the National Defense Authorization Act of 2018 banned the use

of Hikvision and it shall not be used on any projects).

E. The Contractor shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of supporting and maintaining these systems. Provide throughout the warranty period as defined in 00800, all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, installation methods, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.

F. System Integrator:
   1. The Contractor's attention is directed to the fact that the instrumentation is an integrated system and as such, shall be furnished by one supplier, who shall provide all of the equipment and appurtenances regardless of manufacturer, and be responsible to the Contractor for satisfactory operation of the entire system provided. Substitutions on functions specified will not be acceptable.
   2. The exception shall be where instrumentation and control packages are furnished by respective equipment manufacturers as required in Division 11, 14, 15, and 16. All necessary provisions will be made to ensure a proper signal and communication interface as indicated on the P&IDs and associated equipment specifications between the main process instrumentation and control packages specified within this section and those provided. The Contractor shall provide startup reports which demonstrate proper operation of Division 11, 14, 15, and 16 equipment and associated Division 11 control systems.

G. Acceptable System Integrators:
   1. Red Group, Metairie, LA
   2. Louisiana Radio Communications, Inc, Lake Charles, LA
   3. ControlWorx, Baton Rouge, LA
   4. Or equal, having a minimum of 5 years' experience in supplying comparable systems.

1.3 SUBMITTALS

A. Shop Drawings and Samples:
   1. Submit Shop Drawings and O&Ms in accordance with General Conditions Section 01340 and as indicated herein.
   2. Shop Drawings shall consist of:
      a. Project name and location
      b. Contractor's name
      c. Index Sheet - Listing the equipment being submitted utilizing equipment designations, or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/type and catalog number. The .pdf shall also have integral bookmarks.
      d. Manufacturer's scale or dimensioned drawings along with standard catalog number.
      e. Equipment ratings, service clearances and configuration.
      f. Listing of accessories to be furnished
      g. Panel wiring diagrams showing the location of each mounted component, front panel elevation(s), internal wiring diagram of each component including terminal numbers.

h. Bill-of-Material Table showing a complete listing of the components in each control panel. Table shall include separate columns for the following: Item Number, Quantity, Manufacturer, Part number, Description, Designator Tag, Supplier name and phone number.
i. Initial and record ISA S5.4 loop diagrams or equivalent showing point to point wiring for all instrumentation equipment including terminal numbers. Prior to final completion, update the above drawings with wire labels and terminals provided by the Electrical Subcontractor. Refer to Section 13444 for additional information.
j. SAT Report:
    i. The SI shall furnish an I/O checkout sheet identifying and acknowledging that field wiring is properly terminated to the SI furnished hardware.
    ii. The SI shall furnish a checklist of all the instruments that have been configured and ready for additional testing.
    iii. The SI shall furnish a checklist of all of the PLC, SCADA, network, and security functions that have been tested.
k. SCADA screens, OIT screens, and database tags.
l. Refer to the other Division 13 Sections for additional shop requirements.

3. All material shall be contained in one submission; partial submissions will not be accepted.
4. Submissions shall be in the form and quantity indicated in the General Conditions. Each equipment type shall be separated by index tabs with typewritten titles.
5. Provide samples of programs, graphics, etc., within 10 days upon receipt of request from the Engineer.

B. Maintain properly documented and witnessed test and checkout reports and submit these to the Engineer. No form of energy shall be applied to any part of the instrumentation system prior to receipt by the Engineer, from the Contractor, of the supplier's certified statement of approval of the installation and containing his authorization to energize the system, except that the supplier's serviceman may do so for the purpose of check-out as described herein.

1.4 DELIVERY, STORAGE AND HANDLING

A. Coordinate material and equipment delivery with the project schedule. Notify the Engineer immediately, in writing, if material or equipment delivery will adversely affect the project schedule, include documentation from equipment suppliers indicating the revised delivery dates and the reason for the delay.
B. Coordinate delivery of equipment directly to other vendors where instrumentation supplied under this section has to be installed in panels supplied under other specification sections.
C. Exercise care during loading, transporting, unloading and handling of materials to prevent damage.
D. Check for defective or damaged materials, and for incomplete equipment shipments within seven days after equipment delivery to the project site.
E. Store materials and equipment on the construction site in enclosures or under protective covering in order to assure that materials and equipment are kept

undamaged, clean and dry. The Contractor shall maintain an inventory of instruments and control panels received on site and store in a safe, secure, dry and temperature controlled location. This inventory shall be made available to the Engineer upon request.

F. Replace or repair, to the satisfaction of the Engineer, all materials and equipment that are defective or that have been damaged during installation, at no additional cost to the Owner.

1.5 O&M REQUIREMENTS:

A. Provide the Owner with a list of local service departments of duly authorized distributors of materials and equipment of the type installed, which will stock the manufacturer's standard parts, etc. The list may be included on the bill-of-materials.

B. At the completion of the installation, provide Record Drawings on sheets no less than 11" x 17", indicating the final configuration of all systems as they were installed. Symbols, equipment designations, instrument ISA designations, etc., shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground. The following diagrams shall be included:

1. Control Panel diagrams on 11" by 17" sheet showing the front face and panel mounted equipment with full listing of components including names, descriptions and model numbers for each component. One copy of the panel diagrams will be laminated for insertion into the pocket inside each control panel.
2. Point to Point terminal wiring diagrams for all field instruments, motor starters, equipment drives, valve actuators and other field equipment connected to the control system. When called out provide diagrams meeting ISA S5.4 standards requirements for loop diagrams on 8½" by 11" sheets, showing one loop per sheet. Drawings shall reflect as built conditions.
3. Panel wiring diagrams showing the location of each mounted component; front panel elevation(s) and name plates; internal wiring diagram of each component including field instruments and terminal numbers; and network communications including all provided equipment, on 11" by 17" sheets.
4. Network diagrams on 11" x 17" format. Refer to Section 13444 for additional requirements.
5. Provide a hardcopy set of applicable drawings in each control panel and one binder with a hardcopy of all record drawings.
6. Provide a copy of all record drawings to the Owner and Engineer in AutoCAD DWG format or Adobe PDF format on a USB drive. .pdfs shall have integral bookmarks denoting all sections and subsections. USB drive shall be clearly labeled.

C. Refer to the other Division 13 Sections for additional O&M requirements.

D. O&M Manual Organization:

1. O&M's shall be organized to be easily navigable. Devices shall be arranged by group and type. Example, all flow meters will be grouped together and arranged so that mag meters are together, than thermal mass meters, etc. .pdf's shall be bookmarked.

2. The hardcopy operations and maintenance manuals shall be organized in three ring binders with a maximum size of 4". The following is a proposed outline for the O&M Manual(s), provide applicable Sections and information:

TITLE
Table of Contents
Section 1 - Reserved for description of system by Owner
Section 2 - Field Instruments (arranged by device group and type, ex. Flow meters, submersible level, floats, etc.)
2.1 Instrument schedule / Bill of Materials.
2.2 ISA data sheets and instrumentation listing with part numbers
2.3 O&M literature for each type of instrument with labeled dividers
2.4 Instrument configuration data
Section 3 - Panel Equipment (arranged device type)
3.1 Bill-of-Material Table
3.2 O&M and Manufacturer's literature
Section 4 - Miscellaneous devices (arranged alphabetically by manufacturer)
4.1 Bill-of-Material Table
4.2 O&M and Manufacturer's literature
Section 5 - Drawings
5.1 Network drawings
5.2 Panel fabrication and assembly drawings
5.3 Panel wiring diagrams
5.4 Interconnection wiring diagrams
Section 6 - PLC
6.1 CPU, memory capacity, communication ports
6.2 Rack Layout and module configuration
6.3 I/O List
6.4 PLC communication parameters/ port configuration
Section 7 - Miscellaneous Data
7.1 Data Networking Equipment List
7.2 Data Networking Equipment Configuration, IP Addresses, Layout, and Security Access.
7.3 Fiber Optic Cable installation pull-test, and signal test reports.
7.4 Radio telemetry study or startup testing results, license details, signal strength report, path profile, communication parameters, ERP, addresses, polling parameters, etc.
Section 8 - Software programs and PDF Literature
8.1 PLC Programming Software
8.2 OIT Programming Software
8.3 SCADA Software and Licenses
Section 9 - Program
9.1 PLC Program in native format with data tag registers, cross reference list, and comments.
9.2 PID parameter printouts (per loop)

9.3 OIT programs in native format with screen color Printouts, communication configuration, and data tag printout.
9.4 SCADA programs with screen color printouts, communication configuration, and data tag printout.
9.5 Custom Report Printouts
9.6 Alarm Configuration and alarm tag printouts.

E. The cover and edge of each volume shall contain the following information:

East Bank Phase I WW Improvements
City Of New Orleans

Instrumentation and Control System
Operations and Maintenance Manual
Specification Section 13###
Volume X of Y
(where X is the volume number and Y is the number of volumes)
Subcontractor Name, Date

F. Electronic O&M Information:
1. Supply all electronic files on USB solid state media.
a. .PDFs shall be electronically bookmarked by order of O&M and be electronically navigable.
b. Scanned .PDFs shall not be accepted.
2. Refer to other Division 13 specifications for additional information.

G. Warranty Documentation: The Contractor and System Integrator shall investigate, diagnose, repair, update and distribute all pertaining documentation of deficiencies which become evident during the warranty period. All such documentation shall be submitted to the Engineer within 30 days of solving the problem.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
1. All of the equipment and software shall be the manufacturer's latest proven design. If a piece of equipment or software was sole sourced, but is no longer the current version, the SI shall propose and carry the latest version of the product migration path. Specifications and Drawings call attention to certain features, but do not purport to cover all details entering into the design of the instrumentation and process control system. The completed system and the equipment furnished by the Contractor shall be compatible with the functions required.
2. Components shall be finished to the manufacturer's standard for the service intended unless otherwise indicated in the Specifications or on the Drawings.
3. All electrical components of the system shall operate on 120-volt, single-phase, 60-Hertz current, except as otherwise noted in the specifications and drawings. Power shall be supplied from either local electrical distribution panels, or an

associated control panel UPS with breakers for each circuit as indicated on the Instrumentation and Electrical drawings.

4. All controls for electrically operated or motor-driven equipment (including electrically actuated valves, small pumps and chemical feed equipment, etc.) shall be complete, including all necessary auxiliary relays, so as to require only wiring and connections to the equipment control circuit. All contacts for control of motor-operated or electrically operated equipment shall be rated not less than 10 amperes on 120 volts unless otherwise specified herein.
5. Panel components including switches, relays, instrumentation, etc. supplied by the various process equipment manufacturers, but indicated to be installed within panels furnished by the System Integrator, shall be furnished to the System Integrator for incorporation into his panels. Equipment shall be installed to the manufacturers requirements and recommendations. System Integrator shall install these items within his panel and shall produce a complete, functional, pre-wired system for installation requiring only external power and instrumentation connections. The Contractor shall coordinate this requirement and shall ensure that equipment manufacturers provide all necessary installation instructions and requirements to the System Integrator.
6. Identification:
    a. All panels, and control devices shall have identifying nameplates. Equal quality nameplates shall be attached to all field-installed units.
    b. Each field transmitter shall have an attached manufacturer's tag with the Manufacturer's name, model number, serial number, power requirements, and scaled range of the instrument.
    c. Provide suitable lamicoid labels for each process measurement element and transmitter. Label will identify each medium being measured, range and units of measurement and indicating transmitter/element ID No., for example:

Return Sludge Pump Flow
0.00 to 500 (GPM)
FIT-5210

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. The Specifications and Drawings do not attempt to fully indicate the degree of assembly, subassembly, shipped condition, extent of field work, or degree of accuracy required to install the equipment or materials. The Contractor shall be required to rely on his prior experience or to otherwise inform himself of the amount of field work required to assemble, erect, and install the equipment or material, as received, to produce a finished installation ready for use or operation.
2. All equipment installed as part of the work shall be positioned, assembled, aligned, doweled, and otherwise set to the tolerances required by the equipment

manufacturer. Where tolerances and methods are not specifically indicated, they shall be in accordance with best millwright practice.

3. All materials incorporated in the work shall be installed in accordance with the Drawings and Specifications. Where detailed drawings or technical specifications are not provided, the materials shall be installed in accordance with the manufacturer's preferred recommendations and conforming to the best practice of the trade involved. Installation shall include all accessories required to produce a completed installation ready for use.
4. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated and accepted in writing. Final demonstrations shall be made only after the Owner and Engineer are satisfied that the work has been completed in accordance with the intent of the Contract Documents.
5. Sensors or instrumentation to be installed shall be provided with sufficient cable length and mounting configuration for easy removal, service, and replacement. The service of the instrument shall not require its wiring removed or disconnected. Any instrument found deficient in this area shall be reconfigured by the Contractor as approved by the Engineer at no additional cost to the Owner or Engineer. Refer to instrumentation details or submit an RFI prior to procurement, submittal, and/or installation.

B. Electrical Work:
   1. All electrical work shall conform to the requirements indicated in Division 16.
C. Procedures Prior to Startup (Preliminary SAT):
   1. The Contractor and System Integrator shall:
      a. All wiring will be installed, terminated, and tested by the Contractor in each control panel. Wire labeling shall be coordinated between the SI and the Electrical Contractor during construction to assign terminal numbers in loop drawings of all field terminations, including intermediate junction boxes. Refer to Section 16010.
      b. Coordinate and schedule the work of the SI service personnel through Engineer as necessary. The SI shall be onsite during VFD and MCC startup and configuration to verify proper connection and scaling to the control panel using PLC program.
      c. Coordinate and schedule the work of the AESS service personnel through Engineer as necessary. The AESS shall be onsite during VFD and MCC startup and configuration to verify proper connection and scaling to the control panel using PLC program.
      d. Coordinate and schedule the work of the SI service personnel through Engineer as necessary. The SI shall be onsite during the control startup of Division 11 systems to verify proper connection and scaling to the control panel using PLC program.
      e. Calibrate and configure all Division 13 supplied instrumentation as specified in Section 13440.
         i. Verify that each instrument is properly installed, configured, and is properly measuring values for the application.
         ii. Coordinate with the SI that the control system is scaling matches the

instrument scaling.

iii. Provide digital averaging/filtering or any other advanced configuration where required for proper equipment control. This "filtered" engineering process signal used for process control shall accurately track and represent the original engineering process signal without "turbulence", "signal delay" or "signal droop".

iv. Configure all instruments to fail in the safest condition for the specific application. Example, a wastewater pump station with backup floats should have the analog level measurement fail low and a water plant finish water chlorine instrument should fail to a value to shut the facility down.

f. Coordinate with Division 11 control panel manufacturers in establishing network communications as required on the Drawings. If the Division 11 provided PLC's communication protocol does not match that of the PLC being provided by the Division 13 System Integrator, the System Integrator shall provide a protocol converter as specified in Section 13445.

g. Verify the facility installation.

h. Be onsite during Equipment Startup to verify equipment wiring and basic functionality of Division 13 furnished equipment.

i. Coordinate and verify interface with electrical equipment, including field wiring terminations.

j. Document hardware configuration and wiring information.

k. Configure all furnished network equipment unless otherwise specified.

l. Demonstrate network functionality.

2. The Contractor and AESS shall:

a. Coordinate with Division 11 control panel manufacturers in establishing network communications as required on the Drawings, and the signals required in Section 13441. The Division 11 control panel manufacturer shall coordinate communication and programing requirements with the AESS prior to programing effort. Any programming and network configuration changes shall be done to provide network communication shall be provided at no cost to the Engineer and Owner.

b. Prior to the witnessed site acceptance testing, the AESS shall perform a preliminary test to verify operation prior to witnessed testing. The Contractor shall assist as necessary.

c. Perform and IO checkout from field device to PLC prior to any automated and PLC testing.

i. The AESS shall monitor and manipulate the PLC inputs and outputs through the PLC program.

ii. The Contractor, Electrical Contractor, and SI will assist with testing IO from devices. The individual(s) assisting with checkout shall be qualified to do the required testing.

d. Coordinate VFD interface and scaling.

D. Site Acceptance Testing

1. A Site Acceptance Test shall be performed on each Division 13 control system after the installation at each site to verify that each instrument and equipment drive is connected properly to the control panel and that all functions of the control system and network are operating as specified.
    a. The Contractor shall schedule Startup, SAT, Training, and Punchlist activities with the Engineer at least 5 business days in advance.
    b. The Contractor shall not schedule more than 3 days of site acceptance testing, training, or punch list activities during any week without agreement from the Engineer and Owner. No site acceptance testing shall occur on Fridays without agreement from the Engineer and Owner.
    c. Site Acceptance Testing shall be started no later than 4 weeks prior to substantial completion.
    d. Additional SAT activities restrictions may be determined by the Owner to maintain plant operations.
2. The Contractor and SI shall:
    a. Verify the facility installation.
    b. Demonstrate proper instrument configuration.
    c. Provide final instrument field calibration sheet/documentation after SAT has been completed.
    d. Verify accuracy of documentation, operator's manuals, software documentation, and site operating instructions, etc. after SAT has been completed. Documentation shall include all field modifications.
    e. Troubleshoot and correct any hardware deficiencies, including, but not exclusive to communications issues identified by the SI that are not due to the configuration of the device.
    f. Be available during the Site Acceptance Test to correct any hardware deficiencies and/or adjust instrument configurations as necessary.
3. The Contractor and AESS shall:
    a. The AESS will be responsible for all PLC, OIT, and SCADA programming. The Contractor will be responsible for all hardware and equipment unless otherwise specifically stated.
    b. Demonstrate each functional requirement identified by the Specification.
    c. Demonstrate all equipment control functions, including the operation of automatic control strategies. Actuation of field devices and operation of equipment shall be closely coordinated with Engineer and Owner's staff.
    d. Demonstrate all networking functionality.
    e. Verify system performance parameters and system responses under field operational conditions.
    f. Demonstrate all equipment control functions, including the operation of automatic control strategies. Actuation of field devices and operation of equipment shall be closely coordinated with Engineer and Owner's staff.
    g. Demonstrate that the parameters for every PID operation in the PLC provide a smooth responsive transition without over oscillation with a sudden change in the process value or set point. PID parameters will be determined, verified, and demonstrated with trends. Trends will display

trending of the process variable, controlled variable, and set point over time.

i. Demonstrate that the operation of the PID does not over exercise the duty cycle of the device/equipment delivering the Control Variable.

h. Provide PID block information to Engineer in advance of the SAT per the following but not limited to:
   i. Position or Velocity PID block equation
   ii. Dependent or Independent PID block gains
   iii. Loop Update time and manner in which PID block is activated

i. Provide digital averaging/filtering or any other advanced configuration in instruments or PLC program where required for proper equipment control.

j. Verify system performance parameters and system responses under field operational conditions.

k. Verify accuracy of documentation, especially operator's manuals, software documentation, and site operating instructions. Documentation shall include all field modifications.

l. Provide completed site acceptance testing (SAT) test documentation. Including:
   i. Startup reports
   ii. Initial startup values

4. Provide a brief 10 to 30 minute training session to Owner after a successful SAT of each system to provide sufficient conceptual control understanding. The SAT will be observed by the Engineer and/or Owner's representative.

5. Refer to Section 01800 for additional startup, testing, training requirements for the instrumentation equipment.

END OF SECTION

SECTION 13440

INSTRUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Field Instruments:
   a. Furnish and install the instrumentation as shown on the Drawings and listed in the Instrumentation Schedule at the end of this Section. The locations of the instruments are shown on the Process and Electrical Drawings.
   b. Instruments shall be installed in accordance with the Drawings and as indicated in the Manufacturer's installation manuals. Any deviation in instrumentation or electrical installation requirements for the supplied equipment shall be provided at no additional cost to the Owner.
   c. Provide support as necessary during Site Acceptance Testing to adjust the configuration of field instruments (E.g. signal dampening, ranges, echo suppression, etc.).
   d. Provide ISA sheets and instrument configuration documentation after acceptance testing.
2. Miscellaneous:
   a. Furnish and install all transducers, media converters, protocol converters, terminals, transformers, interposing or pilot relays (for both new and existing equipment), signal transmitters, signal splitters/boosters, intrinsic safety barriers, power supplies, power supply connections and other miscellaneous instrumentation required to make a complete system.
   b. Furnish and install all vendor or manufacturer cables and appurtenances between primary instruments and the transmitters, receiving instruments or destination terminals with sufficient service loop. Manufacturer cables between elements and transmitters shall not be spliced without prior engineer approval. All methods, materials and supplies will meet the requirements of Division 16.
   c. Furnish mounting hardware for each instrument. The System Integrator will provide information on the proper installation in accordance with the Manufacturer's requirements for each instrument and shall supervise the installation. Tubing, process taps and an isolation valve will be provided under Mechanical in Division 11 and 15 unless otherwise specified. Coordinate the size and type of connection required. Refer to the Instrument Installation Detail Drawing in the Contract.
3. Acceptance Testing:
   a. Additional Requirements are specified elsewhere including but not necessarily limited to Section 01800, 13410, and 13444.

4. O&M Documentation:
    a. Provide complete O&M documentation as listed in Specification 13410, including:
        i. Final ISA S20 instrument data sheets (or equivalent) with updated calibration data. The ISA instrument datasheet shall be representative of the latest version. If the calibration and configuration data is on the instrument configuration sheets, the calibration and configuration data does not need to be replicated.
        ii. Instrument configuration sheets (often seen in the appendixes of the instrument manuals). Configuration sheets shall be completed with all non-default setup values.
5. Coordination:
    a. Provide manufacturer recommended installation and mounting requirements for each instrument to be connected to process equipment, piping or fittings requiring a process connection such as NPT taps, sample piping and process line insertion. The System Integrator will supervise and provide guidance on proper installation of instrumentation equipment. This shall include manufacturer's recommended mounting installation requirements (clearances for level sensors per manufacturer's blanking distance, etc.) Refer to the execution requirements below for additional installation requirements.

B. Requirements specified elsewhere:
1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
    a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 QUALITY ASSURANCE

A. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements. Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.
B. Refer to installation section for qualification of the individuals configuring and calibrating provided instruments.

1.3 SUBMITTALS

A. Shop Drawings and Samples:
1. Submit Shop Drawings and O&Ms in accordance with General Conditions Section 01340, 13410, and as indicated herein.
    a. Schedule with all tags, part numbers, quantities, and authorized area representative.
    b. Manufacturer's scale or dimensioned drawings and cutsheet along with standard catalog number. Catalog number shall be written on any cutsheet that has an extensive part number or highlighted.

c. Equipment ratings, service clearances and configuration.
d. Listing of accessories to be furnished

2. All material shall be contained in one submission; partial submissions will not be accepted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. Furnish and install all vendor or manufacturer cables and appurtenances between primary instruments and the transmitters, receiving instruments or destination terminals. All methods, materials and supplies will meet the requirements of Division 16.
2. Furnish mounting hardware for each instrument. The System Integrator will provide information on the proper installation in accordance with the Manufacturer's requirements for each instrument and shall supervise the installation. Tubing, process taps and an isolation valve will be provided under Mechanical in Division 11 and 15. Coordinate the size and type of connection required. Refer to the Instrument Installation Detail Drawing in the Contract.
3. Provide manufacturer recommended installation and mounting requirements for each instrument to be connected to process equipment, piping or fittings requiring a process connection such as NPT taps, sample piping and process line insertion. The System Integrator will supervise and provide guidance on proper installation of instrumentation equipment. This shall include manufacturer's recommended mounting installation heights and locations for gas detection sensors, clearances for level sensors per manufacturer's blanking distance, etc.
4. Refer to Section 13410.

B. Instrumentation Equipment (Refer to Instrumentation Schedule at the end of this Section)

1. **Magnetic Flow Meters and Indicating Transmitters: FE/FIT**
   a. Provide electromagnetic type flow meters, as indicated in the Instrumentation Schedule, with the following requirements.
   b. Transmitter:
      i. Type: Remote Wall Mount
      ii. Display: Backlit LCD
      iii. Power: 120 VAC
      iv. Accuracy: Minimum 0.50% of rate above 1 ft/s fluid velocity
      v. Analog Output: 4 to 20 mA DC
      vi. Discrete Output: Sinking 24 VDC Pulse
      vii. Operating Temperature: -4 to 120 ºF
      viii. Electrical Connections: ½" NPT
      ix. Enclosure Rating: NEMA 4X
      x. Communications Protocol: None
      xi. Memory: Non-volatile

xii. Measuring Range: Per Instrumentation Schedule

c. Measuring Element:
   i. Type: Flange Style flow tube for continuous flow measurement
   ii. Applications:
      (1) Pretreated Waste Water
      (2) Liquid Primary and Secondary Sludge
      (3) Waste Water Final Effluent
      (4) Drinking Water
      (5) Dilute Polymer
   iii. Materials:
      (1) Housing & Flanges: Carbon Steel with painted corrosion resistant coating
      (2) Measuring tube: 304 Stainless Steel
      (3) Liner: Hard Rubber
      (4) Measuring Electrodes: Hastelloy C
   iv. Ground Reference: Stainless Steel Ground Rings
   v. Operating Temperature: -30 to 150 °F
   vi. Operating Pressure: Max 230 psi
   vii. Electrical Connection: ½" NPT
   viii. Process Connection: ANSI B16.5 Class 150 (up to 24”) / AWWA C-207 Class D (greater than 24”) connections compatible with the type and classification of pipe installed.
   ix. Size: Per Instrumentation Schedule
   x. Enclosure Rating: Per Instrumentation Schedule
d. Accessories and Spare Parts:
   i. Grounding electrodes.
e. For Flow Tubes mounted in Class I, Div. 1/2 area the entire flow meter system shall be rated for that classification and carry the required Factory Mutual approval. Refer to Instrumentation Schedule for required flow tube enclosure rating.
f. For Flow Tubes used facilities that make or transfer drinking water, the flow tube shall be compliant with NSF 61.
g. The PLC shall use a counting function, in conjunction with the transmitter pulse output, to totalize flow through the flow meter. The pulse output shall close the circuit each time a configurable volume passes through the flow tube. The pulse output shall be configurable through the flow meter transmitter.
h. Equivalent to:
   i. Siemens Sitrans Mag 5000 with 5100 flow tube
   ii. Siemens Sitrans Mag 6000I with 3100 flow tube (C1D1)
   iii. Khrohne IFC 100 with Optiflux 2000 series flow tube
   iv. Rosemount 8712E with 8750W series flow tube
   v. Rosemount 8732 with 8750W series flow tube (C1D1)
   vi. Endress & Hauser Proline 400 with Progmag W series flow tube

vii. Or Equal

2. **Submersible Level Transducer and Transmitter: LE/LIT**
   a. Provide submersible pressure transducers, as indicated in the Instrumentation Schedule, with the following requirements.
   b. Transmitter:
      i. Type: Submersible with Integral Pressure Measuring Element
      ii. Power: 24 VDC Loop Power
      iii. Accuracy: 0.25% full span
      iv. Analog Output: 4 to 20 mA DC
      v. Enclosure Rating: NEMA 6P
      vi. Communications Protocol: None
      vii. Measuring Range: Per Instrumentation Schedule
   c. Measuring Element:
      i. Type: Submersible Elastomeric Diaphragm Pressure Sensor
      ii. Applications:
         (1) Pretreated Waste Water
         (2) Liquid Primary and Secondary Sludge
         (3) Waste Water Final Effluent
      iii. Materials:
         (1) Housing: Stainless Steel or PVC
         (2) Diaphragm: Teflon
         (3) Cable: Teflon or Polyurethane
         (4) Cable Gland: Viton
         (5) Measuring Cell Fluid Fill: Silicone Oil
      iv. Diaphragm: Minimum 0.89" diameter non clogging
      v. Operating Temperature: 32 to 122 °F (compensated over entire temperature range)
      vi. Burst Pressure: 2X Full Span
      vii. Atmospheric Pressure Reference: Atmospheric reference tube with aneroid bellows breather system.
      viii. Lightning Protection: Full Lightning Protection
   d. Accessories and Spare Parts:
      i. Provide a stainless steel mounting rack with an adjustable cable stop for each submersible pressure transducer. Refer to mounting details.
   e. Process fluid shall directly act on the outer diaphragm. The pressure from the process fluid shall be transmitted to the pressure measuring element by the silicone oil fill fluid.
   f. Connect transducer signal wires to a terminal strip in a Division 16 provided junction box. Provide a minimum of 2’ of service loop of signal cable from the instrument. Bellows type vent tube will shall also be terminated in the junction box.
   g. Transducers that are mounted in a Class I, Div. 1/2 designated areas shall be intrinsically safe and be protected by a suitable intrinsically safe barrier. Refer to Instrumentation Schedule for hazardous area requirements.

h. For elements used facilities that make or transfer drinking water, the instrument shall be compliant with NSF 61.
i. Mounting
    i. Provide a 12-inch long section of 316 stainless steel pipe, ¾ to 1-inch diameter with NPT threads to mount to the transducer. The transducer and pipe shall be suspended using a stainless steel PVC coated cable with stainless steel clamps and bolts with friction nuts. Refer to details.
    ii. Submersible pressure transducers that are 2-inch in diameter or smaller shall be installed in a stilling well. Stilling well shall be constructed of 3-4" PVC and suspended from the wall of the wetwell by stainless steel pipe clamps.
    iii. The measuring face of the field instrument shall be located approximately 6" above the tank finished floor.
    iv. Install aneroid bellows in Division 16 supplied junction box.
j. Equivalent to:
    i. KPSI Model 705
    ii. Contegra Model SLX130
    iii. Or equal

3. **Pressure Switch: PS, PSL, PSH, PDSH**
    a. Provide a pressure switch, per Instrumentation Schedule, with the following requirements
    b. Pressure Switch:
        i. Type: Single point or differential electro mechanical pressure switch with diaphragm sealed piston actuator
        ii. Application:
            (1) Drinking Water
            (2) Raw Waste Water
            (3) Liquid Primary and Secondary Sludge
            (4) Neat and Dilute Polymer
            (5) Waste Water Final Effluent
            (6) Waste Water Plant Water
            (7) Air
        iii. Materials:
            (1) Housing: Cast Aluminum
            (2) Diaphragm: Stainless Steel
        iv. Switch Contacts:
            (1) SPDT
            (2) 10 amps at 120 VAC
        v. Setpoint Adjustment: Mechanical adjustment screw
        vi. Operating Temperature: 0 to 160 °F
        vii. Enclosure Rating: NEMA 4X
        viii. Electrical Connections: ½" NPT
        ix. Process Connection: ¼" NPT

x. Operating Range: Per Instrumentation Schedule

c. Accessories and Spare Parts:
   i. Process Isolator:
      (1) Provide diaphragm seal to isolate the pressure switch from the process fluids. The pressure shall be transferred from the process fluid to a reservoir filled with silicon oil by a stainless steel diaphragm.
         (a) Diaphragm assembly shall be cleanout type, which will allow cleaning of the lower diaphragm assembly without breaking the seal or refilling
         (b) The diaphragm shall be 316 stainless steel with a 316 stainless steel housing (process and instrument flanges) and shall be fitted with a bleed screw on the instrument flange, and flushing connection on the process flange. Connecting bolts and nuts shall be 316 SS.
         (c) The diaphragm shall be rated for pressure element operating pressure range. Provide a locking plate or lock-wire to prevent turning of the assembly and to maintain the factory calibration.
         (d) The pressure element and diaphragm seal shall be factory assembled. Filling the oil reservoir in the field will not be acceptable.

d. Pressure switches mounted in Class I, Div. 1/2 shall be explosion proof and carry the required Factory Mutual approval. Refer to Instrumentation Schedule for hazardous area requirements.

e. For elements used facilities that make or transfer drinking water, the instrument shall be compliant with NSF 61.

f. Equivalent to:
   i. United Electric Control Series 100/120
   ii. Ashcroft B Series
   iii. Dwyer
   iv. Or Equal

4. **Float Type Level Switches (for Intrinsically Safe circuits): LSLL, LSL, LSH, LSHH**

a. Provide a float switch, as indicated in the Instrumentation Schedule, with the following requirements. A non-mercury float switch shall be provided with non-oxidizing contacts to allow low DC voltage signals for use with intrinsic safety devices.

b. Float Switch
   i. Type: Narrow angle float switch
   ii. Applications:
      (1) Raw Waste Water
      (2) Primary, Thickened Sludge

iii. Materials: Polypropylene float
iv. Operating Temperature: 32 to 140 °F
v. Float Rating: Submersible
vi. Cable:
(1) Water resistant
(2) Oil Resistant
vii. Switch Contacts:
(1) Non-oxidizing
(3) 0.1 amps at 125 VAC or 30 VDC
(4) Non-mercury mechanically activated

c. Accessories and Spare Parts:
i. Open Tanks or Channels:
(1) Provide a stainless steel mounting rack with an adjustable cable stop for each float switch.
(2) External weight set for setting float switch activation angle
ii. Building Sumps:
(1) Wall mountable clamp for setting float switch activation level and angle

d. Class I, Div. 1/2 Installations:
i. Float switches that are mounted in a Class I, Div. 1/2 designated areas shall be intrinsically safe and be protected by a suitable intrinsically safe barrier.
ii. Float switch cables will terminate in a junction box rated for Class I, Div. 1/2 areas as required by the installation. The gas tight seal, required when transitioning between hazardous and non-hazardous areas, will be installed after the junction box. The manufactured cable will be spliced in the junction box and extend to the respective control panel.

e. Refer to Instrumentation Schedule for hazardous area requirements. Equivalent to:
i. Milliampmaster Control Switch by SJE Rhombus
ii. 9G-EF Float Switch by Siemens
iii. SNF-52 Series by MDI
iv. Eco-Float Gold by Anchor Scientific
v. or equal

5. **Float Type Level Switches (for Non-Intrinsically Safe circuits): LSLL, LSL, LSH, LSHH**

a. Provide a float switch, as indicated in the Instrumentation Schedule, with the following requirements.

b. Float Switch
i. Type: Narrow angle float switch
ii. Applications:
(1) Raw Waste Water
(2) Drinking Water

(3) Waste Water Final Effluent
(4) Primary, Secondary, Thickened Sludge
iii. Materials: Polypropylene float
iv. Operating Temperature: 32 to 160 °F
v. Float Rating: Submersible
vi. Cable:
(1) Water resistant
(2) Oil Resistant
vii. Switch Contacts:
(1) SPDT
(2) 5 amps at 120 VAC or 24 VDC
(3) Non-mercury mechanically activated

c. Accessories and Spare Parts:
i. Open Tanks or Channels:
(1) Provide a stainless steel mounting rack with an adjustable cable stop for each float switch.
(2) External weight set for setting float switch activation angle
ii. Building Sumps:
(1) Wall mountable clamp for setting float switch activation level and angle

d. Equivalent to:
i. Signal Master by SJE Rhombus
ii. Series M by Warrick Controls
iii. LS Float Switch by Siemens
iv. or equal

6. **Temperature Element and Indicating Transmitter: TE/TIT**

a. Provide an industrial temperature element with transmitter, as indicated in the Instrumentation Schedule, with the following requirements.

b. Transmitter:
i. Type: Wall mountable industrial temperature transmitter for degrees F.
ii. Display: 7 Segment LCD
iii. Power: 24 VDC Loop
iv. Accuracy: +/- 1.0 ºF
v. Analog Output: 4 to 20 mA DC
vi. Operating Temperature: 32 to 95 ºF
vii. Electrical Connections: ½" NPT
viii. Enclosure Material: Powder Coated Aluminum
ix. Enclosure Rating: NEMA 12
x. Communications Protocol: None

c. Temperature Element:
i. Type: 100 or 1000 ohm, 3 wire Platinum Sensor
ii. Applications:
(1) Ambient Air

iii. Mounting: Wall mount with bracket kit as shown on the drawings.

d. Equivalent to:
   i. Devar Inc. d-RTTI series
   ii. Allen Bradley 1414 series
   iii. Or Equal

7. **Temperature Element and Indicating Transmitter: TE/TIT**
   a. Provide an industrial temperature element with transmitter with the following requirements.
   b. Transmitter:
      i. Type: Industrial temperature indicating transmitter for degrees F.
      ii. Display: 4 Digit LED with 0.4-inch-high, red characters
      iii. Power: 24 VDC Loop
      iv. Accuracy: +/- 1.0 ^{o}F
      v. Analog Output: 4 to 20 mA DC
      vi. Operating Temperature: -40 to 180 ^{o}F
      vii. Electrical Connections: ½" NPT
      viii. Enclosure Material: Polycarbonate
      ix. Enclosure Rating: NEMA 4X
   c. Temperature Element:
      i. Type: 1000 ohm, Platinum RTD
      ii. Applications:
         (1) Ambient Air
   d. Mounting: Provide with optional conduit fitting (½" NPT, water tight) or hardware as necessary to wall mount.
   e. Equivalent to:
      i. Devar Inc. RTI series
      ii. Honeywell
      iii. ifm
      iv. Or Equal

8. **Chlorine Residual Analyzer: AE/AIT (Type CL)**
   a. Provide a chlorine analyzer and transmitter, as indicated in the Instrumentation Schedule, with the following requirements.
   b. Transmitter:
      i. Type: Remote Wall Mount
      ii. Display: 0.5" Backlit LCD
      iii. Power: 120 VAC
      iv. Accuracy: 0.50%
      v. Analog Output: Two (2) 4 to 20 mA DC
      vi. Discrete Output:
         (1) (3) SPDT relay individually configurable
         (2) Contact Rating: 5 amps at 120 VAC or 24 VDC
      vii. Operating Temperature: -20 to +60 ^{o}C
      viii. Electrical Connections: ½" NPT
      ix. Enclosure Rating: NEMA 4X

x. Communications Protocol: None
xi. Memory: Non-volatile
xii. Measuring Range: Per Instrumentation Schedule
xiii. Mounting: Per Field Instrumentation Enclosures in this Section
xiv. Shall output last known measured value when in "maintenance mode" for calibration. If instrument does not have the function, PLC programming shall implemented to provide the intent.

c. Analyzer:
i. Type: Colorimetric for free, combined or total chlorine. Power: 120 VAC
ii. Accuracy: +/- 5%
iii. Display: Backlight LCD
iv. Analog Output: 4 to 20 mA DC
v. Discrete Output:
(1) Two (2) SPDT relay individually configurable
(2) Contact Rating: 5 amps at 120 VAC or 24 VDC
vi. Enclosure:
(1) NEMA 4X
(2) Thermoplastic
(3) Wall Mountable
vii. Analyzer shall utilize buffering reagents for analysis.

d. Accessories and Spare Parts:
i. Provide all required sample conditioning equipment as recommended by the manufacturer including filters, flow regulation valves, shutoff valves for wastewater effluent application.
ii. Provide one set of sample pump replacement tubing.
iii. Provide 6 months' worth of reagents.

e. Equivalent to:
i. HACH CL17sc and sc4500
ii. Or Equal

9. **Beacon Light:**

a. Beacon lights shall be provided as shown on the drawings and in the instrumentation schedule. Beacon lights shall remain solid.
b. Power: 120 VAC
c. NEMA Rating: Refer to Instrumentation Schedule
d. Each light shall be provided with a mounting bracket suitable for wall mounting to the building.
e. Size: 90 or 120 mm
f. LED lamp.
g. Each light shall be provided with a red Fresnel lens.
h. Equal to:
i. Allen-Bradley 855B Round Industrial Beacon
ii. Federal Signal
iii. Or Equal

10. **Weather Station:**
    a. Provide a weather station, as indicated in the Instrumentation Schedule, with the following requirements.
    b. Instrument:
        i. Type: Wall Mount
        ii. Analog Output: Seven (7) 4 to 20 mA DC
        iii. Pulse Output Sensor: One (1)
        iv. Operating Temperature: -20 to +60 ºC
        v. Electrical Connections: ½" NPT
        vi. Enclosure Rating: Weatherproof
        vii. Mounting: 8+ inches above the ground or roof. Pre-existing base or Global Water Tripod.
    c. Materials:
        (1) Mounting: Stainless Steel
        (2) Mounting Connections: 1” NPT
    d. Accessories and Spare Parts:
        i. Solar Shield with high reflectiveness, low heat retention and low thermal conductivity.
    e. Equivalent to:
        i. Xylem WE900 Weather Station
        ii. Or Equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. The Specifications and Drawings do not attempt to fully indicate the degree of assembly, subassembly, shipped condition, extent of field work, or degree of accuracy required to install the equipment or materials. The Contractor shall be required to rely on their prior experience or to otherwise inform himself of the amount of field work required to assemble, erect, and install the equipment or material, as received, to produce a finished installation ready for use or operation.
2. All equipment installed as part of the work shall be positioned, assembled, aligned, doweled, and otherwise set to the tolerances required by the equipment manufacturer. Where tolerances and methods are not specifically indicated, they shall be in accordance with best millwright practice.
3. All materials incorporated in the work shall be installed in accordance with the Drawings and Specifications. Where detailed drawings or technical specifications are not provided, the materials shall be installed in accordance with the manufacturer's preferred recommendations and conforming to the best practice of the trade involved. Installation shall include all accessories required to produce a completed installation ready for use.
4. Sensors or instrumentation to be installed shall be provided with sufficient cable length and mounting configuration for easy removal, service, and replacement.

Access to the instrument shall not require its wiring removed or disconnected. Any instrument found deficient in this area shall be reconfigured by the Contractor as approved by the Engineer at no additional cost to the Owner or Engineer. Refer to installation details. Coordinate with Engineer, Electrical Contractor, and General Contractor as required.

B. Electrical Work:
   1. All electrical work shall conform to the requirements indicated in Division 16.

C. Field Calibration and Configuration:
   1. All instruments shall be configured by a qualified individual with experience configuring the instruments provided.
   2. All instrumentation shall be calibrated in the presence of the Owner and Engineer using manufacturer's recommended calibration procedure and standards.
   3. All flow and level transmitters shall be factory calibrated and set up to the extent possible at the factory. Span, range, and operating parameter adjustment shall be made at the factory or in the field by a factory trained personnel. Each system shall meet the manufacturer's standard accuracy.
   4. Analyzing instruments shall be field calibrated by a factory-trained engineer or technician using procedures recommended by the manufacturer. Provide all materials required for proper calibration. Calibration shall be done in the presence of the Engineer.
   5. Secondary functions such as alarm actuations and pacing shall be adjusted during initial calibration and demonstrated after the system is placed in service. Range adjustments shall be sealed by colored lacquer in the presence of the Engineer immediately following calibration.
   6. Instruments that fail shall be configured to default to the safest condition to provide a quality product and to not upset the process condition. Failing conditions may be different by instrument type and shall be finalized during construction. Examples include:
      a. An ultrasonic
   7. Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer.
   8. Provide instrument calibration sheet if factory calibrated (per the scaled range in the instrumentation schedule) by the instrument manufacturer.
   9. Each instrument will be provided with an adhesive sticker declaring the date of certified calibration and initialed by the factory authorized field personnel.
   10. Update any instrument configuration documentation after acceptance testing.
   11. Refer to Specification 01800 and 13410 for startup, testing, training requirements for the instrumentation equipment.

INSTRUMENTATION SCHEDULE

Phase 1A

TAG	TYPE/SIZE	DESCRIPTION	LOCATION	RANGE	UNITS	SERVICE	POWER	P&ID	C&I	CP#	SPEC. SECTION
FE/FIT-5210, 5211, 5212, 5213, 5214	MAG/ 16”	Return Sludge Flow	Return Sludge Pumps	Range	GPM	Sensor: NEMA 4X X-mitter: NEMA 4X	120 VAC	I-3	I-5	CP-NR	13440 2.1 B.1
LSH-5202	FLT	Flood Switch	North RAS Pump Room	-	-	NEMA 4X	-	I-3	I-5	CP-NR	13440 2.1 B.4
TE/TIT-5202	-	Pump Room Temperature	North RAS Pump Room	-40 - +120	Deg F	NEMA 4X	24 VDC Loop	I-3	I-5	CP-NR	13440 2.1 B.7
TE/TIT-5201	-	Electrical Room Temperature	North RAS Electrical Room	-40 - +120	Deg F	NEMA 12	24 VDC Loop	I-3	I-5	CP-NR	13440 2.1 B.6
FE/FIT-5220	MAG/ 8”	Waste Activated Sludge Flow	North Ras Pump Station	Range	GPM	Sensor: NEMA 4X X-mitter: NEMA 4X	120 VAC	I-3	I-5	CP-NR	13440 2.1 B.1
LSL-5203, 5204	FLT	Sump Pump Float Control	North Ras Pump Station	-	-	NEMA 4X	-	I-3	I-5	CP-NR	13440 2.1 B.5
LSH-5203B, 5204B	FLT	Sump Pump Float Control	North Ras Pump Station	-	-	NEMA 4X	-	I-3	I-5	CP-NR	13440 2.1 B.5

MAG - Electromagnetic	SUB - Submersible	RAD- Radar	DPI- Differential Pressure
RTD - Resistance Thermal Diode	ORP-Oxygen Reduction Potential	TURB- Turbidity	DO- Dissolved Oxygen
FLT - Float	CL- Chlorine Residual	CAP- Capacitance	ULT- Ultrasonic

END OF SECTION

SECTION 13442

PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, install, program and test the programmable logic controllers (PLCs) and all graphical interfaces as shown in the Instrumentation Drawings and described in Specification Sections 13440 and 13442 herein.
2. Furnish, install, configure, wire, and test the uninterruptable power supply (UPS) and maintenance bypass switch (MBS) as shown in the Instrumentation Drawings and described in Specification Sections 13440 and 13442 herein.
3. Provide a perpetual licensed copy licensed to and in the Owner's name, of all required PLC programming software, communication drivers, hardware interface, and cables used to program the PLC(s). The programming software shall be compatible will all hardware and software, and be capable of all functions described in 13441 and required by the PLC.
    a. Programming software to be provided on a dongle.
4. Provide a perpetual licensed copy licensed to and in the Owner's name, of all required OIT programming software, communication drivers, hardware interface, and cables used to program the OIT. The programming software shall be compatible will all hardware and software, and be capable of all functions described in 13441 and required by the OIT.
5. Requirements specified elsewhere:
    a. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
        i. Section 13410 Instrumentation and Process Control General (and as referenced).

B. Requirements specified elsewhere:

1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
    a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 QUALITY ASSURANCE

A. The PLCs and OITs form an integral part of the overall control system for the facility and as such all PLCs shall be the product of one manufacturer. The Contractor shall provide all coordination as necessary to ensure that all PLCs, whether provided by the System Integrator, individual equipment manufacturers or others, are by the same manufacturer.

1. All PLC's provided within each line-up (E.g. micro, modular, automation modular) shall be part of the same series unless otherwise specified.
2. All PLC IO modules shall be within the same series as the PLC CPU.

B. The OITs form an integral part of the overall control system for the facility and as such all OITs shall be the product of one manufacturer. The Contractor shall provide all coordination as necessary to ensure that all OITs, whether provided by the System Integrator, individual equipment manufacturers or others, are by the same manufacturer.
C. The manufacturer or its authorized representative shall provide complete technical support for all their products.

1.3 SUBMITTALS
A. Submit shop drawings in accordance with the General Conditions of the Construction Contract, Section 01340 (Submittals) and Section 13410.

1.4 DELIVERY, STORAGE AND HANDLING
A. In accordance with Section 13410.

PART 2 - PRODUCTS

2.1 GENERAL
A. The PLC shall consist of rugged components designed specifically for industrial environments. The PLC shall consist of a power supply and one or more racks containing a central processing unit (CPU) module, I/O modules, PLC memory, and PLC network interface module(s). All components shall be housed in structurally secure enclosures.
B. The central processing unit CPU shall be modular and fully enclosed within a durable plastic shroud. When mounted on the system base, the modular CPU shall not occupy more than one available slot.
C. The I/O system shall be modular. Each module shall be fully enclosed within a durable plastic shroud. When mounted on the system base, each I/O module shall not occupy more than one available slot.
D. All components within the controller family shall be manufactured with a high degree of durability. All switches and other operator controlled devices shall be of the size and durability for their intended use as is normally offered for industrial applications. All signal and/or rack expansion cables furnished by the manufacturer shall be constructed so as to withstand, without damage, all normal use and handling.
E. All components within the controller family shall be part of the same series unless otherwise specified, or noted on the drawings, or approval by the engineer.
F. In order to minimize spare parts stocking requirements, the controller family shall have a high degree of interchange ability. The system shall incorporate a modular design using plug in assemblies with pin and socket connectors. Wherever possible, all assemblies and sub-assemblies performing similar functions shall be interchangeable. The system design shall accommodate the replacement of assemblies/modules without having to disconnect field wiring. Wherever possible, removable connectors shall be used to connect field wiring to the individual circuit board assemblies. All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings each of which indicates the manufacturer's catalog number and a product manufacturing date code.
G. Refer to the control panel descriptions in Specification Section 13444.

2.2 MODULAR PROGRAMMABLE LOGIC CONTROLLERS (PLCS)

A. General: Provide Programmable Logic Controllers (PLC) in the control panels as identified on the Instrumentation Drawings, capable of performing the functions and handling the network communications as described in Section 13441.

B. The following Control Panels provided by Division 13 shall have a PLC:
   1. NR-CP
   2. DW-CP
   3. SEP-CP

C. The Following Control Panels provided by Division 11 shall have a PLC:
   1. GBTCP-1
   2. GBTCP-2
   3. PBUCP-1
   4. PBUCP-2
   5. PBUCP-3
   6. DSFP-CP-1
   7. DSFP-CP-2

D. PLC Min. Memory: .6 MB of programmable memory with battery backed-up static RAM.

E. Power: 24 VDC power supply. Each PLC and Remote I/O Module shall be powered by an uninterruptible power supply (UPS)

F. Required agency approvals:
   1. UL Listed (UL 508)
   2. CSA Certified (CSA 142)

G. PLC External Communications: The PLC shall contain 2 Ethernet ports.
   1. Ethernet ports shall be capable of operating on two different subnets.

H. Provide memory module and battery backup.

I. PLC and Remote I/O Requirements:
   1. Provide all PLCs and I/O modules shall be from a single manufacturer.
   2. Discrete Inputs: 24 VDC and 120VAC as required, maximum of 16 points per module.
   3. Discrete Outputs: 120 VAC Relay outputs or 24VDC source. Maximum of 16 points per module.
   4. Analog Inputs: 4-20 mA DC, minimum 15-bit resolution. Maximum 8 channels per module. Provide differential Inputs.
   5. Analog Outputs: 4-20 mA DC, minimum 12-bit resolution. Maximum 8 channels per module. Provide differential Outputs.

J. Future Connections: Provide a minimum of the following for future connections:
   1. 20% additional discrete inputs per PLC (rounded up) wired to terminal blocks
   2. 20% additional discrete outputs per PLC (rounded up) wired to interposing relays and terminal blocks
   3. 10% with a minimum of four (4) additional analog inputs per PLC wired to terminal blocks
   4. 10% with a minimum of two (2) additional analog outputs per PLC wired to terminal blocks
   5. two (2) module spaces for future input, output, or special modules

K. Spare Parts: Provide a minimum of the following spare parts for Division 13 panels

only:

1. one (1) PLC Processor (of each type)
2. one (1) PLC Power Supply (of each type)
3. one (1) Analog Input Module (of each type)
4. one (1) Analog Output Module (of each type)
5. one (1) Digital Input Module (of each type)
6. one (1) Digital Output Module (of each type)
7. one (1) Communication Module (of each type) (as applicable).

L. Communications Modules:
   1. Provide adapters to extend PLC communication from the CPU to separate PLC module racks as necessary for internal or external IO modules. Refer to network drawings.
   2. Provide protocol converters for communication between the PLC native protocol to other networked devices as required.
   3. Adapters shall be fully supported or compatible with the PLC manufacturer or a Manufacturer Technology Partner.

M. Acceptable Programmable Logic Controller (PLC):
   1. Allen Bradley CompactLogix 5069 Series
   2. No equal.

2.3 OPERATOR INTERFACE TERMINALS

A. General: Provide an Operator Interface Terminal (OIT) at the control panels as identified on the Instrumentation Drawings, capable of performing the functions and handling the network communications as described in Section 13441.

B. General: Provide an Operator Interface Terminal (OIT) at each control panel to continuously indicate status of equipment, change operational parameters and indicate alarm status as described in Sections 13440 and 13441. The OIT shall be fully compatible with the PLC provided. The following Control Panels provided by Division 13 shall have an OIT:
   1. NR-CP
   2. DW-CP
   3. SEP-CP

C. Screen Size: 12 inch color active matrix screen with a minimum resolution of 1200 by 800 pixels with field replaceable backlight.

D. Interface: Touchscreen rated at 1 million cycles (minimum).

E. Memory: 64 MB minimum application and graphic memory. The OIT shall also include a SD card port. Provide a compatible SD card.

F. Clock: Provide integral real time clock with battery backup.

G. Communication: Ethernet and USB ports.
   1. Ethernet interface shall be capable of communicating to two PLCs.

H. Power: 120 VAC or 24 VDC

I. Operating Temperature: 32-130°F

J. Enclosure: NEMA 12 with NEMA 4X front-face and touchpad

K. Provide hardware interface and cable used to configure the OIT.

L. Provide programming time required to configure OIT interface as described in Sections 13440, 13441 and finalized in the instrumentation meetings.

M. Provide all cables required to connect the OIT to the network or PLC.

N. The integrated OIT software shall have the following features:
   1. Trending
   2. Data Logging
   3. Alarms
   4. Graphic Symbols
   5. Animation

O. Acceptable Operator Interface Terminal (OIT):
   1. Allen Bradley PanelView 5000
   2. Factory Talk Optix
   3. No Equal

2.4 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

A. Provide an uninterruptible 120-volt backup power supply for each PLC, OIT, Ethernet switch or other device as shown on the Drawings to maintain continuous operation of PLCs, operator interface terminals, Ethernet switches, monitoring instrumentation and control and process circuits during a power outage.

B. UPS type shall be provided as a continuous-duty, on-line, solid state, double conversion, single-phase 120 VAC input, single-phase 120VAC true sinewave output uninterruptible power system with auto-bypass. The UPS shall be provided with surge arresting capabilities to prevent sudden surges to the attached electrical control systems.

C. The UPS will be inside the control panel, located in the bottom section of floor stand type control panels or provided an independent wall mounted enclosure. The UPS shall be installed per UL 508 requirements and be powered by a simplex outlet.

D. UPS shall be installed in a manner to not impede access to terminals or field wiring.

E. Provide appropriate maintenance bypass switch as specified herein to easily remove and bypass the UPS.

F. The UPS shall have “hot-swappable” batteries and be capable of being replaced with the UPS in operation. The run time operation of the UPS shall be accomplished using batteries mounted within the UPS enclosure and supplemented as necessary with batteries in an enclosure to provide the battery runtime specified herein. The battery enclosure shall match the main UPS enclosure as closely as possible.

G. The UPS shall come equipped or provided with an added interface card with the means to signal the following alarms using dry contacts input to the control panel PLC:
   1. UPS Fault
   2. UPS on Battery Power
   3. UPS on Static Bypass
   4. Battery Low

H. The UPS shall be type rated for industrial use and capable of supplying standby power to all connected control panel equipment and circuits at peak load for a minimum of fifteen (15) minutes at full load, thirty (30) minutes half load. UPS minimum rating shall be 750 VA.

I. Acceptable manufacturers:
   1. Schneider Electric APC Smart-UPS
   2. Liebert GXT3 Series
   3. Tripp-Lite SU Series

4. Eaton Powerware
5. or equal.

2.5 MAINTENANCE BYPASS (MBP)

A. Each UPS shall be provided with a two-position external maintenance bypass switch and outlet system to permits the UPS to be removed for repair or maintenance without causing power disruption to the connected power loads. The external bypass switch shall be a snap-action type with switching speed 10ms or less independent of operator action. External bypass switch positions shall be labeled UPS and UTILITY. The bypass switch shall be capable of switching the required amps for the UPS system.

B. For UPS units up to and including 3 KVA, furnish Liebert MicroPOD, Tripp-Lite PDUB15, or equal

1. Substitution of standalone switches along with custom plugs, receptacles, and appropriate wiring to achieve the specified functionality is acceptable, refer to schematics or substitution.
2. For UPS units above 3 KVA, substitute standard manufacturers Maintenance Bypass switch offering or standalone switches as indicated above.

PART 3 - EXECUTION - IN ACCORDANCE WITH SECTIONS 13410 AND 13444

END OF SECTION

SECTION 13444

CONTROL PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Includes:
   1. Furnish, install, test, and commission the following panels listed in the control panel schedule and shown on the drawings.
   2. Coordinate with the manufacturers of supplied equipment for specific instrumentation and control requirements. Any deviation in instrumentation or electrical requirements for the supplied equipment shall be provided at no additional cost to the Owner.

B. Requirements specified elsewhere:
   1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
      a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 QUALITY ASSURANCE

A. The specifications direct attention to certain required features of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish the control panels complete in all details and ready for operation.

B. The control panels are an essential component of an integrated system with all plant controls and as such shall be supplied by the System Integrator in accordance with Sections 13410 and 13441.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract, Section 01340, Submittals, and Section 13410.
   1. Control Panel Layouts, Wiring Diagrams:
      a. Control panel wiring diagrams shall also include point to point wiring for all instrumentation equipment including terminal numbers. Examples of drawings with type of information required are attached to the end of this section. Control panel drawings shall be provided on 11” x 17” format. Loop drawings shall include at a minimum:
         i. Area delineation
         ii. Instrument tagging
         iii. Signal converters, isolators, etc.
         iv. Cable / wire numbers
         v. Internal terminal numbers
         vi. Field terminal numbers
         vii. Field junction boxes, terminal boxes, etc.

viii. Control panel, remote IO panels etc.
ix. PLC / IO terminations

b. The ISA S5.4 loop diagrams or equivalent will be used by the Electrical Contractor as a draft for terminations of Division 13 provided equipment to equipment provided by others. Refer to Section 13410 for additional information.

2. Conduit Entry into Panels:
   a. Conduit entry locations shall be indicated on the panel drawings, and physically marked within the control panel prior to leaving the factory. Entry locations shall include:
      i. Areas where conduit should not enter
      ii. Control conduit locations
      iii. Signal conduit locations
      iv. Intrinsically safe conduit locations
      v. Network cable conduit locations
3. Network Diagrams:
   a. Provide a network diagram showing all networked connections. Information on the network drawings shall include the following at a minimum:
      i. Networked devices and all of the panels or enclosures they are within
      ii. Cable type and specific termination interfaces/ports (including jumpers) of all cables (fiber and copper)
      iii. Cable labels
      iv. VLANs (if used)
      v. IP address with CIDR notation
   b. Network drawings of the different layers shall on separate drawings. Telemetry, SCADA, PLC, and DMZ layers may be combined on a single drawing.
   c. Information on all drawings shall be displayed in traditional drawing format. Information on tables will not be accepted.
   d. This submittal shall be provided as part of the initial submittals for approval by the Engineer. After installation, testing, and acceptance of the Network by the Engineer, the Network Supplier shall resubmit as part of closeout O&M documentation per as-built field conditions.
   e. Provide an updated network drawing incorporating the existing network drawings into the modified network drawing. System Integrator shall investigate and document the entire network. System Integrator shall presume the provided record documentation is accurate.
4. Bills of Materials (with separate columns for the following: Item Number, Quantity, Manufacturer, Part number, Description, Designator Tag)
5. FAT Report Results
6. SAT Report Results

1.4 DELIVERY, STORAGE AND HANDLING

A. In accordance with Section 13410

1.5 CONTROL SYSTEM TESTING:

A. Tests Procedures Prior to Start-up:

1. Refer to Section 13410.
2. Factory Acceptance Test (FAT): A witnessed Factory Acceptance Test and verification for all deliverable equipment, software, and associated documentation shall be performed prior to shipment of control systems. The factory tests shall be performed to verify that the control systems are manufactured and assembled correctly, are operating as designed, and are in compliance with the contractual requirements for the deliverables. Communication and integration with Division 11 equipment shall be demonstrated by indication of network addresses and required data tags with forced status/value changes to be witnessed on SCADA.
   a. FAT shall not be scheduled until the control panel submittals have been reviewed and have a Engineer review code of “0” or “1".
   b. The Contractor shall schedule FAT activities with the Engineer at least 5 business day in advance.
   c. The contractor shall plan for testing of no less than 6 hours or all of the panels during any scheduled FAT day.
   d. The FAT shall include verification and integrated testing of all components. These tests shall include the following.
   e. Visual Inspections: The following inspection checks shall be performed on all deliverable hardware items, as a minimum:
      i. I/O Subsystem physical layout
      ii. Power supply mounting
      iii. Power cable routing
      iv. Data cable routing and mounting
      v. Wiring runs properly separated and installed
      vi. Fans, blowers, and heaters are unobstructed
      vii. Power supply and power conditioning equipment correctly installed
      viii. Wire numbering and color coding
      ix. Device labeling
      x. Enclosure integrity
      xi. Paint work
      xii. Control panel lighting
      xiii. Panel and enclosure ground connections
      xiv. Provide photos:
         (1) Panel Exterior
         (2) Panel Interior – Door
         (3) Panel Interior – Enclosure
         (4) Incoming power distribution
         (5) PLC
         (6) Communications devices
         (7) Rear view of enclosure OIT/HMI
   f. Relay Logic Checkout:
      i. The System Integrator shall perform a complete checkout for all

ladder logic circuits to ensure designed functionality.

g. I/O Point Checkout:
   i. The System Integrator shall perform a complete checkout for every I/O point from the field wiring terminal strip to the operator interface terminal functions. The System Integrator shall test every input and output point including spares for proper operation. Test signals shall be generated to verify the operation of each Analog Input (AI) and Discrete Input (DI) including connected interposing relays, intrinsically safe circuits and relay circuits. Each Analog Output (AO) and Discrete Output (DO) shall be also tested for proper operation including control circuits, isolation relays, signal conditioner/isolators and other required control circuits.
   ii. The System Integrator shall demonstrate that signals are alarmed when reporting under 4 mA and over 20 mA and do not report negative or out of range values.
   iii. The System Integrator shall develop a point checkout form for each I/O point. The point checkout form shall include the point ID, description, all checks performed for the point, configured PLC hardware alarms, date and time of the check, and a signoff block for the System Integrator. For each item checked, the form shall include both the expected value/result and the actual value/result witnessed.
   iv. The following items shall be checked for each I/O point:
      (1) For each analog input point, the following values shall be checked:
         (a) Value at -2% of full scale (ramped in both directions)
         (b) Value at 0% of full scale (ramped in both directions)
         (c) Value at 25% of full scale (ramped in both directions)
         (d) Value at 50% of full scale (ramped in both directions)
         (e) Value at 75% of full scale (ramped in both directions)
         (f) Value at 100% of full scale (ramped in both directions)
         (g) Value at 102% of full scale (ramped in both directions)
         (h) Each High and Low Alarm condition
         (i) Alarm Delay
         (j) Alarm Enable/Disable
      (2) For each analog output point, the following values shall be checked:
         (a) Milliamp reading at 0% of full scale (ramped in both directions)
         (b) Milliamp reading at 25% of full scale (ramped in both directions)
         (c) Milliamp reading at 50% of full scale (ramped in both directions)
         (d) Milliamp reading at 75% of full scale (ramped in both directions)

(e) Milliamp reading at 100% of full scale (ramped in both directions)

(3) For each discrete input point, the following items shall be checked:

(a) For status points, proper indication

(b) For alarm points, proper alarm notification

(4) For each discrete output point, the following items shall be checked:

(a) Proper operation

h. PLC Programming and OIT/SCADA Operation Checkout:

i. Submit the proposed PLC program and OIT/SCADA Configuration (screen printouts) as a shop drawing 15 days prior to the performance of the Factory Acceptance Testing. PLC code shall be a formal submittal.

ii. Verify to the extent possible that the PLC program and OIT/SCADA Operation, as submitted, performs all control and monitoring requirements as described in section 13441 - Control Loop Descriptions. A list of all modifications to the submitted PLC program shall be maintained and submitted after the FAT.

i. 48-Hour Continuous Burn-in Test:

i. After the successful completion of the functional testing specified above, a 48-hour continuous run of each control panel provided shall be performed. The test shall be passed if no function is lost, no hardware or software failure occurs, and no module automatic failover occurs. Hardware failure is defined for this test as the loss of a major piece of hardware, such as a PLC processor, I/O board, power supply, UPS, other panel equipment, or improper operation by the controller.

ii. During this test, the PLC shall be occasionally (a minimum of 3 times per 24-hour period) exercised with simulated inputs, events, and conditions in a manner that approximates an operational environment in order to verify proper operation.

iii. No programming changes will be allowed to bypass failed modules during this test. Any major software and/or hardware correction made to the control panel shall result in the mandatory rerun of the entire 48-hour test for that control panel.

iv. FAT Report

(1) After FAT, provide and submit a checkout sheet of the FAT. The FAT Report shall include a list of all IO checkout, relay logic checkout, visual, and other QAQC observations.

j. If any control panels are shipped to the site without having undergone the specified Factory Acceptance Test; and without the prior authorization by the Engineer, shall be removed from the site and shipped back to the control panel manufacturer’s factory for testing at no cost to the Engineer or Owner.

B. Procedures Prior to Start-up:

1. Refer to Section 13410.

C. Onsite Control System Startup:
   1. Refer to Section 13410.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Refer to the General Conditions of Section 13440. All materials shall be specifically designed for industrial use unless otherwise specified.

B. Field Instrumentation Enclosures:
   1. Field Instrument Local Control Panels (LCP):
      a. All transmitters for field instrumentation located outdoors shall be back panel mounted in a stainless steel NEMA 4X enclosure.
      b. Each enclosure shall be provided with a padlocking door handle with three-point latch, front window kit to allow the operator to view the measured process variable, and drip shield. Screw tightened door clips around the enclosure are not acceptable.
      c. The enclosure shall include terminals, circuit breakers, surge protection for main power and process signal(s), and a thermostatically controlled heater sized to maintain panel interior temperature at 40 °F when the ambient temperature is -30 °F with a constant 15 mph wind. 120 VAC power for each field instrument will be backed up from the UPS in the associated control panel or a UPS power panel. 120 VAC power for each heater will be provided by a second power source separate from the UPS backed power source.
      d. Each enclosure shall be provided with a sun shield that shields the enclosure from direct sunlight.
      e. Refer to this section for general NEMA 4X enclosure requirements.
      f. Provide labels for panels, refer to this section for general panel labeling requirements.
      g. Refer to the drawings and/or schedule for the LCPs to be provided.

C. Intrinsically Safe Equipment
   1. Intrinsically Safe Relay/Barrier Panels (ISR):
      a. All instrumentation that is located in classified spaces must be either explosion proof or intrinsically safe. All instrumentation that is intrinsically safe shall be provided with intrinsically safe relays and barriers. Refer to the Instrumentation Drawings for all signals that shall be protected with intrinsically safe relays and barriers.
      b. Intrinsically safe relays and barriers shall be housed in a dedicated Intrinsically Safe Relay/Barrier enclosure or as noted on the drawings..
      c. Intrinsically Safe Relays and Barriers may be located in the same enclosure, but will not be permitted to be included in the PLC control panels.
      d. Each enclosure shall be sized appropriately to accommodate a minimum of 20% future I/O capacity.
      e. Provide all necessary power supplies, terminals, and circuit breakers in the panel for proper operation.

f. Intrinsically Safe Relay/Barrier panels shall be UL 698 listed and labeled.

2. Intrinsically Safe Relay/Barrier Enclosure Requirements:
   a. The enclosure shall be a wall mount, single door continuous hinged enclosure rated for the area. Enclosures shall meet this sections NEMA 4X / 12 requirements.
   b. A yellow lamicoid label with the words "Intrinsically Safe Enclosure" shall be affixed to the front door of the enclosure.
   c. Provide labels for panels, refer to this section for general panel labeling requirements.
   d. The enclosure shall close with stainless steel screw clamps and have a hasp and staple for padlocking.
3. Intrinsically Safe Relays:
   a. Relays shall be provided for all intrinsically safe sensing or actuation circuits which terminate in hazardous areas.
   b. Relays shall be located in non-hazardous areas and installed in accordance with UL requirements.
   c. Refer to the instrumentation drawings for signals that require Intrinsically Safe Relays. Relays shall be 120VAC powered.
   d. Approvals: FM
   e. Equal to:
      i. Phoenix Contact
      ii. Gems Safe Pak
      iii. MTL 7700 Series
      iv. or equal
4. Intrinsic Safety Barriers
   a. Barriers shall be provided for all intrinsically safe sensing or actuation circuits which terminate in hazardous areas.
   b. Barriers shall reduce the level of energy as required by intrinsically safe protection between safe and hazardous locations.
   c. Barriers shall be suitable for use with 4 to 20 mA DC signals.
   d. Barriers shall be located in non-hazardous areas and installed in accordance with UL requirements.
   e. Refer to the instrumentation drawings for signals that require Intrinsically Safe Barriers. Barriers shall be 24VDC or loop powered.
   f. Approvals: FM
   g. Equal to:
      i. Phoenix Contact
      ii. Gems Safe Pak
      iii. MTL 7700 Series
      iv. or equal

D. Chemical Fill Panels
1. Chemical Fill Panels (CFP):
   a. Chemical fill panels, provided by Division 13, will be located outside and adjacent to the respective chemical fill locations as indicated on the Electrical Drawings.

b. Each panel shall consist of the required controls, indications, and equipment housed in a wall mounted enclosure with interior swing out panel, padlocking dead front door with window kit, drip shield, and internal heater. The heater shall be sized to maintain panel interior temperature at 40 °F when the ambient temperature is -30 °F with a constant 15 mph wind.
c. All required relays, signal splitters, circuit breakers, and power supplies shall be DIN rail mounted to a subpanel in the enclosure.

E. Level Indication Display Panels:
1. Local Control Panels (LCP):
a. Local control panels, furnished by Division 13, will be used to protect the equipment from operating with hardwired interlocks. These panels will be located adjacent to the equipment as shown on the Electrical Drawings.
b. The local control panels will consist of latching relay logic that will protect the equipment based on instrumentation that is provided by the equipment vendor. (e.g. a High Discharge Pressure switch)
c. Each panel will include alarm light indicators and a reset push button to unlatch the alarm. For wiring diagrams of each panel, see the schematic on drawing.
d. All required circuit breakers and relays shall be DIN rail mounted to a subpanel in the enclosure.
e. Refer to schematics for additional information and requirements.
f. Refer to the drawings and/or schedule for the LCPs to be provided.
2. Local Control Panel Enclosure Requirements
a. Each local control panel enclosure shall be a wall mount, single door continuous hinged enclosure that meets the NEMA rating of the area that it is installed in. See the Electrical Drawings for area NEMA ratings.
i. NEMA 4X shall be 304 stainless steel.
ii. NEMA 7 shall be cast aluminum explosion proof
iii. NEMA 12 shall be painted steel.
b. The enclosure shall open with a padlocking three-point latch and handle. Handle shall be operational with the use of only one hand. Additional miniature quarter turn latches may be used around the door if they are required to maintain the NEMA rating. These quarter turn latches shall a wing knob type and be able to be turned by hand, without any additional tools. Edge screw clips will not be accepted.
c. Refer to this section for general enclosure requirements.

F. Control Panels
1. PLC Control Panels (CP):
a. PLC control panels, furnished by Division 13, shall house all of the required PLC and communications equipment.
b. For PLC and OIT hardware in the panel, see Programmable Logic Controllers - Section 13442.
c. For HMI SCADA hardware in the panel, see SCADA System - Section 13443.

d. For other components in the panels, see Control Panel Components section herein.
e. Provide labels for panels, refer to this section for general panel labeling requirements.
f. The enclosure ratings shall be NEMA 12 or NEMA 4X, refer to Electrical drawing E-1 for NEMA ratings required by area.
g. Refer to Electrical power plans and control panel schedule for maximum panel sizes (use scaled drawings).

2. PLC & RIO Control Panel Requirements
   a. Each control panel enclosure shall be a NEMA 12 or NEMA 4X enclosure. The panel shall be sized by the System Integrator house all equipment and room for 20% I/O expansion and meet UL 508A requirements.
   b. All control components shall be mounted using a 35 mm DIN rail.
   c. The center of the Operator Interface Terminal (OIT), Human Machine Interface (HMI), or panel mounted transmitter shall be mounted no higher than 67" and no lower than 63" above the finished floor elevation where an operator will stand.
   d. Provide a folding shelf and keyboard for panel as indicated in the control panel schedule. Shelf should be mounted at least 36-in and no more than 40-in above the floor. Shelf shall hold keyboard when in folded position. Provide an industrial keyboard with integral mouse/touchpad on the enclosure, iKey, Advantech, or equal.
   e. Provide a PLC control panel shall be provided with a marshaling shelf for top conduit entry cable management as indicated in the panel schedule.
   f. Floor mount Panels will be located on a 4" high housekeeping pad. Provide a window-kit for outdoor installation.
   g. Provide heat dissipation and heating calculations of all heat loads for all heated or cooled panels to be included as part of the shop drawing review for this equipment. Design ambient air temperature shall be 0°F for heating and 105°F for cooling. Add necessary cooling as required by the design, and size the heater as necessary for the design if required.
   h. Insulation requirements for heated or cooled panels:
      i. 1” Rigid Fiberglass Insulation installed. The insulation shall:
         (1) Be of a type that conforms with ASTM C612 Type 1VB, C795
         (2) Be installed using mechanical fastening or an adhesive that is listed with a MAGW2 rating.
      ii. Panels that rely on the on the panel thermal transfer for cooling only or indoor panels may not use insulation.
   i. Outdoor installations:
      i. Provide a dead-front enclosure with front panel components mounted to the interior swing-door kit.
      ii. Provide enclosure with provisions for mounting in a NEMA 4X enclosure.

iii. If a dead-front enclosure is not provided as noted on drawings, a window kit and sunshield shall be provided for OIT/HMI installation.
iv. Conduit penetrations on top of enclosure shall not be permitted.
v. Provide a door stop kit to prevent doors from opening further than 120°.

j. Unheated spaces or general outdoors:
i. Shall be equipped with a factory installed built-in heater and adjustable thermostat to heat enclosure to the minimum operating temperature of the installed devices.
ii. The heater shall include a fan to circulate the air within the enclosure to prevent hot spots. Thermostat shall measure air temperature, not surface temperature.
iii. Heater shall be Hoffman Enclosures DAH, Saginaw SCE series, or approved equal.
iv. For smaller panels where an enclosure heater would exceed the requirements (temperature, spacing), provide a strip heater with thermostat for condensation control.
v. Panel heaters shall be installed in the bottom 1/3 of the control enclosure to assist in thermal efficiency.
vi. Refer to above for insulation requirements.

k. Special Cooling Requirements
i. Enclosures installed in high ambient heat areas or which contain Variable Frequency Drives (VFDs) or other heat-producing equipment shall be provided with modifications and/or accessories designed to dissipate excess heat and allow for proper equipment cooling, while maintaining the enclosures NEMA rating. Following are several accessories which may be used, depending upon the ambient temperature and NEMA rating of the area installed.
(1) Heat exchangers with circulating fans and filters, for NEMA 12 enclosures.
(2) Air conditioners, for NEMA 12 or NEMA 4X enclosures in areas with high ambient temperatures. NEMA 4X air conditions shall be close-looped. NEMA 4X open loop ventilation may be acceptable with the Engineers approval dependent on the space.
(3) Cooling fans shall be wired such that they only operate when the VFD or heat producing equipment is running.
(4) Air conditioners where used in enclosures shall operate constantly.
(5) Fan assemblies shall be equipped with replaceable filters. Provide four spare filters.
ii. Refer to above for insulation requirements.

l. The enclosure shall open with a padlocking three-point latch and handle. Handle shall be operational with the use of only one hand. Additional

miniature quarter turn latches may be used around the door if they are required to maintain the NEMA rating. These quarter turn latches shall a wing knob type and be able to be turned by hand, without any additional tools. Edge screw clips will not be accepted.

m. All equipment shall be DIN rail mounted to a subpanel in the enclosure.

n. Provide an LED enclosure light fixture for each panel door at the top of the enclosure with an accessible On/Off switch. Provide a duplex GFI receptacle in the panel with a label showing "For Test Instruments only/Computer use only". The receptacle and panel light shall be provided with a separate overcurrent protective device and connected in such a manner so as to not disconnect control, instrumentation, or PLC power in the event that the GFI outlet should trip.

o. Each PLC control panel shall have a UPS. See section 13442 for specific UPS requirements. The UPS shall be mounted inside of the enclosure on a specific UPS shelf which keeps it off of the floor of the enclosure. Provide a UPS maintenance bypass switch (MBS) that allows the panel to be powered through the UPS or from line power, refer to schematics for additional details.

i. UPS installation shall not be located in front of other panel equipment.

ii. Unless stated otherwise each field instrument whether powered by 120 VAC or 24 VDC shall be powered from the associated Control Panel's UPS. Field instruments that measure processes that are not disrupted during a power outage, require a significant amount of time to reset after power is restored from a power outage, or will cause disruptions to process control if the process value is not immediately available once power is restored shall be backed up by the UPS from the associated Control Panel.

iii. The following shall NOT be powered from the UPS:

(1) Control panel lighting.

(2) Control panel heating.

(3) Control panel cooling.

(4) Instrumentation powered from control panel, but not indicated by UPS power as indicated on the Instrumentation and/or Electrical Drawings.

G. Components and Requirements:

1. Enclosures

a. Shall be either UL508A or UL698 Listed as an assembly, as required by location of intrinsically safe relays or barriers.

b. Enclosures shall be sized as required to contain the necessary apparatus for the particular installation. Final panel/enclosure dimensions shall provide for easy access to all internal components with ease of maintenance and future modifications considered. Enclosure size shall accommodate UL requirements. Conflicts with panel sizing and available spacing shall immediately be brought to the attention of the Engineer prior to proceeding to procurement. Panels purchased without

submittal/Engineer approval that present installation/egress/clearance issues shall be replaced by the Contractor at no additional cost to the Owner/Engineer.

c. Panels larger than 36-inches in width or 48-inches in height shall not be wall mounted. Provide two doors if panel is larger than 36-inches wide.
d. Enclosures larger than 16" in any dimension shall utilize a three-point latching system.
e. Provide door and body stiffeners where necessary for a rigid enclosure. Floor mounted enclosures shall be provided with lifting eyes and, where floor-mounted, with 12-inch floor stands. No floor stands are to be provided for free-standing models.
f. Doors shall have side mounted, stainless steel, continuous length, piano-type hinges and pins.
g. Panels/enclosures shall be equipped with print pockets located on the inside of the door.
h. A complete "As-Built" panel wiring diagram including exterior devices and motors to be connected shall be encased in clear re-sealable plastic pouch(es) and placed in the print pocket.
i. NEMA 12 enclosures shall be sheet steel, 16 gauge for box sizes up to and including 24" by 24", 14 gauge for box sizes larger than 24" by 24" up to 60" by 36", and 12 gauge for box sizes greater than 60" by 36". Free-standing enclosures shall be 12-gauge minimum. Enclosures shall have continuously welded seams, ground smooth, supplied with no holes or knockouts and a rolled lip around door and enclosure opening. Enclosures to be installed in areas with the potential for dripping liquids shall be provided with drip shields. Provide Oil resistant door gaskets. NEMA 12 enclosures shall be coated inside and out with ANSI 61 gray over phosphatized surfaces. Interior sub-panels for mounting of components shall be painted white.
j. NEMA 4X stainless steel enclosures shall be Type 304 stainless steel enclosures shall be 16 gauge for box sizes up to and including 24" by 24", 14 gauge for box sizes larger than 24" by 24" up to 36" width, and 12 gauge for box widths greater than 36 inches. Free-standing enclosures shall be 12-gauge minimum. Enclosures shall have continuously welded seams, ground smooth, supplied with no holes or knockouts and a rolled lip around door and enclosure opening. Enclosures to be installed outdoors shall be provided with drip shields. Provide oil-resistant door gaskets all around door openings. All enclosure hinges, clamps, etc. shall be stainless steel. Enclosures/panels shall be provided unpainted, with metal enclosures having a smooth brushed finish.
k. Provide enclosures equivalent to:
    i. Saginaw Control and Engineering
    ii. Hoffman
    iii. Or equal

2. Control Panel Wiring Requirements:

a. All control panel wiring shall conform to the latest requirements of NEC and all state and local code requirements.
b. Bundles of wires not in raceways must be secured to the panel structure every 8 inches minimum. All interior wiring will be point to point with no splices.
c. Wires to the front of panel devices shall be looped, extra flexible, bundled and located in a manner to prevent damage due to opening and closing the door.
d. All control wires internal to panels shall be minimum No. 16 AWG. All signal wires internal to panels shall be minimum No.18 AWG. Wires carrying line voltage shall be minimum No. 12 AWG. All conductors shall be copper. Wiring in close proximity to heating devices shall be Type AVA UL approved. All wiring shall be run in PVC wiring channels and bundled with nylon cable ties. Line voltage wiring must be run separately from control, signal and intrinsically safe wiring. PVC wiring channels shall be properly sized for the capacity of wires being installed based on the overall project needs and shall not be over filled.
e. Discrete and analog wiring shall be separated to the greatest extent possible. It shall be assumed that discrete and analog conduits shall be installed into the panel on opposing sides. PLC I/O modules slots and field terminal blocks shall be grouped by type. I/O entry shall be indicated on the drawings as required by UL508.
f. Wiring to equipment shall be distributed to the greatest extent possible amongst the PLC IO modules to minimize the amount of common failure points across common equipment. Example: If there are four DI modules and four raw water pumps, each DI module shall have IO for one of the raw water pumps.
g. All network devices shall be powered with two power supplies.
h. Analog wire shields shall be continued until the PLC I/O modules.
i. All main, feeder, and branch circuits shall be provided overcurrent protection. PLCs, OITs, HMIs, instruments, power supplies (if not supplied with a field resettable fuse), spare circuits, and networking equipment shall have a dedicated fuse. Overcurrent protection shall be sized appropriately and account for inrush currents.
    i. Main panel circuit protection shall be a fused disconnect.
    ii. Feeder 120 VAC circuits shall use breakers for circuit protection. 24VDC branch circuits may use breakers or fuses.
    iii. All outgoing power (120 V and 24 V) field devices shall be individually fused.
    iv. All loop powered devices shall be individually fused.
    v. Each PLC module shall have a dedicated fuse.
    vi. Fuse and circuit breaker sizing is the responsibility of the System integrator.
j. All wires shall be marked at both ends with numbers by self-sticking wire markers or with slip-on style plastic markers. Wire markers shall match the terminal block labels, unless otherwise specified.

k. Wire color coding shall include the following:
   i. Red wires - Interior control circuits
   ii. Yellow wires - Power from external sources
   iii. Blue wires - DC voltages
   iv. Blue/White wires – DC return (i.e.-24VDC)
   v. Green wires - Ground

l. Terminals shall be arranged in alphabetic and numeric order in columns on removable sub-plates. A maximum of two connections shall be made to each side of a terminal, including jumpers. Provide an additional 20 percent spare terminals for each control panel with the following minimum requirements:
   i. Power terminals
      (1) 2 spare 120VAC
      (2) 2 spare 24VDC
   ii. Control terminals
      (1) 10 spare
   iii. Signal terminals
      (1) 4 spare loop powered

m. Provide ground terminal for each panel.

n. All control panels shall be provided with spare mountings for additional relays. Number of spare mountings will correspond to 5% of the total number of relays within each panel, with a minimum of one (1) spare mounting.

o. All wiring entering and leaving control panels shall be terminated on field terminal blocks and labeled.

p. Provide individual surge protection for all for all field instruments mounted outside of the building or facility housing the control panel and/or as indicated on the drawings. Instruments mounted within the same structure as the associated control panel do not require surge protection.

q. Provide a fuse and circuit breaker schedule with sizing and part number on panel door.

r. Provide protection on all signal and data circuits that leave a building or are routed external to a building. Data circuit protection shall be provided at both ends of the signal or data highway lines within the control panel at one end and as close to the instruments or termination device as possible. Refer to drawings for additional requirements.

s. Wiring shall be in compliant with the National Electric Code and with the applicable UL requirements. All wiring shall be done with best practices and follow equipment manufacturer guidelines.

t. Provide complete "As Built" wiring diagrams to be provided with the O&M manuals and in the enclosures for all control panels.

3. Exterior Panel Labeling:
   a. A lamicoid label on the door of the enclosure shall identify the panel. Label shall include the panel tag number and the panel name as indicated in the list below.

b. Provide a label indicating each power source on the front of each panel. As-built Panel drawings shall also indicate power source.
c. Provide equipment labels for all devices on the subpanel to easily identify panel components (relays, network switches, power supplies, etc.) Labels on equipment is not acceptable.

4. Programmable Logic Controllers (PLC):
   a. Refer to Specification 13442 - Programmable Logic Controllers for PLC requirements.
5. Operator Interface Terminal (OIT):
   a. Refer to Specification 13442 - Programmable Logic Controllers for OIT requirements.
6. Uninterruptible Power Supply (UPS):
   a. Provide an uninterruptible 120-volt backup power supply for each instrumentation and control and process circuits during a power outage.
   b. UPS type shall be provided as a continuous-duty, on-line, solid state, line interactive, single-phase 120 VAC input. The UPS shall be provided with surge arresting capabilities to prevent sudden surges to the attached electrical control systems.
   c. The UPS will be inside the control panel, located in the bottom section of floor stand type control panels or provided an independent wall mounted enclosure. The UPS shall be installed per UL 508 requirements and be powered by a simplex outlet.
   d. UPS shall be installed in a manner to not impede access to terminals or field wiring.
   e. Provide appropriate maintenance bypass switch as specified herein to easily remove and bypass the UPS.
   f. The UPS shall have “hot-swappable” batteries and be capable of being replaced with the UPS in operation. The run time operation of the UPS shall be accomplished using batteries mounted within the UPS enclosure and supplemented as necessary with batteries in an enclosure to provide the battery runtime specified herein. The battery enclosure shall match the main UPS enclosure as closely as possible.
   g. The UPS shall be type rated for industrial use and capable of supplying standby power to all connected control panel equipment and circuits at peak load for a minimum of fifteen (15) minutes at half load. UPS minimum rating shall be 700 VA.
   h. Acceptable manufacturers:
      i. Schneider Electric APC Backup Pro
      ii. Tripp-Lite SU Series
      iii. or equal.
7. Ethernet Switches (Managed MES, Unmanaged ES):
   a. Refer to Specification 13445 – Communications Network for MES and ES requirements.
8. Data/Power Port:
   a. Provide a Data/Power port with Ethernet RJ45 jack and 120 VAC GFI outlet to meet Arc flash 70E requirements. Data power port will have a

lockable hinged cover with panel mounted hardware and shall be installed on the front of the control panel.

b. Control panels with a keyboard shall have a Data/Power port with a USB connection.
c. Environmental Rating: To match panel NEMA rating.
d. The Data and Power port shall be:
    i. Grace Engineered Products
    ii. Hubble "Panel-Safe" Power and Data Access Ports
    iii. Or equal

9. 12 and 24 VDC Power Supplies:
    a. Provide 12 and 24 VDC power supplies in the control panel to power field instruments, panel devices, etc., as required.
    b. No more than three internal panel devices or external field instruments requiring 12 or 24 VDC power shall be powered from a single 12 or 24 VDC power supply.
    c. Input voltage: 115 VAC
    d. Output voltage: 24 or 12 VDC.
    e. Ripple: <50 mVpp.
    f. The power supply shall have a NO fault /voltage OK contact.
    g. The power supply shall be sized to accommodate 125% of the design load.
    h. Operating temperature: 32 to 140 °F.
    i. The power supply shall be provided with a means to protect instruments from over current and over voltage.
    j. Mounting: Din rail mount inside enclosures. Power supply shall be located in the enclosure such that heat generated does not cause other panel components to malfunction or become damaged.
    k. 12 or 24 VDC power supplies shall be:
        i. Sola SDN
        ii. Allen-Bradley 1606
        iii. or Equal
10. Hand Switches: HS
    a. Push buttons and selector switches shall be 30 mm and heavy duty.
    b. Switches shall have the same NEMA rating as the panel that the switch is installed in.
    c. Contact blocks shall be stackable and provide all necessary contacts as shown on the Drawings.
    d. Each switch shall be labeled as indicated on the Drawings.
    e. Equal to:
        i. Allen Bradley 800H series
        ii. Eaton Cutler-Hammer HT800 series
        iii. Or equal
11. Potentiometer:
    a. Potentiometers shall be 30 mm and heavy duty.
    b. Potentiometers shall have the same NEMA rating as the panel that the potentiometer is installed in.

c. Potentiometer ohm value shall be compatible with the equipment and application.
d. Equal to:
    i. Allen-Bradley 800H Series
    ii. Square D 9001 Series

12. Indicator Lights: YL, AL
    a. All indicator lights shall be 30 mm, heavy duty oil-tight, 120 VAC, LED with push to test option. Indicator Lights shall be wired such that they can be tested with Control or UPS Power source.
    b. Lights shall have the same NEMA rating as the panel that the light is installed in.
    c. Indicator lights shall be provided with a chrome-plated metal or anodized-aluminum mounting rings, engraved as indicated on the Drawings.
    d. All indicating lights will use the following light color convention: See Instrumentation Drawing I-1 “Indicator Light Color Legend”.
    e. Equal to:
        i. Allen Bradley 800H series
        ii. Eaton Cutler-Hammer HT800 series
        iii. Or equal
13. Fuses:
    a. Fuses shall be 3AB ceramic body fuses rated for at least 125 volts at the current ratings shown on the Drawings. Fuse size shall be ¼” by 1¼”.
    b. Blow time shall be: 110%, 4 hours minimum; 135%, 1-hour maximum; 200%, 15 seconds maximum for 1/8-12 amp fuses and 60 seconds maximum for 15-30 amp fuses.
    c. Fuses shall be:
        i. Entrelec
        ii. Bussmann,
        iii. Or approved equal.
14. Line Surge Protection:
    a. A UL1449 dedicated surge protection device (non-UPS) shall be installed for main power into a panel.
    b. A UL1449 dedicated surge protection device (non-UPS) shall be installed for panel powered instruments located outside of the building.
    c. Surge protection shall protect L-G, L-N and N-G.
    d. Surge arrestor shall be adequate for intended function and shall be by a nationally recognized manufacturer with a minimum of 3-years’ experience in manufacturer of such devices. Technology shall a hybrid of Silicone Avalanche Diodes and MOV or MOV and thermal fusing. GDT or sole MOV technology is not acceptable.
    e. Surge arrestor to include a dry contract for remote monitoring of a surge event.
    f. Surge arrestor shall be installed per manufacturer recommendations, as close to incoming power as possible, and incoming leads shall be as short as possible.

g. Surge arrestor shall have a positive indication of device operation or failure.
h. Surge arrestor shall have a Surge Current rating of 25kA per phase.
i. Surge Arrestor shall be:
    i. Weidmuller SPD series
    ii. Citel DS40 series
    iii. Or Equal

15. Analog I/O Surge Protection:
    a. Surge protection shall be installed for all PLC analog inputs and outputs for signals that originate outdoors and/or signals that transition outdoors or as noted on the drawings.
    b. Surge arrestor shall be adequate for intended function and shall be by a nationally recognized manufacturer with a minimum of 3-years' experience in manufacturer of such devices. Technology shall be Hybrid or MOV, GDT technology is not acceptable.
    c. Surge arrestor shall include protection for the shield.
    d. Surge arrestor shall have a Surge Current rating of 5kA.
    e. Surge Arrestor shall be:
        i. Citel DLA series
        ii. Weidmuller VSCP series
        iii. Or Equal
16. Discrete I/O Fusing:
    a. Fuse discrete inputs and outputs in logic groups per card
    b. Coordinate fuse rating with individual points and the rating required if all eight points were active.
    c. Use MDA type fusing
17. Analog I/O Loop Fusing:
    a. Fuse all analog input and output loops individually.
    b. Use 250ma ACG type fusing or equal.
18. Discrete I/O Surge Protection:
    a. Surge protection shall be installed for all PLC discrete inputs and outputs for signals that originate outdoors and/or signals that transition outdoors or as noted on the drawings.
    b. Surge arrestor shall be adequate for intended function and shall be by a nationally recognized manufacturer with a minimum of 3-years' experience in manufacturer of such devices. Technology shall be Hybrid or MOV, GDT technology is not acceptable.
    c. Surge arrestor shall have a Surge Current rating of 5kA.
    d. Surge Arrestor shall be:
        i. Emerson DRS series
        ii. Phoenix PT 2X1VA series
        iii. Or Equal
19. AC Filter:
    a. Provide a low pass EMI filter to protect PLC and instruments from high-frequency noise and low-energy transients.

b. Filtering shall only be provided on UPS powered circuits and located after the power supply.
c. Filter shall be sized for 125% of full load.
d. Filter shall attenuate both common and differential mode noise.
e. Attenuation: 30dB @100kHz
f. MTBF: >1 million hours
g. AC Filter shall be:
    i. Sola STFV
    ii. Islatrol/IC+
    iii. Corcom
    iv. Or Equal

20. Control Relays:
    a. Scope: Control relays used for relay logic.
    b. Relays shall be electrically held, Form C, electrically operated with 120 volt coils except as noted otherwise on the Drawings. Contacts shall be rated 10 amps at 600 volts or higher as required by the application.
    c. The number of poles required shall be determined by the System Integrator depending on specific requirements of what the relay is used for. Each relay will be at minimum DPDT or one spare pole per relay.
    d. Control relay shall have an energized indicator in either the form of a mechanical flag, or neon lamp (LED for DC applications).
    e. Relays shall be provided with a suppression diode for inductive loads.
    f. Control Relays shall be:
        i. Allen Bradley 700HB Series
        ii. Idec RU Series
        iii. Or equal
21. PLC Output Relays:
    a. Scope: Control relays used for PLC outputs (isolation relays)
    b. Each PLC discrete output shall be protected with an interposing relay including spare PLC discrete outputs. PLC output relays shall be SPDT electrically held, Form C, electrically operated with 120 volt coils. Contacts shall be rated at a minimum 5 amps at 300 volts. System Integrator shall use higher capacity relays for equipment that is being powered directly through the relay's contacts.
    c. Control relay shall have an energized indicator in either the form of a mechanical flag, or neon lamp (LED for DC applications).
    d. PLC output relays shall be DIN rail mounted and have a slim profile in order to conserve panel space.
    e. Relays shall be provided with a suppression diode for inductive loads.
    f. Control Relays shall be:
        i. Allen Bradley 700HK Slim Line Series
        ii. Phoenix Contact PLC relay series
        iii. Or equal
22. Automatic Transfer Relays (ATR)
    a. Scope: ATRs shall be Contactors or IEC control relays are used for the ATR circuit. Devices shall be IEC listed.

b. Relays shall be 4NO and 4NC at a minimum and have an auxiliary contact to indicate to the PLC the ATR fail status. The number of poles required shall be the responsibility of the system integrator.
c. Relay coil shall be actuated via 120VAC except as noted otherwise on the Drawings.
d. Contacts shall be thermally rated for 16A continuously minimum (for 20A panel, or as required by feeder circuit current) at 120VAC and shall be mechanically linked. Auxiliary contacts shall be rated for 5A at 120VAC.
e. Relay shall provide positive safety for the N.O. and N.C. contacts which assure that the N.O. contacts will not close before any N.C. contact opens
f. Equal to:
    i. Allen Bradley 700-CF series
    ii. ABB N44 series
    iii. Or equal

23. Contactors:
    a. Scope: Industrial contactors shall for all relay providing line power to energize equipment (ie. fans, pumps, etc.). Contactors shall be IEC listed.
    b. Contactor coil shall be actuated via 120VAC or 24VDC as required.
    c. Contacts shall be rated for a minimum 1HP or 16A continuously at 120VAC single phase or higher as required by the application. Contacts shall be rated for a minimum of 125% of equipment FLA.
    d. The number of poles required shall be determined by the System Integrator depending on specific requirements of what the contactor is used for.
    e. Shall be provided with a bimetallic overload with auxiliary contact. Overload to be sized by integrator and coordinated with equipment manufacturers. Auxiliary contacts shall be rated for 5A at 120VAC.
    f. Equal to:
        i. Allen Bradley 100 series
        ii. ABB
        iii. Or equal
24. Loop Isolator:
    a. Provide a loop isolator that receives a 4-20mA signal and provides dual isolated 4-20mA output signals.
    b. Power:
        i. Loop Powered, 24VDC, or 120VAC
    c. Input:
        i. 4-20mA input
        ii. Channels: 1
    d. Output
        i. 4-20mA output
        ii. Channels: 2
        iii. Transmission Error: <0.2% Off Full Scale

iv. Transient Protection 1.5kV

e. Relative Humidity: 5 to 95%
f. Temperature: -13 to 167 ^{o}F
g. Accuracy: 0.05% output span
h. Equal To:
    i. Phoenix Contact
    ii. Pepperl+Fuchs
    iii. Or Equal

25. Time Delay Relays:
    a. Time delay relays shall be used as required for use as shown on the drawings or described in the specifications. Time delay relays shall be capable of the following functions:
        i. On Delay (delay on make)
        ii. Off Delay (delay on release) / True Off Delay
        iii. Interval On
        iv. Single Shot
        v. Cyclic
        vi. Single Shot Momentary Interval
        vii. Or other functions specifically referred to on drawing schematics
    b. Delay timing relays shall be solid state, Form C, electrically operated with 120 VAC coils except as noted on the drawing.
    c. The number of poles required shall be determined by the System Integrator depending on specific requirements of what the relay is used for. Each relay will be at minimum DPDT or one spare pole per relay.
    d. Contacts shall be rated 5 amps at 240 volts.
    e. Minimum time range shall be adjustable from 1 second to 10 minutes. Other ranges as required by function and as indicated on the Drawings or within the Specifications.
        i. Final settings shall be indicated on the O&M drawings.
    f. Provide wiring to the relays as required by the function used.
    g. Basis of Design: Basis of design are multifunction time delay relays. System Integrator may provide single function relays as required, however a spare is required for every type.
    h. Time Delay Relays shall be:
        i. IDEC RTE Series
        ii. Square D RE Series
        iii. Magnecraft TDR Series
        iv. Allen Bradley 700 Series
        v. Or Equal
26. Duplex Alternating Relay:
    a. A duplex cross-wired Alternating Relay shall alternate the load every time an initiating switch is opened.
    b. The relay shall have two initiating inputs for lead / lag functionality.
    c. The relay shall have two DPDT outputs rated for 120VAC at 3A.
    d. Two LEDs shall indicate load position.
    e. Control Voltage: 120VAC

f. Alternating Relay shall be:
   i. Macromatic
   ii. Time Mark
   iii. Or Equal

27. Triplex Alternating Relay:
   a. A triplex cross-wired Alternating Relay shall alternate the load every time an initiating switch is opened.
   b. The relay shall have two initiating inputs for lead functionality.
   c. The relay shall have three DPDT outputs rated for 120VAC at 3A.
   d. LEDs shall indicate load position.
   e. Selectable between Duplex and Triplex pump control
   f. Control Voltage: 120VAC
   g. Alternating Relay shall be:
      i. Macromatic
      ii. Time Mark
      iii. Or Equal
28. Terminal Blocks
   a. Field terminal strips with box type connectors shall be supplied to make all power, control, and signal connections to and from each control panel.
   b. All terminals shall be clearly marked for easy identification. A ground terminal strip shall also be provided.
   c. Field terminal blocks shall be single tier for ease of installation and maintenance.
   d. At least 20 percent of terminals supplied shall be spare. All wiring in and out of a control panel shall be terminated on field terminal blocks.
   e. All spare PLC I/O (including interposing relays) shall be wired to terminal blocks.
   f. Prewired terminal blocks from the PLC manufacturer as also acceptable. The prewired terminal blocks (PLC Terminal System) shall also meet the specifications herein.
   g. Field Terminal Blocks shall be:
      i. Phoenix Contact UT Series
      ii. Allen-Bradley 1492 Series
      iii. Or equal
29. DIN Rail
   a. Size: 35mm
   b. Material: Aluminum or Bronze
   c. All field terminal blocks shall be mounted on 2” raised DIN rail
30. Motor High Temp and Seal Fail Relay:
   a. Submersible pumps and dry pit submersible pumps will each be supplied with a relay system to detect a motor high temperature condition and seal fail condition. The pump manufacturer will provide the required relays and devices, for measuring these conditions, to the System Integrator. The System Integrator shall install these devices in the appropriate control panel as required per the Contract Documents.

31. Spare Parts and Test Equipment:
    a. The System Integrator shall furnish the following spare parts :
        i. 2 surge suppressors of each type
        ii. 1 24 VDC Power Supply of each type
        iii. 1 Uninterruptible Power Supply
        iv. PLC Components - Refer to section 13442
        v. 3 of each color indicator light lens.
        vi. 1-time delay relay (of each type)
        vii. 5 control relays (of each type)
        viii. 5 PLC output relays (of each type)
        ix. 1 ATR relay
        x. 1 relay base (of each type)
        xi. 1 contactor (of each type)
        xii. 1 complete selector switch of each type.
        xiii. 1 complete push-button of each type.
        xiv. 1 complete speed potentiometer of each type
        xv. 1 of each different contact block for control units.
        xvi. 1 breaker of each type
        xvii. 1 fused disconnect of each type
        xviii. 1 box of every type of fuse in every panel provided.
        xix. 5 spare fuse block holders (if applicable based on equipment supplied)
        xx.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Refer to Section 13410 PART 3 - EXECUTION.

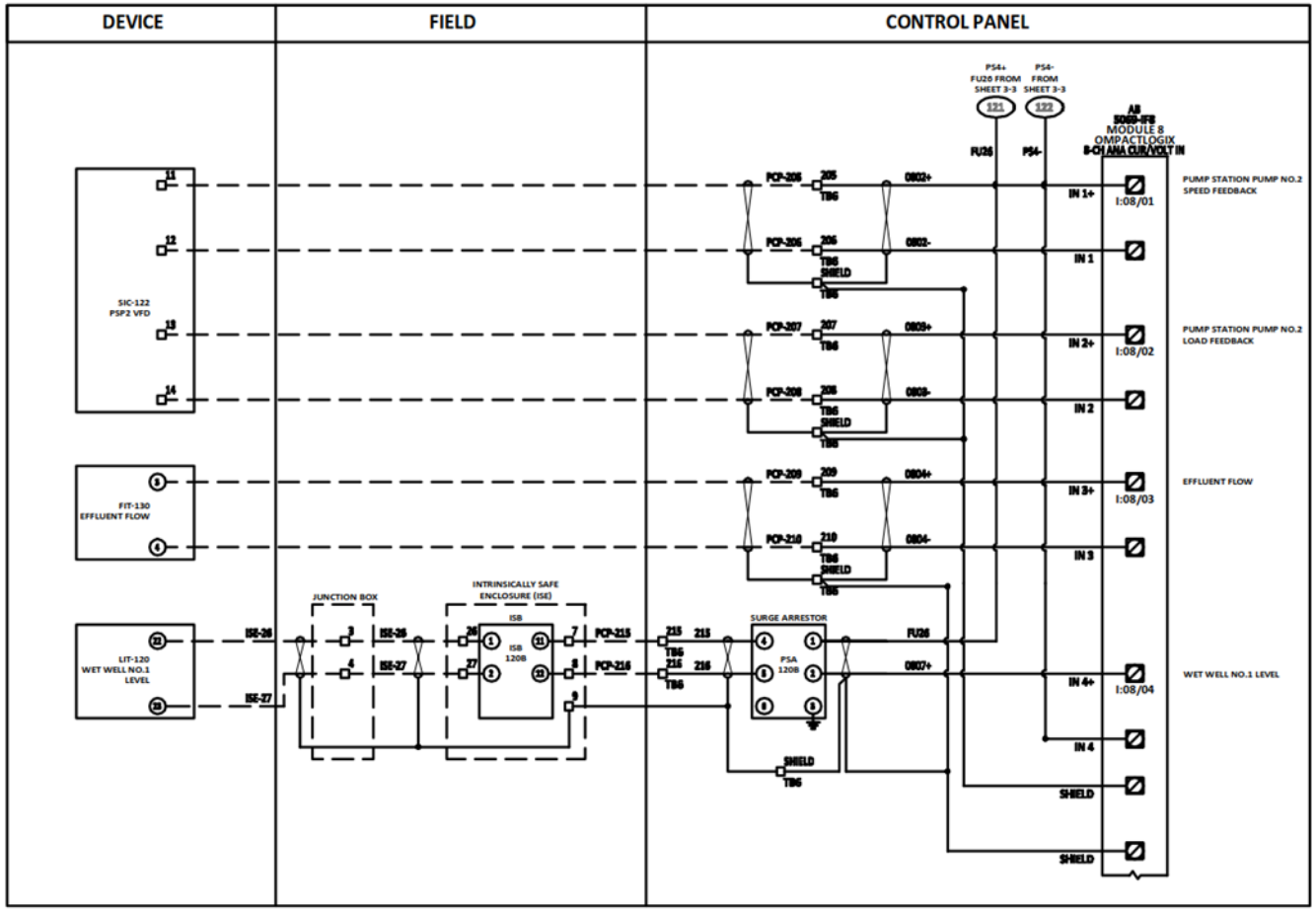
3.2 PANEL SCHEDULE

Phase 1A:

Description	Abbreviation	Type	NEMA Rating	Panel Width*	Mounting*	Shelf & Keyboard	Marshaling Shelf
North RAS Pump Station Control Panel	NR-CP	CP	12	36”	Floor	No	No

*The panel width and mounting are the dimensions and arrangements shown on the electrical plans for reference. System Integrator is responsible for working with the General Contractor and Electrical Contractor for coordinating size and room layouts, and adhering to the specifications.

SAMPLE ISA EQUIVALENT DRAWINGS [NTS: Remove is no ISA dwgs]



NOTE:

THIS FIGURE IS PROVIDED AS A GENERAL REPRESENTATION OF PROJECT WIRING REQUIREMENTS.

SAMPLE ISA EQUIVALENT DRAWING
SPECIFICATION SECTION 13444

PROJ NO:	OHINST	DATE:	FEBRUARY 202

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 13445

COMMUNICATION NETWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. System Integrator Work Included: Furnish, configure and test a new Ethernet communication network(s) consisting of the following:

1. The System Integrator shall furnish and test all hardware specified herein.
2. The System Integrator shall configure network equipment described and management software as specified herein and shall coordinate testing during, FAT, startup's, and SAT.
3. The System Integrator shall modify the existing SCADA network such as to inject the new equipment into the ring for redundant communications.
4. Provide hardware for an Ethernet type Process Control Network to allow communication between the Division 13, Division 11 Control Panels, VFD's, and SCADA as shown on the Network Diagrams.
5. The System Integrator shall furnish, connect, and test all new CAT6 and fiber optic cables between each control panel (CP), patch panel, and Ethernet devices as shown on the Network Drawing and the Electrical Drawings. Cables shall be installed by the Contractor.
6. Coordinate with the fiber optic installation and testing. Refer to Specification 13460.
7. Provide Network Management Software for the communication equipment.
8. Provide all network IP addresses for Division 11, 13 equipment and VFD's.
9. Configure the new managed Ethernet switches. Managed switches on the ring shall be configured to communicate with each other in a redundant ring. Switches shall be configured with the correct time. Refer to 13443 for additional switch configuration requirements. All devices shall be configured to maintain program after loss of power.
10. Provide a list of all SI configured network devices with IP addresses, usernames, and passwords to access the management tools. Usernames and passwords shall be changed from the default settings and be in best security practices.
11. The System Integrator shall provide an individual USB drive with each of the network appliance configurations, including, individual managed switches, router, firewall, or cellular router configurations and locate it in the respective control panel or network panel, taped to the door. The configuration shall also be provided in the O&M on a USB drive and copied on the primary SCADA computer.
12. Update the firmware of all network devices and update the configuration backups within 1 month of the end of the warranty period.
13. Refer to 13443 for network device security requirements
14. Refer to 13444 for network drawing requirements.

B. Tests and Procedures Prior to Start-up

1. The CONTRACTOR shall secure the supervisory services of a factory-trained service engineer/technician who is specifically trained on the type of equipment specified herein, shall be provided during construction to assist the CONTRACTOR in methods of installing conduit and special cable; mounting, piping, and wiring of each de-vice, and the methods of protecting all of the equipment prior to placing it into service. Upon completion of the installation, provide the services of a trained service engineer/technician to configure, calibrate, test, and startup the equipment and provide instruction and training for the operating personnel. A sufficient number of service days shall be provided to place the system in satisfactory operation. One additional service call of one 8-hour working day (not including travel time) shall be included for use upon demand of the Owner within the first year's operation.

C. Demonstration of the Complete Network System
   1. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.
   2. After the Communication Network is completed, and when directed by the engineer, demonstrate that each of the communication ports on the network is functioning and make final adjustments to the system. If any system or piece of equipment within a system fails to function properly, rectify such defects or inadequacies and make a final demonstration as directed by the Engineer.
   3. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation and maintenance of the system installed under this Contract.
   4. Pay all charges or fees, including the cost of any special test equipment, factory engineers, etc., necessary for the proper performance of the specified tests, demonstrations and instructions.
   5. All demonstrations and instructions referred to shall be scheduled at the convenience of the Engineer and the Owner and in no case shall be scheduled without at least seventy- two (72) hours written notice.

D. Requirements specified elsewhere:
   1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
      a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 QUALITY ASSURANCE

A. All materials provided under this Contract shall be equal in quality, appearance and performance to that specified herein and shall be subject to the approval of the Engineer. Verify the availability of all materials proposed to be used in the execution of the work prior to submitting same for the Engineer's approval. The discontinuance of production of any material or product after approval has been granted shall not relieve the Contractor from furnishing an Engineer approved alternate of comparable quality and design without additional cost.

B. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in the manufacture of such products and shall be the manufacturer's latest standard design that complies with Specification requirements.

Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.

C. The Network Supplier shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of designing and maintaining these systems. Provide, for a period of twelve (12) months from the date of final acceptance of the work, all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.

D. Network Supplier:
   1. The communication network of similar type (e.g all layer 2 switches) shall be furnished by one supplier, who shall provide all of the equipment and appurtenances regardless of manufacturer, and be responsible to the Owner for satisfactory operation of the entire system.
   2. All necessary provisions will be made to ensure a proper interface between the existing control systems and new control panels provided under separate contracts.

E. Acceptable Suppliers:
   1. Refer to 13410 acceptable System Integrators.

1.3 SUBMITTALS

A. Shop Drawings and Samples:
   1. Submit Shop Drawings in accordance with General Conditions Section 01340 and as indicated herein.
   2. Shop Drawings shall be thoroughly checked for compliance with the Contract Documents. Verify that all furnished equipment and materials will fit into available space and maintain specified clearances, and that all equipment is compatible with the system operation.
   3. Shop Drawings shall consist of:
      a. Project name and location
      b. Contractor's name
      c. Index Sheet - Listing the equipment being submitted utilizing equipment designations, or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/type and catalog number.
      d. Manufacturer's scale or dimensioned drawings along with standard catalog number.
      e. Equipment ratings, service clearances and configuration.
      f. Bill of Materials and listing of accessories to be furnished.
      g. Refer to 13444 for network drawing requirements.
   4. All material shall be contained in one submission except for fiber optic cabling.

B. Maintain properly documented and witnessed test and checkout reports and submit these to the Engineer. These shall include the proper termination and testing of each of the fiber optic cables. No form of energy shall be applied to any part of the communication system prior to receipt by the Engineer of the supplier's certified statement of approval of the installation and containing their authorization to energize the system, except that the supplier's technician may do so for the purpose of check-

out as described herein.

C. Provide the Owner with a list of local service departments of duly authorized distributors of materials and equipment of the type installed, which will stock the manufacturer's standard parts, etc.

D. At the completion of the installation, provide reproducible Record Drawings indicating the final configuration of all systems as they were installed. Symbols, equipment designations, etc., shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground.

1.4 DELIVERY, STORAGE AND HANDLING

A. Coordinate material and equipment delivery with the project schedule. Notify the Engineer immediately, in writing, if material or equipment delivery will adversely affect the project schedule, include documentation from equipment suppliers indicating the revised delivery dates and the reason for the delay.

B. Coordinate delivery of equipment directly to other vendors where instrumentation supplied under this section shall be installed in panels supplied under other specification sections.

C. Exercise care during loading, transporting, unloading and handling of materials to prevent damage.

D. Check for defective or damaged materials, and for incomplete equipment shipments within seven (7) days after equipment delivery to the project site.

E. Store materials and equipment on the construction site in enclosures or under protective covering in order to assure that materials and equipment are kept undamaged, clean and dry.

F. Replace or repair, to the satisfaction of the Engineer, all materials and equipment that are defective or that have been damaged during installation, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 COMMUNICATION NETWORK

A. General:

1. Provide a PLC, HMI/SCADA communications system consisting of a new managed Ethernet hybrid ring/star-network including network panels, managed Ethernet Switches, CAT6 and fiber optic cable and fiber patch panels. Refer to network drawing for layer information. The ring network consist of the following panels and network racks:
   a. DW-CP
   b. NR-CP
   c. SEP-CP
2. The networks will use Ethernet protocol and meet 10/100/1000BaseT.
3. The network equipment will be mounted at each location as shown on the Network Diagrams, Electrical drawings, and as listed below in the Network Schedule.
4. Network Switch firmware updates shall be of no cost to owner.

5. The management port of managed switches, routers, and firewalls shall remain open for configuration purposes.

B. Fiber Optic Cable and Fiber Optic Patch Panels:
   1. Fiber optic cable is specified in section 13460.

2.2 ETHERNET MEDIA CONVERTERS

A. General
   1. Provide Ethernet media converter(s) as necessary and as shown in the Drawings and specified herein.

B. Physical Features
   1. Copper ports: per network schedule
   2. Fiber ports: per network schedule
   3. Operating temperature: -20 to 130 °F
   4. Power: Redundant 24 VDC inputs
   5. Enclosure: DIN-rail mountable

C. Additional Features
   1. N/A

D. Acceptable Manufacturers
   1. N-Tron – 302MC-N
   2. Hirschmann
   3. Moxa
   4. Or Equal

E. Basis of design: The drawings are based on generic network equipment. Equivalent alternate equipment (ex. switch in lieu of media converter) will be considered provided that all revisions required to the design, are accomplished at no cost to the owner

2.3 GIGABIT MEDIA CONVERTER:

A. Provide DIN Rail mounted media converters as shown on the Network Diagram and listed in the Network Schedule.

B. Power: Redundant 24VDC Inputs

C. Compliance: Ethernet compatible with the communication protocol of the PLC to be provided

D. Operating Temperature:
   1. Indoor Mounted: -10 to 60°C
   2. Outdoor Mounted: -20 to 75°C

E. Communication Ports:
   1. Copper ports: per network schedule
   2. Fiber ports: per network schedule

F. Indicators: Power, Link, and Active LED indicators.

G. Reliability: MTBF >2million hours

H. Equivalent to:
   1. N-TRON 1002MC-SX
   2. MOXA IMC-21GA
   3. Antaira
   4. Or equal

I. Basis of design: The drawings are based on generic network equipment. Equivalent

alternate equipment (ex. switch in lieu of media converter) will be considered provided that all revisions required to the design, are accomplished at no cost to the owner.

2.4 UNMANAGED ETHERNET SWITCHES

A. General
   1. Provide unmanaged Ethernet switch(s) for connection to the control network as shown in the Drawings and specified herein.

B. Physical Features
   1. Copper ports: per network schedule
   2. PoE Copper ports: per network schedule
   3. Fiber ports: per network schedule
   4. Operating temperature: 32 to 130 degrees f
   5. Power: 24 VDC
   6. Enclosure: Metal case, DIN-rail mountable
   7. Rating: ANSI/ISA Class 1, Division 2 Groups A, B, C, and D

C. Network Features
   1. Auto sensing duplex and speed
   2. LED link/activity status indication

D. Acceptable Manufacturers
   1. Allen Bradley Stratix
   2. No equal

E. Basis of design: The drawings are based on generic network equipment. Equivalent alternate equipment (ex. SFP ports, PoE switch in lieu of PoE injectors) will be considered provided that all revisions required to the design, including but not limited to power supplies, fiber optic cable connections, and spare fiber optic jumper cables be accomplished at no cost to the owner.

2.5 MANAGED ETHERNET SWITCHES (LAYER 2)

A. General
   1. Provide Layer 2 Managed Ethernet Switches for connection to the control network backbone as shown in the Drawings and specified herein.
   2. All Managed Ethernet Switches to be sized with 25% spare copper and fiber ports (minimum of 1 spare) beyond what is required to provide the intended design functionality. The following table below lists the Managed Ethernet Switches and the minimum number of ports required to produce the design intent. Note that this table accounts for the required spare capacity assuming a network topology as shown on the Control System Architecture Drawings. Any submitted network architecture equipment differing from the Drawings and Specifications must meet spare ports requirement and the Managed Ethernet Switch Schedule below.

B. Physical Features
   1. Fiber ports: Refer to Network Schedule at the end of this section.
   2. Copper ports: Refer to Network Schedule at the end of this section.
   3. PoE ports: Refer to Network Schedule at the end of this section.
   4. Operating temperature: 20 to 130 °F
   5. Power: 120VAC redundant power supply inputs

6. Enclosure:
   a. 19" Rack Mountable
   b. DIN-rail mountable, metal case
   c. Refer to schedule
7. Rating: UL Class 1, Division 2 Groups A, B, C, and D
8. Reliability: MTBF >2million hours

C. Network Features
1. Fault tolerant for use in a hybrid ring topology as shown on drawings
   a. Ring topology shall utilize the G.8032 standard
2. Full duplex on all ports
3. Auto negotiation and manual configurable speed and duplex
4. Wire speed switching fabric
5. IEEE 802.1w RSTP
6. IGMP snooping
7. IGMP filtering
8. Configuration password protected
9. Configuration backup capability required
10. SNMP V3

D. Additional Features
1. The switch shall come equipped with a dry contact rated for 120 VAC 5A that shall be used for common trouble alarm. Contact shall be Normally Closed, open on alarm. The alarm shall be programmable. If the contact cannot use 120 VAC 5A, provide the necessary 24 VDC power from the PLC panel and provide interposing relays in the PLC panel.

E. Acceptable Manufacturers
1. Allen Bradley Stratix
2. No Equal

F. Basis of design: The drawings are based on generic network equipment. Equivalent alternate equipment (ex. SFP ports, PoE switch in lieu of PoE injectors) will be considered provided that all revisions required to the design, including but not limited to power supplies, fiber optic cable connections, and spare fiber optic jumper cables be accomplished at no cost to the owner.

2.6 POE+ INJECTOR:

A. Provide DIN Rail mounted PoE+ injectors as shown on the Network Diagram and listed in the Network Schedule.
B. Input Power: 24VDC
C. Output Power: PoE+ IEEE802.3af/at Compliant (60W)
D. Compliance:
1. Ethernet compatible with the communication protocol of the PLC to be provided
2. IEEE802.3af/at Compliant

E. Operating Temperature: -40 to 75°C
F. Communication Ports:
1. Copper ports: per network schedule
2. PoE Copper ports: per network schedule
3. Fiber ports: per network schedule

G. Indicators: Power and Active LED indicators.
H. Reliability: MTBF >2million hours
I. Equivalent to:
   1. MOXA INJ-24A
   2. Hirchman Spider
   3. N-Tron
   4. Or Equal
J. Basis of design: The drawings are based on generic network equipment. Equivalent alternate equipment (ex. PoE switch in lieu of PoE injectors) will be considered provided that all revisions required to the design are accomplished at no cost to the owner.

2.7 GIGABIT POE+ INJECTOR:

A. Provide DIN Rail mounted gigabit PoE+ injectors as shown on the Network Diagram and listed in the Network Schedule.
B. Input Power: 24VDC
C. Output Power: PoE+ IEEE802.3af/at Compliant (60W)
D. Compliance:
   1. Ethernet compatible with the communication protocol of the PLC to be provided
   2. IEEE802.3af/at Compliant
E. Operating Temperature: -40 to 75°C
F. Communication Ports:
   1. Copper ports: per network schedule
   2. PoE Copper ports: per network schedule
   3. Fiber ports: per network schedule
G. Indicators: Power and Active LED indicators.
H. Reliability: MTBF >2million hours
I. Equivalent to:
   1. MOXA INJ-24A
   2. Hirchman Spider
   3. N-Tron
   4. Or equal
J. Basis of design: The drawings are based on generic network equipment. Equivalent alternate equipment (ex. PoE switch in lieu of PoE injectors) will be considered provided that all revisions required to the design are accomplished at no cost to the owner.

2.8 SMALL FORM-FACTOR PLUGGABLE INTERFACES (SFP'S)

A. Provide SFP's as required with the provided network devices. Refer to schedule for interface bandwidth requirements.
B. SFP's shall be manufactured from the same manufacturer of the piece of network equipment they are to be installed into.

2.9 WIRES AND CONNECTORS

A. Ethernet 10/100/1000 BASE-T/TX Cable.

1. The unshielded twisted pair (UTP) cable shall be designed for use with a high speed (10/100/1000 Mbps) Ethernet 10/100/1000 BASE-T/TX communications network. The twisted pair cable shall have a nominal impedance 100 ohms at one MHz, a maximum attenuation of 8 dB per 1000 feet at one MHz. The twisted pair cable must have frequency tested up to 250 MHz or more. The twisted pair cable shall be plenum rated and shall have a minimum of four 23 AWG solid copper conductor pairs. All 10/100/1000 BASE-T/TX (RJ-45) terminations on the twisted pair cable shall be done in a professional and workman like manner. Terminations shall provide for proper strain relief on the cable jacket. Strain relief on the wire and/or wire insulation shall not be acceptable.
2. Identification: Control Panels and networks racks shall use color coded fiber and copper patch cables:
    a. OT Layer: Gray
    b. IT Layer: Blue
    c. DMZ Layer: Yellow
    d. Security Layer: Red

2.10 SPARE PARTS

A. General requirements for spare parts are specified in sections 13410 and 13444.
B. The following Network and Communications System spare parts shall be furnished
    1. One switch of each type provided
    2. One SFP of each type provided.
    3. One spare device of each type used if provided submission various from design basis
    4. Manufacturer's cables - one of each type installed.
    5. Three-6ft CAT 6 patch cables of every color with connectors installed
    6. Three-10ft CAT 6 patch cables of every color with connectors installed
    7. One spare cellular router with, one spare of each type whip assembly and one spare of each type antenna connector used

2.11 NETWORK SCHEDULE

Phase 1A:

ID Tag	Description	Location	Power Supply	10/100TX RJ45 Ports	10/100FX Ports (SC Type)*	10/100/1000TX RJ45 Ports	10/100/1000 SX/LX Ports (LC Type)*	PoE RJ45 Ports	Managed	Mounting
MES-NR	Managed Switch	NR-CP	24VDC	0	0	8	4	0	Yes -L2	DIN

* 1 port is defined as one rx/tx pair

END OF SECTION

SECTION 13460

FIBER OPTIC CABLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Contractor shall provide all labor, materials, equipment and incidentals required to install, and place into successful operation, fiber optic cables and appurtenances for the process and non-process (with exception to fire alarm) communications systems throughout the plant as specified herein. The system includes, but is not limited to, fiber optic cables, connectors, patch panels, termination kits, enclosures and related appurtenances.

B. Contractor shall terminate all fibers in the patch panels and equipment designated on the Contract Drawings. Cable runs between termination points shall be continuous. Provide type and quantity of fiber optic cable as shown on the Contract Drawings.

C. The Contractor shall be responsible to install the equipment specified under this section in accordance with the staging instructions noted in the Contract Documents.

D. The Contractor shall label all existing Fiber Optic cables referenced on the drawings in accordance with section 3.2.

E. The Contractor shall provide all terminations, testing, field measurement reports, and implementation of the system.

F. The Fiber Optic Provider shall provide coordination with the System Integrator or AESS for network testing and installation.

G. Requirements specified elsewhere:

1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
    a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 QUALITY ASSURANCE

A. Installers shall be personally experienced in the installation of optical fiber systems and shall have been regularly engaged in the installation of fiber cable for a minimum of the past three years. Connector assemblies shall be done by a Bicsi Installer 2, FOA CFOT or CFOS/T technician, ETA FOT, or equivalent. Certification shall be through Bicsi, FOA, or equivalent body.

B. Provide all cable in accordance with the listing requirements of Article 770 of the National Electrical Code.

C. Cable manufacturer shall have a minimum of 20 years in manufacturing optical fiber cable in order to demonstrate reliable field performance. Cable and fiber manufacturer shall be the same company to ensure long-term reliability of the cabled fiber and to ensure the availability of fully integrated technical support.

D. Testing of any fiber link or connection shall be done by a Bicsi Installer 2, FOA CFOT or CFOS/T technician, ETA FOT, or equivalent. Certification shall be through Bicsi, FOA, or equivalent body. If the installer does not have trained and certified technicians for testing, a certified third party shall be used. Third party testing

agencies are FiberNext, Fiber Optic Cable Specialists LLC, or approved equal.

1.3 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of the General Conditions, Article 4 - Contractor's Working Drawings, Design and Shop Drawings, as specified under Detailed Specification 01340, and as specified herein.
   1. Manufacturer's product data sheets and complete construction details including physical characteristics of optical fiber, strength members, and jackets.
   2. Overall dimension of cable.
   3. Cable correction factor.
   4. Cable pulling plan, which specifies the sequence of work, tasks, materials, and equipment. The information submitted must include splicing and termination data including the following:
      a. Detailed bill of materials including fiber optic cable, terminations, patch panels, breakout enclosures, splice kits, connectors, pigtails, and fan-outs.
      b. Method of connecting cables.
      c. Details of cable preparation.
      d. Method of applying materials (including quantities).
      e. Precautionary measures.
      f. Drawings showing method of splicing including dimensions.
   5. Cable manufacturer's certified test data for attenuation and bandwidth and the maximum pulling strain allowed.
   6. Provide an optical link analysis for each fiber optic link. Calculate point-to-point (transmit/receive) optical power budget of each fiber link using proposed installed cable lengths. Include all losses through connectors. The power budget shall include transmitter power, receiver sensitivity, connector losses, cable attenuation, and a 2db aging margin. Submit calculated values including sketches graphically showing the proposed cable route.
   7. Installer and tester certifications..
   8. Training plan of fiber optic system.
   9. Test reports of any newly installed fiber optic cable.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cable Delivery:
   1. No cable over one-year-old shall be acceptable for delivery.
   2. Ends of cables shall be kept sealed at all times, except when making splice sand terminations. Splice and termination methods approved by the cable manufacturer shall be followed.
   3. Include the following data on each reel:
      a. Facility name and address.
      b. Contractor's Name.
      c. Project Title and Number.
      d. Date of Manufacture.
      e. Manufacturer's Name.
      f. Linear Feet.
      g. Project specific locations specific cable is to be installed.

h. Date of manufacture.

B. Cable Storage: Cable shall be stored at a temperature recommended by the manufacturer for optimum workability.

C. As the cable reel arrives on site and before the fiber optic cable is removed from the wooden cable reel, the cable shall be attenuation tested at 850nm and 1300nm for multimode fiber (1310nm and 1550nm for single-mode fiber)

PART 2 - PRODUCTS

2.1 GENERAL

A. All fiber optic cables and connectors specified herein shall meet or exceed the following performance ratings unless otherwise specified:

1. Bandwidth:

Category	Bandwidth
OM1	200 / 500 MHz·Km
OM2	500 / 500 MHz·Km
OM3	1500 / 500 MHz·Km
OM4	3500 / 500 MHz·Km
OS1	3500 / 500 MHz·Km
OS2	3500 / 500 MHz·Km

2. Attenuation:

Wavelength	Bandwidth
850nm	3.5 dB/Km
1300nm	1.5 dB/Km
1310&1550nm	1.0 dB/Km

3. Minimum Bend Radius: 20X outside diameter. (installation)
4. Minimum Bend Radius: 10X outside diameter. (in-service)
5. Cable and connectors are to be fungus resistant.
6. Operating Temperature: -20 to +70 degrees C (Indoor Cable) -40 to +70 degrees C (Indoor/Outdoor and OSP Cable)
7. Loose-Tube cable shall be dry tube, dry core.
8. Cables shall conform to EIA/TIA-568 guidelines and EIA/TIA-455 testing requirements.
9. Cables and connectors shall be provided by one of the following manufacturers:
   a. Optical Cable Corporation
   b. AFL Global
   c. Corning Cable Systems
   d. Or Equal

2.2 FIBER OPTIC INDOOR/OUTDOOR CABLE

A. Provide graded index loose tuber, gel-free or tight buffered optical glass fiber core cable compatible with LED and/or VCSEL (category dependent) based transmission system.

B. Cable shall meet UL OFNP specifications and not require transition splicing upon building entry in order to meet fire codes. Cable shall be suitable for installation in aerial, plenum, and riser environments.

C. Fanout or Furcation kits shall be used when terminating connectors onto loose tube

cables, 900µm or 3mm kits will be used. Fanout kit hollow tube colors must match the color of fiber in which it is installed on.

D. Cable Specifications:
   1. Category: OM3
   2. Fiber Count: 12
   3. Coated Fiber Size: 250µm (Loose Tube) or 900µm (Tight Buffered)
   4. Nominal Cable Diameter:
   5. Maximum Tensile Load Short-Term: 600 lbf (2700 N)
   6. Maximum Tensile Load Long Term: 200 lbf (890 N)
   7. Minimum Crush Resistance: 1800 N/cm

2.3 FIBER OPTIC TERMINAL CONNECTORS

A. Furnish connectors and components and use specific tools and methods as recommended by the connector manufacturer to form complete and reliable fiber optic cable terminations.

B. Multimode connectors shall be pre-polished with a PC shaped ferrule for fiber optic cable. "Fuse-on" or "FuseConnect" type are recommended as they do not require splice trays. Terminal shall be constructed of a composite housing, ceramic ferrule and a fiber stub permanently bonded into the ferrule.

C. Connections shall be epoxy or fusion spliced. "Unicam" or similar mechanical connections shall not be accepted.

D. Connection adapters shall be used sparingly to reduce the amount of attenuation in the fiber optic links. Adapters shall only be used with the approval of the engineer.

E. Connectors shall be only installed and connected to identical fiber core size cables.

F. The terminal connector performance characteristics shall be as follows:

1. Reflection:	Refer to Section 3
2. Durability Delta (1,000 matings)	0.1 dB.
3. Operating Temperature:	-40 to +85 degrees C.
4. Cable Retention:	40 pounds.

G. Specifications:
   1. Type: LC, coordinate with the network equipment specified in Section 13445 as applicable.

H. Terminal connectors shall be provided by one of the following manufacturers:
   1. Corning Cable Systems.
   2. Optical Cable Corporation.
   3. Or approved equal.

2.4 FIBER OPTIC PATCH CABLES

A. Graded index, fiber optic jumper cables shall of suitable length. Jumpers within control enclosures shall be a minimum of 2ft in length. Jumpers shall be furnished with same type of connectors specified in Section 2.3 and coordinate with equipment, PVC jacket and be furnished by the fiber optic backbone cable manufacturer. Jumper cables fabricated on site shall not be acceptable.

B. Jumper cables to be of the same category as the other cabling specified herein or as shown on the drawings.

C. Provide a quantity of jumper cables equal to the total number of fibers terminated in all patch panels.

D. Jumper cables shall be provided by one of the following manufacturers:
   1. Corning Cable Systems.
   2. Optical Cable Corporation.
   3. Or approved equal.

2.5 CABLE CONSTRUCTION

A. Riser Cables
   1. Riser cables up to 12 fibers: In cables with more than one fiber, the fibers shall be stranded around a dielectric member and surrounded by layered aramid yarns. The aramid yarns shall serve as the tensile strength member of the cable. A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal. The outer jacket shall be extruded over the aramid yarns for physical and environmental protection.

B. Plenum Cables
   1. Plenum cables up to 12 fibers: The fibers shall be stranded around a dielectric member and surrounded by layered aramid yarns. The aramid yarns shall serve as the tensile strength member of the cable. A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal. The outer jacket shall be extruded over the aramid yarns for physical and environmental protection.

C. The strength member shall be a high modulus aramid yarn. The aramid yarns shall be helically stranded around the buffered fibers. Non-toxic, non-irritant talc shall be applied to the yarn to allow the yarns to be easily separated from the fibers and the jacket.

D. Cable jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.

E. The cable shall be all-dielectric.

2.6 CABLE IDENTIFICATION

A. The individual fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, “Color Coding of Fiber Optic Cables.” The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color coded buffered fibers shall not adhere to one another. When fibers are grouped into individual units, each unit shall be numbered in the unit jacket for identification. The number shall be repeated at regular intervals. Outer jacket color shall be standard to the fiber cable category, unless otherwise noted or used in an application where UV stabilization is necessary.

B. The outer cable jacket shall be marked with the manufacturer’s name or UL file number, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet. The markings shall be in contrasting color to the cable jacket.

2.7 FIBER OPTIC CABLE PATCH PANELS (FPPS)

A. Fiber optic patch panels designated as wall mounted as indicated in the Contract Drawings shall be enclosed in a NEMA 4X wall mounted cabinets for outdoor locations, NEMA 12 for indoor locations, unless otherwise specified. Patch panels shall utilize adapter plates of the same connector type as is identified in Section 2.3 or as shown on drawings. All panels shall be suitable for the cabling specified herein. Where is NEMA 4X FPP is required, it will be acceptable to use a NEMA 12 FPP in a NEMA 4X enclosure as specified in the following section.

B. Panel mounted fiber optic patch panels shall be mounted directly to the interior subpanel with a minimum of 6" clearance around the patch panel. Panels shall be din-rail mountable and accommodate one connector panel adapter. Din Rail mount patch panels shall be used only if fiber count is twelve or less. Otherwise a wall mounted panel shall be used and mounted in the panel, regardless of what is shown on the contract drawings.

C. Wall mounted patch panels shall accommodate a minimum of four, six connector panel adapters. Panels shall have a metal enclosure, hinged door, jumper routing guides, strain relief points and lockable door. Appropriate quantities of connector modules shall be furnished.

D. Distribution rack patch panels shall be mounted in an EIA standard 19-inch width rack enclosure and be on rails. Rack mounted fiber optic patch panels shall accommodate a minimum of three, six connector panel adapters.

E. Patch panels to use the same type of connectors as specified in Section 2.3.

F. Splice trays or cassettes shall be installed into any patch panel that contains a splice.

G. Slack trays or cassettes shall be installed in any rack patch panel that does not use a splice tray or cassette.

H. Wall mounted and Distribution patch panels shall not be populated any more than 50% of its listed maximum capacity. Panels shall be sized appropriately and be supplied with an appropriate quantity of panel adapters. Blank adapter slots shall be populated with covers for all FPP's.

I. Strength members of fiber cable shall be secured to the panel. Cables shall be secured to panel.

J. Zip ties shall not be used to directly clamp cables in panel. A protective sleeve (such as a felt strip) shall be used to distribute the clamping force. Zip ties shall be hand tightened and trimmed, use of zip tie guns are not permitted.

K. All patch panels to be installed with a schedule identifying the cable label and fiber number(s). Label is to be visually accurate to the arrangement of the panel.

L. Install patch panels and fiber in accordance the manufacturer recommendations. Install fiber in panels in accordance with the NEC for any conductive fiber optic cables.

M. Provide fiber optic cable patch panels as referenced on the Contract Drawings and that meet the following requirements:

1. Furnish panels with the following accessories:
    a. Splice trays/cassettes (if applicable)
    b. Slack trays/cassettes (if applicable)
    c. Cable strain relief
    d. Bend radius protectors

e. Routing guides
f. Grommetted cable entries
g. T adapters and adapter plates
h. Sufficient working space for removal of connectors
i. Identification label
j. All cable management hardware required to accomplish the installation

2. Installation of accessories in a separate enclosure inside the NEMA 4X enclosure shall be permissible.
3. Furnish each cabinet with a key lock and four (4) keys. All cabinets provided are to be keyed alike so that a single key opens all cabinets.
4. Furnish cabinets with internal space to store, organize, and strain relieve incoming and outgoing cables.
5. Ground lug for cable support member and routing supports to maintain allowable cable bend radius.

N. Where the required number of terminations exceeds the capacity of a single patch panel, multiple patch panels shall be provided.
O. Product and Manufacturers: Provide one of the following:
1. Corning Cable Systems.
2. Optical Cable Corporation.
3. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables in the indicated raceway systems. Inspect raceways prior to pulling cables. Rod and swab out conduits and ducts prior to installing cables.
B. Pull cables prior to attachment of connectors. Terminate all fibers at each patch panel. Install jumper cables at each patch panel as shown on the Contract Drawings, or as directed by the Engineer.
C. Pull cables using an indirect attachment method such as a "Kellems Grip," along with fiber strength members attached. Pulls with strain directly on the fiber core shall not be allowed. Use swivel when applicable.
D. Do not exceed maximum pulling strength limits of the cable during installation. Monitor cable pull tensions at all times during the installation of the cable using a remote sensing puller, strain gauge or running line tensiometer. If electronic tension monitoring equipment is used, it shall be calibrated or checked for calibration on a daily basis or prior to any cable pull. If there is evidence of over-tensioning of cable during installation, visible through excessive macrobends, the cable is to be replaced.
E. To reduce cable friction and minimize pulling forces during installation, use a polymer based, water soluble lubricant when pulling cable.
F. Do not exceed the minimum bend radius of the cable. Tight loops, kinks, knots, or tight bends shall not be allowed during installation.
G. For conduit installation, the minimum bending radius shall be 20X when under tension. Use sweeping elbows at all transitions from horizontal to vertical conduit runs.
H. Provide adequate lengths of cable such that all runs, from termination-to-termination are without splices. Cable splices shall be avoided to the greatest extent possible.

Where splices are required they shall be done with the approval of the Engineer and in accordance with the manufactures recommendations. Splicing shall be done with a fusion splicer. Splices shall be located in a FPP rated for area. If approval is not granted by the engineer, the cable shall be replaced.

I. Provide a minimum of 6ft of service loop for all fibers (used and unused) in every patch panel. Provide a minimum 4' of service loop of fiber cable in the control panel. No more than 12' may be coiled up in the panel, remaining shall be coiled in pullboxes or handholes.

J. Provide handholds and pull boxes as required by the cable manufacturer or at a minimum of every two hundred feet or at the third 90-degree conduit bend.

K. Within manholes, route and support fiber optic cable along the inside wall.

L. Install patch panels at the locations shown on the Contract Drawings.

M. Unused or disconnected fiber connectors shall be covered with plugs to prevent damage to the fiber ends.

N. Fibers in patch panels shall be neatly coiled in trays.

3.2 IDENTIFICATION

A. Label each termination point.

B. Tag each cable in each junction box, pull box, manhole, and handhold. Tags shall solvent and tear resistant, waterproof, and indicate the cable number. Attach tags to cable with cable ties or lacing cord.

C. Label each patch cord with a wraparound or heat shrink sleeve identifying the cable number and fiber pair within 12 inches of both ends. Labels that have a "tail" will not be accepted. Information shall include cable number as indicated on the Electrical Drawing / Network Drawing and network or control panel the cable is "from" or connected to.

D. Label each patch cord with a wraparound or heat shrink sleeve identifying the cable number and fiber pair within 12 inches of both ends. Labels that have a "tail" will not be accepted. Patch cords that are 3 feet or less that do not enter a wire way may only use one label.

E. Label each fiber patch panel.

3.3 CHECKOUT AND TESTING

A. Test fiber optic cables before and after field installation. Tests shall be witnessed by the Engineer and scheduled with 5 business days' notice.

1. Upon receipt of the fiber optic cable reels, test each fiber separately with an Optical Time Domain Reflectometer (OTDR) to verify fiber length, attenuation and continuity.
2. Test each cable with a launch and receive cable to capture the performance of the entire cable using the OTDR. Both launch and receive cables shall be 150m or greater in length.
3. Test each cable with best practices, including but not limited to:
    a. Cleaning all connectors prior to each termination and test.
    b. Proper cursor and window settings: Tested cable section (including launch and receive links) is to be greater than 50% of screen, cursors are to be located just before and after first and last link under test connections.

c. Pulse width to be appropriate to cable length to minimize dead zones and saturation while still having discernible events. Pulse width is to be 30ns or less for any cable run less than 1km. Pulse width is to be 10ns or less for any cable run less than 0.5km.
d. Averaging time to be appropriate to cable length and pulse width to yield a detailed but smooth trace.
e. Mandrel installed at end of receive cable in the event of excessive noise.
f. Indexing gel is not to be used during testing or installation.

4. Test all fibers including spares. Test shall include, but not be limited to the following:
   a. The test shall be performed on a point to point basis from the head end device to the end device. Test shall cover all terminations. Test shall verify proper termination points within patch panels.
   b. If a section of the fiber optic cable does not meet the testing requirements specified herein or has evidence of micro-bending, the entire link is to be replaced.
   c. The Contractor shall be responsible for repairing any connector and or cable that does not meet the specifications. Repairs shall meet the requirements specifications.
5. Furnish certification documents for each test and record the following data. Include printouts from the OTDR with the certification documents.
   a. Installer's company name and address.
   b. Installer's name.
   c. Date of certification.
   d. Test date and time.
   e. Attenuation of each fiber link.
   f. Length of each fiber optic link measured.
   g. Cable name or number.
   h. Fiber pair.
   i. Pulse width.
   j. Length of Launch and Receive cable.
   k. Graph of test results with scales labeled on each axis. Graph should take up no less than half of an 8 ½ x 11 page. Cursors shall be located prior to the first connection, and after the last connection.
   l. Event table with losses and reflection of each event.
   m. Equipment used to certify the fiber optic link.
      i. Name of person(s) and certifications of technician(s) recording the test data.
   n. Digital copies of the OTDR trace results in SOR format shall be available to the engineer upon request.

B. OTDR’s shall have calibrations traceable to IEC 61746-1 or TIA/EIA-455-226 standard.

C. Regardless of core diameter, the maximum cable attenuation for each fiber optic link (device to device) shall not exceed the following losses:

	10/100Base-## (dB)	1000Base-## (dB)
Single Mode Fiber	13.0*	9.0*
Multimode Fiber	7.5*	5.5*

*The attenuation loses include a 3dB aging margin.

D. The maximum connector and cable attenuation for each fiber optic link shall meet the following:

	Splice Loss (dB)	Connector Loss (dB)	Cable Attenuation	Connector Reflectance (dB)	ORL (including connections) (dB)
Single Mode Fiber	≤0.30	≤0.75	≤1.0dB /km @ 1310Mhz* ≤1.0dB /km @ 1550Mhz*	≤-45 @ 9µM	≥36
Multimode Fiber	≤0.30	≤0.75	≤3.5dB /km @ 850Mhz ≤1.5dB /km @ 1300Mhz	≤-25 @ 62.5µM ≤-30 @ 50µM	≥30

*OSP SM attenuation shall be less than 0.5dB/km at both 1310 and 1550Mhz frequencies for outdoor cable.

3.4 SPARE PARTS AND TEST EQUIPMENT

A. Contractor shall furnish and deliver the spare parts and test equipment as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this specification.

B. Spare parts shall be packed in containers suitable for long term storage, bear labels clearly designating the contents and the pieces of equipment for which they are intended.

C. The following shall constitute the minimum required spare parts:
   1. Three (3) (#ft) fiber patch cables of each type used.
   2. Six “One-Click” Mini or equal for use with each type of connector used. One to be placed in each panel with fiber and one loose spare
   3. Six resealable packages of 50 fiber wipes.

D. The following shall constitute the minimum required test equipment:
   1. One (1) fiber optic test kit with rings (AFL Telecommunications, Noyes® M200 OTDR or JDSU TBerd 2000).

END OF SECTION

SECTION 14320

HOIST SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish, install, and test manual hoist systems as shown on the Drawings and as specified herein.

B. The hoist systems shall be complete with I or S-beam track, monorail track, swing out section, trolley, hoist and all appurtenances necessary to complete the installation.

C. This hoist system shall be completely manual with no electrical components.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1.3 REFERENCES

A. AISC - American Institute of Steel Construction

B. AWS - American Welding Society

C. ASME B30.11 2010 - Monorails and Underhung Cranes

D. ASME B30.16 - 2007 -Overhead Hoists (Underhung)

E. HMI - Hoist Manufacturers Institute

F. MMA - Monorail Manufacturers Association

G. OSHA - Occupational Safety and Health Administration

1.4 SUBMITTALS

A. Submit complete shop drawings as specified in specification sections 01340 and 11000 and including but not limited to;

1. Equipment specifications and data sheets identifying all materials used and methods of fabrication. Weights of all component parts and assembled weight of units.
2. Complete assembly, layout and installation drawings with clearly marked dimensions.
3. Interconnection ladder-type wiring diagrams for power and control wiring required for final connections. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.
4. Spare parts recommended by the manufacturer.
5. Special tools necessary to disassemble, service, repair and adjust the hoist systems.
6. Installation, start-up, operating and maintenance instructions.
7. Warrantee/guarantee

1.5 QUALITY ASSURANCE

A. All of the monorail track, swing out section and trolley equipment on the monorail track shall be provided by a single, experienced and qualified manufacturer who is a member of the Monorail Manufacturers Association.

B. Trolley equipment for hoists on I-beam track shall be provided by the hoist manufacturer.
C. All of the hoisting equipment shall be provided by a single, experienced and qualified manufacturer who is a member of the Hoist Manufacturers Institute.
D. All components and installations shall be the responsibility of one manufacturer.
E. The current issue of Underhung Cranes and Monorail Systems by the MMA and the Hoist Manufactures Institute shall be included as a part of this section unless otherwise specified.

1.6 DELIVERY, STORAGE AND HANDLING

A. Contractor shall be responsible to off load, store and cover hoisting systems and protect controls and electrical equipment from moisture.

PART 2 - PRODUCTS

2.1 HOIST SCHEDULE

Location	Capacity	Hoist	Trolley	Lift Height	Service Class	Remarks
North RAS PS Pump Room	4.0 ton	M	M	20'-0"	H1	SHR, CR

M - Manual; E - Electric; LHR - Low headroom; SHR - Standard Headroom; XP - Class 1/Division 1 or Division 2; CR - Corrosion resistant materials; H1 - Infrequent Use

2.2 SYSTEM REQUIREMENTS

A. All components of all equipment, including hoist and trolley, wire rope or cable, and other appurtenances shall be rated to satisfy the requirements of the NEMA rating designated for the rooms in which the equipment will be used in and travel through. Space NEMA Classifications for equipment in rooms shall be as indicated on Contract Drawing E-00-00l.

2.3 MANUFACTURERS

A. Bridge Crane Kit
   1. TC/American Monorail, Inc., St. Michael, MN
   2. North American Industries/Dearborn Crane Woburn, MA
   3. Ace Industries, Norcross, GA
   4. Or equivalent

2.4 MONORAIL TRACK

A. Monorail track shall be designed for the following loads:
   1. Vertical load with manual hoist: Weight of the trolley, hoist and rated lifted capacity plus a 15% impact factor.
   2. Lateral load: 20% of the rated lift capacity.
   3. Longitudinal load: 10% of the rated lift capacity.
   4. Deflection: Not to exceed 1/600 of the distance between supports or the length of the cantilevered portion.
B. Fabricated section consisting of a steel top flange and web and a specially rolled Tee section bottom flange with a high carbon - manganese alloy steel raised operating flange.

C. Curves shall be of the same track as straight sections. Coordinate with trolley manufacturer that the trolley supplied will negotiate the curve designed into the monorail track as shown on the Contract Drawings.
D. All track hardware including splices, end stops or other items necessary to furnish a complete system shall be provided.
E. Provide all necessary clamps, hanger rods and other fittings from which monorail track is supported. Monorail track shall be mounted to superstructure at the locations as shown on the Contract Drawings. Hanger rods shall be sway and thrust braced as required by the manufacturer.
F. Provide additional supports at the monorail curve section in accordance with the monorail manufacturer's recommendations.
G. Provide cantilever hanger at the monorail cantilever support beam in accordance with the monorail manufacturer's recommendations.

2.5 TROLLEYS

A. Trolleys shall be manufactured with heavy section rolled steel side frames.
B. Wheels shall be bronze, induction hardened to a minimum of 425 Brinnel. Bearings shall be double row, combination radial and thrust, anti-friction precision type. They shall be prelubricated and sealed and have a minimum B-10 bearing life of 5,000 hours.
C. Trolleys shall fit on standard "I or S" type structural beam or Monorail Track as indicated on the Structural Drawings.
D. Trolley wheel gears and pinions shall have machined cut geared teeth. Spacer washers shall be provided for trolley adjustments to various beam sizes.
E. Movement of hand-geared trolleys is accomplished by pulling on an endless zinc plated hand chain. .
F. Trolleys shall be provided with rubber bumpers capable of stopping a trolley at an average rate of deceleration not to exceed 4.7 ft/s/s when traveling in either direction at one-third of the rated load speed.

2.6 HOISTS

A. Hoists shall have safety-type lug mounted connection.
B. Hoists shall have full blocks with safety latch swivel hook. Hooks shall be bronze or high bronze alloy in Explosion Proof areas.
C. Each manual hoist shall have enclosed gear train, screw and disc type load brakes, slip clutch type load limiting device and anti-friction bearings throughout.
D. Provide chain baskets for all chain hoists. .

2.7 RATED LOAD

A. Each hoist shall be marked with its rated load. These markings shall be clearly legible from the loading position.
B. Both sides of the each monorail track and/or I-beam shall be marked with its rated load. These markings shall be clearly legible from the floor below.

2.8 SURFACE PREPARATION AND SHOP COATING

A. Provide surface preparation and shop coatings in accordance with Specification Section 09905.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall verify all dimensions and clearances in the field prior to erection and shall be responsible for the proper fitting and operation of the equipment.

B. Install in strict accordance with the manufacturer's instructions and Specification Section 11000. Installation shall include furnishing any required oil and grease in accordance with the manufacturer's instructions.

3.2 USE DURING CONSTRUCTION

A. At no time during the construction period shall the monorail, I-beam, hoist and trolley be used by the Contractor for construction purposes. The hoist/trolley manufacturer shall render the equipment inoperable until final testing, checkout and startup.

3.3 START UP AND TESTING

A. In accordance with Specification Sections 01800 and 11000.

B. The monorail, trolley and hoist shall be tested at the rated load by the Contractor to demonstrate the ability to lift and continuously transport the load throughout the entire length of the runway.

C. Contractor shall provide necessary weights, slings, etc., necessary for conducting the test. Weights shall be calibrated.

3.4 CLEANING

A. Contractor shall thoroughly clean all installed materials and equipment and touch up factory finish as required.

END OF SECTION

SECTION 15050

PIPE & PIPE FITTINGS – GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support, and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Other Trades: Cooperate with all other trades whose work is to be coordinated with piping work.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.

1. Section 01340 – Submittals
2. Section 01600 – Delivery, Storage and Handling
3. Section 09905 – Surface Preparation and Shop Coatings
4. Section 15094 – Prefabricated Pipe Hangers, Supports and Bracing
5. Section 15100 – Valves – General

1.3 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI B31.1 – Power Piping
2. ANSI B31.3 – Process Piping
3. ANSI B31.4 – Liquid Transportation Systems for Hydrocarbons,
4. Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohol.
5. ANSI B31.5 – Refrigeration Piping
6. ANSI B31.9 – Building Services Piping
7. ANSI B31.8 – Gas Transmission and Distribution Piping Systems
8. NSF 61: Drinking Water System Components – Health Effects
9. NSF 372: Drinking Water System Components – Lead Content

1.4 SUBMITTALS

A. Submit shop drawings in accordance with Section 01340 and the General Conditions of the Construction Contract.

B. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.

C. Submit other documents as specified in the appropriate Sections of this Division.

D. Submit complete pipe support system design stamped by a Professional Engineer registered in the Project State with at least 5 years of experience in the analysis and design of similar system within the last 5 years.

E. Computerized calculations with supporting and backup documentation will be acceptable.

F. The design of the pipe support system shall include analyzing the system piping and

service conditions to develop a detailed support system, specific to the piping material, pipe joints, valves and piping appurtenances.

G. The support system design shall include the criteria for each piping system.

H. The piping system analysis and design shall conform to ANSI B31.

I. The support system shall be designed for dead weight and dynamic analysis, including system thermal effects, pressure thrusts and seismic forces. Refer to paragraph 1.5 Seismic Control for seismic requirements.

J. Each piping system shall be presented in an isometric graphic and shall show the resolved and resultant force and moment systems as well as all recommended hangers, supports, anchors, restraints and expansion/flexible joints.

K. Submit complete layouts, schedules, and location plans for all piping systems.

L. Submit complete piping drawings for each piping submittal indicating type of hanger and/or support, location, magnitude of load transmitted to the structure and type of anchor, guide and other pipe supporting appurtenances including structural fasteners.

M. Submittal shall include catalog cut for each different type of pipe hanger or support indicating the materials of construction, dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special anchor and/or support.

N. Summary of Contractor selected related components including joints, class, valves, appurtenances, etc., and commercial supports and piping materials.

O. Coordinate piping support arrangements to eliminate interference with similar systems to be installed under HVAC, Plumbing, Fire Protection and Electrical; to account for structural expansion joints and to maintain access for both personnel and for removal of equipment.

P. After the work is installed, but before it is filled for start-up and testing, the support system design engineer shall inspect the work and certify its complete adequacy. Each system shall be inspected and certified in the same way. Submit a report, including all field modifications and all certificates.

1.5 SEISMIC CONTROL

A. Not applicable.

1.6 DELIVERY, STORAGE AND HANDLING

A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.

B. Do not drop pipe and fittings.

C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as required by the Engineer.

D. Assure that materials are kept clean and dry.

E. Do not store materials directly on the ground.

F. Follow manufacturer's specific instructions, recommendations and requirements.

G. Store in a manner to protect items with epoxy shop coatings from exposure to UV light which can cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with coating manufacturer’s recommendations. This includes protection from UV light after installation while

awaiting covering or filling of tanks, or prior to field painting for items scheduled to be topcoated as specified in Section 09900.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials are specified in the following Sections in this Division.

2.2 BOLTS, ANCHOR BOLTS AND NUTS

A. Furnish all necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.
B. All bolts, anchor bolts, nuts, washers, lock washers, plates, and bolt sleeves shall be Type 316 stainless steel.
C. Unless otherwise specified, stud, tap, and machine bolts shall be of the best-quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to AN Standard B 1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).
D. All bolts shall be suitable size for the intended purpose, with direct input from the product manufacturer.

2.3 SURFACE PREPARATION AND SHOP COATINGS

A. Provide surface preparation and shop coatings in accordance with Specification Section 09905.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
    1. Defects and damage.
    2. Deviations beyond allowable tolerances for joint dimensions.
    3. Removal of debris and foreign matter.
D. Examine areas and structures to receive piping for:
    1. Defects, such as weak structural components that adversely affect the execution and quality of work.
    2. Deviations beyond allowable tolerances for pipe clearances.
E. All materials and methods not meeting the requirements of this Contract will be rejected.
F. Immediately remove all rejected materials from the project site.
G. Start work only when conditions are corrected to the satisfaction of the Engineer.

3.2 INSTALLATION

A. General:

1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as specified herein.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
3. Install adapters, acceptable to the Engineer, when connecting pipes constructed from different materials.
4. Support all piping not being installed in trenches in accordance with the "Pipe Hangers & Supports" Section in Division 15.

B. Installation in Trenches:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Set the pipe true to line and grade.
7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
8. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
11. Take all necessary precautions to prevent floatation of the pipe in the trench.
12. Bedding and backfill for all pipe materials shall be as specified in Section 02200, Earthwork, and as shown on the Drawings.

C. Temporary Plugs:

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

3.3 CLEANING AND TESTING

A. Cleaning & Testing Piping - General:
   1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
   2. When the installation is complete, test all pipelines in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner. When requested by the Engineer or local plumbing inspector, building gravity drains shall be tested prior to backfilling or concealing. All other piping must be tested after backfilling.
   3. Equipment: Supply all labor, equipment, materials, taps, gauges, and pumps required to conduct the tests.
   4. Retesting: Perform all retesting required by the Engineer at no additional cost to the Owner.

B. Outside Potable Water Piping:
   1. Pressure Test (CLASS I):
      a. CLASS I Pressure Testing shall be performed in accordance with Section 4 of AWWA Standard C600.
      b. Pressure and leakage tests are required and will be conducted concurrently.
      c. Hydrant branch gate valves shall remain open during this test.
      d. The hydrostatic pressure shall be at the test pressures noted on the Drawings based on the elevation of the lowest point in the Section under test. If no test pressure is indicated, perform pressure and leakage test at 1-1/2 times the maximum system pressure or 150 psi, whichever is greater (based on the elevation of the lowest point of the section under test and corrected to gauge location). Test duration shall be two (2) hours.
   2. Leakage, if any, shall be equal to or less than the amounts as determined by the equation in Section 5.2.1.4 of AWWA C 600-17.

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

L = testing allowance (makeup water), in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during the hydrostatic test, in pounds per square inch

      a. The Contractor shall furnish and install corporation stops, taps and lengths of line as required to conduct the testing.
   3. Disinfection of Pipelines:
      a. Chlorinate all new potable water lines in accordance with the procedure outlined in AWWA C651. (Section 5.1 deleted)
      b. Review locations of chlorination and sampling points with the Engineer prior to beginning disinfection.

c. Use a dosage which will produce an initial minimum concentration of 25 mg/l and not less than 10 mg/l chlorine residual after a contact period of 24 hours.
d. During the chlorination period, exercise care to prevent the contamination of water in the existing water main.
e. After chlorination, flush the piping with clean potable water until the residual is that prevailing in the existing system or less than 0.5 mg/l.
f. The Contractor shall furnish and install corporation stops, taps, lengths of pipe as required to conduct testing.
g. Dispose of chlorinated water as per AWWA C651, Appendix B.

4. Bacteriological Testing:
   a. Test all new potable water lines for total coliform bacteria at no additional cost to the Owner.
   b. The length of pipe to be tested and the time of the test itself shall be as approved in advance by the Engineer.
   c. The Engineer will observe the taking of samples.
   d. Have all samples tested by a laboratory certified by the State and submit test results to the Engineer.
   e. Any segment of a potable water line shall be considered unsuitable for service if a coliform bacteria count is obtained from that sample or if results show a high non-specific bacteria level.
   f. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until satisfactory results are obtained.
   g. Place piping into service when it has been successfully tested for pressure, leakage and total coliform bacteria and has been accepted by the Engineer.

C. Building Interior or Exposed Water Lines: Clean and test in accordance with the "Plumbing General" Section in Division 15.

D. Building Interior or Exposed Sewer System: Clean and test in accordance with the "Plumbing General" Section in Division 15.

E. Outside Sewer Lines (CLASS II): CLASS II pipe testing shall be performed in accordance with Section 02755.

F. All Other Piping Systems:
   1. CLASS IV and CLASS V Hydrostatic Pressure Test – Ductile iron and PVC pressure pipes:
      a. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blowoffs are not available at high points for releasing air the Contractor shall make the necessary excavations, backfilling and taps at such points and shall plug said holes after completion of the test.
      b. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
      c. CLASS IV - Perform pressure and leakage test at the test pressure shown on the Pipe Schedule. If no test pressure is indicated, perform pressure and leakage test at 1-½ times the maximum system pressure or 100 psi

whichever is greater (based on the elevation of the lowest point of the section under test and corrected to the gauge location).

d. CLASS V - Perform pressure and leakage test at the test pressure shown on the Pipe Schedule. If no test pressure is indicated, perform pressure and leakage test at 1-1/2 times the maximum system pressure or 20 psi whichever is greater (based on the elevation of the lowest point of the section under test and corrected to the gauge location).

e. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period on buried pipelines exceeds a rate calculated by the equation in paragraph 3.3,B,1,e of this Specification Section, the section shall be considered as having failed the test. All pipes within structures and chambers and all flanged joints shall have no visible leakage.

f. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at their own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.

2. Connection to Work by Others.

   a. If work involves connection of pipe lines to pipes or structures provided by others, pressure tests pipe line prior to making the connection.

   b. After successfully passing the pipe line pressure test, make the necessary connections to the work by others, and pressure test the connection.

   c. The connection shall be pressurized to the pipe line test pressure, for a minimum of 4 hours. The connection shall have no visible leakage.

   d. Correct any leakage at no cost to the Owner and retest until connection passes.

3. Cleaning: Perform all specialized cleaning as specified or required by system.

3.4 PIPE SCHEDULE

TAG	DESCRIPTION	LOCATION (1)	SIZE	MATERIAL (2)	JOINT SYSTEM	PRESSURE TEST CLASS (3)	DELEGATED PE DESIGN OF PIPE SUPPORTS (4)	DELTA OPER. PRESS. (PSI)	DELTA OPER. TEMP. (degF)
PIPE SCHEDULE PART 1: **PART 1 OF THIS PIPE SCHEDULE APPLIES TO ALL PIPING EXCEPT FOR PLUMBING AND MECHANICAL PIPING. REFER TO PART 2 AT THE END OF THIS TABLE FOR PLUMBING/MECHANICAL PIPING SCHEDULE.**									
DR	DRAIN	EXPOSED	<4”	SCH 40 PVC	SOLVENT WELD	CLASS V	NO	-	-
SC	SCUM	EXPOSED	ALL	SCH 80 PVC	SOLVENT WELD	CLASS IV	NO	-	-
RAS/ WAS/ TWSL	SLUDGE	BURIED	ALL	CLASS 52 D.I.	PUSH-ON	CLASS IV	N/A	-	-
		INTERIOR EXPOSED RAS/WAS	ALL	CLASS 53 D.I.	FLANGED		YES	75	40
		EXTERIOR EXPOSED WAS	ALL	SCH. 80 PVC	SOLVENT WELDED		YES	75	80
		EXTERIOR EXPOSED RAS DISCHARGE PIPING (TO INFLUENT AERATION CHANNELS)	ALL	SCH. 40 304 SS	FLANGED		YES	75	80
SPD	SUMP PUMP DISCHARGE	EXPOSED	ALL	SCH 80 PVC	SOLVENT WELD		NO	-	-

TAG	DESCRIPTION	LOCATION (1)	SIZE	MATERIAL (2)	JOINT SYSTEM	PRESSURE TEST CLASS (3)	DELEGATED PE DESIGN OF PIPE SUPPORTS (4)	DELTA OPER. PRESS. (PSI)	DELTA OPER. TEMP. (degF)
UW	UTILITY WATER	EXPOSED	ALL	SCH 80 PVC	SOLVENT WELD	CLASS IV	YES	100	80
PIPE SCHEDULE PART 2: **PART 2 OF THIS PIPE SCHEDULE APPLIES TO PIPING SHOWN ON PLUMBING, MECHANICAL, AND CIVIL DRAWINGS. FOR PROCESS PIPING, REFER TO PART 1 OF THIS TABLE.** **NOTE 1: "X" AT THE END OF THE TAG DENOTES PIPE IS BELOW A CONCRETE SLAB OR BELOW GRADE.** **NOTE 2: WASTE PIPING (W) CHANGES TO SANITARY PIPING (S) DOWNSTREAM OF WHERE A TOILET CONNECTS.**									
CD	CONDENSATE DRAIN	EXPOSED	< 4"	SCH 80 PVC OR TYPE L COPPER	SOLVENT WELD OR SOLDERED	N/A	NO	-	-
		EXTERIOR		TYPE L COPPER	SOLDERED				

(1) PIPE CONTAINED WITHIN TANKAGE SHALL BE CONSIDERED "EXPOSED" OR "INTERIOR" PIPING FOR THE PURPOSES OF THE PIPE SCHEDULE (UNLESS OTHERWISE SPECIFICALLY DESIGNATED).

(2) TYPE L COPPER MAY BE USED IN LIEU OF D.I. FOR 3" DUCTILE IRON PIPE.

(3) IF A SPECIFIC PRESSURE IS NOT INDICATED IN PARENTHESES AFTER THE PRESSURE TESTING CLASS, USE THE TEST PRESSURE INDICATED IN THE SPECIFICATION WRITE UP FOR THAT GENERAL PIPE PRESSURE TESTING CLASS.

(4) REFER TO SECTION 15094 FOR PIPE SUPPORT REQUIREMENTS AND SUBMITTALS. ALL EXPOSED PIPES REQUIRE SUPPORTS; SOME PIPES REQUIRE PIPE SUPPORTS, BRACING OR RESTRAINTS DESIGNED BY A PROFESSIONAL ENGINEER.

END OF SECTION

SECTION 15052A

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install polyvinyl chloride (PVC) pipe of the size(s) and type(s) and in the location(s) shown on the Drawings and as specified herein. This section includes PVC pressure pipe and pre-insulated PVC pressure pipe.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15050 – Pipe & Pipe Fittings – General

1.3 QUALITY ASSURANCE

A. Standards:
   1. Schedule 40 and 80 Pipe: ASTM D-1785
   2. Pressure Rated (SDR) Pipe: ASTM D-2241
   3. Materials: ASTM 1784
      a. PVC Normal Impact: Cell Classification 12454.
      b. PVC High Impact: Molecular oriented PVC confirming to ASTM D-3139.
      c. CPVC (high temperature): Cell Classification 24448 (½" to 8") and 23447 (10"-16").
   4. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372..

B. Manufacturers – PVC Pipe:
   1. IPEX USA LLC.
   2. Certain-Teed.
   3. J-M Manufacturing.
   4. Harvel.
   5. Or approved equal.

C. Manufacturers – Pre-Insulated PVC Pipe:
   1. Certain-Teed.
   2. J-M Manufacturing.
   3. Or approved equal.

PART 2 - PRODUCTS

2.1 MATERIALS – PVC PIPE

A. Piping Outside Buildings:
   1. Pipe and Fittings:

a. Pipe and fittings shall be gasketed style utilizing twin gasket coupling or single gasket bell and spigot.
b. Class as shown on the Drawings.
c. PVC Class Water Pipe: Made to cast iron O.D.'s instead of IPS, or as shown on the Drawings and/or as approved by the Engineer.
d. Pipe Lengths: Laying lengths of 20 feet or as shown on the Drawings.

2. Joints:
a. Provide rubber gaskets in sufficient quantity to allow for loss.
b. Provide couplings of the same quality as the pipe that will maintain tight joints when subjected to the same hydrostatic tests designated for the pipe.

3. Adaptors: When applicable, provide adaptors for connecting polyvinyl chloride pipe to pipes constructed from other material.

B. Piping Inside Buildings:
1. Pipe and fittings:
a. Solvent weld type unless otherwise shown on the Drawings or specified in other Sections in the Division.
b. Piping, fittings and components: Schedule 40 PVC, normal impact unless otherwise shown on the Drawings or specified in other Sections in this Division.
c. Flanges: PVC and CPVC flanges to have the same bolt hole dimensions as Class 150 metal flanges per ANSI B16.5.

2. Joints:
a. Joints: Solvent weld using solvent supplied by or approved by pipe manufacturer.
b. Threaded and Screwed Joints: Permitted only on Schedule 80 and heavier pipe.
c. Couplings and Fittings: Minimum schedule and pressure rating as the pipe.
d. Flanges: Minimum pressure rating of 150 psi at ambient temperature (73°F).

3. Provide suitable adaptors for connections to equipment and other piping systems.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Jointing:
1. Clear each pipe length, coupling and fitting of all debris and dirt before installing.
2. Provide and use coupling pullers for jointing the pipe when required.
3. Shove home each length of pipe against the pipe previously laid and hold securely in position.
4. Do not pull or cramp joints.

B. Fabrication:
1. Cutting:
a. Use a hand saw or pipe cutter with blades (not rollers).

b. Examine all cut ends for possible cracks caused by cutting.

2. Connecting:
   a. Solvent weld connections as recommended by the manufacturer; manufacturer to provide on-site job start-up.
   b. Connect pipe and fittings only when temperature is above the minimum recommended by the manufacturer.
   c. Threaded adapters shall be connected only with plastic male into metal female.
   d. Use only manufacturer approved lubricants.

END OF SECTION

SECTION 15062

DUCTILE IRON PIPE & FITTINGS (INTERIOR/EXPOSED APPLICATIONS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test ductile iron pipe and fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15050 – Pipe & Pipe Fittings – General

1.3 QUALITY ASSURANCE

A. Standards (As Applicable):
   1. Cement-mortar lining for water: ANSI A2l.4 (AWWA C104).
   2. Rubber gasket joints: ANSI A2l.ll (AWWA C111).
   3. Ductile iron pipe thickness: ANSI A2l.50 (AWWA C150).
   4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A2l.5l (AWWA C151).
   5. Pipe flanges and fittings: ANSI Bl6.l and ANSI A21.10 (AWWA C110).
   6. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
   7. Cast and ductile iron fittings: ANSI A2l.l0 (AWWA C110).
   8. Ductile Iron Compact Fittings: ANSI 21.53 (AWWA C153).
   9. NSF 61: Drinking Water System Components – Health Effects.
   10. NSF 372: Drinking Water System Components – Lead Content
   11. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.

B. Acceptable Manufacturers:
   1. Tyler Union
   2. Griffin
   3. US Pipe
   4. Victaulic Company (fittings only, where allowed)
   5. Or equivalent.

1.4 SUBMITTALS

A. In accordance with the requirements specified in Section 01340 and 15050. Submit such shop drawings, manufacturer’s literature, short-term and long-term storage requirements, and operations and maintenance manuals.

B. Submit Manufacturer’s “Certification of Conformance” that pipe and fittings meet or exceed the requirements of these specifications.

C. Submit Manufacturer's installation instructions for all pipe and fittings.

1.5 DELIVERY, STORAGE & HANDLING

A. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

B. Protect the spherical spigot ends and the plain ends of all pipe during shipment by wood lagging securely fastened in place.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. General:
   1. Unless otherwise shown on the Drawings, the minimum thickness of ductile iron pipe shall be Class 53.
   2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
   3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings and AWWA C606.
   4. The outside of all interior pipe shall be coated in accordance with Section 15050.

B. Pipe Interior Lining:
   1. Pipe shall be double thickness cement lined and seal coated unless noted otherwise on the Drawings and except for air piping lines which shall be completely unlined.
   2. When required, glass lining shall meet the following requirements:
      a. Glass lining shall be fused to metal base by firing entire pipe or fitting to a temperature above 1,400 degrees F and held at that temperature for sufficient time to develop a smooth vitreous lining which has a molecular bond to the metal.
      b. Glass lining shall be a minimum of 0.008-inch thick and shall be capable of withstanding an instantaneous thermal shock of 350 degrees F temperature differential without crazing, blistering or spalling. Lining shall be free of pinholes which expose the metal.
      c. Glass lining shall have a hardness of 5-6 on the Mohs scale and a density of 2.5 to 3.0 grams per cubic centimeter.

C. Joints (as shown on Drawings or as specified):
   1. Flanged:
      a. Provide specially drilled flanges when required for connection to existing piping or special equipment.
      b. Flanges shall be flat face, long-hub screwed tightly on pipe by machine at the foundry prior to facing and drilling.
      c. Gaskets:
         i. Full face gaskets only.
         ii. Thickness of gaskets - Use standard 1/8-inch thickness gaskets, unless thinner gaskets are required for tight retrofit installations.

iii. On high temperature applications such as air lines, the gaskets shall be suitable for service from 40°F to 250°F.

d. Bolting/Fasteners:
   i. Make joints with bolt, studs with a nut on each end, or one tapped flanged with a stud and nut.
   ii. The number and size of bolts shall meet the requirements of the applicable ANSI standard.
   iii. Nuts, bolts, and studs shall be–316 stainless steel. Refer to Section 15050 for additional information.

e. When applicable, provide and install flange clamps as shown on the Drawings.

2. Grooved Joint Couplings: Couplings shall consist of two or more ductile iron housing segments to ASTM A536, pressure responsive FlushSeal gasket to ASTM D2000, and zinc electroplated steel bolts and nuts to ASTM A449 or stainless steel to ASTM F593.
   a. For direct connection to grooved end IPS/steel pipe sizes transition couplings may be used. The coupling housings shall be cast with offsetting angle-pattern bolt pads for joint rigidity.
   b. Split ring couplings, sleeve couplings, flexible joints and couplings, shall be supplied as specified in "Couplings and Connectors" Section.
   c. All grooved joint couplings, fittings, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
   d. All castings used for coupling housings, and fittings shall be date stamped for quality assurance and traceability.

3. Joint Bracing:
   a. Provide joint bracing to prevent the piping from pulling apart under pressure as required and as shown on the Drawings.
   b. Types of bracing:
      i. Pipe and fittings furnished with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with bituminous paint in buried installations and shall be coated with the same coatings as the piping system in interior installations after assembly or, if necessary, prior to assembly.
      ii. Other types of bracing as shown on the Drawings.

2.2 FITTINGS

A. Standard Fittings:
   1. Either gray cast iron or ductile iron fittings may be furnished.
   2. Pressure rating of 250 psi unless indicated otherwise on the Drawings or as specified.

3. Flange fittings shall be ANSI B16.1, Class 125 unless indicated otherwise. Flanges shall be flat faced, with full face gaskets.
4. Grooved end fittings shall comply with ANSI A21.10/AWWA C110 for center-to-end dimensions, and ANSI A21.10/AWWA C110 or AWWA C153 for wall thickness. Ends shall comply with AWWA C606, and the fittings shall be of the same manufacturer as the grooved components.
5. Joints the same as the pipe with which they are used or as shown on the Drawings.
6. Provide fittings with standard bases where shown on the Drawings.
7. Cement lining and seal coat unless noted otherwise on the Drawings, and except for air piping applications where the fittings shall be unlined.
8. All interior fittings shall receive coating in accordance with Section 15050.
9. On high temperature applications such as air lines, the gaskets shall be suitable for service from 40°F. to 250° F.

B. Non-Standard Fittings:
1. Fittings having non-standard dimensions shall be subject to the Engineer's review and acceptance.
2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
3. The lengths and types of joints shall be determined by the particular piping to which they connect.
4. Flanged fittings not meeting the requirements of ANSI A21.10 (i.e., laterals or reducing elbows) shall meet the requirements of ANSI B16.1 in Class 125.

C. Wall Castings:
1. Size, type and location as shown on the Drawings.
2. Dimensions shall conform to ANSI A21.10 except where required. A flange substantially flush with the face of a concrete or masonry wall shall be drilled and tapped for studs.
3. Other dimensions shall be identical to the corresponding parts of standard bell and spigot fittings.
4. Sealing/anchoring collar shall be not less than 0.38-inch thick up to 36-inch diameter pipe and not less than 0.5-inch thick for 42-inch diameter pipe and larger.
5. Sealing and anchoring collar shall be the same diameter as the flange and shall be welded to the barrel at a point that will locate it midway through the wall.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerances for pipe clearances.

D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. General:
   1. Install in strict accordance with the pipe and fitting manufacturer's instructions and recommendations and as specified or as shown on the Drawings.
   2. Acceptable thrust resistant system is required at all fittings on pressure pipe.

B. Assembling Joints:
   1. Flanged Joints:
      a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
      b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.
   2. Grooved Joints:
      a. Grooved joint shall be installed in accordance with the manufacturer’s written recommendations.
      b. Grooved ends shall be clean and free from indentations, projections, or roll marks.
      c. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service.
      d. The coupling manufacturer’s factory trained representative shall provide on-site training for the contractor’s field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor’s representative is not considered qualified to conduct the training.)
   3. Bolted Joints:
      a. Remove rust preventive coatings from machined surfaces prior to assembly.
      b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
      c. All stainless steel fasteners for piping and supports shall be hand tightened to limit the potential for galling.

C. Fabrication:
   1. Tapped Connections:
      a. Make all tapped connections as shown on the Drawings or as required by the Engineer.
      b. Make all connections watertight and of adequate strength to prevent pullout.
      c. Drill and tap normal to the longitudinal axis of the pipe.
      d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A2l.5l based on 3 full threads for ductile iron.
      e. Taps in fittings shall be located where indicated by the manufacturer for that particular type of fitting.

D. Castings in Masonry:
   1. Accurately set and align castings to be encased in masonry.
   2. Thoroughly clean castings immediately prior to being set in place. Remove all rust, scale and other foreign material.

END OF SECTION

SECTION 15088

COUPLINGS & CONNECTORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install couplings and connectors of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15050 – Pipe & Pipe Fittings – General

1.3 QUALITY ASSURANCE

A. Minimum pressure rating equal to that of the pipeline in which they are to be installed.
B. Couplings and connectors, other than those specified herein, are subject to the Engineer's approval.
C. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All Couplings and Connectors:
   1. Gasket Materials: Composition suitable for exposure to the liquids to be contained within the pipes.
   2. Diameters to properly fit the specific types of pipes on which couplings and connectors are to be installed.
B. Sleeve Type Couplings (When Applicable):
   1. Exposed Couplings (When Applicable):
      a. Steel middle ring,
      b. Two steel follower rings,
      c. Two wedge-section gaskets,
      d. Sufficient steel bolts to properly compress the gaskets,
      e. Acceptable Manufacturers:
         i. Smith-Blair – Style 411
         ii. Romac – Style 400
         iii. Baker Hughes (GE Company) – Style 38
         iv. Or equal
   2. Buried Couplings (When Applicable):
      a. Cast iron or epoxy coated steel middle rings with pipe stops removed,
      b. Two malleable iron or epoxy coated steel follower rings with ribbed construction,

c. Two wedge-section gaskets,
d. Sufficient AWWA C-111 or galvanized steel nuts and bolts to properly compress the gaskets,
e. Acceptable Manufacturers:
    i. Smith Blair – Style 411
    ii. Romac – Style 501
    iii. Or equal.

C. Split Type Couplings (When Applicable):
1. Constructed from malleable or ductile iron.
2. For use with grooved or shouldered end pipe with minimum wall thickness as required so as not to weaken pipe.
3. Cast in two segments for 3/4 inch through l4 inch pipe sizes, four segments for 15 inch through 24 inch pipe sizes, and six segments for pipe sizes over 24 inch.
4. Coating: Enamel.
5. Bolts: Carbon steel.
6. All gaskets shall be Manufacturers Standard or as required for intended service with respect to fluid, temperature and pressure.
7. Acceptable Manufacturers:
    a. Victaulic Company of America, Style 77 for IPS Pipe, Style 31 for Ductile Iron Pipe.
    b. Star Pipe Products,
    c. Or equal.

D. Flanged Adapters (When Applicable):
1. For joining plain end or grooved end pipe to flanged pipes and fittings.
2. Adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125 or 150 pound standard unless otherwise required for connections.
3. Exposed Sleeve Type:
    a. Constructed from steel.
    b. Coating: Enamel.
    c. Bolts: Carbon steel or ASTM A588 steel.
    d. Acceptable Manufacturers:
        i. Dresser Manufacturing Co. - Style 128 for cast iron, ductile iron and steel pipes with diameters of 2 inches through 96 inches,
        ii. Smith Blair
        iii. Or equal.
4. Exposed Restrained Type
    a. Constructed of ductile iron, ASTM A536
    b. Coating: Fusion bonded epoxy
    c. Acceptable Manufacturers:
        i. Romac Style RFCA
        ii. Mueller/Krausz Hymax Grip Flange Adaptor
        iii. Or equal
5. Split Type:
    a. Constructed from malleable or ductile iron.
    b. For use with grooved or shouldered end pipe.

c. Coating: Enamel.
d. Acceptable Manufacturers:
i. Victaulic Company of America - Style 741 for IPS pipe, or Style 341 for Ductile Iron Pipe, for pipe diameters of 2 inches through 12 inches,
ii. Victaulic Company of America - Style 742 for IPS pipe, or Style 342 for Ductile Iron Pipe, for pipe diameters of 14 inches through 16 inches,
iii. Star Pipe Products,
iv. Or equal.

E. Flexible Joints:
1. Expansion Joints (Liquid Service):
a. Materials shall be capable of withstanding the temperature, pressure and type of material in the pipeline.
b. Shall be the filled arch type that will prevent sediment build up for all sludge, sewage, and other lines with similar service.
c. Supplied with control rods to restrict elongation and compression.
d. Metal retaining rings shall be split and beveled galvanized steel for placement against the flange of the expansion joint.
2. Expansion Joint (Air Service)
a. Rubber expansion joints for all low pressure process air piping shall be of the non-filled arch double bellow type, unless otherwise noted.
b. The expansion joint shall have ANSI 125-pound flanges.
c. All low pressure process air piping rubber expansion couplings shall be capable of withstanding a pressure of 15 psig at a temperature of 250°F.
d. Rubber expansion couplings shall be as manufactured by General Rubber Corp., Mercer Rubber Co., or equal.
3. Deflection Joints:
a. Joints designed to permit a nominal maximum deflection of 15 degrees in all directions from the axis of the adjacent pipe length, will prevent pulling apart, and will remain watertight at any angle of deflection under 15 degrees.
b. Material to be manufactured from a composition material suitable for exposure to the liquid, pressure and temperature to be contained within the pipe.
c. Supplied with control rods as required.

F. Dismantling Joints:
1. Service: Provide flexibility for installation and dismantling of flanged pipe interfaces with valves, pumps, blowers, meters, compressors and various appurtenances.
2. Restraint: Tie rods.
3. Size: 4" to 24"
4. Finish: Epoxy
5. Double-ended flange adapter capable of 2 to 20 inches longitudinal adjustment.
6. Pressure: Minimum 150 pound design working pressure, or match pipe rating, whichever greater.

7. Fabricated steel body, welded construction.
8. Materials: flange carbon steel, body carbon steel; follower ductile iron for 12" and less and carbon steel for 14" and larger; wedge gasket Buna-S or Buna-N and suitable for fluid.
9. Connection: 150 pound ANSI flanges welded to spool piece and flange adapter.
10. Acceptable Manufacturer:
    a. Dresser Style 131
    b. Smith Blair Model 975
    c. Or equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Sleeve Type Couplings (When Applicable):
   1. Thoroughly clean pipe ends for a distance of 8 inches from the ends prior to installing couplings, and use soapy water as a gasket lubricant.
   2. Slip a follower ring and gasket (in that order) over each pipe and place the middle ring centered over the joint.
   3. Insert the other pipe length into the middle ring the proper distance.
   4. Press the gaskets and followers evenly and firmly into the middle ring flares.
   5. Insert the bolts, finger tighten and progressively tighten diametrically opposite nuts uniformly around the adapter with a torque wrench applying the torque recommended by the manufacturer.
   6. Insert and tighten the tapered threaded lock pins.
   7. Insert the nuts and bolts for the flange, finger tighten and progressively tighten diametrically opposite bolts uniformly around the flange to the torque recommended by the manufacturer.

B. Split Type Flange Adapters (When Applicable): Install in the same manner as Split Type Couplings.

C. Buried Cast Iron Couplings, Adapters and Connectors (When Applicable): Thoroughly coat all exterior surfaces, including nuts and bolts, after assembly and inspection by the Engineer with a heavy-bodied bituminous mastic as approved by the Engineer.

D. Buried Epoxy Coated Steel Couplings: Thoroughly coat all exterior surfaces, including nuts and bolts after assembly and inspection by the Engineer with a coal tar approved by the Engineer. Prior to coating, roughen the epoxy with emory paper and follow with a solvent cleaner (aeromatic similar to xylol). Dry film thickness of the coal tar is to be 12-16 mils.

E. Install thrust rods, supports, and other provisions to properly support pipe weight and axial equipment loads.

F. All interior sleeve type couplings shall be restrained with tie rods when used on pressurized lines. All buried couplings on pressure lines shall be restrained (solid sleeve) type.

END OF SECTION

SECTION 15092

PIPE SLEEVES & SEALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install wall sleeves and seals of the type(s) and sizes(s) and in the location(s) shown on the Drawings and specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15050 – Pipe & Pipe Fittings – General

1.3 QUALITY ASSURANCE

A. Provide and install all sleeves of the types specified herein, as shown on the Drawings and as directed by the Engineer.
B. Provide sleeves that are airtight, gastight or watertight as required.
C. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372.
D. Penetrations through fire rated walls, floors and ceiling shall have proper fire stopping, as specified in Section 07270.

PART 2 - PRODUCTS

2.1 TYPES AND LOCATIONS

A. General
   1. Refer to details on Process Drawings.
B. Penetrations through New Construction:
   1. Interior Masonry, Drywall, or Wood Partition (Non-Load Bearing) - Air to Air:
      a. 24 gauge, zinc coated (galvanized) steel tubes with wired or hemmed edges.
      b. Minimum 1/4 inch annular space between sleeve and pipe or insulation.
      c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.
      d. Install split cover plates in all finished areas. Both sides of wall if required. Plates shall be chrome finished, suitably sized to fit pipe in question and cover opening.
   2. Exterior Masonry and Wood Walls
      a. Schedule 40 galvanized steel pipe, hot-dip galvanize after fabrication.
      b. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      c. Minimum ¼-inch annular space between sleeve and pipe or insulation.

d. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.

3. Interior Concrete Partitions - Air to Air:
   a. Schedule 40 galvanized steel pipe with 1 inch x 1/8 inch thick welded sealing and anchoring collar in middle, hot-dip galvanize after fabrication. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
   b. Minimum 1/4 inch annular space between sleeve and pipe or insulation.
   c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.
   d. Refer to details on Process Drawings.
4. Concrete Floor Penetrations - Air to Air; and Air to Ground:
   a. Same as “Interior Concrete Partitions - Air to Air”.
   b. Pipe sleeve to extend 2 inches above finished floor.
   c. Pipe sleeve bottom to be set flush with underside of slab.
   d. Galvanized steel pipe riser clamp with threaded rod embedded into concrete floor to be installed on topside of penetration to support the pipe vertically.
   e. Refer to details on Process Drawings.
5. Roof Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions” and as shown on the Drawings.
6. Exterior Concrete Walls - Air to Air; and Air to Ground:
   a. Schedule 40 galvanized steel pipe with 1 inch x 1/4 inch integrally cast sealing and anchoring collar in middle, hot-dip galvanize after fabrication. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
   b. Size of pipe sleeve as required by seal manufacturer.
   c. Seal with rubber link compression seal.
   d. Alternate wall sleeve system as manufactured by Omni Sleeve, Malden, MA can be utilized as reviewed and accepted by Engineer, in place of above specified wall sleeve system.
   e. Refer to details on Process Drawings.
7. Concrete Tank Walls - Liquid Containing Structures to Air, Ground, or Liquid
   a. For ductile iron and steel piping systems, utilize wall castings, or sleeve and double rubber link compression seal. Materials, schedule, class and size to match pipe.
      i. For galvanized steel piping systems, use SCH 40 galvanized steel pipe with 1-inch x 1/4-inch welded sealing and anchoring collar in middle, hot-dip galvanized after fabrication. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      ii. For stainless steel piping systems, use Schedule 40 stainless steel pipe with 1-inch x 1/4-inch welded sealing and anchoring collar in middle. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      iii. For ductile or cast iron piping systems, use wall casting with 1-inch

x 1/4-inch integrally cast sealing and anchoring collar in middle; or sleeve with 1-inch x 1/4-inch welded sealing and anchoring collar in middle, hot-dip galvanized after fabrication.

iv. Refer to details on Process Drawings.

b. For plastic piping systems, sleeve and seals to be in accordance with "Exterior Concrete Walls - Air to Ground" requirements noted above. These type penetrations will be allowable only in those locations specifically depicted on the drawings.

8. Foundation Walls Below Grade - Ground to Ground:
   a. Schedule 40 or max. 3/8 inch thick wall galvanized steel sleeve. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
   b. Minimum 1/2 inch annular space.
   c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.
9. Other conditions shall be sleeved or as reviewed and accepted by the Engineer.

C. Penetrations Through Existing Construction:
1. Interior masonry, drywall, or wood partition - Air to Air:
   a. Cleanly cut brick or block as required. Grout sleeve into place using non-shrink grout.
   b. Cleanly cut wood frames partitions as required. Set sleeve into position and secure.
   c. Sleeves to be as required for New Construction - Interior masonry, drywall, or wood partition - Air to Air.
   d. Holes bored with equipment leaving a smooth hole in masonry walls less than l/2 inch larger than the pipe will not require a sleeve, unless otherwise specified.
   e. Minimum 1/4 inch annular space between cored opening or sleeve and pipe or insulation.
   f. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.
   g. Install split cover plates in all finished areas. Both sides of wall if required. Plates shall be chrome finished, suitably sized to fit pipe in question and cover opening.
2. Interior Concrete Partitions - Air to Air:
   a. Core smooth-walled opening with coring machine. Grout sleeve into place using non-shrink grout.
   b. Sleeves to be as required for "New Construction - Interior Concrete Partitions - Air to Air".
   c. Holes cored with equipment leaving a smooth hole, less than l/2 inch larger than the pipe will not require a sleeve, unless otherwise specified.
   d. Minimum 1/4 inch annular space between cored opening or sleeve and pipe or insulation.
   e. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.
3. Interior Concrete Partitions - Air to Air:

a. Same as “Exterior Concrete Wall”.

4. Interior Concrete Partitions - Air to Air (Unclassified to Classified):
   a. Same as “Concrete Tank Wall”.
5. Exterior Masonry Walls
   a. Core drill a smooth hole through all layers of the existing masonry. Hole shall be sized to facilitate standard rubber link compression seal installation.
   b. Install rubber link compression seal at each layer of masonry.
   c. Seal each face with polyurethane sealant.
   d. If a clean, smooth hole cannot be achieved, remove the masonry as required to install Schedule 40 galvanized wall sleeve. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness. Grout sleeve in place. Install rubber link compression seal and sealant as noted above.
6. Exterior Wood Walls
   a. Remove existing siding and other materials, as required to install the new item.
   b. Restore the wall and siding to provide a weather-tight seal acceptable to the Engineer.
7. Concrete Floor Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions - Air to Air”, except that sleeve will not be required.
   b. Stainless steel pipe riser clamp with stainless steel threaded rod embedded into concrete floor to be installed on topside of penetration to support the pipe vertically.
   c. Install rubber link compression seal, as shown, covered by self-leveling sealant (SikaFlex or equivalent).
   d. Refer to details on Process Drawings.
8. Roof Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions - Air to Air” and as shown on the Drawings.
9. Concrete Exterior Walls - Air to Ground:
   a. Core smooth-walled opening with coring machine. Grout smooth any irregularities in opening.
   b. Size of cored opening as required by seal manufacturer.
   c. Seal with rubber link compression seal.
10. Concrete Tank Walls - Liquid Containing Structures to Air or Ground:
   a. Core smooth-walled opening with coring machine. Grout smooth any irregularities in opening.
   b. Size of cored opening as required by seal manufacturer.
   c. Seal with two, back to back rubber link compression seals.
11. Foundation Walls Below Grade - Ground to Ground:
   a. Core smooth-walled opening with coring machine. Grout sleeve into place using non-shrink grout.
   b. Sleeves to be as required for “New Construction - Foundation Walls Below Grade - Ground to Ground”.

c. Holes cored with equipment leaving a smooth hole, less than 1-inch larger than the pipe will not require a sleeve, unless otherwise specified.
d. Minimum 1/2 inch annular space between cored opening or sleeve and pipe or insulation.
e. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07920 for standard penetrations.

12. Other conditions shall be installed as reviewed and accepted by the Engineer.

D. Pipe openings in and penetrations through precast concrete structures shall be as specified in Division 2 and 3.

E. Rubber Link Compression Seals:
1. Acceptable Manufacturers:
a. Link Seal
b. Flexicraft
c. Or equivalent.
2. Multi-rubber link type with pressure plates, bolts, nuts and sealing element providing a leak proof seal. Model numbers provided below are based on Link Seal and are to establish type and level of quality.
3. General Service (Model C):
a. Glass Reinforced Nylon Pressure Plate.
b. Carbon steel zinc-dichromate nut and bolt.
c. Sealing element: EPDM rubber.
d. Temperature Rating: -40°F to 250°F.
4. Corrosive Service: (Model S-316):
a. Use in the following locations: Sludge tanks, scum tanks, digesters, wetwells, manholes, dewatering rooms, headworks rooms, exterior tanks, chemical rooms, as shown on the Drawings.
b. Glass Reinforced Nylon Pressure Plate.
c. Bolt and nut, l8-8 stainless steel.
d. Sealing element: EPDM rubber.
e. Temperature Rating: -40ºF to 250ºF.
5. Potable/Clean Water Service (Model S61)
a. Blue reinforced Nylon polymer pressure plates.
b. 316 stainless steel nuts and bolts.
c. Sealing element: Black EPDM NSF 61 certified.
d. Temperature Rating: -40º to 250º F.
e. Certified to NSF/ANSI standard 61.
6. High Temperature Service (Model T)
a. Steel zinc dichromate pressure plates.
b. Carbon steel with zinc dichromate finish nuts and bolts.
c. Sealing element: Silicone.
d. Temperature Rating: -67º to 400º F.
7. Refer to details on Process Drawings.

F. Wall Plates: Provide split type cast iron or brass wall plates on pipes penetrating walls in finished spaces such as labs and offices. Refer to details on Process Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. New construction:
   1. Concrete: Set sleeves in proper location prior to placing concrete. Sleeves set by mechanical, plumbing, and HVAC trades as appropriate.
   2. Masonry: Mechanical, plumbing, and HVAC trades to provide sleeves and locations to masonry trades for installation.
   3. Partitions: Set sleeves in place as work progresses.

B. Hollow Concrete Roof or Floor Planks:
   1. Provide planks with sleeve cast-in-place at time of construction,
   2. Or core drill planks in location reviewed and accepted by Engineer and plank manufacturer. Submit written approval of locations from pre-cast concrete plank manufacturer.
   3. Firmly grout sleeve in place.

C. Existing Construction:
   1. The location will be reviewed and accepted by the Engineer prior to coring or cutting hole.
   2. For concrete, holes shall be located to avoid the reinforcing steel when possible.
   3. Patch all damaged work as required to maintain a neat and clean appearance.

D. Rubber Link Compression Seals: Install as required and in strict accordance with the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 15094

PREFABRICATED PIPE HANGERS, SUPPORTS AND BRACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Design, furnish and install prefabricated pipe hangers, supports, and braces to support pipes, maintain the necessary pitch, minimize vibration, prevent movement, and allow expansion and contraction of the pipes shown on the Drawings, as specified in Section 15050, as specified herein and as referenced. Supports shall be designed for all tributary gravity loads and lateral loads from operating pressures, seismic forces, and startup/shutdown water hammer thrust. This Specification covers hangers, supports, and braces for process and mechanical piping systems including ductile iron, carbon steel, galvanized steel, stainless steel, fiberglass, PVC and copper piping.

B. Hangers for electrical conduit, plumbing piping, HVAC ducts, and other utilities are found within their respective Specification sections.

C. Structural steel pipe support frame systems required specifically for supporting prefabricated pipe hangers are detailed on the Structural Drawings and shall be supplied under Specification Section 05120 [Pipe hangers and supports that are detailed on the Structural or Process Drawings and do not utilize prefabricated hangers or supports shall be supplied under Specification Section 05120.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.

1. Section 15050 – Pipe & Pipe Fittings – General

1.3 REFERENCES

A. This section contains references that are applicable to this Specification Section. The applicable edition of the indicated references shall be the version that was the most current at the time of the Advertisement of Bids.

B. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

1. MSS SP-58 Pipe Hangers and Supports – Materials, Design and Manufacture
2. MSS SP-69 Pipe Hangers and Supports – Selection and Application
3. MSS SP-89 Pipe Hangers and Supports – Fabrication and Installation Practices
4. MSS SP-90 Guidelines on Terminology for Pipe Hangers and Supports

C. ASTM A123/A123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron & Steel Products

D. ASTM A153/A153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

E. ASTM C881/C881M - Specification for Epoxy-Resin-Base Bonding Systems for Concrete

F. ASCE 7 – Minimum Design Loads for Buildings and Other Structures, American

Society of Civil Engineers – Version identified on the Drawings

G. Building Code of the Project State – Version identified on the Drawings.

1.4 DESIGN REQUIREMENTS

A. Contractor shall provide all necessary hangers, supports and braces as needed to provide a fully functional and adequately supported and restrained system.

B. This Specification requires the delegated design of pipe hangers, supports and bracing. The performance criteria, design requirements and materials of construction are specified herein. Refer to the Structural Drawings for a list of prohibited and allowed structural components from which piping can be hung, supported or braced. The absence of specific pipe support details shall not relieve the Contractor of the responsibility for designing and providing a fully functional system meeting the requirements of this Specification. Specification Section 15050 identifies which piping systems will and will not require a pipe support design by a Professional Engineer.

C. Prefabricated pipe supports shall be provided for all pipes shown on the Contract Drawings. Unless otherwise indicated, the terms “pipe support”, “pipe hanger” and “pipe guide” shall refer to prefabricated pipe supports, hangers, guides, and braces specified herein.

D. The term “Pipe Support Design Engineer” shall refer to the Professional Engineer hired by the General Contractor to design the pipe support system.

E. All structural steel pipe support frames and shop fabricated pipe support assemblies shown on the Contract Drawings are specified elsewhere and not required as part of this Specification.

F. Pipes supports shall be classified as one of the following:

1. Type 1 – Supported from an overhead structural member using overhead hangers, guides, clevises, rollers, clamps or other means as specified herein.
2. Type 2 - Supported from a structural member below the pipe using guides, rollers, clamps, saddles or other means as specified herein.
3. Type 3 – Supported from an adjacent wall or other vertical structural member using brackets with either Type 1 supports or Type 2 supports or other means as specified herein.
4. Type 4 – Miscellaneous Pipe Hangers, Supports and Braces not specifically identified above.
5. Additionally, each pipe support shall be classified as one of the following based on function:
    a. Type S - Simple Support
    b. Type G - Guide Support
    c. Type F - Fixed Support

G. Where flexible joints or couplings are indicated on the Contract Drawings at equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc., shall be rigidly supported, to prevent transfer of system forces to the equipment. No fixed or restraining supports shall be installed between a flexible joint or coupling and the piece of equipment.

H. All pipe and appurtenances connected to the equipment shall be supported in a manner

to prevent any strain or load from being imparted on the equipment or piping system.

I. Pipe supports shall be provided to minimize forces through valves, split and sleeve type couplings, flexible expansion joints and to minimize all pipe forces on equipment housings. Equipment housings shall not be utilized to support connecting pipes.

J. Unless otherwise indicated on the Drawings, maximum hanger and support spacing shall not exceed the following:
   1. Copper Pipe:
      a. 1" diameter and smaller – 5 feet
      b. 1 1/4", 1 1/2" and 2" diameter – 7 feet
      c. Greater than 2" diameter – 9 feet
   2. Steel and Stainless Steel Pipe:
      a. 2" diameter and smaller – 7 feet
      b. 2 ½" - 4" diameter – 11 feet
      c. 5" – 8" diameter – 16 feet
      d. Greater than 10" diameter – 22 feet
   3. Ductile and Cast Iron Pipe:
      a. All diameters – 10 feet
   4. PVC and FRP Pipe:
      a. Hanger and support spacing shall be as recommended by the pipe manufacturer based on pipe size and service temperature. Individually supported PVC pipes shall be supported as recommended by the manufacturer except that support-spacing shall not exceed 3-feet.
   5. The maximum support spacings listed above are based on the specific pipes being full of liquid without any additional vertical loads or thrusts. The actual required support spacings may be limited to the hangers selected or the presence of additional loads.
   6. Supports shall be spaced such that the resulting concentrated load at any suspended (Type 1) support does not exceed 2,000 pound maximum and combined load shall not exceed 25 pounds per square foot over each slab panel the supports extend into, or as indicated on the Structural Drawings.
   7. Pipe alignment guides shall not be used as vertical support of the piping.
   8. Wall penetration sleeves (link-seal type or equivalent) shall not be used as support of the piping.

K. Contractor shall provide pipe supports at the following locations:
   1. At all locations indicated on the Contract Drawings.
   2. At all locations such that the maximum support spacing listed above are not exceeded.
   3. At all locations such that the allowable load capacity of the prefabricated hangers are not exceeded.
   4. At the end of all pipe runs.
   5. At all changes in pipe direction greater than 22 degrees.
   6. Within 1 foot of all valves, couplings, expansion joints and pipe joints.
   7. All other locations deemed necessary by the Contractor, Pipe Support Design Engineer or pipe manufacturer.
   8. Spaced such that the deflection in the pipe under operating conditions does not exceed L/360, where L is the distance between supports.

L. All drilled anchors used in suspended Type 1 and Type 3 pipe supports shall meet the following requirements:
   1. All supports shall have a minimum of 2 anchors per support.
   2. Anchors shall be sized such that the ultimate capacity of the anchor is a minimum of 5 times greater than the anticipated design forces (Minimum Factor of Safety of 5).
   3. Anchors shall have a minimum embedment depth of 6 inches, minimum spacing of 6 inches and a minimum edge distance of 6 inches.
   4. Concrete anchors shall either be the epoxy adhesive or expansion anchor type, except expansion anchors are not permitted in exterior or wet service applications.
   5. Masonry anchors shall either be the epoxy adhesive or expansion anchor type, except expansion anchors are not permitted in exterior or wet service applications. Masonry cells shall be grouted at the anchors. Drop-in, Toggle or epoxy anchors with screen tubes shall not be permitted.

M. All pipe supports shall be designed for the following loads:
   1. Dead loads (including cement lining, insulation, etc)
   2. Liquid Density – use a liquid specific gravity of 1.10 for water, wastewater and sludges and use the appropriate liquid specific gravity for chemicals, unless otherwise noted
   3. Operational Thrust – refer to Specification Section 15050
   4. Water Hammer Thrust – refer to Specification Section 15050
   5. Thermal forces – refer to Specification Section 15050
   6. Wind Load – In accordance with ASCE 7. Refer to the Structural Drawings for wind design parameters
   7. Snow Load – In accordance with ASCE 7. Refer to the Structural Drawings for snow design parameters
   8. Ice Load – In accordance with ASCE 7

1.5 SUBMITTALS

A. Submit a complete set of shop drawings of all items to be furnished under this Section and as required by Section 01340 and 15050.

B. For piping systems that require delegated design by a Professional Engineer, submit experience statement from the proposed Pipe Support Design Engineer to demonstrate compliance with the following criteria prior to submitting any technical information.
   1. Engage the services of an independent registered Professional Engineer ordinarily engaged in the business of pipe support systems analysis, to analyze system piping and service conditions and to develop a detailed support system, specific to the piping material, pipe joints, valves and piping appurtenances proposed for use. The proposed Pipe Support Design Engineer shall have at least 5 years of experience in the analysis and design of similar systems, including the use of commercial and custom pipe support and in the use of commercial pipe stress software programs. Firms meeting these criteria include: Newman Associates, LLC., Canton, MA; SAC Incorporated, Williston, VT; NEFCO Tech Sales, East Hartford, CT; or equivalent.
   2. The Pipe Support Design Engineer shall be registered in the Project State.

C. Technical submittals for all projects shall include the following information:
   1. Layout drawings with all pipe supports clearly labeled, located, and coordinated with the tabulated list noted below. Layout drawings shall include both Plan and Section views with the pipe supports clearly labeled in each view. All pipe layout changes proposed by the General Contractor shall be incorporated in the layout and identified as a proposed modification. Layout drawings shall address gravity loads and dynamic loads including thermal effects, pressure thrusts and seismic forces.
   2. Summary of Pipe Hangers, Supports and Bracing: Submit a tabulated list of pipe support information which includes the following information at a minimum:
      a. Hanger/Support/Brace Number
      b. Location
      c. Pipe Diameter (nominal ID)
      d. Pipe centerline elevation
      e. Pipe material
      f. Additional dead weight (Cement lining, insulation, etc)
      g. Lineal foot dead weight of pipe
      h. Contents of pipe
      i. Total lineal foot weight (dead weight and live weight)
      j. Length of pipe tributary to support
      k. Total gravity and dynamic load at support
      l. Type of support (as identified in Section 1.3.B above)
      m. Fixity of support (as identified in Section 1.3.B above)
      n. Structure supporting pipe support (Section 1.3.F above)
   3. Representative catalog cut for each different type of pipe hanger, brace, or support indicating the materials of construction, material finishes, pipe sleeve or insulation information, protective shields, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special hanger and/or support.
   4. Representative catalog cuts for accessories (e.g., threaded rod, insulation shields and saddles, never-seize compound, etc.)
   5. Letter from the General Contractor stating that the following has been coordinated:
      a. Each pipe support system will not interfere with the other pipe support or seismic bracing systems.
      b. Components from the pipe support systems shall not extend within any means of egress or walking pathways in building spaces or at tanks.
      c. Components from the pipe support systems shall not interfere with the normal maintenance or operation of a component or equipment.

D. Supplemental technical submittals for projects which require a Pipe Support Design Engineer, as identified in Section 15050, shall include the following information:
   1. Completed Certificate of Design (included at the end of this Section).
   2. Dead weight and dynamic load analysis, including system thermal effects and pressure thrusts. Computer-based software system equivalent to ADLPIPE or

Autopipe . Each piping system shall be presented in an isometric graphic and shall show the resolved and resultant force and moment systems, as well as all recommended hangers, supports, anchors, restraints and expansion/flexible joints.

3. After the work is installed, but before it is filled for start-up and testing, the Pipe Support Design Engineer shall inspect the work and shall certify its complete adequacy. Submit documentation for each piping system to demonstrate the inspection and certification of adequacy.

E. After the installation is completed and certified, submit as-built drawings for record purposes.

PART 2 - PRODUCTS

2.1 GENERAL

A. All uninsulated non-metallic piping such as PVC, CPVC, etc., shall be protected from local stress concentrations at each support point. Protection shall be provided by pipe insulation shields or other methods after review with no exceptions taken by the Engineer. All shields shall cover the pipe where it is in contact with the support.

B. All insulated pipe shall be furnished with a pipe insulation shield and/or saddle at each pipe support location as specified herein.

C. Where pipe hangers and supports come in contact with copper piping, provide protection from galvanic corrosion by wrapping pipe with 1/16-inch thick neoprene sheet and galvanized protection shield; isolators similar to Eleen, Figure No. 228; or PVC-coated hangers and supports. All stainless steel piping shall be isolated from all ferrous materials, including galvanized steel, by use of neoprene sheet material and protection shields, similar to above methods.

D. Pipe supports PVC piping:

1. Pipe supports for multiple PVC plastic piping shall be continuous wherever possible.
2. Multiple, suspended, horizontal plastic PVC pipe runs, where possible, shall be supported by ladder type cable trays.
3. Ladder shall be of galvanized steel construction.
4. Rung spacing shall be 12 inches.
5. Tray width shall be approximately 6 inches for single runs and 12 inches for double runs.
6. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required by a complete support system.
7. Acceptable manufacturers:
   a. Electray Ladder by Husky-Burndy;
   b. Globetray by the Metal Products, a division of United States Gypsum,
   c. Or equal.
8. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners similar to Globe, Model M-CAC; Husky-Burndy, Model SCR or equal.
9. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe. Individual clamps, hangers

and supports in contact with plastic PVC pipe shall provide firm support but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.

E. All vertical pipes shall be supported at each floor or at intervals of not more than 12 feet (whichever is less) by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to ensure rigid construction. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar.

F. Link-seal compression type wall penetration sleeves shall not be used to support static or dynamic loads. Additional supports shall be provided such that static gravity loads and horizontal dynamic loads are not transferred to these penetration sleeves.

2.2 MATERIALS

A. Unless otherwise specified herein, pipe hangers and supports shall be standard catalogued components, conforming to the requirements of MSS-SP-58, MSS SP-69 and MSS SP-89.

B. Pipe hangers, supports, braces and accessories shall be standard catalogued components as manufactured by Anvil International, Inc , Carpenter & Peterson, Inc. or equivalent (metallic pipe) or Jove (non-metallic pipe). Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary.

C. Materials of all prefabricated pipe hangers, supports, braces and accessories (including bolts, nuts, washers) shall be as follows:
   1. For steel, stainless steel, ductile iron, HDPE, FRP and PVC piping:
      a. Exposed interior or exterior and all other spaces not otherwise defined below shall be hot-dipped galvanized steel conforming to ASTM A123 and ASTM A152.
      b. Submerged or within/directly above tanks shall be Type 316 stainless steel.
      c. Exposed interior or exterior spaces subjected to a damp or corrosive environment including the following spaces shall be 316 stainless steel.
         i. Sludge Thickening Canopy
         ii. Dewatering Room
         iii. All Pump Rooms
      d. Exposed interior and exterior spaces subjected to chemical/ corrosive environment including the following spaces shall be FRP or PVC.
         i. Polymer Storage Area
   2. For copper piping: shall be copper plated steel.

D. Type 1
   1. Metallic pipe (Steel, stainless steel and ductile iron):
      a. Adjustable Clevis Type (Type S) (Pipes greater than 4” diameter):
         i. Anvil International, Inc. (Fig 260)
         ii. Carpenter & Patterson Inc. (Fig 100)
         iii. Or equal
      b. Adjustable Clevis Type (Type S) (Pipes 4” diameter or less):
         i. Anvil International, Inc. (Fig 65)
         ii. Carpenter & Patterson Inc. (Fig 200)
         iii. Or equal

c. Adjustable Steel Yoke Pipe Roll (Type S):
   i. Anvil International, Inc. (Fig 181)
   ii. Carpenter & Patterson Inc. (Fig 140)
   iii. Or equal
d. Adjustable Pipe Roll (Type S):
   i. Anvil International, Inc. (Fig 177)
   ii. Carpenter & Patterson Inc. (Fig 142)
   iii. Or equal
e. Pipe Clamp (Type F):
   i. Anvil International, Inc. (Fig 212, Fig 216 or Fig 295 Clamp w/ Fig 272 Eyerod)
   ii. Carpenter & Patterson Inc. (Fig 175, Fig 298 or Fig 304 Clamp w/ Fig 93 Eyerod)
   iii. Or equal
f. U-Bolt (Type S)
   i. Anvil International, Inc. (Fig 137)
   ii. Carpenter & Patterson Inc. (Fig 283)
   iii. Or equal

2. Non-Metallic pipe (HDPE, FRP and PVC):
   a. Adjustable Clevis Type (Type S):
      i. Jove (Model FS-11)
      ii. Or equal
   b. Pipe Clamp (Type F):
      i. Jove (Model FS-4)
      ii. Or equal
3. Copper Pipe:
   a. Adjustable Clevis Type (Type S)
      i. Anvil International, Inc. (Fig CT-65)
      ii. Carpenter & Patterson Inc. (Fig 100CT)
      iii. Or equal
   b. Adjustable Swivel Ring Type (Type S)
      i. Anvil International, Inc. (Fig CT-69)
      ii. Carpenter & Patterson Inc. (Fig 1ACT)
      iii. Or equal

E. Type 2
1. Metallic pipe (Steel, stainless steel and ductile iron):
   a. Pipe Roll Stand (Type S) (Non Adjustable)
      i. Anvil International, Inc. (Fig 271)
      ii. Carpenter & Patterson Inc. (Fig 39)
      iii. Or equal
   b. Pipe Roll Stand (Type S) (Adjustable)
      i. Anvil International, Inc. (Fig 274)
      ii. Carpenter & Patterson Inc. (Fig 40)
      iii. Or equal
   c. Pipe Roll Chair (Type S)
      i. Anvil International, Inc. (Fig 175)

ii. Carpenter & Patterson Inc. (Fig 67)
iii. Or equal

d. Adjustable Pipe Roll (Type S)
i. Anvil International, Inc. (Fig 177)
ii. Carpenter & Patterson Inc. (Fig 109)
iii. Or equal

e. Pipe Alignment Guide (Type G)
i. Anvil International, Inc. (Fig 255 or 256)
ii. Carpenter & Patterson Inc. (Fig 1006 or 1007)
iii. Or equal

f. Pipe Slide Assembly (welded to pipe) (Type G or F)
i. Anvil International, Inc. (Fig 257 or 436)
ii. Carpenter & Patterson Inc. (Fig 1010)
iii. Or equal

g. Pipe Slide Assembly (w/ welded clamp) (Type G or F)
i. Anvil International, Inc. (Fig 257 or 436 w/ Fig 432 clamp)
ii. Carpenter & Patterson Inc. (Fig 1010 w/ Fig 158 clamp)
iii. Or equal

h. Floor Mounted Stanchions w/ Adjustable Saddles (Type S)
i. Anvil International, Inc. (Fig 63 Stanchion w/ Fig 264 or Fig 265 Saddle)
ii. Carpenter & Patterson Inc. (Fig 138 Stanchion w/ Fig 101 or Fig 101U Saddle)
iii. Or equal

i. Concrete cradles
i. Provide as detailed on the Structural Drawings

2. Non-Metallic pipe (HDPE, FRP and PVC):
a. Pipe Slide Assembly (w/ welded clamp) (Type G or F)
i. Jove (Model FS-8)
ii. Or equal

b. Floor Mounted Stanchions w/ Adjustable Saddles (Type S)
i. Jove (Model FS-7 with stanchion)
ii. Or equal

c. Concrete cradles
i. Provide as detailed on the Structural Drawings

F. Type 3 (Type S) (all pipes)
1. Wall Bracket
a. Anvil International, Inc. (Fig 194, Fig 195 or Fig 199)
b. Carpenter & Patterson Inc. (Fig 69, Fig 84 or Fig 139)
c. Or equal
d. Fabricated brackets may be used in lieu of pre-fabricated brackets. Material shall conform to Part C above.

G. Accessories:
1. Threaded Rods
a. Anvil International, Inc. (Fig 140, 142 or 146)
b. Carpenter & Patterson Inc. (Fig 94 or 133)

c. Or equal

2. Pipe Insulation Shield
   a. Anvil International, Inc. (Fig 167 or Fig 168)
   b. Carpenter & Patterson Inc. (Fig 265GS or Fig 265P)
   c. Or equal
3. Pipe Insulation Saddle
   a. Anvil International, Inc. (Figs 160-166A)
   b. Carpenter & Patterson Inc. (Figs 351-357Z)
   c. Or equal
4. Anti-seize compound
   a. Never Seez by Bostik, Inc.
   b. Or equal

H. Miscellaneous Pipe Hangers, Supports and Braces (Type 4 or Custom):
   1. Contractor shall provide additional hangers, supports and braces as required that are not classified as Types 1, 2 or 3 above.
   2. Materials shall conform to Part C above.

I. Concrete Anchorage:
   1. Epoxy anchors. ASTM C881, non-expanding, two-component epoxy resin with AISC Type 316 Stainless Steel threaded road with washer nut. Manufactured by Hilti Fastening Systems (HIT RE500SD); Ramset Fastening Systems (Chemset Capsule Series); Power Fasteners (T308 Plus); or equivalent.
   2. Expansion anchors. Stainless steel AISI Type 316 for galvanized and aluminum fabrications; cadmium plated for painted steel fabrications. Manufactured by Hilti Fastening Systems (Kwik Bolt III); Ramset Fastening Systems (Tru Bolt Stud Anchor); Power Fasteners (Power Stud); or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install prefabricated hangers and supports in accordance with the pipe support shop drawings, in accordance with MSS SP-89 and as specified herein. Deviations from the shop drawings shall not be permitted without written approval from the Pipe Support Design Engineer.

B. Hangers shall be used for their intended purpose only. They shall not be used for rigging or erection purposes.

C. General Contractor shall coordinate the installation of field run conduit, piping and other utilities to avoid interference with the pipe supports.

D. All pipe supports shall include features to permit adjustments of pipe elevations. Once all piping is properly aligned and at the correct elevations, the supports shall be locked into place. Locking nuts, cotter pins, temporary locking devices and other locking means should be properly engaged. Tack welding shall not be utilized to lock supports in place.

E. Type 1 hangers using threaded rods shall be attached to the building structure or supplemental framing. Connections to the building structure shall be with beam clamps, welded angles or embedded concrete weld plates or threaded inserts.

F. Install all drilled anchors in accordance with the anchor Manufacturer’s instructions.

G. Secure Type 2 pipe support to structural supporting member. All pipe supports shall be rigidly anchored to their structural supporting members.
H. PVC Piping and Fiberglass Piping: Support in strict accordance with the manufacturer's instructions and recommendations for the conditions of operation, temperature and size of pipe. Support in a manner which will prevent subsequent visible sagging of the pipe between supports due to plastic deformation.
I. All surfaces of steel and aluminum in contact with or embedded in concrete or masonry shall be coated with epoxy paint (min 5 mils dry film thickness).
J. Drain, waste, and vent piping: Support by adjustable hangers.
K. Valves, Fittings & Specialties: Independently support pipe connected to pumps, equipment and piping systems.
L. Temporary pipe supports:
    1. General Contractor shall be responsible for providing all temporary pipe supports and rigging.
    2. Lay out each section of pipeline and make connections while the pipe is held in temporary supports.
    3. After the completion of connections in each section of pipeline, hold the section in place with temporary clamps.
    4. Do not remove the temporary clamps until the piping is correctly installed on the permanent supports.

3.2 TESTING

A. All permanent pipe supports shall be installed prior to testing.
B. Demonstrate compliance with the requirements of this section with respect to support, pitch, vibration, movement, and expansion and contraction during start-up testing of the equipment and associated piping systems as indicated in Section 01800.
C. Systems which do not meet the requirements of this section with respect to support, pitch, vibration, lateral movement, and expansion and contraction shall be supplemented with additional braces as required and re-demonstrated until compliance is achieved.

3.3 COATINGS

A. Provide shop coatings in accordance with Section 09905.
B. Provide field coatings for steel items in accordance with Section 09900.
C. Provide touch-up field galvanizing for hot dipped galvanized items in accordance with Section 09900.
D. Provide field coatings on surfaces with dissimilar metals. Utilize epoxy paint (minimum 5 mil thickness) in accordance with Section 09900.
E. Provide temporary support or bracing as necessary to allow complete and continuous coats.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____

CONTRACTOR: _____

PROJECT: _____

The undersigned hereby certifies that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the State of _____; (Location of Project)

2. Is qualified by education and training to design the pipe support and bracing system as specified in Section 15094 of subject contract;

3. Has previously designed comparable pipe support and bracing systems;

4. Has prepared the design in full compliance with the requirements of subject contract documents, including all applicable laws, regulations, rules, and codes; and

5. Has confirmed by design that the static gravity loads and dynamic horizontal and vertical seismic, hydraulic pressure, and thrust forces tributary to each pipe support and the system as a whole have been determined, and that all supports and braces are designed to resist these forces within the allowable capacities of each component of the pipe support, including anchorage. (Excluding supports specifically designed by the Engineer-of-Record Wright-Pierce)

6. Will inspect the completed installation of the pipe support system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	PIPE SUPPORT DESIGN ENGINEER
By: _____	By: _____
(Signature)	(Signature)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Professional Engineer No. and State)
_____	_____
(Date)	(Date)

END OF SECTION

SECTION 15100

VALVES & SPECIALTIES – GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support, and test valves, gates, hydrants, cocks, stops, and faucets, when applicable, (hereinafter referred to as "valves") in the location(s) and of the size(s) and quantities shown on the Drawings and/or as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 01010 – Summary of Work (construction sequencing requirements that affect number and duration of equipment startups and certifications)
   2. Section 01340 – Submittals
   3. Section 01600 – Delivery, Storage and Handling
   4. Section 01800 – Equipment Startup, Certification and Operator Training.
   5. Section 09905 – Surface Preparation and Shop Coatings
   6. Section 15050 – Pipe & Pipe Fittings – General
   7. Section 15094 – Prefabricated Pipe Hangers, Supports and Bracing
   8. Valves specified in Division 15.

1.3 QUALITY ASSURANCE

A. Provide valves of proven reliability manufactured by reputable manufacturers.

B. Acceptable manufacturers are listed in each section of this Division. Substitute or "or-equal" valves will be allowed only when indicated.

C. All valves in contact with potable water, or water being processed to become potable water, shall be NSF 61 compliant and shall be constructed of “Lead-free” material in compliance with NSF 372.

1.4 SUBMITTALS

A. Provide shop drawings in accordance with the requirements of the General Conditions, Section 01340 and as specified herein. Shop drawings shall contain the following information at a minimum:
   1. Completed Submittal Certification Form. Shop drawing submittals will be returned unreviewed without this form.
   2. Certified shop drawings.
   3. Manufacturer's literature and illustrations for all equipment to be installed to supplement certified shop drawing information.
   4. Short-term and long-term storage requirements.
   5. Seismic analysis, design and calculations as specified herein.
   6. Shop preparation and shop coatings.

7. Proposed valve identification tag information

B. Provide Operation and Maintenance Manuals in accordance with the requirements of Section 01340.

1.5 DELIVERY AND HANDLING

A. Shipping:
   1. Prepare valves and accessories for shipment as required for complete protection.
   2. Seal valve ends to prevent entry of foreign matter into valve body.
   3. Box, crate, completely enclose, and protect valves and accessories from accumulations of foreign matter.

B. Storage:
   1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.
   2. Do not store valves or accessories directly on the ground.

C. Handling: Handle valves and accessories to prevent damage of any nature to the interior and the exterior surfaces.

1.6 INSPECTION

A. Carefully inspect all materials for:
   1. Defects in workmanship and materials.
   2. Removal of debris and foreign material in valve openings and seats.
   3. Proper functioning of all operating mechanisms.
   4. Tightness of all nuts and bolts.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials are specified in appropriate Sections in this Division.

B. The specifications direct attention to certain required features of the valves and gates but do not purport to cover all details entering into their design and construction. Nevertheless, the Contractor shall furnish the valves and gates complete in all details and ready for operation for the intended purpose.

2.2 BOLTS, ANCHOR BOLTS AND NUTS

A. Furnish all necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.

B. All bolts, anchor bolts, nuts, washers, lock washers, plates, and bolt sleeves shall be carbon steel unless otherwise indicated below or as specified elsewhere.
   1. Stainless steel hardware (minimum of Type 304, unless otherwise indicated) is required in all corrosive atmospheres, exterior areas, and/or areas with NEMA 4X or NEMA 7 rating.
   2. Stainless steel hardware (minimum of Type 316, unless otherwise indicated) is required in all submerged applications as well as in wetwells, headworks, dewatering rooms, chemical rooms, clarifiers, aeration basins, splitter structures, equalization or storage tanks, high chloride conditions, etc. For

additional description and definition of submerged surfaces refer to Specification Section 09900.

C. Unless otherwise specified, stud, tap, and machine bolts shall be of the best-quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to AN Standard B 1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).

D. All bolts shall be suitable size for the intended purpose, with direct input from the product manufacturer.

2.3 SURFACE PREPARATION AND SHOP COATINGS

A. Provide surface preparation and shop coatings in accordance with the applicable section of Division 9.

2.4 VALVE LOCK-OUT/ TAG-OUT HARDWARE

A. Provide accessory hardware for the purpose of locking out valves utilizing standard padlock. Lockout hardware shall be provided for specific valves, where indicated on the Drawings or specified elsewhere.

2.5 VALVE ACTUATORS

A. Unless otherwise specified or shown on the Drawings, all valves shall be manually actuated. All valves shall have an operating handwheel or a handle/lever mounted on the operator. Valves with operating nuts shall be of non-rising stem design and be provided with an AWWA 2 inch square operating nut. The valves shall be provided with handwheel actuators on all manually actuated valves 8 inch and larger in size unless otherwise specified or shown on the Drawings.

B. The valve Manufacturer shall supply and factory mount all actuators; including any type of manual or powered actuators. The valves and actuators shall be shipped as a single unit. All valve actuators shall be sized to operate the associated valve for the full range of pressures and velocities. Position indicators shall be provided for all interior valves.

C. The force in a manual actuator shall not exceed 40 pounds of rim-pull under any operating condition, including initial breakaway. The actuator shall be equipped with gear reduction when force exceeds 40 pounds of rim-pull. All manual actuators shall be self-locking type or shall be equipped with a self-locking device. The actuators shall be capable of moving the valves from a fully open to a fully closed position and a fully closed position to a fully open position. The actuator shall be capable of holding the valve at any position in between the fully open and fully closed positions. A position indicator shall be supplied on quarter-turn valves. Each actuating device shall have the word "OPEN" permanently cast as well as an arrow indicating the direction of operation. Handwheels shall be cast iron or cast aluminum.

D. Unless otherwise specified or shown on the Drawings chainwheel actuators shall be provided for all valves 3 inches and larger with the valve center line located 6 feet or greater above the operating floor. All chainwheel actuators shall be provided complete with chain guides and hot dipped galvanized or cadmium-plated steel chain. The chain loop shall extend to within 4 feet from the operating floor level. Where chains hang in normally traveled areas, appropriate "L" type tie-back anchors shall be used.

E. All chainwheel actuators of the same type, style, and duty shall be supplied by a single Manufacturer. Where applicable and whenever possible, chainwheel actuators shall be provided by the Manufacturer of the valve being served.

2.6 GEAR ACTUATORS

A. Unless otherwise specified or shown on the Drawings, all valves larger than 6 inches shall be provided with gear actuators (totally enclosed type). All manually actuated valves with a rim pull greater than 40 ft-lbs shall also be provided with gear actuators. Worm and gear actuators shall be a one-piece design with worm-gears of gear bronze or machine cut steel material. Worm shall be hardened alloy steel with the thread ground and polished. Traveling nut type actuators shall have threaded steel reach rods with an internally threaded bronze or ductile iron nut.

B. The output shaft shall be perpendicular to the valve shaft and be provided with a removable handwheel. Unless otherwise noted or specified all gear actuators shall conform to AWWA C504 standards. All gear actuators shall be removable from the valve without removing the valve from the line or dismantling the valve.

C. All gear actuators shall indicate the valve position and have adjustable stops. The maximum handwheel size shall be 24 inches in diameter. All position indicators shall be of the embossed, stamped, engraved, etched, or raised types.

D. Unless otherwise specified or shown on the Drawings, all gear actuated valves 3 inches and larger shall be provided with position indication at the point of operation. Valves smaller than 3 inches shall have position indication on their respective handwheels or lever actuators.

2.7 FLOOR STANDS

A. Provide floor stands where required on the Drawings.

B. Floor stands shall be of the non-rising stem, indicating type, and designed for counterclockwise operation. The distance from the base flange to the handwheel shall not be less than 34”.

C. The pedestal shall be cast of ductile iron grade 65-45-12 and meet ASTM-A536. The pedestal shall have a vertical indicating slot. The word “OPEN” shall be cast in the pedestal at the top of the indicating slot. A “CLOSED” tag will be field mounted to the pedestal, to indicate the closed position of the valve. A bronze indicator shall travel on a carbon steel threaded stem to indicate the position of the valve.

D. The stem shall be Xylan coated to prevent corrosion.

E. The floor stand shall be coated in a two-part epoxy for corrosion resistance.

F. Where a floor is not directly over the valve and extension stem, the floor stands shall be supported by a ductile iron wall bracket mounted to the side wall. Wall brackets shall contain a carbon steel plate designed to support the floor stand.

G. Stem guides with corrosion resistant bushing shall be provided as recommended by the floor stand Manufacturer.

H. Provide intermediate shaft supports as recommended by the Manufacturer based on shaft length.

I. The floorstand shall be operated by a cast iron handwheel of no less than 12” in diameter.

J. Floorstands shall be as manufactured by:
   1. Trumbull Industries, Youngstown, Ohio.

2. Troy Valve, Troy, Pennsylvania.
3. Or Equivalent

2.8 VALVE IDENTIFICATION TAGS

A. All valves in piping including individual valves provided with equipment shall be tagged in accordance with that shown on the Drawings. The tags shall be provided with identifying numbers and letters to match those shown on the Drawings. Identification tag numbering shall be reviewed/confirmed with the Engineer and Owner through the submittal process prior to ordering any tags. Refer to Section 11000 for additional information regarding valve tagging.

B. All identification tags shall be provided with sufficient lengths of chain for attachment to the respective valve.

C. Tags shall conform to the following specifications:
   1. The tags shall be 2.5-inch diameter, 1/16" thick, rigid, multi-layered sandwich laminate with contrasting inner and outer colored acrylic plastic layers. Top hole size is 5/32" for hanging tags.
   2. Tags shall be available in 7 different outside colors. Owner and Engineer shall select up to 4 different colors for the project.
   3. Tags shall have up to three lines engraved on a side and eight characters per line of identification information. Tags shall be engraved one side.
   4. Tags shall be secured to valves with nylon cable ties or adjustable metal bead chain. Securing method shall be selected by the Owner and Engineer.
   5. Tags secured to equipment shall be fastened to a flat visible surface by a minimum of two SS screws or SS pop rivets.
   6. Tags shall have a service temperature of -40°F to 175°F
   7. Manufactured by Seton Name Plate Corporation, New Haven, CT, Brimar Industries, Garfield, NJ or equal.

D. All buried valves shall be provided with tags embedded in a concrete pad surrounding the valve box.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves and accessories in strict accordance with manufacturer's instructions and recommendations, as shown on the Drawings and/or as specified herein.

B. Install valves with stems pointed up in vertical position, or horizontally on high valve for chain wheel use, but in no case with stems pointed downward of the horizontal plane. Allow sufficient room for maintenance, removal and proper operation. All valves shall be located and oriented to permit easy access to the valve operator, and to avoid interferences.

C. Valve Orientation: The stem of a manual valve shall be installed in a vertical position when the valve is installed in horizontal runs of pipe having centerline elevations of 4.5 feet or less above finished floor, unless otherwise shown on Contract Drawings. The stem of a manual valve shall be installed in a horizontal position in horizontal runs of pipe having centerline elevations between 4.5 feet and 6 feet above the finish floor, unless otherwise shown on Contract Drawings. All manually actuated valves 3 inches and smaller shall have the valve indicators and operators located to display

toward the normal operational locations.

D. Carefully erect all valves and support them in their respective positions free from distortion and strain.
E. Independently support all valves connected to pumps and equipment, and in piping systems that cannot support valves.
F. Repair any scratches, marks and other types of surface damage etc. with original coating as supplied by the factory.
G. Install valves such that "open" and "close" position indicators are easily visible.
H. All valves (and actuators where specified) shall be installed in a manner that will provide for proper clearances and ease of operation. In addition, valve actuators must be capable of being rotated in 90° increments to facilitate field installation.
I. Check and adjust all valves and accessories for smooth operation.

3.2 TESTING

A. The Contractor shall test all valves and gates in the presence of the Engineer to demonstrate that each valve and gate complies with specified requirements and allowable leakage rates.
B. The contractor shall test all valves visually for leaks and proper operation under pressure. The contractor shall also test the valves to ensure proper valve function and actuation.
C. Valves may either be tested while testing pipelines, or as a separate step. It shall be demonstrated that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other, and in both directions for two-way valve applications. The Contractor shall count and record the number of turns required to open and close each valve and account for any discrepancies with the Manufacturer's data.
D. Air and vacuum relief valves shall be examined as the associated pipe is being filled to verify venting and seating is fully functional. The Contractor shall set, verify, and record set pressures for all relief and regulating valves. Self-contained automatic valves shall be tested at both maximum and minimum operating ranges, and reset upon completion of test to the design value.
E. The contractor shall take care not to overpressure any valve and appurtenances during testing.

3.3 RETESTING

A. If the equipment does not successfully pass the tests listed above, the Manufacturer/Contractor shall repair the equipment and perform the tests again until passing the tests successfully. If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be re-conducted at no additional cost to the Owner.

3.4 CLEANING

A. All items, including but not limited to all valves and valve interiors, shall be thoroughly cleaned prior to installation, testing, and final acceptance. All dirt, debris, and other foreign materials shall be removed.

3.5 FIELD COATINGS

A. In accordance with Section 09900.

END OF SECTION

SECTION 15101

GATE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test gate valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All gate valves of same type and style shall be manufactured by one manufacturer.
B. Acceptable Manufacturers: as noted herein.
C. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372.

PART 2 - PRODUCTS

2.1 VALVE, LOCATION AND USE

A. Type, location and use as shown on the Drawings.
B. Bolts, nuts, washers, fasteners shall be as defined in Section 15100.
C. For Water Supply Piping:
   1. Buried: AWWA Type, NRS.
   2. Exposed: AWWA Type NRS.
D. For General Service Piping (liquids containing solids):
   1. Includes plant water, and liquids containing solids.
   2. 2-l/2 inches and smaller: l25 bronze.
   3. 3 inches and larger Buried: NRS, resilient wedge.
   4. 3 inches and larger Exposed: NRS.
E. Accessories: As shown on the Drawings and required for proper operation.

2.2 MATERIALS

A. Waterworks type NRS valves (AWWA):
   1. Valve Body, bonnet and stuffing box - Cast iron (ASTM A126, C1B), or Ductile iron (ASTM A536), coated inside and out with fusion bonded epoxy meeting AWWA C550. Face-to-face dimensions shall comply with ANSI B16.10 and flanges to comply with ANSI B16.1.
   2. Resilient Wedge - Ductile iron wedge with bonded EPDM or Nitrile (Buna-N/NBR) rubber covering.
   3. Stem - Manganese bronze, ASTM B584

4. Stuffing box O-rings
    a. Two O-rings, each nitrile rubber.
    b. Capable of changing under pressure.
5. Wedgenut - Bronze, ASTM B62 or Manganese bronze, ASTM B584
6. Water working pressure: 250 psi
7. End Connections
    a. Exposed valves – flanged and bolted joints in conformance with ANSI/ASME B16.1 and AWWA standards for appropriate pipe material.
8. Operation
    a. Exposed valves
        i. Manual – Refer to 15100
            (1) Handwheel, Chainwheel where required based on height above finished floor.
            (2) Floor stand actuators where indicated on the Drawings.
            (3) Floor boxes where indicated on the Drawings.
        ii. Automatic – Refer to 15120.
    b. Opening Direction – counterclockwise (open left)
9. Standards - valves shall meet or exceed AWWA C509, latest edition.
10. Manufacturer
    a. American Flow Control
    b. Kennedy/McWane
    c. Clow/McWane
    d. Mueller
    e. Or equal

B. General Service - 3 inches and larger NRS valves:
1. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber, except for guide and wedge nut areas.
2. Non-rising stem (NRS).
3. 125 class body.
4. Meet or exceed AWWA C-509.
5. Face to Face dimensions: ANSI B16.1.
6. Water working pressure:
    a. 12 inches and smaller: 200 psi.
    b. 14 inches and larger: 150 psi.
7. End Connections
    a. Exposed valves
        i. Flanged and bolted joints in conformance with ANSI/ASME B16.1 and AWWA standards for appropriate pipe material.
8. Operation:
    a. Exposed valves
        i. Manual – Refer to 15100
            (1) Handwheel, Chainwheel where required based on height above operating floor.
            (2) Floor stand actuators where indicated on the Drawings.
            (3) Floor boxes where indicated on the Drawings.
        ii. Automatic – Refer to 15120.

b. Opening Direction – counterclockwise (open left)

9. Acceptable Manufacturers:
   a. American Flow Control
   b. Kennedy/McWane
   c. Clow/McWane
   d. Mueller
   e. Or equal.

C. Knife Gates:
1. Wafer body, rising stem, bonnetless construction.
2. Body:
   a. 304 stainless steel wetted parts.
   b. Resilient seat, replaceable.
   c. Flanges shall be ANSI 125/150 pound.
   d. Rated for 150 psi working pressure.
3. Valve stem shall be 303 or 304 stainless steel.
4. Valve body shall include guides and jams to assist seating.
5. Valve body shall have a raised face seat with relief area to prevent jamming.
6. Operation
   a. Exposed valves
      i. Manual – Refer to 15100
         (1) Handwheel, Chainwheel where required based on height above operating floor.
         (2) Floor stand actuators where indicated on the Drawings.
         (3) Floor boxes where indicated on the Drawings.
      ii. Automatic – Refer to 15120.
   b. Opening Direction – counterclockwise (open left)
7. Acceptable Manufacturers:
   a. Dezurik, Series L (for valves 42" and larger), Series KGC for valve smaller than 42").
   b. Red Valve
   c. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and test in accordance with Section 15100, AWWA C500 and AWWA C-509, latest revision.

B. For horizontal piping, install valves with stem position between horizontal to vertical upward.

END OF SECTION

SECTION 15102

GLOBE AND ANGLE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test globe and angle valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All globe and angle valves of the same type, class, and duty shall be by one manufacturer.

B. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372.

C. Acceptable Manufacturers:
   1. Crane
   2. Jenkins
   3. Or acceptable equivalent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Service - 3 inches and smaller:
   1. Valves shall be 200-lb. WOG minimum bronze valves with screwed or solder-joint ends.
   2. Body material shall conform to ASTM Standard Specification for Composition Bronze or Ounce Metal Castings, Designation B62-76.
   3. Valves shall have union bonnet, renewable or regrindable stainless-steel plug and seat.
   4. Stems shall conform to ASTM B584, Copper Alloy UNS No. C87500 or equivalent having a maximum zinc content of 14 percent.
   5. If the manufacturer does not furnish this stem material in the class specified, the valves shall be furnished in the next higher class in which the stem material is available.
   6. Provided with steel handwheel operator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In accordance with Section 15100.

END OF SECTION

SECTION 15104

PLUG VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test plug valves and actuators of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All plug valves of same type, style, and duty shall be of one manufacturer.
B. All actuators shall be supplied by the valve manufacturer who shall be responsible for proper operation of all valves with the actuators specified.
C. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372.
D. Acceptable Manufacturers:
   1. DeZurik Corporation
   2. McWane Plant and Industrial
   3. Val-Matic
   4. Or equivalent.

1.4 JOB CONDITIONS

A. Piping as shown on the Drawings is detailed to accommodate standard design flanged plug valves having face-to-face dimensions of standard flanged gate valves.
B. Make all necessary adjustments to piping, subject to review of the Engineer, to accommodate plug valves furnished with face-to-face dimensions not of standard flanged gate valves.
C. Valves 2 inches and smaller may be of screwed type unless indicated otherwise.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type, location and use as shown on the Drawings.
B. Bolts, nuts, washers, fasteners shall be as defined in Section 15100.
C. Two Way Valves:
   1. Non-lubricated, eccentric type, cast iron body with end type as shown on the Drawings.

2. Shall have an unobstructed shaped waterway, when open, of not less than 80% of nominal pipe area.
3. Body shall be of gray cast iron, ASTM A126 Class B with resilient plug facings of neoprene or Buna-N.
4. Packing shall be Buna-N with a maximum temperature of 250 F. Packing shall be manually adjustable.
5. Bearings shall be stainless steel or bronze as required.
6. Suitable for particular service in piping in which installed.
7. Welded-in nickel or stainless steel seat.
8. Shall have drip-tight shut-off.

D. Actuators (type as shown on the Drawings and specified herein):
   1. Operation
      a. Exposed valves
         i. Manual – Refer to 15100
            (1) For 6-inch and smaller, level actuator. Chainwheel where required based on height above operating floor. Handwheel where valve location does not permit a lever actuator.
            (2) For 8-inch and larger, handwheel, chainwheel where required based on height above operating floor.
            (3) Floor stand actuators where indicated on the Drawings.
            (4) Floor boxes where indicated on the Drawings.
         ii. Automatic – Refer to 15120.
      b. Opening Direction – counterclockwise (open left)

E. Accessories (When Applicable):
   1. Extension (for lever actuated valves):
      a. Shall include extension pipe, bearing plate and couplings of the sizes as required.
   2. Extended Actuator Mounting: Supplied when actuators are extended above ground.
   3. Floor Boxes:
      a. Iron body, size as required for valve.
      b. Cast iron or bronze screwed cover plate.
      c. Suitable for cast concrete floors of thickness as shown.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In accordance with Section 15100.

B. For horizontal piping, install valves with stems horizontal such that the plug in upper part of the body when in the open position and such that the plug is in the upstream end of the body when in the closed position. Coordinate valve orientation with the Engineer.

END OF SECTION

SECTION 15107

PROCESS SYSTEMS BALL VALVES (BRONZE BODY)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test process piping system ball valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein. Process Piping Systems including, but are not limited to:
   1. Process flushing water that can be called Effluent Flushing Water, Plant Water, Settled Effluent, Final Effluent, Non-Potable water.
   2. Polymer Dilution Water that can be Process Water or Potable City Water
   3. Chemical Dilution Water.
   4. Pump Seal Water Systems
   5. Process Pumps and Equipment Gauge Assemblies
   6. Other applications in damp areas of potentially high corrosion rates.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All ball valves of same type, style, and duty shall be of one manufacturer.
B. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of “Lead-free” material in compliance with NSF 372.
C. Acceptable Manufacturers: Bronze Body
   1. Nibco
   2. Apollo
   3. Or equivalent.

PART 2 - PRODUCTS

2.1 GENERAL

A. Any and all types of valves used in insulated piping systems shall have valve stem extensions to allow the valve handle to be placed outside the insulation while retaining the full thickness of insulation around the valve housing. Alternatively fully insulated enclosures with a well secured but easily removable cover may be fabricated to enclose the valve and handle.
B. Any and all types of valves used with electric motor or pneumatic and hydraulic cylinder actuators shall have housings and valve stems that allow the actuators to be attached to the valve either directly or with the use of adaptors and extensions.
C. All valves specified to be electric motor or pneumatic and hydraulic cylinder actuated

shall be provided as a complete assembly. Field assembly of the actuator to the valve by the Contractor is not allowed.

2.2 MATERIALS: BRONZE BODY BALL VALVES FOR 3" AND SMALLER VALVES

A. Three Piece Bronze Body Full Port for 3" size
1. 600 PSI Non Shock Cold Working Pressure
2. Threaded or solder ends as needed for piping system and valve size.
3. Blow out proof stem
4. Vented ball
5. Provide valve stem extensions for all valves installed in insulated piping systems.
6. Materials of construction included manufacturer's options:

a.	Handle nut	300 Series Stainless Steel
b.	Handle	300 Series SS with plastic grip
c.	Threaded Pack Gland	Brass ASTM B-16 Alloy C3600
d.	Stem	316 SS ASTM A276
e.	Body	Bronze ASTM B584 Alloy C84400
f.	Packing	PTFE
g.	Body End	Cast Bronze ASTM B584 Alloy C84400
h.	O-ring seal	Fluorocarbon rubber
i.	Seat Ring	PTFE
j.	Ball (vented)	316 SS ASTM A276
k.	Thrust Washer	Reinforced PTFE
l.	Body Bolts	300 Series SS
m.	Body Nuts	300 Series SS

B. Two Piece Bronze Body Full Port 2½" to ¼":
1. 600 PSI Non Shock Cold Working Pressure
2. Threaded or solder ends as needed for piping system and valve size.
3. Blow out proof stem
4. Vented ball
5. Provide valve stem extensions for all valves installed in insulated piping systems.
6. Materials of construction included manufacturer's options:

a.	Handle nut	300 Series Stainless Steel
b.	Handle	300 Series SS with plastic grip
c.	Threaded Pack Gland	Brass ASTM B-16 Alloy C3600
d.	Stem	316 SS ASTM A276
e.	Body	Bronze ASTM B584 Alloy C84400
f.	Body End Piece	Bronze ASTM B584 Alloy C84400
g.	Packing	PTFE
h.	Seat Ring	PTFE
i.	Ball (vented)	316 SS ASTM A276
j.	Thrust Washer	Reinforced PTFE

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves in accordance with the "Valves and Specialties - General" Section in this Division.

END OF SECTION

SECTION 15110

CHECK VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test check valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All check valves of same type and duty shall be by one manufacturer.
B. All components in contact with potable water, or water being processed to become potable water, shall be compliant with NSF 61 and shall be constructed of "Lead-free" material in compliance with NSF 372..

PART 2 - PRODUCTS

2.1 SWING CHECK VALVES - 2-½ INCHES AND SMALLER – GENERAL USE

A. Standard, all brass or bronze, swing check with screwed ends.
B. Suitable for l50 psi working steam pressure.
C. Shall meet MSS SP-80 standards, Class 125, cast-bronze body and cap conforming to B62.
D. Acceptable Manufacturers:
   1. Watts
   2. Apollo
   3. Or equal.

2.2 SWING TYPE CHECK VALVES – 3 INCH AND LARGER – GENERAL USE

A. The check valve shall conform to the materials of construction, pressure rating and test requirements of AWWA C508 and be suitable for installation in a horizontal or vertical flow up pipe.
B. The body shall be made of cast iron conforming to ASTM A126 Class B with a bolted steel cover allowing complete access to and removal of all internal components while the valve is in the line.
C. The valve body shall have integral flanges, flat faced and drilled per ANSI B16.1 Class 125 or Class 250, as required.
D. The valve body shall have a removable Type 316 stainless steel body seat held in place with stainless steel pins.
E. The disc arm shall be ductile iron and the disc shall be cast iron with a replaceable Buna-N (or other suitable material) disc seat held in place by a type 316 stainless steel

follower ring and stainless steel screws. The disc shall be attached to the disc arm by means of a center pin, disc nut and washer providing 360 degree angular articulation but not rotation.

F. The disc arm shall be suspended from and keyed to a stainless steel shaft that is supported at each end by stainless steel or no-lead bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable packing.

G. Bosses shall be provided on check valves which may be tapped for draining or used for by-pass. The inside and outside of all valves together with the working parts, except bronze and machined surfaces, shall be coated in accordance with AWWA C-550.

H. Marking shall be in accordance with AWWA C-508 and shall include size, working pressure, and cast arrow to indicate direction of flow, name of manufacturer, and year of manufacture.

I. The valve shall be supplied with an outside lever and adjustable counterweight. The lever and weight shall be on the right hand side of the valve (looking in the direction of flow) but shall be field convertible to the left hand side without additional parts. Fitted with an adjustable dashpot or snubber to control speed of valve closure.

J. The valve shall also be provided with a single, side mounted air-cushion assembly directly mounted to the valve body. The amount of cushioning shall be adjustable without the need for pre-charged air chambers.

K. Acceptable Manufacturers:
   1. Val-Matic Series 7800LW
   2. GA Industries Figure 220
   3. Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In accordance with Section 15100.

B. Install check valves in horizontal sections of pipeline unless otherwise indicated on the Drawings.

END OF SECTION

SECTION 15120

ELECTRIC VALVE ACTUATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide all labor, materials, tools and equipment necessary to furnish, install, start-up and test valve actuators and appurtenances as indicated on Drawings and as specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. In accordance with the requirements specified in Section 15100.
B. The valve manufacturers shall be responsible for furnishing the valve actuators. All valve actuators shall be the product of a single Manufacturer.
C. Acceptable Manufacturers (120VAC, single phase power applications):
   1. Limitorque Corporation - QX Series
   2. Rotork Controls – IQS Series
   3. Auma - SA(R) Series with AC controls
   4. or acceptable equivalent
D. Acceptable Manufacturers (480VAC, three-phase power applications):
   1. Limitorque Corporation - QX Series
   2. Rotork Controls - IQ(M) Series
   3. Auma - SA(R) Series with AC controls
   4. equivalent

1.4 SUBMITTALS

A. Submit shop drawings, manufacturer's literature, short-term and long-term storage requirements, maintenance data and operating instructions in accordance with the General Conditions, Section 01340 and Section 15100. Additional specific information which shall be submitted is listed below.
   1. Manufacturer standard wiring diagrams including all terminal connections.
   2. Project specific wiring interconnection diagrams showing all field termination points to remote equipment.
   3. Shop drawing information on electric actuator, gear ratio, performance charts, and parts list.
   4. Recommended spare parts.
   5. Factory performance report, including specified information.

PART 2 - PRODUCTS

2.1 NON-INTRUSIVE ELECTRIC ACTUATORS

A. Electric actuators shall be a self-contained unit and shall include the motor, integral reversing starter, gearing, limit switches, torque switches, de-clutchable auxiliary handwheel, and local motor controls. Electric actuators shall have micro-processor-based controls with LCD display in a separate sealed enclosure. Micro-processor shall have configurable discreet output relays.

B. Electric actuators shall be factory wired requiring only connections of power supply, control circuits, and remote-control stations, where applicable.

C. Electric actuators shall meet the latest revision of the applicable AWWA C540 standard.

D. Electric actuators shall be provided as indicated in the Electric Actuator Schedule at the end of this Specification section.

E. Actuators shall be designed for the following conditions of service:

1. Modulating and Positioning Service:

Maximum Starts Per Hour Rate	Maximum Starts Per Hour	Duty Per Hour (minutes)	IEC 60034-1 Rating
1200	1200	30	S4-50%

2. On/Off, Three Position (Inching) Service (Open/Close and (Open/Stop/Close):

Maximum Starts Per Hour Rate	Maximum Starts Per Hour	Duty Per Hour (minutes)	IEC 60034-1 Rating
600	60	15	S2-15min S3-25%

F. Each valve actuator shall deliver sufficient torque to open or close the valve at up to 125 percent of the rated working pressure of the valve and at +/- 10% of the nominal specified voltage. The entire valve assembly including the motor actuator and integral controls shall be tested at the valve manufacturer's factory to the requirements herein. Refer to drawings and specifications for line pressures.

G. Motors shall be low inertia, high starting torque, totally enclosed, non-ventilated type. Motor bearings shall be anti-friction type and shall be permanently lubricated. All motors shall include overload protection. Temperature shall be limited by thermostat device embedded in the motor end windings and integrated into the actuator control. Motors shall be in the same enclosure as the control Motor voltages shall be as follows:

1. 3" and Smaller Valves: Suitable for operation on single phase, 60 Hz, 120 volt power.
2. Valves Larger than 3": Suitable for operation on 3 phase, 60 Hz, 460 volt power.
3. Slide Gates and Sluice Gates: Suitable for operation on 3 phase, 60 Hz, 460 volt power.
4. Refer to schedule for any voltage deviations.

H. Complete valve and gate actuator, including integral controls, for non-hazardous rated locations shall be housed in a NEMA 4/6, submersible enclosure, IP68 rated for 7 meters for 72 hours. For hazardous areas service, actuators shall be rated Class 1, Division 1, Group D, and be Factory Mutual tested and certified for explosion proof areas in compliance with NEC, Article 500, NEMA 7.

I. Electric actuator shall be supplied complete with operating controls consisting of the

motor reversing starter (electrically and mechanically interlocked), control transformer with fused secondary, OPEN-STOP-CLOSE and LOCAL-OFF-REMOTE selector switch, terminal strip, and 120 volt space heater or provide sufficient heat dissipation through power supplies to prevent condensation, all integrally mounted & wired in an o-ring sealed compartment. Modulating actuators shall be supplied with solid state starters.

J. Input/Outputs to the SCADA system include the following:
   1. For the Modulating and Positioning valves:
      a. Position command (4-20mA input signal to the actuator)
      b. Position feedback (4-20mA output signal from the actuator)
      c. Full Open Status
      d. Full Closed Status
      e. Fault or Alarm Signal
      f. In Remote Status
   2. For the Open/Close or Three Position valves:
      a. Full Open Status
      b. Open Command*
      c. Full Closed Status
      d. Close Command*
      e. Fault or Alarm Signal
      f. In Remote Status
      g. *Actuators shall have the capability of being configured to only have one position command. If that position command isn't true, the actuator will command the valve to go to the other position. Refer to Instrumentation Drawings for anticipated inputs and outputs.
   3. All contacts shall be SPDT rated for 5A at 120VAC/24VDC.

K. All provisions for external wiring connections shall be via a screw type terminal strip. All interconnecting power and control wiring shall be furnished and installed under Division 16.

L. Valve and gate actuators shall be multiple reduction units with power gearing consisting of spur or helical gearing with worm gearing. There shall be a self-locking worm gear set within the gear train to maintain valve position. Motor brakes shall not be used. High speed gear set shall be of hardened alloy steel and the worm gear shall be alloy bronze. Aluminum or cast iron gearing shall not be allowed. Anti-friction ball or roller bearings shall be used throughout.

M. For valves, the overall gear ratio shall be selected to provide full open to full closed travel in not more than 60 seconds, or as otherwise selected by individual equipment suppliers to satisfy the process requirements.

N. For slide gates and sluice gates, the overall gear ratio shall be selected to provide an opening rate of at least 10 inches per minute, or as otherwise selected by the individual equipment suppliers to satisfy the process requirements.

O. Valve position indication shall be indicated by a mechanical pointer connected to the valve stem, gear box or a rising stem indicator.

P. Display:
   1. The actuator display shall include a dedicated numeric/symbol digital position indicator displaying valve position from fully open to fully closed in 1%

increments. Valve closed and open positions shall be indicated by symbols showing valve position in relation to the pipework to ensure that valve status is clearly interpreted. With main power on, the display shall be backlit to enhance contrast at low light levels and shall be legible from a distance of at least 6 feet (2m). The digital display shall be capable of indicating real time torque and valve position simultaneously, both being displayed in 1% increments of valve position and actuator rated torque. In addition torque shall be also displayed in a horizontal bar graph form.

2. Red, green, and yellow lights corresponding to open, closed, and intermediate valve positions shall be included on the actuator display when power is switched on. The digital display shall be maintained and updated during handwheel operation when all power to the actuator is isolated for a minimum of 48 hours.
3. In addition, the actuator display shall include a separate text display element with a minimum of 32 characters to display operational, alarm and configuration status. Provision shall be made to orientate the actuator display through increments of 90 degrees.

Q. All integrally mounted motor controls shall be completely factory wired to the motor, limit switches, and torque switches. The only field wiring that shall be required shall be for the connections to external power and control signals, which shall be connected to terminal strips provided within the actuator's control enclosure.

R. All rotating power train components shall be immersed in grease with provision for inspection. Lubricants shall be suitable for ambient temperature conditions of -20 degrees to +150 °F.

S. Manual Operation: A permanently attached metallic auxiliary handwheel with open-close direction indication arrow shall be provided for manual operation. The handwheel shall be prevented from rotating during motor operation but a fused motor shall not prevent manual operation. Maximum allowable rim effort shall not exceed 80lbs. under worst case operating conditions. Handwheel operation shall be accomplished via. a declutch lever/mechanism which mechanically disengages the motor and related gearing. When in the manual mode, the unit shall stay in this mode until the motor is energized, at which time the actuator will automatically return to electric operation. It shall be impossible for simultaneous manual and motor operation to occur. Friction type declutch mechanisms are not acceptable. The handwheel actuator clutch mechanism shall be designed to permit padlocking in both the engaged and disengaged positions.

T. Position and torque limitation.
   1. Position setting range shall be;
      a. Multi-turn: 2.5 to 100,000 turns with a resolution of 7.5 degrees on one actuator output revolution.
      b. Direct drive quarter turn actuators range shall be 90 degrees +/- 10 degrees, with resolution to 0.1 degrees of actuator output.
   2. Torque switches shall be programmable from 30% to 100% of actuator rated torque.
   3. Actuators shall be sized to operate at no more than the following rated torques:
      a. Thrust: 75%

b. Non-Thrust: 50%

U. Position and torque sensors shall accurately measure and control the position of the actuator without use of mechanical gears.

V. Modulating and positioning actuators shall incorporate a current positioning transmitter (CPT) that will provide a signal corresponding to valve position for remote indication (Potentiometers will not be acceptable). Actuators shall be able to accept a 4-20ma signal which will enable the actuators to automatically position the valve in proportion to an analog current. To prevent unnecessary frequent operation actuators shall incorporate a means of deadband adjustment (0-9.9% of travel) and a motion inhibit timer (adjustable from 2 – 99 seconds.) Loss of control signal shall result in one of the following programmable actions; stay put; move to high signal; move to low signal.

W. A means for automatic “torque switch bypass” to inhibit torque off during valve unseating and “latching” to prevent torque switch hammer under maintained or repeated control signals shall be provided. The electrical circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit.

X. Diagnostics: Provide an integral diagnostic module, which will store and enable download of historical actuator data to permit analysis of changes in actuator, gate or valve performance. Provide diagnostic software from actuator manufacturer to allow configuration and diagnostic information to be reviewed, analyzed and reconfigured. Provide diagnostic status screens capable of showing multiple functions simultaneously so troubleshooting can be affected rapidly and efficiently.

Y. Secondary Gear Boxes: Secondary gearing shall be provided for multi-turn or quarter-turn applications where operating time, thrust or torque considerations require. Secondary gearing shall be bevel or spur, totally enclosed in a cast/ductile iron housing, fully sealed rated to NEMA 4 and suitably lubricated for the service intended. Each gear assembly shall be manufacturers standard selection or combination of as detailed in published product literature. Each gearbox shall be provided with a removable output drive coupling suitably sized for the intended service. Quarter-turn gearboxes shall be equipped with adjustable mechanical stops (at 0 and 90 degrees +/- 5%) to permit limiting open and closed travel during manual operation. All secondary gearboxes must meet latest AWWA C504 standards.

2.2 SPARE PARTS

A. Provide the following spare parts:
   1. Lubrication oil for 1 oil change for each unit provided.
   2. One set of bearings, o-rings and seals for each unit provided.
   3. One complete electronic control module for each type of unit provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In accordance with Section 15100 and manufacturer's written instructions.

3.2 START-UP AND TESTING

A. In accordance with Section 01800 and 15100 and manufacturer's written instructions.

B. Factory Test - Provide a factory performance test for each motor operated valve assembly. The test shall consist of simulating each typical valve loads with the following parameters recorded: current at maximum torque setting; torque at maximum torque setting; flash test voltage; and actuator output speed or operating time. Submit results of factory test to Engineer for review and approval prior to shipment.

C. Field Demonstration Test - After installation, start-up testing and adjustment have been completed by manufacturer's field service engineer, each motor operated valve assembly shall be demonstrated to operate satisfactorily throughout the specified operating range. Field demonstration testing shall be performed in the presence of the Engineer.

D. Promptly correct or remove and replace equipment which does not meet specifications at no additional cost to the Owner. Repeat testing until specified parameters are obtained.

E. Training - Training shall be performed in accordance with Section 01800.

3.3 TOUCH-UP FIELD COATINGS

A. Provide in accordance with Section 09900. Field coatings shall be compatible with shop coating.

3.4 ELECTRIC ACTUATOR SCHEDULE

Tag	Valve/Gate Type	Description/ Service	Service	Environment	Voltage*	Quarter-turn/ Multi-turn
MOV-5220	Plug	North RAS PS Waste Sludge Bleed Valve	Open/Close	Unclassified	-	Quarter-turn
MOV-6665	Plug	North RAS PS WAS Feed to Waste Sludge Storage Tank	Open/Close	C1/D2	-	Quarter-turn
MOV-6666	Plug	South RAS PS WAS Feed to Waste Sludge Storage Tank	Open/Close	C1/D2	-	Quarter-turn
MOV-6667	Plug	North RAS PS WAS Feed to Thickened Sludge Storage Tank	Open/Close	C1/D2	-	Quarter-turn
MOV-6668	Plug	South RAS PS WAS Feed to Thickened Sludge Storage Tank	Open/Close	C1/D2	-	Quarter-turn
MOV-6640	Ball	Washwater Booster Pump Feed to GBT-1	Open/Close	C1/D2	-	Quarter-turn
MOV-6641	Ball	Washwater Booster Pump Feed to GBT-2	Open/Close	C1/D2	-	Quarter-turn

*Refer to Paragraph 2.1. Voltage is only indicated if there is a deviation from Paragraph 2.1

END OF SECTION

SECTION 15127

AIR RELEASE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test air release valves of the size (s) and the type (s) and in the location (s) shown on the Drawings and specified herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.
   1. Section 15100 – Valves & Specialties – General

1.3 QUALITY ASSURANCE

A. All air release valves, for the same service, shall be manufactured by one manufacturer.
B. Acceptable Manufacturers:
   1. Dezurik/APCO Valves
   2. Crispin
   3. GA Industries
   4. Or equal.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. All valves shall be suitable for the intended services.
   2. Valve sizing shall be as recommended by the manufacturer to suit the pressure and flow condition of each application.
   3. The valve manufacturer shall furnish installation and maintenance manuals with each valve.
B. Sewage and Sludge Service:
   1. Air Release Valves.
      a. Shall be designed to operate (open) while pressurized, allowing entrained air to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a needle mounted on float energized compound lever mechanism and prevent sewage media from escaping.
      b. Shall be specially adapted for use with sewage and sludge.
      c. The venting orifice and mechanism and the valve body shall be capable of being back-flushed with water.
      d. Cast iron body and covers, stainless steel float and lever pins, bronze seat with the mechanism cast bronze and Buna-N needle.

e. Furnished with 2-inch inlet shutoff valve; ½-inch outlet; 1-inch blowoff/drain valve; 2-inch shutoff valve with quick disconnect coupling and 5-feet of hose to permit backflushing without dismantling valve.
f. Valve shall be capable of withstanding 500 psi line pressure.
g. Equal to Series ASR- 400 APCO sewage air release valve.

2. Air and Vacuum Release Valves:
   a. Shall be float operated valves designed to release accumulated air or gas from a piping system while the system is in operation and under pressure.
   b. Shall allow unrestricted venting or re-entry of air, through it, during filling or draining of the force main, to prevent water column separation or pipeline collapse due to vacuum.
   c. Valve shall incorporate one upper and one lower stainless steel float, connected by a common stainless steel float guide, thereby maintaining an air gap between the bottom float and top shut-off float. The air gap shall retard waste solids from fouling or clogging the top shut-off float.
   d. The internal baffle shall be fitted with a guide bushing and act to protect the shut-off float from direct air flow. The baffle shall retain the 45 Durometer Buna-N seat in place without distortion, for tight shut-off.
   e. Cast iron body, cover and baffle; brass internal parts.
   f. All internals shall be easily removed through the top covers without removing the main valve from the lines.
   g. Both floats shall withstand 500 psi or more.
   h. Furnished with inlet shutoff valve; outlet; blowoff/drain valve; shutoff valve with quick disconnect coupling and 5-feet of hose to permit backflushing without dismantling valve.
   i. The valve inlet shall have 2-inch N.P.T. and the outlet 1-inch N.P.T.
   j. Equal to Series ASV-401 APCO sewage air and vacuum valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves in accordance with manufacturer's instructions and recommendations and as shown on the Drawings.
B. Install all valves in the vertical position and allow sufficient clearance around valve for proper maintenance and removal.
C. Provide gate valve between air release valve and pipeline.
D. Inlet piping to the air valves shall be brass.
E. The exhaust lines from the air valves shall terminate in down turned position 18 inches above the floor. For water applications, the end of the line shall be covered with a 24 mesh stainless steel screen attached with a stainless steel clamp.

END OF SECTION

SECTION 15180

PIPE AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide insulation to all non-buried interior piping and equipment as scheduled herein, including but not limited to domestic water, process water, heating system pipeline components, boiler breaching and emergency generator exhaust pipe and muffler.

B. Provide insulation jacketing as scheduled herein.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.

1. Section 15050 – Piping – General
2. Section 15100 – Valves – General
3. Section 15400 – Plumbing – General
4. Section 15600 – HVAC – General

1.3 QUALITY ASSURANCE

A. Standards:

1. Fiberglass pipe insulation: ASTM C547, ASTM C1136.
2. All-service vapor retarder jacket: ASTM C1136.
3. Mineral fiber high temperature pipe insulation: ASTM C547, Type II.
4. Flexible elastomeric pipe insulation: ASTM C534
5. PVC jacketing: ASTM D1784, Type 1
6. Aluminum jacketing: ASTM B209, ASTM C1729
7. Dimensional requirements: ASTM C585
8. Thermal conductivity: ASTM C177, ASTM C518
9. Water vapor transmission: ASTM E96
10. Flame spread & smoke development: ASTM E84, UL 723

B. Insulation shall be installed by skilled and experienced applicators who are regularly engaged in commercial and industrial insulation work.

C. Fire Hazard Rating: All insulation materials, adhesives, coatings and other accessories shall have a listed hazard rating not to exceed 25 for flame spread and 50 for smoke developed.

1.4 SUBMITTALS

A. Submit manufacturer's literature containing material product data in accordance with the General Conditions of the Construction Contract, Section 01340, Section 15050, Section 15100, Section 15400, and Section 15600.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide insulation on pipe and equipment as identified in Table 1 and at the thicknesses identified in Table 2.

B. Fiberglass Pipe Insulation:
   1. Bio-soluble glass fibers bonded with thermosetting resin
   2. All service vapor retarder jacket.
   3. All cold piping shall be sealed with continuous, unbroken vapor seal to prevent condensation.
   4. Provide PVC jacketing on straight runs of fiberglass insulated piping as identified in Table 3.
   5. Acceptable Manufacturers:
      a. Owens-Corning
      b. Johns Manville
      c. Thomas Insulation
      d. Or equal

C. Flexible Preformed Elastomeric Insulation:
   1. For use on piping in designated wet areas as identified in Table 3
   2. Insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. Insulation shall be formaldehyde free, low VOC's, fiber free, dust free and mold and mildew resistant.
   3. Insulation shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft2- °F at a 75°F mean temperature. Insulation shall have a maximum water vapor transmission of 0.08 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.
   4. Methods of Securing:
      a. Manufacturer's recommended adhesive, applied by brush to both butting insulation surfaces.
      b. Self-sealing adhesive, factory applied to the seam, plus PVC overlap tape.
   5. Insulation jacketing: Field applied jacket.
   6. Acceptable Manufacturers:
      a. AeroFlex USA Inc.
      b. Armacell LLC.
      c. K-Flex USA.
      d. Or equal.
      e.

D. Fittings and Valves:
   1. Pre-molded PVC covers with fiberglass fill on fiberglass insulation systems.
   2. Mineral fiber insert insulation with an aluminum pre-molded fitting cover.
   3. Do not insulate unions and flanges.

E. Staples: Outward clinching type, Type 304 or 3l6 stainless steel.

F. Adhesives:
   1. Fiberglass: Non-flammable vapor barrier adhesive as manufactured by Benjamin Foster or Childers or equal.

2.2 INSULATION APPLICATION TABLES

TABLE 1 – PIPING WHICH REQUIRES INSULATION

PIPE SYSTEM	FLUID TEMPERATURE RANGE (°F)
Domestic Water Systems – Cold Water	40 – 100
Domestic Water Systems – Tepid Water	40 – 90
Domestic Water Systems – Hot Water	100 – 200
Air Conditioning Systems – Chilled Water	35-55
Heating Systems – Refrigerant	35-55

TABLE 2 - MINIMUM PIPE INSULATION THICKNESS (IECC)

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE SIZE (INCHES)				
	Conductivity (BTU-in/hr-ft^2-°F)	Mean Temperature Range (°F)	<1	1 to 1 ½	1 ½ to <4	4 to <8	8+
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20-0.26	75	0.5	1.0	1.0	1.0	1.5

TABLE 3 - IDENTIFICATION OF INSULATION TYPES

Locations	Fiberglass	Fiberglass with PVC Jacketing	Flexible Preformed Elastomeric
All areas not listed below	X		
Intermittent Drip/Splash - Plant Water / Process Flushing Water		X	
Frequent Drip/Splash/Washdown - Refrigerant			X

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's written instructions, submittals, and in proper relationship with adjacent construction.
B. Apply insulation only after all pipes have been tested and approved.
C. Clean and dry all surfaces to which insulation is to be applied.
D. Insulation at sleeves:
    1. Insulation shall be continuous through all sleeves except where gas-tight seal is indicated.
    2. Provide aluminum cover on insulation where caulking is required.
    3. Delete insulation at walls requiring a gas-tight seal.
E. Insulation at Hangers:
    1. Insulation shall be continuous at hangers.
    2. Piping shall be supported in such a manner that the insulation is not compromised by the hanger or the effects of the hanger.

3. Provide protection saddles at pipe hangers where required to prevent compression or distortion of insulation in accordance with insulation manufacturer's requirements.
4. Piping systems larger than 3 inches in diameter, high-density inserts with sufficient compressive strength to support the piping shall be used between the pipe and support.
5. Hanger spacing shall be such that the circumferential joint shall be outside the hanger.
6. In vertical applications, insulation support rings shall be used with no more than 8 feet spacing between them or as indicated on drawings. The support ring shall be wide enough to support one half of the thickness of the outermost insulation layer.

F. Fiberglass or mineral fiber insulation shall be firmly fastened in place with joints (longitudinal and circumferential) butted tightly and mechanically held in place using one 16-gauge stainless steel wire or 0.5 inches x 0.020 inches stainless steel bands and clips, placed on maximum 12-inch centers.
G. Maintain a vapor barrier by properly sealing joints, penetrations, and other openings.
H. Seal valve stems with caulking to allow free movement of the stem but still provide a seal against moisture incursion.
I. Apply equipment insulation as smooth as possible by grooving, scoring, and beveling insulation as necessary.
J. Bevel and seal the ends of insulation to equipment, flanges, and piping.
K. Flanges, couplings, and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as the surrounding pipe sections.
L. Rough cut ends, laps, joints, exposed staples shall be coated with a suitable vapor resistant mastic.
M. On hot systems where fittings are to be left exposed, insulation ends shall be beveled away from bolts for easy access.
N. Neatly finish insulation at supports, protrusions, and interruptions.
O. Do not insulate over nameplates or ASME stamps. Form a tight insulation seal around them.
P. When equipment with insulation requires periodic opening for maintenance, repair or routine inspection, install the insulation in such a way that it can be easily removed and put back in place without damage.

3.2 CLEANING

A. Clean all insulation of accumulated paint, concrete, mortar, etc.
B. Do not damage insulation during cleaning.

END OF SECTION

SECTION 15200

HOSE BIBB AND FLUSHING CONNECTION ASSEMBLIES (NON-POTABLE)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish and install hose bibb and flushing connection assemblies for non-potable water supplies (i.e., process water and/or plant water), including but not limited to piping, fittings, valves, hose bibbs, hose racks, spray nozzle and all required specialties and appurtenances.
2. Furnish and install washdown hose bibb stations as shown on the Drawings.
3. Furnish and install flushing water hose bibb stations and blind flange flushing connections (BF/FC) as shown on the Drawings.

B. The Washdown Hose Bibb Stations (HBW) shall include the following components:

1. A source of washdown water (3/4" non-potable water drop from a main supply line) with a ¼-turn ball valve with cam and groove quick connect male adaptor fitting attached (see Process Detail Drawings).
2. A flexible hose section with cam and groove quick connect couplers, a hose section shall have a male adapter on one end and a female adapter on the other end.
3. Provide a high volume wash-down nozzle attached to a female cam & groove adaptor that can be attached to the male coupler on one end of the hose.
4. A heavy duty hose rack to store the washdown hose adjacent to the water supply ball valve.

C. The Flushing Water Hose Bibb Stations (HBF) shall include the following components: A source of flushing water (1-1/2" non-potable water drop from a main supply line) with a ¼-turn ball valve with cam and groove quick connect male adaptor fitting attached (see Process Detail Drawing).

1. A flexible hose section with a cam and groove quick connect couplers, a hose section shall have a male adapter on one end and a female adapter on the other end. The hose section will be used to carry pressurized flushing water to a pipe line in need of flushing or function as a drain hose to carry pipe line waste contents from a pipe line to a floor drain.
2. A Flushing or Drain Connection (BF/FC) shall be provided on the sludge/drain or other process piping (or manufacturer's supplied equipment piping) where indicated on the drawings or specified. This shall consist of a cam and groove quick connect/disconnect female adaptor fitting connected to a ¼-turn ball valve that is tapped into a blind companion flange on a piping tee, wye, or to the pipe line itself using a tapping saddle or an end of pipe connection via a pipe nipple. Provide an end plug/cap with 304 stainless steel retainer cable to terminate the end connection when not in use.
3. A heavy duty hose rack to store the flushing hose adjacent to the flushing water ball valve.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Requirements Specified Elsewhere: Additional requirements are specified elsewhere including, but not limited to General Conditions, Supplementary Conditions, and Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Valves
   1. Process Systems Ball Valves per Section 15107
   2. Globe Valves per Section 15102.

B. Hose for washdown and flushing hose bibb stations:
   1. Flexible synthetic rubber multi-layered reinforced with spiral-plied layers of synthetic fabric with smooth internal tube surface and exterior cover for abrasion resistance.
   2. Hose outside cover layer to be EPDM synthetic rubber.
   3. Exterior cover color to be selected by Owner. Color options shall be red, yellow, black, green or blue.
   4. Interior tube shall be black EPDM.
   5. Working pressure not less than 200 psi.
   6. Working Temperature range -40 to 190°F.
   7. Size and length: 50 foot lengths for washdown hose bibb stations; and 50 foot lengths for flushing water hose bibb stations.
   8. Equal to Goodyear "Horizon"
   9. End couplings to be cam and groove quick connectors as noted under hose assembly descriptions below.

C. Nozzles:
   1. A multi-turn stream/fog nozzle of aluminum, fiberglass, and stainless steel construction with a rubber grip. Equal to Bon Aire “Ultimate” with 5/8” female threaded connection. Provide 5/8” by ¾” brass bushing to match threads of cam and groove female adaptor.

D. Cam and groove quick connect/disconnect adaptors and couplings:
   1. Twin-Kam Kamlock™ couplers by OPW Engineered Systems, or equal, consisting of female cam “Couplers” and male grooved “Adaptors”.
   2. Materials of construction:
      a. Aluminum Body A356 casting.
      b. Cam actuator arms: Arms shall be Guaranteed For Life (GFL™) with unique cam detent positions to prevent accidental opening.
      c. Stainless steel spring finger rings with design to prevent rings from getting trapped under the arms.
      d. Manufactured to dimensional specifications of ML-C-27487 for interchangeability to other manufactured quick disconnect cam and groove coupler systems.
      e. Gaskets: Buna-N
   3. Cam and groove couplers and adaptors shall be OPW Kamlok Model 633 or equal.

E. Hose Racks:
   1. Heavy Duty Hose Racks for washdown flushing assemblies:
      a. Provide hose rack for washdown and flushing hoses at all wall mounted hose bibb locations shown on the Drawings. Exact mounting location of hose racks shall be coordinated with Owner and Engineer as directed.
      b. Hose racks shall be fabricated aluminum (6061-T6) as detailed on the Process Detail Drawings.
      c. Alternatively, the hose racks can be stainless steel welded construction similar in shape and design as the detailed aluminum racks on the Drawings, and shall be equivalent to Leonard Model Extra Heavy Duty Hose Rack, HDHR fabricated from 304 stainless steel welded construction with 0.125" thick wall and front hose retention bracket, and 0.250" thick curved rack all polished to a #4 finish.

F. Water Hammer Arrestors: Provide Plumbing and Drainage Institute (PDI) rated water hammer arrestors, with stainless steel shell, gas charged expansion chamber, stainless steel or elastomer bellows. PDI size as required to minimize water hammer effects at each PRW and PW Washdown and Flushing Hose Bibb Drop. Equal to Zurn Z-1700 Series. Pipe Nipple:
   1. 1-1/2" stainless steel, SCH 40, ASTM A-312

H. Companion Flange:
   1. Flange to be of same material as pipe material per Section 15050.
   2. Flange to have 1-1/2" NPT tapped hole in the center of flange. If the flushing connection is at piping low point and will also function as a drain, the tapped hole to be located at the edge of the flange.

2.2 SPARE PARTS

A. (2) nozzles
B. (2) 50 foot sections of hose for Washdown Stations (HBW) with quick connect fittings.
C. (2) 50 foot sections of hose for Flushing Stations (HBF) with quick connect fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all piping systems in a neat workmanlike manner.
B. Lines and grades:
   1. Unless otherwise shown on the Drawings, install all piping parallel to the building walls wherever possible.
   2. Install all piping to accurate lines and grades.
C. Supports: Provide pipe hangers and supports as specified in Section 15094.
D. Expansion: Provide suitable provisions for expansion of pipelines wherever necessary.
E. Do not provide nor install close nipples.
F. Do not install piping through, directly over, or in front of electrical switchgears, power panels and control panels.
G. Caulk the spaces between the pipe and walls, ceilings, and floors gas-tight where

shown on the Drawings.

H. Fittings for dismantling piping: provide a sufficient number of unions to allow the dismantling of all piping.

3.2 TESTING

A. When the installation is complete, test all pipelines in the presence of the Engineer. Provide all necessary equipment and utilities.

B. Test piping prior to application of paint and insulation.

C. Repairs:

1. Should leaks be found, repair as required even to the extent of disassembling and remaking the joints, or replacing sections of pipe.
2. Caulking of threads or the use of chemical compounds to correct leaks will not be permitted.
3. Replace defective pipe and fittings and repeat tests until the testing results are approved by the Engineer.

3.3 PAINTING AND IDENTIFICATION

A. All piping, valves and equipment shall be painted and labeled in accordance with Specification Section 09900.

END OF SECTION

SECTION 15600

HVAC - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Perform the following items of work required to complete the work of this Section, as shown on the drawings and specified herein:

1. All labor, materials, equipment, and transportation shall be provided as required to completely furnish, install, and test the Heating, Ventilating, and Air Conditioning systems, with all connections as shown on the drawings and described in these specifications or as required by the Mechanical Code of the Project State. The accompanying drawings do not show every detail of ductwork, dampers, pipe, valves, fittings, hangers, equipment, and fixtures which are necessary for the complete installation but are provided to show the general arrangement and extent of work to be performed. Provide all work as indicated on the drawings together with all items necessary for or incidental to the completion of the work.

B. Work included: The Heating, Ventilating, and Air Conditioning work shall include, but not be limited to the following, refer to requirements specified in Division 15:

1. Heating system piping, valves, supports, and specialties.
2. Heat generation and transfer equipment.
3. Ductwork and devices.
4. Air moving and air handling equipment.
5. Automatic temperature control systems.
6. Pipe and equipment insulation.
7. Balancing air systems.
8. Connections to equipment installed by other trades.
9. Installation of components and devices furnished by other trades that are located in Heating and Ventilating piping, ducts, or equipment.

C. Drawings and Measurements:

1. The Drawings show the general arrangement, direction, and sizes of pipes, ductwork, and equipment. They are not intended to show every offset, valve, and fitting, and every structural difficulty that may be encountered.
2. Coordinate HVAC system installation with the work of other trades.
3. Verify measurements at the job site.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

B. Seismic Control: When applicable, refer to Section 13081 for general project and equipment specific seismic requirements.

C. Electrical Work:

1. The HVAC work shall include the installation of all motors, temperature controls, limit switches, etc., as herein specified. All 480-volt, 208-volt, and

120-volt wiring and connections, and all motor starters, not specified in this Section, will be provided under Division 16 - Electrical.

2. All 24-volt wiring and auxiliary devices required for the specified systems, equipment and operations indicated in this Section shall be provided under this Section, unless specifically indicated on the Drawings related to Division 16 - Electrical. This shall include, but is not necessarily limited to, all wiring for automatic temperature and damper modulation control.
3. The materials and methods for all electrical work provided under this Section shall comply with the requirements specified under Division 16 - Electrical. Coordinate equipment ratings, starter sizes, protective device sizes, wire and conduit sizes, holding coil voltages and control voltages with Division 16.

1.3 QUALITY ASSURANCE

A. Materials and Workmanship: All materials and workmanship shall be suitable for the respective work and the type of service encountered. The contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Division.
B. Equipment: All equipment shall be constructed to operate safely without undue wear.
C. Local Codes: Install all systems in accordance with applicable state and local codes; in the event of conflict between or among specified requirements and pertinent regulations and/or codes, the more stringent requirement will apply.
D. Permits: Arrange for all permits, inspections, and tests required by codes at no additional cost to the Owner.
E. Standards: When standards are referred to, the latest issue shall apply.

1.4 JOB CONDITIONS

A. Scheduling Work: Install and test all materials to be cast into or buried under concrete floor slabs prior to the placement of concrete.

1.5 SUBMITTALS

A. Provide shop drawings in accordance with the requirements of the General Conditions, Section 01340, and as specified herein. Shop drawings shall contain the following information at a minimum:
    1. Completed Submittal Certification Form. Shop drawing submittals will be returned unreviewed without this form.
    2. Manufacturer's literature and illustrations for all equipment and materials to be installed indicating all capacities, performance requirements, electrical characteristics, options, and accessories as shown on the drawings and as specified in each Section.
    3. Guarantees/Warranties as specified in each Section.
B. Operations and Maintenance Manual: Provide Operations and Maintenance Manual for all mechanical equipment as specified in the General Conditions. Refer to Operation and Maintenance section of specification 01340 for all other requirements for submissions to engineer. Operations and Maintenance Manual shall contain the following information at a minimum:

1. Manufacturer's operation & maintenance manuals with all non-applicable content removed or crossed out.
2. Table of Contents
3. Contractor and Manufacturer Contact Information.
4. Operator service requirements including Preventative Maintenance Schedule and Summary.
5. Troubleshooting Information.
6. Warranty Information.
7. Shop Drawings corrected to As-Built Conditions.
8. Wiring and Control Diagrams.
9. Parts and Service Contact Information.
10. List of All Component Part Numbers.
11. Spare Parts and Supply Lists.
12. Completed Operations and Maintenance Manual Certification Form at the start of each section for all equipment provided.
13. Complete the following table for all equipment installed and include the following Table of Contents for all installed equipment or at the beginning of each section for the equipment in that section:

Equipment Name	Unit Tag	Serial Number	Model Number	Building / Location	Date Installed

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01600.
B. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of equipment and materials.
C. Store materials on the project site in enclosures or under protective coverings.
D. Assure that all materials are kept clean and dry.
E. Do not store materials directly on the ground.
F. The Contractor shall be responsible for the care and protection of all materials and mechanical work until the project is accepted by the Owner.
G. Immediately remove from the construction site all materials damaged and/or destroyed and replace with new materials to the complete satisfaction of the Engineer without additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide and install only new materials and equipment and of the latest design of the respective manufacturers.
B. All materials and equipment of the same classification shall be the product of the same manufacturer unless otherwise specified.
C. Provide all electrical specialties and accessories as specified with the equipment in accordance with the requirements of Division l6. All specialties and accessories shall meet the NEMA Electrical Classification of the space in which they are installed.

See Drawing Sheet E-1 for the NEMA Schedule.

D. Furnish to the proper trades, all manufacturers' wiring diagrams for installation of mechanical equipment.

E. Provide tee fittings, elbows, reducers, sheet metal safing, and other required components to install equipment and control devices furnished by other trades.

F. Furnish and install all necessary supports and bases for all items furnished under HVAC as required for the specific item/equipment to provide alignment to adjacent inlet and outlet interconnecting piping and/or ductwork. In the absence of specific details within the Contract Documents for the supports and bases, submit proposal outlining supports/bases for the specific item/equipment being provided including materials of construction, size, components and other necessary details for review and acceptance by the Engineer. Materials of construction shall be suitable for the intended operating environment. Standard 4-inch concrete housekeeping pads are not included within this specification and are furnished by others.

2.2 BOLTS, ANCHOR BOLTS, NUTS, UNISTRUT, HANGERS, AND SUPPORTS

A. Furnish all necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.

B. All bolts, anchor bolts, nuts, washers, lock washers, plates, bolt sleeves, duct and pipe hangers and supports shall be constructed of the following materials:

1. Galvanized steel in accordance with Division 5 unless otherwise indicated below or specified elsewhere.
2. Stainless steel hardware (minimum of Type 304, unless otherwise indicated) is required in all corrosive atmospheres, exterior areas, and/or areas with NEMA 4X or NEMA 7 rating.
3. Stainless steel hardware (minimum of Type 316, unless otherwise indicated) is required in all heavy moisture or submerged applications as well as in wet wells, headworks, dewatering rooms, chemical rooms; and enclosed clarifiers, aeration basins, or storage tanks, etc. For additional description and definition of submerged surfaces refer to Specification Section 09900.

2.3 EQUIPMENT AND VALVE TAGS

A. Identify all new HVAC equipment shall be identified with a color-coded equipment/valve tag. Submit a complete list of proposed Identification Tag information for review by the Engineer and Owner. Tag information shall match the information provided on the Drawings.

B. Tags shall conform to the following specifications:

1. 2.5-inch diameter, 1/16" thick, rigid, multi-layered sandwich laminate with contrasting inner and outer colored acrylic plastic layers. 5/32" top hole for hanging tags.
2. Tags shall be black or red unless otherwise specified.
3. Tags shall have up to three lines engraved on the outward facing side, with eight characters per line of identification information.
4. Valve tags shall be secured to valves with adjustable stainless steel bead chain.
5. Tags secured to equipment shall be fastened to a flat visible surface by a minimum of two stainless steel screws or stainless-steel pop rivets.

6. Tags shall be rated to withstand temperatures from -40°F to 175°F
7. Manufacturers:
    a. Seton Name Plate Corporation
    b. Brimar Industries
    c. Supreme Instrument & Electrical Services
    d. Equivalent Manufacturer

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all work in a neat workmanlike manner.
B. Make all installations structurally sound throughout.
C. All equipment and appurtenant components shall be installed in strict accordance with the manufacturer's written instructions, recommendations and as shown on the drawings.
D. Supports: Support ductwork and piping in accordance with the mechanical code. Hanger and support materials shall be as indicated in paragraph 2.2.B of this section.
E. Expansion: Provide provision for expansion of pipelines.
F. Do not install piping through, directly over, or in front of electrical switchgear and power panels.
G. Caulk the spaces between the duct or pipe and walls, ceilings, and floors gas-tight where shown on the Drawings.
H. Coordinate locations of piping, sleeves, inserts, hangers, equipment, and access provisions with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities.
I. Follow manufacturer's published recommendations for installation methods not otherwise specified.
J. Coordinate locations of structural systems necessary for duct, pipe, and equipment support to permit proper installation.
K. Coordinate locations of duct and pipe sleeves, trenches and chases with duct, piping, and equipment locations.
L. Core holes through concrete and masonry using rotary core drill. Locate holes to avoid interference with structural members such as beams or grade beams. Lay out holes in advance and perform drilling only after approval by the Engineer. Obtain approval in advance by the Engineer for drilling holes through structural members.
M. Gauges and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms.
N. Locate all installations to avoid interference with cranes and materials handling equipment, storage areas, work of other trades, and traffic areas.
O. Perform all work incidental to the installation of the apparatus and materials including, but not limited to, cutting, patching, trenching, excavating, backfilling, trench covering, plastering and the constructing of chases, slots, furring, foundations, piers, and pads, when applicable. All work shall be performed in accordance with the applicable Divisions of this Specification by qualified workers regularly employed in the applicable trades.

3.2 TESTING

A. When the installation is complete, test pipelines in the presence of the Engineer and the Plumbing or Building Inspector in accordance with the requirements of the local and state mechanical codes. Provide necessary testing equipment and utilities.
B. Test underground piping prior to backfilling.
C. Test piping prior to application of paint and insulation.
D. Separately test portions of piping which will be concealed before completion.
E. Procedure:
   1. Refrigerant Piping: Test in accordance with the mechanical code.
   2. Isolate equipment that cannot withstand test pressures prior to any testing.
   3. Do not test plastic piping with compressed air or other gases.
F. Repairs:
   1. Should leaks be found, repair as required even to the extent of disassembling and remaking the joints or replacing sections of pipe.
   2. Do not repair leaks through the application of external caulking at joint surfaces or the use of chemical compounds.
   3. Replace defective pipe and fittings and repeat tests until the testing results are approved by the Engineer.

3.3 CLEANING

A. Do not allow refuse and surplus materials to accumulate and obstruct the construction site.
B. Upon completion of the installation, remove refuse and surplus materials from the construction site and leave the building neat and clean.

3.4 PAINTING AND IDENTIFICATION

A. All HVAC piping shall be identified by this Contractor through the use of vinyl pressure sensitive markers. Markers shall indicate system, using abbreviations supplied by Engineer. Each system shall use a different color marker.
B. Flow arrows shall indicate direction of fluid flow.
C. Labels and arrows shall be provided at twenty-foot intervals and in or above each room.
D. Paint HVAC piping, and equipment in accordance with Specification Section 09900.
E. Apply signage and identification in accordance with specification section 10140.

3.5 OPERATOR TRAINING

A. Operator Training shall be performed by a duly authorized representative of the HVAC contractor, who is fully trained in the installation, startup, and operation of the installed equipment.
B. Provide combined training and operational assistance for plant operators in the proper operations of the mechanical system equipment, and in the techniques, methods, schedules, etc. associated with maintenance.
C. The level of the training and operational assistance provided shall be as required to ensure proper understanding of the equipment's operations, maintenance, and warranty conditions. Should the representative require time in addition to the minimums indicated herein to sufficiently detail the proper operations and maintenance of the equipment, it will be provided at no additional cost to Owner.

Under absolutely no circumstances shall warrantees become void due to Owner's failure to follow operational and maintenance procedures which were not fully detailed and described in Owner's representatives during these sessions.

D. At the Owner's discretion, the training sessions may be video recorded for Owner's future use.

E. The contractor’s representative shall fill out the Operator Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

3.6 BALANCING

A. Balancing of air and water system flows shall be in accordance with Section 15907.

OPERATOR TRAINING CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment: _____

_____

Specification Numbers: _____

_____

I, the undersigned System Provider's Authorized Representative, have trained the Owner's personnel listed below in the proper operation and maintenance of the above listed equipment.

_____

_____

_____

_____

_____

_____

(System Provider's Authorized Representative/ Signature & Printed Name) (Date)

_____

(Owner's Representative/ Signature & Printed Name) (Date)

_____

(Witnessed by Engineer/ Signature & Printed Name) (Date)

END OF SECTION

SECTION 15604

AUTOMATIC TEMPERATURE CONTROL (ELECTRONIC)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish, install, and test a fully functional electronic automatic temperature control (ATC) system of the type and function as required on the drawings and herein specified.
   1. All 24-volt (low voltage) wiring systems included for automatic temperature controls systems as part of this specification shall be installed by the Automatic Temperature Controls contractor.

B. Coordination with Other Trades: The automatic temperature control trades shall coordinate and supervise other trades whose work affects the control systems, including but not limited to:
   1. Coordinate installation and wiring of air monitoring equipment furnished and installed under Division 13.
   2. Coordinate interconnections with SCADA system furnished and installed by Division 13 as shown on the drawings and described herein.

C. Work Performed by Other Trades: The following incidental work shall be furnished by the designated trade under the supervision of the automatic temperature control (ATC) trade:
   1. The heating/cooling trades shall:
      a. Install automatic valves and separable wells that are specified to be supplied as a portion of the control systems.
      b. Furnish and install all necessary: valved pressure taps, water, drain and overflow connections and piping.
   2. The sheet metal trades shall:
      a. Furnish and install all automatic dampers.
      b. Provide necessary blank-off plates required to install dampers that are smaller than duct size.
      c. Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
      d. Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation and affix and seal permanently in place only after stratification problem has been eliminated.
      e. Provide access doors or other approved means of access through ducts for service to control equipment.
   3. The electrical trades shall:
      a. Install line-voltage electrical wiring systems (120 volt single phase, 240 volt single phase, 208 volt 3-phase or 460 volt 3-phase) in accordance with Division 16 requirements.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16075 – Conduit, Cable and Wiring Identification and Tagging
   2. Section 16160 – Cabinets and Enclosures
   3. Section 16900 – Controls

1.3 QUALITY ASSURANCE

A. The system shall be installed, tested, and balanced by competent technicians regularly employed by the temperature control manufacturer.

1.4 SUBMITTALS

A. Provide shop drawings in accordance with the requirements of the General Conditions, Section 01340, and as specified herein. Shop drawings shall contain the following information at a minimum:
   1. Manufacturer's literature for all equipment including maintenance and operating instructions and parts lists.
   2. Description of operation for all systems.
   3. Electric wiring diagrams showing all wiring, and equipment including all inter-connections on a terminal to terminal basis. Refer to ladder wiring diagrams shown on the Drawings. Note any discrepancies due to actual system submitted.
   4. Panel layout drawings for all local and central panels (to scale).
   5. Valve and damper operator schedule showing size, configuration, capacity and location of all equipment.

B. Operations and Maintenance Manual: Provide Operations and Maintenance Manual for all mechanical equipment as specified in the General Conditions. Refer to Operation and Maintenance section of specification 01340 for all other requirements for submissions to engineer. Operations and Maintenance Manual shall contain the following information at a minimum:
   1. Manufacturer's operation & maintenance manuals with all non-applicable content removed or crossed out.
   2. Table of Contents
   3. Contractor and Manufacturer Contact Information.
   4. Operator service requirements including Preventative Maintenance Schedule and Summary.
   5. Troubleshooting Information.
   6. Warranty Information.
   7. Shop Drawings corrected to As-Built Conditions.
   8. Wiring and Control Diagrams.
   9. Parts and Service Contact Information.
   10. List of All Component Part Numbers.
   11. Spare Parts and Supply Lists.
   12. Completed Operations and Maintenance Manual Certification Form.

1.5 GUARANTEE

A. The control system designated on drawings and plans and herein specified, shall be guaranteed to be free from original defects in both material and workmanship for a

period of one (1) year of normal use and service, excepting damages from other causes. This guarantee shall become effective starting the date the Owner begins to receive beneficial use of the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Honeywell
   2. Johnson Controls
   3. Schneider Electric
   4. Reliable Controls
   5. Automated Logic
   6. Siemens
   7. Or equivalent manufacturer.

2.2 MATERIALS

A. General: The control system shall consist of enclosures containing the necessary standalone programmable controllers; all required, terminal strips, interposing relays, selector switches, and other ancillary components; as well as all sensors, thermostats, temperature transmitters, controllers, automatic valves and dampers, damper operators, control panels, and other accessory equipment to meet the intent of the specification and provide for a complete and operable system. Refer to Drawings for electrical wiring and interlocks.

B. All panels and devices shall meet the NEMA electrical classification of the space in which they are installed. Refer to drawing Sheet E-1 for NEMA classification schedule.

C. Standalone Controller:
   1. Protocols
      a. BACnet
      b. Supports one B/IP subnetwork and B/VPN.
      c. Ethernet or MS/TP.
      d. DHCP: Dynamic Host Configuration Protocol.
      e. SMTP: Simple Mail Transfer Protocol:
      f. Provides standard email communications for broadcasting email alarms.
      g. Supports TLS/SSL security.
      h. SNTP: Simple Network Time Protocol.
      i. Wi-Fi on controllers with the -W option:
      j. Supports WPA-Personal and WPA2-Personal security.
   2. Touchscreen Display
      a. Display full-color graphics, runtime logs, trend logs, alarms, and schedules.
      b. Full-color screen, 4.3" wide-quarter VGA, thin film transistor, projective capacitive touch; Display area 2 1/4" x 3 3/4".
   3. Universal Inputs
      a. 12-bit A/D converter.
      b. Analog: 0–10 VDC 4–20 mA, thermistor.

c. Binary: Dry contact.
d. Impedance: MΩ for 0–10 VDC range, 250 Ω for 4–20 mA range, 20 kΩ pull-up for thermistor/dry contact range.
e. Pulse counting up to 150 Hz. Supports flow meters.
f. 24 VAC overvoltage protection.

4. Universal Outputs
   a. 12-bit D/A converter.
   b. Analog: 0–12 VDC.
   c. Binary: Software-configurable between 0–12 VDC.
   d. Maximum 75 mA each.
   e. 24 VAC overvoltage and short protection.
5. Spare I/O
   a. Controller shall be provided with spare inputs and outputs for connection of additional equipment and devices. Number of spare input and outputs will correspond to 20% of the total used, with a minimum of two inputs and two outputs.
6. Equivalent to:
   a. Reliable Controls MACH-Pro
   b. Automated Logic WebCTRL
   c. Siemens Desigo
   d. Or equal

D. Electric Line-Voltage Industrial Thermostat:
1. Industrial/heavy commercial grade, Line-Voltage type thermostats in NEMA 12, 3R, 4/4X process and production areas capable of directly activating heating or cooling equipment.
2. Thermostat shall be wall mounted in a heavy-duty metal enclosure. The enclosure shall meet the NEMA requirements of the area in which they are installed. Minimum rating shall be dust tight, NEMA 12.
3. Switching shall be SPST with a minimum rating of 16 Full Load Amps (FLA) and 80 Locked Rotor Amps (LRA) at 120 VAC or the full load rating of the device(s) to be activated, whichever is greater.
4. Differential shall be fixed 3-5 deg. F.
5. Bulbs shall be corrosion resistant, shielded and either locally or remote mounted as required.
6. Covers shall have temperature set point adjustment knob except when concealed or removable key adjustment is noted. Scale range shall be 40 to 100 °F unless described otherwise in the control description under paragraph 3.1.
7. In areas of a building that comply with the Americans with disabilities act, thermostats shall be mounted at a height of 48" above a finished floor.

E. Industrial Temperature Controller:
1. Industrial/heavy commercial grade, Temperature Controllers in NEMA 12, 3R, 4/4X process and production areas capable of controlling heating and cooling equipment through motor starters, variable speed drives, industrial relays or other equipment control devices.

2. The temperature controller shall be programmable for staged on-off heating and cooling control with front mounted program pushbuttons with LCD backlit display to show current temperature, setpoint and programming modes.
3. Temperature controller shall be wall mounted in a metal enclosure. The enclosure shall meet the NEMA requirements of the area in which they are installed. Minimum rating shall be dust tight, NEMA 12.
4. Power shall be 120 VAC with battery backup or programmed parameter stored in non-volatile memory.
5. The controller will include a minimum of four (4) form C contacts rated a minimum of 5 amps at 120 VAC.
6. Differential shall be programmable from 1-5 °F.
7. Temperature sensor shall be a shielded and water tight platinum RTD temperature sensor mounted external to the control enclosure or remotely mounted as required.
8. In areas of a building that comply with the Americans with disabilities act, thermostats shall be mounted at a height of 48" above a finished floor.
9. Honeywell Model T775 or equivalent product.

F. Thermometers:
1. A thermometer shall be located adjacent to each rigid stem thermostat. A dual thermometer with liquid-filled remote system shall be mounted adjacent to each remote bulb thermostat. Averaging bulb thermometers shall be used where averaging bulb thermostats are required.
2. Provide duct-type thermometers in all fresh air intake, mixed air, return air, and all supply fan discharges and elsewhere where noted or shown. Thermometers shall have the proper range scales for the locations where installed.
3. Panel-mounted indicating thermometers shall be minimum two inches' diameter.

G. Control Valves: Three-way, two-way, mixing, or diverting service as required. Operator shall be electric. Valve pressure drop shall not exceed 7 feet water column (w.c.). Control valves shall be sized by the ATC contractor.

H. Dampers:
1. All control dampers shall be furnished as part of Section 15862.
2. All dampers shall be installed by sheet metal trades.
3. All dampers installed for outside air applications shall be low leakage design and construction. Refer to Section 15862 for minimum construction details.

I. Damper Operators and Linkages:
1. Damper operators shall be electric open-close or fully proportioning as indicated or required.
2. Linkages shall be suitable to connect operator to damper leaves and transmit full torque of motor. All necessary hardware shall be included with the linkages.
3. Damper motors shall be quiet in operation and shall have ample power to overcome friction of damper linkage and air pressure acting on louvers to position dampers accurately and smoothly. The damper operator mounting arrangement shall be outside the airstream wherever possible.
4. The operators shall be capable of operating at varying rates of speed to correspond to the dictates of the controllers and variable load requirements. The

operators shall be capable of operating in sequence when required by the sequence of the operation. The operators shall have external adjustable stops to limit the stroke in either direction. The operator linkage arrangement shall be such as to permit normally open or normally closed positions of the dampers as required.

5. Electric Operators:
   a. On-off, reversing, or proportional as required.
   b. Spring return to closed or open position as required.
6. Dampers associated with emergency generator cooling shall fail open on loss of electrical power.

J. Miscellaneous Devices:
1. Provide all the necessary relays, positioners, clocks, transformers, etc. to make a complete and operable system.
2. Locate these devices on local panel unless specified otherwise.

K. Miscellaneous Hand Switches and Indicator Lights:
1. Size: 30 mm
2. All indicator lights shall be 120V AC, LED with push to test option.
3. Reference Section 16900 for additional specifications.
4. Number of positions and nameplate legends shall be as indicated in Paragraph 3.1 of this specification.
5. Selector switches shall be configured in the order listed; for example, a three position Hand-Off-Auto switch shall be configured such that the left position is “Hand”, center position is “Off”, and right position is “Auto”.

L. Relays:
1. Pilot duty relays shall be Form C, UL listed, two (2) to four (4) pole relay with DIN rail mounted base rated a minimum of 5 amps at 120 VAC. Relay shall have indicator and mechanical test pushbutton.
2. Industrial relays or contactors shall be used to directly drive 120 VAC single phase equipment.
3. Refer to Section 16900 for additional requirements.

M. Panels:
1. Panels shall be provided to enclose all relays, switches, and controllers as required.
2. Panels shall be front access with gasketed, hinged covers with keyed tee handles.
3. Required indicating and control devices shall be installed in the cover.
4. Terminal strips shall be provided for all electrical connections.
5. Enclosure shall be furnished with a corrosion resistant finish.
6. Panels shall be central and/or local as indicated or required.
7. Control Panels shall be provided in accordance with Section 16160.
8. All Control and Industrial Panels shall be constructed in accordance with UL 508A standard. Refer to Section 16160-2.
9. Control panel shall be provided with spare mountings for additional relays. Number of spare mountings will correspond to 5% of the total number of relays within each panel, with a minimum of one spare mounting.

10. All wiring entering and leaving control panels shall be terminated on field terminal blocks and labeled.

N. Gauges:
   1. Thermometers and pressure indicating gauges shall be provided as shown on the Drawings and other points throughout the system where the visual indication of temperature or pressure is required or will prove beneficial to operating personnel in the operation of the control system. Gauges will not be required on room type thermostats.

O. Duct-mounted Airflow Switch:
   1. SPDT paddle-type or thermal dispersion proof- of- airflow switch, for mounting in ductwork of ventilation equipment serving Class 1/Division 2 rated areas and Unclassified rated areas in accordance with NFPA 820.
      a. Paddle type: Stainless steel paddle, range adjustment screw, 120 Volt, 16 FLS AC rated. Unit shall have NEMA 4X or NEMA 7 enclosure in areas requiring same. Furnish switch, for mounting in ductwork by mechanical contractor; provide wiring to ATC panel. Dwyer V4, or equivalent product by Johnson Controls, Omega, or equal.
      b. Thermal dispersion: 316 Stainless steel sensor head, NEMA 4X and Class 1 Division 1&2 rated powder coated housing, 120VAC, 4W. Ameritrol FX, or equivalent product by Johnson Controls, Magnetrol, or equal.

PART 3 - EXECUTION

3.1 DESCRIPTION OF OPERATION

A. General
   1. Ductless Split System Air Handling Units (DS-52-1,2,3,45,6 & Corresponding HP units):
      a. System controls shall be packaged controls provided by the manufacturer.
         i. Cooling setpoint - 85°F (adj.)
         ii. Heating setpoint - 60°F (adj.)

B. North Ras Pump Station (52)
   1. Supply and Exhaust Fans (SF-52-1 & EF-52-1)
      a. Controlled by the following associated with panel ATC-52-1
         i. Hand/Off/Auto switch
         ii. Outdoor Air Temperature Sensor
         iii. Proof of Flow Switch
         iv. Light Status Relays (provided by Division 16). Provide wiring to dry contacts; coordinate locations with electrical contractor and electrical plans; refer to ATC riser diagrams for additional information.
      b. If the lights in the space served are energized, then the space shall be considered occupied; if the lights are de-energized, the space shall be considered unoccupied.
      c. IF the outside air temperature is greater than 50°F OR the space is occupied OR the switch is in the “Hand” position;
         i. Fans SF-52-1 and EF-52-1 shall be energized.
         ii. Corresponding ECM motors shall modulate the fan speed to operate

at the design airflow

d. IF the outside Air temperature is less than 50°F AND the space is unoccupied AND the switch is in the “Auto” position;
   i. Fans SF-52-1 and EF-52-1 shall be energized.
   ii. Corresponding ECM motors shall modulate fan speeds to operate at 50% of design airflow.
e. IF the switch is in the “Off” position (for maintenance only)’
   i. Fans SF-52-1 and EF-52-1 shall be de-energized.
f. Duct-Mounted Flow Switch: If the proof-of-flow switch indicates a lack of air flow, an alarm and detailed notification shall be sent to the SCADA system alerting the operator to the condition. Flow switch activation and alarm signal generation is covered under Division 13. Proof of flow relay shall be SPDT and be configured as normally open, held closed.

3.2 INSTALLATION

A. Control wiring shall be neatly installed, parallel to building lines, and in locations not subject to damage. All wiring and conduit to be installed in accordance with the requirements of Division 16.

3.3 IDENTIFICATION

A. Provide all control equipment, panels and manual controls with black lamacoid nameplates engraved with white letters indicating the function, tag number, service or apparatus being served.
B. Properly number all wires and terminals where applicable.

3.4 TESTING AND COMPLETION

A. Initial equipment testing shall be performed in coordination with the work of other trades to confirm system functionality.
B. Coordinate with Testing and Balancing Contractor to adjust settings as necessary for speed-controlled equipment.
C. Start-up and operational testing shall be performed in the presence and to the satisfaction of the Engineer's designated representative to demonstrate the function of each system.
D. Upon completion of the project, the automatic temperature control system provider shall completely adjust, ready for use, all thermostats, controllers, valves, damper operators, relays, etc., provided under this Section.

3.5 OPERATOR TRAINING

A. Operator Training shall be performed by a duly authorized representative of the ATC system provider, who is fully trained in the installation, startup and operation of the equipment.
B. Provide combined training and operational assistance for plant operators in the proper operations of the ATC system equipment, and in the techniques, methods, schedules, etc. associated with maintenance.
C. The level of the training and operational assistance provided shall be as required to ensure proper understanding of the equipment's operations, maintenance and warranty conditions. Should the representative require time in addition to the minimums

indicated herein to sufficiently detail the proper operations and maintenance of the equipment, it will be provided at no additional cost to Owner. Under absolutely no circumstances shall warrantees become void due to Owner's failure to follow operational and maintenance procedures which were not fully detailed and described in Owner's representatives during these sessions.

D. At the Owner's discretion, the training sessions may be video recorded for Owner's future use.

E. The system provider representative shall fill out the Equipment Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

3.6 PROGRAMMED MAINTENANCE

A. Upon completion of the installation, the automatic temperature control contractor shall submit to the Owner for consideration an agreement, to provide the necessary programmed maintenance to keep the various control systems in proper working condition.

B. This proposed programmed maintenance agreement shall fully describe the maintenance work to be performed and shall advise the cost of this work during the 1-year guarantee period provided as part of this Contract by the ATC Contractor as well as for subsequent years thereafter.

3.7 ADJUSTMENTS

A. The automatic temperature control contractor shall make three (3) follow-up visits during the guarantee period to make adjustments to the system for seasonal variations.

ATC SYSTEM TRAINING CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

ATC System Provider
Representative: _____

Equipment: _____

I, the undersigned System Provider's Authorized Representative, have trained the Owner's personnel listed below in the proper operation and maintenance of the above listed equipment.

_____

_____

_____

_____

_____

_____ _____
(System Provider's Authorized Representative/ Signature & Printed Name) (Date)

_____ _____
(Owner's Representative/ Signature & Printed Name) (Date)

_____ _____
(Witnessed by Engineer/ Signature & Printed Name) (Date)

END OF SECTION

SECTION 15671

DUCTLESS SPLIT SYSTEM HEAT PUMP UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, and test ductless split system heat pump systems of the size and capacities as shown on the drawings. Each unit shall include an outdoor condensing unit, direct expansion fan coil unit, refrigeration specialties, refrigerant charge, and remote controller. Refer to additional requirements in specification Section 15600.

B. Other Trades: Cooperate with other trades whose work is to be coordinated with ductless split system heat pump units.

1.2 QUALITY ASSURANCE

A. Each system shall be rated and certified in accordance with ARI Standards 210/240 and 270. Components shall be listed in the ARI directory as matched sets (systems).

B. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, the NEC and be constructed in accordance with UL standards and shall carry the UL label of approval.

1.3 SUBMITTALS

A. Submittals shall be in accordance with specification Section 01340 and 15600.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Mitsubishi
2. Daikin
3. Samsung
4. Or equal.

2.2 MATERIALS

A. Outdoor Unit

1. Unit Cabinet:
   a. Unit cabinet shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.
   b. Assembly hardware shall be cadmium plated for weather resistance
   c. Unit access panel should be removable with minimal screws and shall provide full access to the compressor, fan, and control components.
2. Fans:
   a. Outdoor fans shall be direct-drive propeller type, and shall discharge air horizontally. Fan shall draw air through the outdoor coil.

b. Outdoor fan motors shall be totally-enclosed, single phase motors with class B insulation and permanently-lubricated ball bearings. Motor shall be protected by internal thermal overload protection.
c. Shaft shall have inherent corrosion resistance.
d. Outdoor fan openings shall be equipped with PVC metal/mesh coated protection grille over fan.

3. Compressor:
   a. Compressor shall be fully hermetic variable speed rotary type.
   b. Compressor motor shall be direct current type equipped with a factory supplied and installed inverter drive package.
   c. The compressor will be equipped with internal thermal overload protection.
   d. Compressor shall be equipped with oil system, operating oil charge, and motor.
   e. Motor shall be NEMA rated class F. suitable for operation in refrigerant atmosphere.
   f. Compressor shall be mounted to avoid the transmission of vibration.
   g. Unit shall have an accumulator and high-pressure safety switch.
4. Outdoor Coil:
   a. Nonferrous construction with lanced or corrugated plate fins on copper tubing.
   b. Protected with an integral metal guard.
5. Refrigerant Components:
   a. Refrigerant circuit components shall include brass external liquid line service valve with service gauge port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader type fittings with brass caps, accumulator, reversing valve.
   b. Refrigerant flow shall be regulated by means of an electronically controlled, precision, linear expansion valve.
6. Safeties: Operating safeties shall be factory selected, assembled, and tested. The minimum functions shall include the following:
   a. Compressor discharge over temperature protection.
   b. System low voltage protection.
   c. Compressor overload protection.
   d. Compressor over current protection.
   e. IPM module protection.
7. Electrical Requirements:
   a. Unit electrical power shall be a single point connection.
   b. All power and control wiring must be installed per NEC and all local electrical codes.
   c. Units shall have high and low-voltage terminal block connections.
8. Low ambient cooling:
   a. Where the drawings call for the unit to supply low ambient cooling, provide the unit with low ambient cooling accessories including but not limited to:

i. Wind baffle on the front (discharge) of the unit
ii. Wind baffles on the sides and rear (intake) of the unit, if available
iii. All other accessories recommended by the manufacturer for this application.

B. Indoor Unit:
1. Wall Mounted Indoor Unit:
a. Unit Cabinet:
i. Discharge and inlet grilles shall be attractively styled, high-impact polystyrene.
ii. Fully insulated for improved thermal and acoustic performance.
iii. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for drain.
iv. Separate back plate to secure the unit to the wall.
b. Fans:
i. Tangential direct-drive blower type with air intake at the top of the unit and discharge at the bottom front.
ii. Statically and dynamically balanced to run on a motor with permanently lubricated bearings.
iii. Automatic, motor-driven vertical air sweep shall be provided standard. Air sweep operation shall be user selectable. The vertical sweep may be adjusted using the wired remote controller and the horizontal air direction maybe set manually.
c. Coil:
i. Copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion.
ii. Drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap.
d. Motors:
i. Open drip-proof, permanently lubricated ball bearing with inherent overload protection.
e. Filters:
i. Units shall have filter track with factory-supplied cleanable filters.
2. Ceiling-Suspended Indoor Unit:
a. Unit Cabinet:
i. Discharge and inlet grilles shall be attractively styled, high-impact polystyrene.
ii. Fully insulated for improved thermal and acoustic performance.
iii. Panel shall have provisions for a field installed filtered outside air intake.
b. Fans:
i. Assembly with up to four Sirocco fans direct driven by a single motor.
ii. Statically and dynamically balanced to run on a motor with permanently lubricated bearings.
iii. Integral, motorized, multi-position, horizontal air sweep flow louver

with five (5) positions plus Auto and Swing shall be provided, controlled from the wired remote controller.

c. Coil:
   i. Nonferrous construction with smooth plate fins on copper tubing. Tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
   ii. The coils shall be pressure tested at the factory.
   iii. Drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap.

d. Motors:
   i. Open drip-proof, permanently lubricated ball bearing with inherent overload protection.

e. Filters:
   i. Easily removable, factory supplied, washable filter.

3. Controls:
   a. Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self-diagnostics. The temperature control range shall be from 50ºF to 85ºF.
   b. The unit shall have the following functions as a minimum:
      i. Automatic restart after power failure at the same operating conditions as at failure.
      ii. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
      iii. Temperature sensing control to enter set points and operating conditions.
      iv. Wired remote controller to enter set points and operating conditions.
      v. Automatic air sweep control to provide on or off activation of air sweep louvers.
      vi. Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
      vii. Fan-only operation to provide room air circulation when no cooling is required.
      viii. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.
      ix. Fan speed controls shall be user-selectable: high, medium, low or microprocessor controlled automatic operation during all operating modes.
   c. The unit shall be protected against the following:
      i. Indoor coil freeze-up.
      ii. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.

C. Refrigerant Piping:
   1. ASTM B280, ACR Type, annealed, refrigeration grade copper tubing.
   2. Individually insulated in twin-tube, flexible, closed-cell, CFC-free, elastomeric material for the insulation of refrigerant pipes and tubes, thermal conductivity equal to or better than 0.27 BTU-inch/hour per sqft/°F, water vapor transmission equal to or better than 0.08 Perm-inch, a Flame-Spread Index of less than 25 and a Smoke-Development Index of less than 50 as tested by ASTM E 84.
   3. Connections shall be flare type.
   4. Refrigerant line sizing shall be in accordance with manufacturer specifications.
   5. Refrigerant piping shall be leak tested in accordance with the mechanical code and repairs to the piping and connections made as necessary. Leak stop agents shall not be used to correct leaks in refrigerant piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All system components shall be installed in strict accordance with the manufacturer's instructions, recommendations and as shown on the Drawings.

3.2 ADJUSTING AND CLEANING

A. Adjust operation and clean to the satisfaction of the Engineer.

3.3 STARTUP, TESTING, AND TRAINING

A. Provide startup, testing and training in accordance with the requirements of Section 15600.

END OF SECTION

SECTION 15820

VENTILATION FANS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install ventilation fans of the types and arrangement as shown on the Drawings and as specified herein. Refer to additional requirements in specification Section 15600.

1.2 QUALITY ASSURANCE

A. Standards
   1. Air Movement and Control Association
      AMCA 210-85 Laboratory Methods of Testing Fans for Rating
      AMCA 300-85 Test Code for Sound Rating
   2. National Fire Protection Association
      NFPA 70-90 National Electrical Code
      NFPA 90A Installation of Air Conditioning and Ventilating Systems

B. Each fan shall be licensed by AMCA to bear the Certified Rating Seal. When this standard is not applicable, the manufacturer shall submit data to verify the fan capacity at the specified operating condition.

1.3 SUBMITTALS

A. General: Submittals shall be in accordance with specification Section 01340.

B. Submittals shall show physical dimensions, shaft sizes, drives, drive arrangement, motor data, electrical data, and performance curves. Where there is a requirement for explosion proof motor the shop drawing will verify that the motor and associated wiring devices meet Class I, Group D, Division I requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Refer to the Drawings for the following information (when applicable):
   1. Specific type and size of fan.
   2. Electrical characteristics - voltage and phase.
   3. Direct or belt drive.
   4. Requirement for explosion proof motors including wiring devices (Class I, Group D, Division 1).
   5. Requirements of explosion proof fan construction shall comply with AMCA Standards handbook Publication 99-86, construction type "B".
   6. Special corrosion resistant coatings.
   7. Additional accessories and specialties.

B. Motors:
   1. Totally enclosed fan cooled (TEFC) unless noted otherwise.
   2. Integral thermal overload protection on single phase fractional horsepower motors

3. Two speed motors shall be two winding style. Single winding two speed motors are not acceptable without specific approval of the Engineer.
4. Motors driven by Variable Frequency Drive units shall be rated for VFD operation.
5. ECM motors shall be DC electronic commutation type motor (ECM) specifically designed for fan applications. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.

C. Roof Curbs:
1. Acceptable Manufacturers
   a. Greenheck Fan Corp.
   b. Dayton
   c. Fantech
   d. Equivalent manufacturer.
2. Required for all roof mounted fans unless an integral part of roof structure and so shown on the Architectural Drawings.
3. 24 inches high.
4. Supplied with fan.
5. Prefabricated all welded aluminum construction structurally reinforced to support fan.
6. 1½ inch thick rigid fiberglass insulation.
7. Wood blocking when required for fan installation.

D. Inline Centrifugal Fans:
1. Acceptable Manufacturers
   a. Greenheck Fan Corp.
   b. Loren Cook, Co.
   c. Pennbarry
   d. Equivalent manufacturer.
2. Duct mounted, belt or direct driven as scheduled.
3. Fan wheels, aluminum backward inclined.
4. Housing, all aluminum construction.
5. Mounting brackets and vibration isolations required for wall mounting or hanging from ceiling as shown.
6. AMCA certified for both air and sound performance.
7. Completely wired internally with leads brought to an external junction box.
8. Belt drive fans shall have variable pitch sheaves selected with scheduled operating point midrange of the selected sheave.

E. Power Roof Ventilators:
1. Acceptable Manufacturers:
   a. Greenheck Fan Corp.
   b. Loren Cook, Co.
   c. Pennbarry
   d. Equivalent manufacturer.

2. Ventilator housings: Spun aluminum construction completely weather-proofed and securely seated on and fastened to the roof curb.
3. Fan wheels: Aluminum Centrifugal, backward inclined, non-overloading, quiet-operating, statically and dynamically balanced.
4. Gravity backdraft damper unless motor operated damper is required and shown on the Drawings.
5. Aluminum bird screen.

2.2 SPARE PARTS

A. Provide one set of manufacturer’s recommended spare parts for future use by the Owner:
   1. Air filters.
   2. Fan belts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install as required in strict accordance with the manufacturer's instructions and recommendations and as shown on the Drawings.
B. Provide flexible duct connections on inlet and outlet of fan when fans are ducted.
C. Install fans on roof or exterior wall with flashing to prevent water and weather from entering building.
D. Performance testing and balancing shall be in accordance with specification Section 15907-Testing and Balancing Heating and Ventilating Systems.

END OF SECTION

SECTION 15832

ROOF VENTILATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install roof ventilators as shown on the Drawings and as herein specified. Refer to additional requirements in specification Section 15600.

1.2 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Penn-Ventilator, Inc. "Airette"
   2. Louvers & Dampers, Inc.
   3. American Warming and Ventilating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Low Profile Rectangular:
   1. Hood and base:
      a. Formed aluminum cross broken for adequate element run-off, Hood shall be hinged. Screwed hoods are unacceptable.
      b. Properly braced to withstand wind and snow loads.
      c. Undercoated with insulating mastic.
      d. All joints shall be fastened by means of extruded aluminum splice members heliarch welded.
      e. Finish: Standard mill.
      f. Throat size shall be as indicated on the Drawings.
   2. Furnish aluminum weather and insect screen.
   3. Roof Curb:
      a. Furnish unless concrete curb is constructed integral with roof.
      b. 12-inch-high galvanized steel or aluminum construction.
      c. Inside shall have 1 inch minimum of semi-rigid insulation with aluminum liner.
      d. 2-inch x 2-inch treated wood nailer when required and 3-inch x 3-inch integral cant or self-flashing style.
      e. Sealed and welded corner support angles.
   4. Back Draft Damper:
      a. Furnish where indicated on the Drawings.
      b. 14 Ga. aluminum frame and blades.
      c. All welded construction.
      d. 1/2-inch aluminum shaft.
      e. Adjustable counterweights or springs.
      f. Polyurethane or other suitable material blade edge and end seals.
      g. Size to fit throat of ventilator curb.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install as shown on the Drawings and using manufacturer's recommendations.
B. Adjust damper counterweights for proper operation.
C. Install as job progress requires to ensure proper flashing and counter flashing.

3.2 CLEANING

A. Clean roof ventilators of grease, tar and dirt to the satisfaction of the Engineer.

END OF SECTION

SECTION 15891

DUCT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install all duct insulation as shown on the Drawings and specified herein. Refer to additional requirements in specification Section 15600.

1.2 QUALITY ASSURANCE

A. Fire Hazard Rating: When tested by ASTM E84 method flame spread rating shall not exceed 25.

B. Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold, or provide certification or validation by other third-party programs that products meet the requirements of this Section.

C. Qualified installers shall have successfully completed three or more similar type jobs within the last five years.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit samples of each insulation type.

B. Submit 2'-0" piece of sealing tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Closed cellular flexible plastic:
   a. Armacell "AP/ARMAFLEX".
   b. Rubetex.
   c. Equivalent manufacturer.
2. 2. Fiberglass:
   a. Owens-Corning.
   b. Knauf.
   c. Certainteed.
   d. Equivalent manufacturer.

2.2 MATERIALS

A. Duct insulation for wet area locations:

1. Closed cellular flexible plastic:
   a. One inch thick
   b. Thermal conductivity @ 75°F: 0.27/BTU-in/hr-ft2-ºF maximum
   c. UL flame spread: 25 or less
   d. Equal to Armacell AP/ARMAFLEX
2. Designated wet areas as follows:

a. Wet wells.
b. Grit screening/storage areas.
c. Areas subject to exposure to severe condensation.

B. Duct insulation for non-wet area locations:
1. Ductwork:
a. 1½ inch thick fiberglass duct wrap
b. Factory applied reinforced aluminum or vinyl vapor barrier facing.
c. Thermal conductivity @ 75°F: 0.26/BTU-in/hr-ft2-ºF maximum
d. Equal to Owens-Corning series ED-100 FRK-25
2. Plenums and duct sections with one side 48" or larger:
a. l½ inch thick rigid industrial fiberglass insulating board
b. Factory applied reinforced aluminum or vinyl vapor barrier facing
c. Thermal conductivity @ 75°F: 0.24/BTU-in/hr-ft2-ºF maximum
d. Density: 3 lb/cu. ft.
e. Equal to Owen-Corning series 703 FRK-25

C. Exterior Duct Insulation
1. Closed cell foam rubber insulation/jacket:
a. Self-adhering, 2” thick flexible elastomeric insulation with 12mil laminated covering
b. Thermal conductivity at @ 75°F: 0.25/inch minimum
c. U.L. flame spread: 25 or less
d. Equal to Armacell ArmaTuff SA

PART 3 - EXECUTION

3.1 APPLICATION

A. Duct Insulation:
1. Required on all outside air intakes from exterior wall or roof to duct termination including fan casing.
2. Required on all heated or cooled supply air ductwork from air handling unit to duct termination including air handler if not factory insulated.
3. Required on exhaust ductwork from outside closure damper to exterior wall or roof.
4. Insulate entire ducts and seal to prevent condensation on cold surfaces, including standing seams, support straps, and other metal attached to the ductwork.
5. Insulate access doors and gaskets to prevent metal to metal contact.

B. Apply insulation to clean, dry ductwork.

C. Remove damaged insulation and replace to the satisfaction of the Engineer at no additional cost to the Owner.

D. Use sealing tapes 3 inches wide, reinforced, pressure sensitive type, SMACNA approved. Tapes that do not adhere to insulation shall be cause for rejection of all insulation work. Only apply tape when ambient temperature is between 40°F and 100°F.

E. Closed cellular plastic:
1. Obtain adhesive from the insulation manufacturer and apply to entire duct surface, and all joints.

2. Apply in strict accordance with manufacturer's instructions and recommendations.

F. Fiberglass Ductwrap:
   1. Apply insulation adhesive in 4" wide strips, 8" on center, circumferentially around duct.
   2. Tightly wrap insulation around duct with all joints butted and longitudinal joint overlapped 2 inches.
   3. On the bottom of ductwork over 24 inches wide, provide and install mechanical fasteners at not more than 18" on center.
   4. Tape all joints with 3" wide tape.
   5. Tape over protruding stick pins.

G. Rigid Fiberglass Duct Board:
   1. Impale insulation on welded pins or stick clips.
   2. Install pins not more than 3" from edges, and 12" on center.
   3. Seal all insulation edges and butt joints with 3" wide tape.
   4. Seal all stick pin penetrations with round vapor barrier patches.

H. Exterior Duct Insulation with Weatherproof Jacket:
   1. Apply exterior, weatherproof insulation in strict accordance with the manufacturer's recommendations for outdoor installation.
   2. Obtain adhesive from the insulation manufacturer and apply to all seams and joints.
   3. Apply 6" seal tape with 12 mil laminated cladding, matching insulation material, to all joints and seams in strict accordance with the manufacturer's recommendations. Ensure all laps are sealed with adhesive, watertight with no gaps.

END OF SECTION

SECTION 15907

TESTING AND BALANCING HEATING AND VENTILATING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The testing and balancing Work includes the measurement and setting of air and water flow devices in accordance with the Contract Documents for the systems, recording data, making tests, and preparing reports, all as hereinafter specified. Perform the Work specified in this Section on, and after the completion of, Work on the HVAC systems. Refer to additional requirements in specification Section 15600.

B. Qualifications: Obtain the services of a qualified testing organization, approved by the Engineer, to perform the testing and balancing work as herein specified. The criteria for determining qualifications of the testing organization shall be certification by the Associated Air Balance Council (AABC), certification by the National Environmental Balancing Bureau (NEBB), or organization shall have submitted proof to satisfy the Engineer that the organization meets the technical standards for membership of the AABC as published in the AABC "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, except that affiliation with manufacturers, installing contractors, or engineering firms may not preclude their acceptance.

C. Procedures: Accomplish the Work in accordance with the agenda specified herein. Follow procedures described herein and, in general, if not specifically described herein, the Work shall be in accordance with the Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation Total System Balance", Volume Two, No. 12173, and standards of NEBB.

D. Cooperate with the selected test and balance agency in the following manner:

1. Provide sufficient time before final completion date so that tests and balancing can be accomplished.
2. Provide immediate labor and tools to make corrections when required without undue delay. Install balancing dampers as required by test and balance agency.
3. Put all heating, ventilating and air conditioning systems and equipment into full operation and continue the operation of same during each working day of testing and balancing.
4. Keep the testing and balancing agency informed of any major changes made to the system during construction and provide with a complete set of as-built drawings.
5. Include the costs of dampers, pulley and belt changes and the costs of obtaining the test and balancing agency in the Contract price.

E. Installation shall not be considered complete until final reports by the testing agency have been submitted to the Engineer and approved.

1.2 SUBMITTALS TO THE ENGINEER

A. Submit the name of the proposed testing organization to the Engineer for approval within 90 days after Contract award.

B. Provide all results of all required tests for the Engineer's approval.

1.3 AGENDA

A. Preliminary Report: Review Drawings and Specifications prior to the installation of any of the affected systems and submit a written report to the Engineer indicating any deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the systems.

B. Submit an agenda for approval by the Engineer prior to start of testing and balancing work. The agenda shall include the following:

1. A complete listing of all air and water flow and air terminal measurements to be performed.
2. Specific test procedures and parameters for determining specified quantities, e.g., flow, drafts, etc., from the actual field measurements to establish compliance with the Contract Documents.
3. Samples of forms showing applications of procedures and calculations to typical systems.

C. Advise the Engineer in advance when the testing will begin so that the testing procedure and techniques can be evaluated and approved or modified.

D. Procedure Reporting: Specific test procedures for measuring air quantities at terminals shall specify type of instrument to be used, method of instrument application (by sketch), and factors used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Not applicable in this Section.

PART 3 - EXECUTION

3.1 PROCEDURES AND INSTRUMENTS - GENERAL

A. Requirements: Adjust all systems and components to perform as required by the Drawings and Specifications.

B. Test Duration: Perform operating tests of fans and other equipment no less than a four-hour duration after stabilized operating conditions have been established. Base capacities on temperatures and air and water quantities measured during such tests.

C. Instrumentation: Use methods of application of instrumentation in accordance with the approved agenda.

D. Use only instruments used for measurements that are accurate and calibrated within 6 months of the testing with calibration histories for each instrument available for examination. Have each test instrument calibrated by a laboratory approved by the Engineer or by the manufacturer. The Engineer has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.

E. Apply all instruments in accordance with manufacturer's instructions and

recommendations.

F. Provide all labor, instruments and appliances required. Do not install instruments that are permanent installations used for the tests, e.g., gages, thermometers, etc., until just prior to the tests to avoid damage and changes in calibration.

G. Accuracy of all thermometers shall be plus or minus l graduation at the temperatures to be measured. Graduations shall conform to the following schedule.

Medium	Design Temperature Differential (°F)	Maximum Graduation (°F)
Air	10 or less	1/2
Air	over 10	1

3.2 AIR SYSTEM PROCEDURES

A. Adjustments: Adjust all air handling systems to provide the required design air quantity to, or through, each component. Conduct adjustment and balancing of all systems during the period of the year approximating maximum seasonal operation, unless otherwise directed or approved by the Engineer.

B. Equalizers: Adjust equalizing devices to provide uniform velocity across the inlets (duct side for supply) of terminals prior to measuring flow rates.

C. Balance: Use flow adjusting (volume control) devices to balance air quantities only, i.e., proportion flow between various terminals comprising system, and only to the extent that their adjustments do not create objectionable air motion or sound, i.e., in excess of normal limits.

D. Accomplish balancing between runs (submains, branch mains and branches) generally by flow regulating devices at, or in, the divided flow fitting.

E. Restriction imposed by flow regulating devices in or at terminals shall be minimal. Make final measurements of air quantity after the air terminal has been adjusted to provide the optimum air patterns of diffusion.

F. Fan Adjustment: Generally vary the total air system quantities, by adjusting fan speeds, or axial-flow fan wheel blade pitch. Use damper restriction of a system's total flow only for systems with direct connected fans (without adjustable pitch blades), provided system pressure is less than 1/2-inch w.g.

G. Except as specified herein, make pitot tube traverses of each duct to measure air flow therein. Pitot tubes, associated instruments, traverses, and techniques shall conform to the ASHRAE Handbook of Fundamentals.

H. Omit pitot tubes traverse when the duct serves only a single room of space and its design volume is less than 200 cfm. In lieu of Pitot tube traverse, determine air flow in the duct by totaling volume of individual terminals served, measured as specified herein.

I. Where duct's design velocity and air quantity are both less than 1000 (fpm/cfm), determine air quantity by measurements at terminals served.

J. Test Holes: Provide test holes, in straight ducts, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices, to optimize reliability of flow measurements.

K. Air Terminal Balancing.

L. Air Motion: Air motion and distribution shall be as specified and as shown on Drawings. In addition to air motion measurements, make smoke tests wherever requested by the Engineer, to demonstrate the air distribution from air terminals, at no additional cost to the Owner.
M. Changes in the specified agenda due to field conditions, will be considered for approval by the Engineer.

3.3 TEST RECORDS

A. Submittal: Submit three (3) copies of the reports described herein, covering air and water system performance, and air motion (fpm), to the Engineer prior to final tests and inspection.
B. Instrument Records: Include types, serial numbers, and dates of calibration of all instruments.
C. Reports: Identify conspicuous items not conforming to Contract requirements in the reports.

3.4 AIR SYSTEM DATA

A. Report: Include in the certified report, for each air-handling system, the following data (as applicable):
    1. Equipment (fan or factory fabricated station unit):
        a. Installation Data:
            i. Manufacturer and Model.
            ii. Size.
            iii. Arrangement, Discharge, and Class.
            iv. Motor H.P., Voltage, Phase, Cycles and Full Load Amps.
            v. Location and Local Identification Data.
        b. Design Data: Data listed in schedules on the Drawings and in the Specifications.
        c. Fan Recorded (Test) Data:
            i. C.F.M.: Discharge CFM and % of OA under minimum conditions.
            ii. Static Pressure: S.P. total, S.P. suction and S.P. discharge.
            iii. R.P.M.: Fan and motor.
            iv. Motor Operating Amps.
            v. Motor Operating B.H.P.
            vi. Motor Sheave Size and Make.
            vii. Fan Sheave Size and Make.
            viii. Number of Belts Size and Make.
    2. Duct Systems:
        a. Duct Air Quantities (Maximum and Minimum) - Main, Submains, Branches, Outdoor (Outside) Air, Total-Air, and Exhaust:
            i. Duct size(s)
            ii. Number of Pitot tube (Pressure) Measurements.
            iii. Sum of Velocity Measurements (Note: Do not add pressure measurements).
            iv. Average Velocity.
            v. Recorded (Test) C.F.M.
            vi. Design C.F.M.

b. Individual Air Terminals:
   i. Terminal Identification (Supply or Exhaust, Location and Number designation).
   ii. Type, Size, Manufacturer and Catalog Identification.
   iii. Applicable Factor for Application, Velocity, Area, etc., and Designated Area.
   iv. Design and Recorded Velocities - F.P.M. (State "core", "inlet", etc., as applicable). Record data for three readings and average.
   v. Design and Recorded Quantities - C.F.M. Record data for three readings and average.
   vi. Deflector Vane or Diffusion Cone Settings.

3.5 FINAL TESTS, INSPECTION AND ACCEPTANCE

A. General: Make tests to demonstrate that the capacities and general performance of air and water systems comply with the Contract Documents.
B. At the time of final inspection, recheck, in the presence of the Engineer, random selections of data (air quantities and air motion) recorded in the Certified Report.
C. Points and areas for recheck will be selected by the Engineer.
D. Measurement and test procedures shall be the same as approved by the Engineer for the Work forming basis of report.
E. Selections for recheck (specific plus random), in general, will not exceed 15 percent of the total number tabulated in the report.
F. Retests: If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Balance Report listings, at ten percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, readjust all systems and re-test. Submit new data recorded, new Balance Reports and make new inspection tests, all at no additional cost to the Owner.
G. Marking of Settings: Following final acceptance of Balance Reports by the Engineer, permanently mark the settings of all splitters, dampers, and other adjustment devices so that adjustment can be restored if disturbed at any time. Do not mark devices until after final acceptance.

END OF SECTION

INFINITY ENGINEERING CONSULTANTS, LLC
LICESNE # EF.0003109

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END OF SECTION

SECTION 16010

ELECTRICAL - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, equipment, operations, methods and procedures as indicated in the Contract Documents, together with all items necessary for or incidental to the completion of the work.

B. All systems or additions to existing systems indicated in the Contract Documents shall mean all necessary supervision, labor, equipment and materials required to provide complete, properly functioning systems.

C. All systems shall be adjusted, tested, inspected and turned over to the Owner in working order.

D. The words "provide", "supply", "supply and install", "install", "furnish" or "furnish and install", as used in DIVISION 16 or as indicated on the Drawings related to DIVISION 16 shall mean a complete and properly functioning Electrical installation performed by the Contractor.

E. References:

1. Refer to Architectural, Structural, Mechanical, Plumbing, Process Piping and Instrumentation Drawings to coordinate material and equipment locations and electrical requirements.
2. Additional requirements outlined in DIVISION 0 and DIVISION 1 , are part of DIVISION 16.

F. Division 16 Contract Requirements and Responsibilities:

1. The requirements of Division 16 - Electrical is based on the information provided in the Contract Documents. This information has been outlined in either the specifications or the drawings or both. The Contractor's responsibility is to review all information in both the specifications and the drawings in order to determine the complete work required. Whether the work is specified in the Specifications or shown on the Drawings it is required as part of the work. No additional compensation or interpretations stating that it was not shown in both locations will be acceptable or allowed. The Engineer will have the authority to make the final determination for unresolved conflicts between specifications and drawings. No additional compensation will be allowed due to the Engineer’s determination.

G. Work Specified Herein:

1. Visit and examine the project site and become familiar with all existing conditions pertinent to the work to be performed thereon. No additional compensation will be allowed for failure to be so informed. The Contractor is responsible for becoming familiar with the conditions of the project during the bidding period in order to bring any clarifications or issues to the attention of the Engineer prior to submission of their final bid price.
2. The following scope of work is a brief generalization of the type and extent of the work specified under DIVISION 16. Detailed requirements are indicated

on the Drawings and in related sections of the Specifications. The work specified under DIVISION 16 includes, but is not limited to the following, as shown on the Drawings and as specified herein:

a. Provide Electrical Service and Distribution Systems as indicated on the "Single-Line Diagrams There is a significant amount of electrical demolition and reconnection of equipment to remain for the work required for this project and therefore a thorough understanding of the existing conditions is critical. It is to be understood that the drawings do not intend to show or provide details for all of the existing conditions or equipment to be demolished. In addition, not all existing condition information may reflect exact conditions due to the accuracy of existing data and information.
b. Provide complete lighting system(s), including all necessary fixtures, hangers, wiring, connections, controls and lamps.
c. Provide all required 480 Volt, 208 Volt, 240V, and 120 Volt Power and Control wiring, Signal wiring, grounding, and connections for equipment specified under DIVISIONS 11, 13, 14, and 15 except as indicated.
d. Provide all required and supplemental motor starters, protective device sizes, wire and conduit sizes, holding coil voltages and control voltages specified under DIVISIONS 11, 13, 14, and 15 except as indicated. All rating and sizing shall match the requirements of equipment specified. No additional compensation will be allowed for modifications required due to equipment and devices which differ from those of specified equipment.
e. Provide complete branch circuit wiring systems including all raceways, conductors, cables, outlet and junction boxes, wiring devices and device connections.
f. Provide paging/intercommunication system equipment, outlets, panels, devices, equipment, conduit and wiring.
g. Provide complete TVSS and/or lightning arrestor and surge capacitor devices for distribution equipment and/or instrumentation devices.
h. Provide a complete Fire Alarm System.
i. Provide a complete Security System.
j. Provide a complete Standby Power System and Automatic Transfer Switch.
k. Provide complete telephone, paging, intercom, and data communication system. Provide all related outlets, jacks and wiring.
l. Provide site area lighting. Also provide all new electrical work required to disconnect, remove, store, reinstall and reconnect existing site area lighting which is to remain.
m. Provide a complete Uninterruptible Power Supply System.
n. Provide a complete UL Master labelled Lightning Protection System.
o. Provide a complete Master Antenna Television System.
p. Coordinate with the electrical, telephone and/or cable utility(s) as required to complete the new service entrance(s).
q. Provide all required interface to the gas monitoring system control panels being supplied under Division 13.

H. Work Specified Elsewhere:
   1. The materials and methods used for all Electrical Work indicated in the Contract Documents shall meet the requirements specified in Division 16.
   2. The Contractor is to review all Contract Documents and Drawings and shall coordinate closely with the other related areas which will affect their work under this Contract to avoid all conflicts.

I. Removals and Relocations and Rearrangements:
   1. Examine the existing site, structure(s) and installation(s) for the work of all trades which will influence the cost of the work under DIVISION 16. This work shall include removals, relocations, rewiring and rearrangements relating to the work of all trades which may interfere with, disturb or complicate the performance of the work under DIVISION 16; and relating to the work involving systems, equipment and related service lines which shall continue to be utilized as part of the finished project.
   2. When the Contract Documents indicate elimination of, or structural changes in walls, floors, ceilings, enclosures, pipe chases, etc., remove, relocate, rearrange and reconnect as required, all existing Electrical Work such that systems to remain shall continue to function properly.
   3. Provide all associated labor, material, and costs to include all removals, relocations, rewiring, rearrangements, and reconnections herein specified, necessary or required to provide approved operation and coordination of the combined new and existing systems and equipment.
   4. Demolition:
      a. Disconnect and remove existing equipment, devices, boxes, conduit, and associated electrical equipment as shown on the contract drawings.
      b. Any demolition, relocation or rearrangement work performed which results in unused openings in existing-to-remain control panels, instrument panels, control stations, pull or junction boxes, etc., shall be plugged by appropriate means such that it maintains the integrity of the NEMA classification of the area, as defined on Drawing E-1.
      c. Any demolition, relocation or rearrangements work performed which results in unused openings in walls, ceilings, floors, etc. shall be sealed using approved methods to maintain the fire rating and NEMA classification of the existing structure.
      d. Review all Contract Documents and coordinate with all disciplines for a complete understanding of this demolition work.
      e. There are areas where the demolition shall require that existing pullboxes, conduit, wiring and associated devices be disconnected, removed, relocated and in some cases, be replaced so the new equipment, walls, structures, etc. may be constructed and installed. In most cases, the detail of these existing conditions has not been shown. The Contractor will be responsible to perform all work necessary to demolish all required conduit, wiring, boxes and associated equipment for the noted and intended demolition.

f. Disconnect and remove all abandoned conduits, wiring, boxes, equipment, controls, hangers, etc. shown or not shown, which is located within the area of construction under this contract.

g. Per the request of the Owner, disconnect, remove, protect and return to the Owner specific equipment scheduled for demolition. No additional compensation will be allowed.

5. The Contractor is responsible for temporary power associated with Removals, Relocations, and Rearrangements to maintain the existing facility operational. Refer to section within this section for requirements.

J. Fees:

1. Secure and pay for all permits, fees and licenses necessary for the proper execution of the work under DIVISION 16.

K. Tests and Procedures Prior To Start-up:

1. Refer to Section 16950 - Testing Electrical Systems and start-up for testing and scheduling requirements.

L. Demonstration of Complete Electrical Systems:

1. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated and accepted by the Engineer in writing. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.

M. All electrical equipment shall be suitable for the areas where mounted in accordance with Area Classifications indicated on Electrical Drawings. In specific, refer to Drawing E-1 NEMA classification for Electrical Equipment and Enclosures for specific requirements and these specifications. In addition, there are several areas which have been indicated to meet NEC National Electrical Code requirements based on the final location of the equipment. Coordinate and provide these NEMA ratings whether or not specifically stated on the Drawings. Contractor shall assure that the proper type, enclosure, mounting and catalog numbers are provided during the Submittal phase.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 01010 – Summary of Work (construction sequencing requirements that affect number and duration of equipment startups and certifications)
2. Section 01340 – Submittals
3. Section 01600 – Delivery, Storage and Handling
4. Section 01800 – Equipment Startup, Testing and Operator Training
5. Section 09905 – Surface Preparation and Shop Coatings

1.3 QUALITY ASSURANCE

A. Provide all new materials, devices and equipment in conformance with:

1. Underwriter's Laboratory, Inc.
2. National Electrical Manufacturers Association.
3. American National Standards Institute.
4. National Electrical Code (N.F.P.A. No. 70.

5. Life Safety Code (N.F.P.A. No. 101
6. Local Utility Company standards, specifications, and requirements. .
7. Local Telephone Company standards, specifications, and requirements.
8. Local Internet Provider standards, specifications, and requirements.
9. Occupational Safety and Health Act (O.S.H.A.) - regarding construction practices.
10. State and Local electrical codes, building codes, and fire codes for the locale where the work is to be performed.
11. N.F.P.A. 820 Standards for Fire Protection in Wastewater Treatment and Collection Facilities.

B. All materials provided under this Contract shall be equal in quality, appearance, and performance to that specified herein and shall be subject to no exceptions taken by the Engineer. Verify the availability of all materials proposed to be used in the execution of the work prior to submitting same for the Engineer's review. The discontinuance of production of any material or product after the Engineer's review has been made shall not relieve the Contractor from furnishing an alternate of equal quality and design without additional cost.
   1. All discontinued products after submittal approval shall require resubmittal.

C. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements.

D. The Contractor shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of designing and maintaining these systems. For a period of twelve (12) months from the date of acceptance of the work, provide all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, installation methods, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.

E. All switchboards, motor control centers, panelboards, motor starters, transformers, and distribution equipment shall be by the same Manufacturer based on providing the Owner with equipment of the same type. This will allow for replacement and spare parts of the same type and also allow efficient maintenance of this equipment. This coordination shall be demonstrated in the submittals.

F. All electrical equipment shall be suitable for the areas where mounted in accordance with Area Classifications indicated on Electrical Drawing E-1. Contractor shall assure all equipment is installed in strict accordance with the latest version of the National Electrical Code.

G. Compliance with the above codes, standards, etc., does not relieve the Contractor from the requirements of the Contract Documents which may exceed these codes, standards, etc. but which are not contrary to them.

H. If it is observed that the Contract Documents are at variance with any of the above codes, standards, etc., promptly notify the Engineer in writing, and necessary changes shall be adjusted by appropriate modification. If any work is performed which is contrary to such codes, standards, etc., the Contractor shall assume full

responsibility therefore and shall bear all costs in correcting such work in order to comply with such codes, standards, etc.

1.4 SEISMIC CONTROL

A. Design, furnish and install Seismic Restraints for Nonstructural Components of electrical systems per Division 13 Specifications.

1.5 SUBSTITUTIONS

A. Refer to Instructions to Bidders, General Conditions and Supplemental Conditions for requirements.

1.6 SUBMITTALS TO THE ENGINEER

A. Submit Shop Drawings, O&M documentation, and Manufacturer certificates per Section 01340.

B. Submit additional specific information as follows:

1. All materials proposed to be used for the project, including short-term and long-term storage instructions.
2. Provide all certificates of inspection and approval from all regulatory agencies having jurisdiction over the Work under Division 16.
3. Coordination, Short Circuit and Arch Flash Study.
4. Submit properly documented and witnessed test and checkout reports prior to energizing the Electrical system.
5. Submit conduit layout plan prior to any conduit installation
6. Record drawings

C. These requirements for Shop Drawings are in addition to the standards in Section 01340.

1. Shop Drawings Shall Consist of:
   a. Project name and location.
   b. Contractor's name.
   c. Index Sheet - Listing the equipment being submitted utilizing equipment designations, or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/ type and catalog number.
   d. Manufacturer's scale or dimensioned drawings along with standard catalog "cut" sheets. These cut sheets shall be marked up to indicate equipment, sizes, types, etc., of equipment and all options being provided.
   e. Equipment ratings, service clearances and configuration.
   f. Listing of accessories to be furnished.
   g. Single-line and schematic diagrams where applicable. All text and symbols shall be easily legible and submitted on a 11"x17" sized drawing(s) as necessary.
   h. Refer to related sections of the specifications for special shop drawing requirements for individual equipment types.
2. All Cut Sheets shall be marked up to indicate specific equipment, specific sizes, specific types, etc., for all equipment and materials with all options provided for this project. Catalog cut sheets that are not properly marked up or are difficult to read and understand as to what equipment or application that it is used for will be returned un-reviewed for re-submittal.

3. The Contract Drawings have provided detailed customized schematic wiring diagrams for all motor control center equipment as well as individual wall mounted starters, control panels, etc. These are very detailed and a lot of effort has been expended to compile these diagrams. The equipment manufacturer/supplier of this equipment as specified shall be responsible to provide the following detailed and customized schematic wiring diagrams.
    a. A separate customized and detailed schematic for each piece of equipment (i.e. RAS pumps No. 1, No. 2 and No. 3). Even though the schematic appears to be same for this equipment a separate schematic for each will be provided with the referenced title (i.e. RAS Pump No. 1, etc.) noted on the respective schematic.
    b. Each schematic shall indicate and show the specific devices (hand-off-auto, run light, ETM, etc.) and a reference to where this is located.
    c. All contacts and interlocks shall be identified as to their location.
    d. All metering and interface devices such as digital metering, TVSS, lightning protection, etc., shall be shown, identified, and dimensional heights from bottom of equipment shall be noted.
    e. Failure to provide the proper customized schematic wiring diagrams shall be grounds for automatic rejection. Any delays, scheduling issues and additional contract time and cost associated with these delays due to equipment not being approved or being rejected for these reasons shall be the responsibility of the Contractor.

1.7 RECORD DRAWINGS

A. At the completion of the installation, provide reproducible Record Drawings indicating the final configuration of all Electrical Systems as they were installed. Symbols, equipment designations, etc. shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground.

B. Electrical Contractor shall provide detailed, red-lined instrumentation loop diagrams, control panel diagrams, and motor schematics indicating exact point to point wiring. The electrical contractor shall coordinate and provide red line information to the instrumentation vendor. The instrumentation vendor shall revise diagrams and motor schematics based on red lined information.

C. The requirements above are in addition to the standards for Record Drawings in Section 01720.

1.8 DELIVERY, STORAGE AND HANDLING

A. Refer to additional requirements of Section 01600.

1.9 GUARANTEE/WARRANTY

A. Guarantee all equipment, materials and workmanship in accordance with the General Conditions and Supplemental Conditions of the Construction Contract and Section 11000.

B. Warrant that all material furnished and work executed is in accordance with all applicable laws and regulations.

1.10 COORDINATION, SHORT CIRCUIT AND ARC FLASH STUDY

A. Furnish and implement a complete and approved Coordination, Short Circuit and Arc Flash Study for the complete electrical system.

B. The following is a summary of the requirements of this study:

1. Bound copy of the complete study information with cover sheet, table of contents, tabbed index markers for each appropriate section, and cover letter.
2. Short circuit and protective device coordination study including complete arc flash system study for the entire project location including all new and existing electrical systems and equipment and a summary of findings.
3. Tables and listings of all equipment and results of short circuit results summarized for review.
4. Description of the study and overview of system and how the study was performed.
5. All single line diagrams, devices shown, identification tags, bus tags for a complete description.
6. Circuit breaker and relay settings table summarizing the final recommendations for breaker coordination settings.
7. Identifying any discrepancies with the system devices and overall short circuit and coordination settings for the system with recommendations for revisions to the equipment.
8. Field testing and setting of all equipment with final field walk-through with the Engineer that these settings have been properly performed. A system check off and sign off must be performed for final acceptance that the actual installed equipment is coordinated with the final study requirements and settings.
9. A complete and acceptable system shall be provided for this portion of the work.
10. Furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2002, the IEEE Guide for Performing Arc-Flash Calculations. Studies shall be performed by a registered engineer in the state that the project is being completed. The engineer shall have 10 or more years of experience in completing Arc Flash Hazard Analysis Studies.
11. Furnish available fault current lamacoid nameplates at all service equipment including switchboards and all motor control centers within the facility as required by the National Electric Code article 110.24(A).
12. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
13. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images. Labeling and Arc Flash results shall be provided for each and every electrical distribution system equipment both existing and new for this facility.

C. Submittals for Review:

1. The studies shall be submitted to the design engineer prior to receiving final review of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, review from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

D. Qualifications:
1. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
2. The Registered Professional Electrical Engineer shall have a minimum of five (5) years' experience in performing power system studies for similar sized facilities.
3. The engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.

E. Data:
1. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final review of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
2. Source combination may include present and future motors and generators.
3. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.
4. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.
5. A complete and acceptable system study shall be provided for final acceptance.

1.11 SUBCONTRACTOR COORDINATION AND RESPONSIBILITY

A. Coordination with Division 13
1. Instrumentation supplier shall provide point to point wiring schematics to electrical subcontractor to allow completion of all instrumentation and control conduit and wiring between all devices, system control panels, and all equipment provided by Division 11, Division 13, Division 15 and Division 16.
2. The instrumentation supplier shall coordinate all power, control and signal needs or requirements with the electrical contractor prior to construction.

B. Coordination with Division 15
1. Electrical subcontractor is responsible to review the HVAC Drawings and Specifications to determine the power conduit and wiring requirements. Electrical subcontractor is responsible to implement conduit and wiring needs to match the functional descriptions in DIV. 15 except that specifically

identified as being provided by the HVAC subcontractor. HVAC subcontractor shall be responsible for all control, low voltage 24VDC / 24VAC, conduit and wiring. This shall include, but is not necessarily limited to, wiring for automatic temperature control, and control wiring for plumbing systems. The HVAC subcontractor shall provide all miscellaneous 120VAC control from HVAC control panels to final control devices, as required, unless specifically included in Electrical work per the Drawings and Specifications.

C. Coordination with Division 2 and Division 3
   1. The electrical subcontractor is required to provide a substantial amount of underground work and coordination relating to the following items:
      a. Underground duct banks and installation
      b. Pad-mounted transformer and Standby Generator
      c. Electrical manholes and handholes
      d. Existing and new underground utilities and process equipment
         i. The electrical manholes and handholes shall be furnished and installed under Division 2 - Site Work. The electrical subcontractor shall coordinate all required elevations, manhole or handhole openings, elevations, wall openings and final locations of these structures with this section to provide for a proper installation. Coordinate and verify that all manhole and hand-hole covers are "stamped" with the proper designation for power, control, signal and other wiring identifications.
         ii. Excavation, bedding and backfilling shall be furnished and installed under Division 2 - Site Work. The electrical subcontractor shall coordinate all excavation for duct bank locations for both new and existing conditions with this section in order to provide a complete understanding of where and how these duct banks are to be installed.
         iii. Concrete encasement for duct banks shall be furnished and installed under Division 3 - Concrete. Duct banks shall be formed up neat and tight to provide for proper encasement of conduits. Reinforcing steel shall also be furnished and installed under Division 3 - Concrete.
         iv. Concrete pads for pad mounted transformers or standby power generators shall be furnished and installed by Division 3 - Concrete. The excavation; bedding and backfill shall be furnished and installed under Division 2 - Site Work. Coordinate pad sizing, openings and orientation with this section for proper installation.

D. Coordination with Miscellaneous Divisions
   1. The electrical contractor shall coordinate all coring, cutting and patching of openings in existing structures and locations with the General Contractor in a timely manner not to delay scheduling of the project.

E. Schedules:
   1. The electrical subcontractor shall maintain close contact and coordination at all times with the work of these related Divisions in order to provide a complete electrical system or delay the scheduling of the project.

2. Perform all coordination and scheduling of all cutting, temporary power usage with all other trades. patching, trenching, painting, trench covers, plastering, chases, slots, furring, grounds, masonry foundations, piers, excavating, pole bases, backfilling, pads, duct banks and other work incidental to installation of apparatus as required for electrical work.

1.12 CONDUIT LAYOUT PLANS AND DETAILS FOR CONCEALED AND EXPOSED WORK

A. The Contract documents require that conduit be concealed in walls, floors, ceilings or below floor slab in slab on grade areas due to the configuration and layout of the proposed building construction.

B. In areas of exposed conduits, conduits shall be installed via vertical drops down to equipment in order to maintain a clean and consistent look of conduit for this installation. Horizontal runs shall be limited to ceiling racked installation and shall drop down to equipment. In areas of hung ceilings and accessible space above ceilings conduits shall be installed concealed within these areas with vertical drop down to the equipment to be fed.

C. A detailed conduit layout plan and routing path for the new addition shall be submitted for review and with no exceptions taken by the engineer prior to performing any work. The plan shall clearly indicate the equipment locations and path of runs along with overall sizes of conduits to be installed for a complete layout plan.

D. The contract drawings specifically note areas with blockout structural openings for the installation of conduits into and within the proposed building. A coordination review of equipment locations and layouts will be required such that the conduit layout plan has been pre-planned and approved prior to the commencing of the work. There is a significant amount of conduit to be installed under this project and this plan will provide an overview of the intended work to be performed.

E. The contractor shall be allowed to reduce the number of conduit runs by combining conduit runs and increasing overall conduit sizes based on the National Electrical Code (NEC) allowable sizing and derating requirements. The contract documents will limit this however based on the allowable sizing of conduits within the slab and also this will be limited to smaller branch circuit feeders. Individual motor feeders to equipment such as pumps, process equipment runs, electrical distribution feeders and HVAC larger loads will not be allowed to be combined as further stated within the contract documents.

F. The Conduit and Wire Schedule has provided a summary of individual conduit runs throughout the project in order to clearly indicate where conduit and wiring is to be installed. The contractor shall utilize the schedule along with the electrical plans to develop the overall Conduit Layout Plan as required under this section. The submitted plans shall be formatted on 2' x 3' full size plans and submitted as part of the shop drawings requirements for this project prior to commencing any and all work.

G. The electrical contract drawings are diagrammatic and may not specifically show exact locations of the equipment. The contractor shall coordinate all conduit layout, and dimensions with the final equipment locations for the entire project for both concealed and exposed conduit runs.

1.13 BID ALLOWANCE AND COST TO BE CARRIED UNDER THIS CONTRACT

A. The General Contractor shall include as part of their overall bid an allowance for all work to be performed by the respective utility companies or service companies under this Contract as required in General Conditions and Supplementary Conditions.

B. All work required by the Electrical Subcontractor shall be included in the Base Bid and not part of this allowance.

1.14 WORK ASSOCIATED WITH UTILITY COMPANIES AND SERVICE COMPANIES

A. The Power Company serving this project is .

1. The Power Company contact information is as follows:
   Contact Person:
   Contact Telephone No:
2. Coordinate all work required by the Power Company via the contact referenced above and contact this individual concerning any questions regarding this work.
3. The work of the Power Company is shown on the Contract Drawings. The following is a summary of this work:
   a. Install temporary electric service to the project location necessary for the sequence of construction.
   b. Modify overhead primary service for permanent electric service and install a new service riser pole.
   c. Install new primary underground electric service and new pad-mounted transformer, metering and work required by them for the permanent electric service.
   d. Coordinate all required shutdowns and energizations for the existing and new electrical services.
   e. All other associated work required by them for the needs of this project.

B. The Telephone Company serving this project is .

1. The Telephone Company Engineering Service Center shall be the contact point for this work:
   Contact Person: .
   Contact Telephone No: .
2. Coordinate all work required by the Telephone Company for the project.
3. The work of the Telephone Company is shown on the Contract Drawings. The following is a summary of this work:
   a. Install temporary telephone (telemetry) service to the project locations necessary for the sequence of construction.
   b. Remove existing underground telephone service as indicated on the drawings.
   c. Modify overhead telephone service for permanent telephone service.
   d. Install new underground telephone cables and telephone interface equipment required by them for permanent telephone service.

C. The Cable Company serving this project is .

1. The Cable Company Engineering Service Center shall be the contact point for this work:
   Contact Person: .
   Contact Telephone No: .

2. Coordinate all work required by the Cable Company for the project.
3. The work of the Cable Company is shown on the Contract Drawings. The following is a summary of this work:
    a. Install temporary cable service to the project locations necessary for the sequence of construction.
    b. Remove existing underground cable service as indicated on the drawings.
    c. Modify overhead cable service for permanent cable service.
    d. Install new underground cables and cable interface equipment required by them for permanent cable service.

D. The Fire Department local jurisdictions having authority for the Town/City shall establish the fire alarm system requirements for this project.
1. The work of this Contract shall require that the fire alarm systems be tied into and sent to the local authorities in order to respond to these respective alarms.
2. The portion of work of this Division 16 requirement has been included as part of the Bid Allowance established for the work of Division 16. This shall include the required work of the respective service companies for the fire alarm system.
3. The final requirements and related work of the fire alarm system shall be determined by the Fire Department local jurisdiction having authority. Coordinate all work and requirements with the local authority for final connections and operations of the complete fire alarm system for final acceptance.

1.15 SEQUENCE OF CONSTRUCTION/TEMPORARY REQUIREMENTS

A. Requirements for Sequence of Construction: Refer to Section 01010A.
B. Maintain the existing treatment facility operational during all times of the work of this contract. Provide the following during demolition, installation, start-up and testing:
1. All necessary temporary power, control, signal, telephone, and telemetry system requirements necessary.
2. All temporary relocations, conduit, wiring, re-wiring, temporary electrical equipment, etc., necessary.
3. All emergency/standby power requirements necessary.

C. The Electrical Sub-contractor shall provide all necessary material, labor, equipment, and associated costs, etc. necessary to maintain the existing facility operation and sequence of construction. No additional costs or compensation shall be allowed for any temporary power requirements necessary for this project.
D. The General Contractor shall pay for all energy usage associated with temporary power and start-up operations. The Owner will be responsible for the share of the power associated with continuing to operate the baseline existing facilities.
E. Refer to Section 01500, Temporary Facilities and Controls, for separate requirements related to job trailers and other temporary facilities.

1.16 BID ALTERNATES

A. Refer to Section 01100 for all work related to Bid Alternates for this project. Bid Alternates have been identified and described for specific work areas and equipment. The Contractor shall determine all associated work and costs required for these items for a complete system.

B. The Drawings indicate and define areas where work related to the bid alternates under this section is required. This has been noted and shown as clearly as possible. However, it does not show each and every possible component for these bid alternates. Therefore, it shall be the contractor's responsibility to include all associated materials, labor and costs associated with the required bid alternatives for a complete system.

1.17 MEASUREMENT AND PAYMENT

A. Measurement and payment for the work described in this section will be made in accordance with the provisions of DIVISION 1 MEASUREMENT AND PAYMENT.

1.18 REQUEST FOR INFORMATION

A. When there is a conflict or coordination issue, or if additional information is necessary for the Contractor to proceed with the intended work, a Request for Information (RFI) form shall be submitted through the General Contractor to the Engineer. The specific issue shall be described in the RFI and shall be sent to the Engineer for review and response. RFI form shall be available via the General Contractor through the Engineer as required for this contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be as specified in the appropriate Sections of DIVISION 16.

PART 3 - INSTALLATION

3.1 INSTALLATION

A. Installation shall be as specified in the appropriate Sections of DIVISION 16.

3.2 TESTS

A. Refer to all related requirements as set forth within SECTION 16950 and additional testing as indicated in the appropriate Sections of the Specifications.

3.3 CLEANING

A. Do not allow refuse and surplus materials to accumulate on the project site during the course of the work. Areas shall be cleaned and picked up on a daily basis.
B. Upon completion of the work, remove all refuse and surplus materials and leave the premises neat and clean on a daily basis.
C. Clean all equipment surfaces and touch up all damaged surfaces to the satisfaction of the Engineer prior to requesting Final Completion.
D. Clean all lighting fixture reflector assemblies, lenses, louvers and lamps upon completion of the installation.
   1. Relamp all fixtures that have been in use longer than 6 months prior to Substantial Completion.

END OF SECTION

SECTION 16050

BASIC MATERIALS AND METHODSGENERAL

1.1 DESCRIPTION

A. The Drawings are diagrammatic, unless detailed dimensioned Drawings are included, and show approximate locations of distribution equipment, fixtures, control panels and wiring devices. Equipment layouts shall be submitted prior to work in these areas with sufficient time for a detailed review. All equipment and locations shall be closely reviewed and coordinated. Coordinate all work and equipment locations with the Engineer prior to performing final installations.

B. While the general run of electrical feeders, branch circuits and conduits are indicated on the Drawings, it is not intended that exact routing be determined there from. Conductors can be combined in conduits for ease of construction as permitted by these specifications and the latest edition of the N.E.C.

C. Circuit designations can be found on the contract drawings in the combination of any of the following formats:

Single Line Diagrams	"Home Runs"
Electrical Schematics	Wiring Diagrams
Control and Instrumentation Diagrams	Panelboard Schedules
	Conduit and Wire Schedule

The Contractor shall be responsible for reviewing all drawings and may modify these designations subject to field conditions and review of the Engineer.

D. Measurements shall be made and coordinated with all approved equipment at the site and in the buildings during construction and all systems installed as the work progresses in such a manner that the equipment, piping, vents, ducts, conduit, etc., will fit in the space provided, maintain head room and if in unfinished areas, be as neatly installed, as obscure and "out-of-the- way" as physically possible.

E. Prior to submission for review any item of equipment, determine whether or not it will fit in the space provided and that no design changes in conduits, wiring or controls will be required. Any changes in the size, location or interconnections of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Engineer and no exceptions must be taken before such alterations are made.

F. All equipment and accessories and its interconnecting piping, ductwork, conduits, etc., shall be installed in such a manner that ample maintenance passage and Code-required space/access will be provided.

G. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general ductwork shall be given preference (except where grading of piping becomes a problem) followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, etc., it is determined that ample maintenance and passage space has not been provided, the work shall be rearranged and/or furnished with other equipment as required to

provide this space at no additional cost to the Engineer. The Contractor shall review the drawings for all other trades to determine any potential interferences and identify and coordinate with those with other trades.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. In General, the workmanship of the electrical installation shall be as described in the N.E.C.A. Electrical Design Guidelines. All methods of construction, details of workmanship, etc. that are not specifically described therein or indicated in the Contract Documents, shall be subject to the control and approval of the Engineer.
B. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the Specifications.
C. Work determined by the Engineer to be unsatisfactory according to industry standards shall be redone at the Contractor's expense, with no additional compensation.
D. All efforts shall be made in the location and installations of all raceways and equipment for a neat, logical, and safe installation as it pertains to personnel and operations.
E. An electrical conduit and associated electrical devices, etc., shall be installed concealed wherever possible in order to provide for a clean and limited amount of exposed conduit runs. Coordinate all work with the Engineer prior to performing this work.

1.4 SUBMITTALS TO THE ENGINEER

A. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.
B. Submit a shop drawing for the following equipment, materials, products, etc.:
   1. Conduit, Raceway and Tubing.
   2. Conductors and Cable
   3. Outlet Boxes
   4. Pull and Junction Boxes and Terminal Cabinets
   5. Wiring Devices
   6. Control Devices and Equipment
   7. Motor Starters
   8. Safety Disconnect Switches
   9. Enclosed Circuit Breakers
   10. Fuses
   11. Ground Rods
   12. Metal Framing Channel
   13. Hangers and Supports
   14. Phase Failure Relays
   15. Time Delay Relays (Electro-pneumatic)

16. Submission of written verification that the electrical manholes, handholes and covers, electrical duct banks and transformer pads have been coordinated, reviewed and acceptable with the electrical work to be provided under this Section.
17. Distribution Equipment (medium and low voltage)
18. Motor Control Centers
19. Main Switchboard and Secondary Switchboards
20. Control Panels
21. Miscellaneous Electrical Distribution Equipment
22. Lighting Fixtures
23. Variable frequency drives
24. Transformers
25. Lighting flexible hangers
26. Conduit and wall and floor link seal fittings
27. Conduit cable sealing fittings
28. Medium Voltage Cable
29. Hand Hole
30. Conduit Layout Plans in accordance with requirements outlined in Section 16010.
31. Test results on all feeder conductors and heat trace cables as specified in Section 16950.
32. Test results for all VFD equipment specified in Section 16469 and 16443.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conduit, Raceway and Tubing

1. Rigid Heavy Wall Steel Conduit (RSC or RGS) shall be constructed of hot dipped galvanized or electro-galvanized steel. Acceptable Manufacturers: Allied - a division of Atkore, Wheatland, Republic Conduit, or equal.
2. Electrical Metallic Tubing (EMT) shall be constructed of electro-galvanized steel. EMT fittings shall be interlocking compression type of cadmium-plated malleable iron or zinc coated steel, or stainless steel. No die cast, set screw and indenter type fittings shall be used. Acceptable manufactures are Allied - a division of Atkore, Wheatland, Republic Conduit, or equal.
3. Aluminum conduit shall be rigid, heavy wall aluminum. Acceptable manufacturers: Anaconda, Kaiser, VAW, or equal.
4. Flexible Metal Conduit
   a. Flexible Metal Conduit shall be constructed of one continuous length of U. L. Approved electro-galvanized, spirally wound steel strip with interlocking convolutions and interior surfaces free from burrs and sharp edges.
   b. Flexible metal conduit shall be "liquid-tight" with PVC jacket. Acceptable Manufacturers: Alflex - a division of Southwire, Electri-Flex, Thomas & Betts - a division of ABB, or equal.
   c. Flexible Metal Conduit installed in outdoors, NEMA 4X, or 4X Corrosive areas shall use PVC coated connectors.

d. Flexible metal conduit installed in hazardous, NEMA 7, Class I Div 1 areas shall be UL Listed, and shall have a stainless steel braid covering over a flexible stainless steel inner core. Packing shall be woven cotton braid impregnated with asphalt. Acceptable manufacturer: Crouse-Hinds - a division of Eaton, Killark, Thomas & Betts - a division of ABB -XP Series, or equal.

5. Non-Metallic (P.V.C.) Conduit shall be Schedule 80, extra heavy wall or Schedule 40, heavy wall and UL Listed for the use intended. Acceptable Manufacturers: Carlon, Harrison, JM Eagle, or equal.
6. P.V.C. Coated Rigid Galvanized Steel Conduit
   a. The PVC Coated Rigid Galvanized Steel conduit, shall fully comply with the following industry listings and manufacturer's standards without exception prior to PVC coated application, shall conform to Federal Specifications WW-C-581E, ANSI Standard C80.1, ANSI Standard C80.5 UL Standard #6 and NEMA RN1-2005.
   b. The PVC coated rigid galvanized steel (RGS) conduit shall comply with the below listed specifications without exceptions allowed. PVC coated rigid galvanized steel (RGS) conduit shall be hot dipped galvanized both internally & externally. The PVC coated rigid galvanized (RGS) conduit shall have hot dipped galvanized threads. The external PVC coating shall be a nominal 40 mils of external PVC coating and 2 mils of blue interior urethane coating. The PVC coating shall be applied by the same manufacturer of the hot dipped galvanized rigid steel (RGS) conduit.
   c. Conduit bodies and fittings for PVC coated rigid galvanized steel (RGS) conduit shall be from the same manufacturer as the PVC coated rigid galvanized steel (RGS) conduit. Conduit bodies shall be coated on the entire body both internally and externally with 2 mil of blue urethane and exterior coated with 40mil of PVC coating.
   d. All conduit, conduit bodies, connectors, support systems and accessories in the corrosive areas, above grade or below grade, shall be coated as specified.
   e. The thickness of the coating is to be a nominal 40 mils except where the configuration or application of the unit dictates otherwise.
   f. PVC coated conduit shall be UL or ETL Listed.
   g. During the manufacturing of the PVC coated rigid galvanized steel (RGS) conduit, the factory applied hot dipped galvanized coating of both the internal and external (RGS) conduit shall not be disturbed in any fashion prior to the application of PVC coating being applied as per UL 6. The PVC coated rigid galvanized steel (RGS) conduit shall comply with all UL listings providing the hot dipped galvanized coating as the primary means of protection of corrosion protection for the conduit, and the PVC coating shall be listed as a secondary means of corrosion protection as required by UL 6 and NEMA RN-1-2005.
   h. Every female opening shall have a plastic sleeve extending one pipe diameter or 2", whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the pipe used

with it. The wall thickness of the sleeve shall be the same as the plastic coating.

i. Fittings and Accessories:
   i. Right angle beam clamps and U-bolts will be provided with PVC encapsulated nuts that cover all exposed parts of the threads.
   ii. U-bolts will be sized to snugly fit the nominal 40 mil coated conduit.
   iii. The screw heads on Form 8 condulets shall be stainless steel encapsulated by the same manufacturer. All conduit bodies used in wash down, wet or outdoor applications shall be NEMA 4X rated.
   iv. Couplings shall have longitudinal ribs 40 mils in thickness to protect them from wrenches or channel-locks.
   v. All coated conduit and fittings must be installed wherever possible by a certified trained installer using a tool available from the manufacturer for the use intended in order to protect the PVC coating.

j. The interior coating shall be applied in such a manner so as to allow field bending without cracking or flaking of the interior coating.

k. Acceptable manufacturers shall be: Plasti-Bond, Thomas & Betts-a Division of ABB/Ocal, Perma-COTE, or equal.

7. All fittings shall be of the same material as the respective raceway system.

B. Cable Tray:

1. Materials and Finishes:
   a. Aluminum straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. Fabricated parts shall be made from Alloy 5052.
   b. Pre-galvanized steel straight section and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A446, Grade A and mill¬-galvanized in accordance with ASTM A525, Coating Designation G90. Covers for all types of steel tray will also be furnished from mill-galvanized steel in accordance with ASTM A525 G90.
   c. Hot-dip galvanized after fabrication steel straight section and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A570, Grade 33 for 14 gauge and heavier, ASTM A611, Grade C for 16 gauge and lighter and shall be hot-dip galvanized after fabrication in accordance with ASTM A386.
   d. Stainless steel tray sections, fittings, covers and accessories shall be of AISI Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms shall be welded to the side rails with type 316 stainless steel welding wire.
2. Tray Types:
   a. Ladder type trays shall consist of two longitudinal members (side rails) with transverse members (rungs) welded to the side rails. Rungs shall be spaced 9 inches on center. Rung spacing in radiused fittings shall be measured at the center of the tray's width. Rungs shall have a minimum

cable bearing surface of 7/8" with radiused edges. No portion of the rungs shall protrude below the bottom plane of the side rails.

b. Trough type trays shall be of three piece construction consisting of two longitudinal members (side rails) with a corrugated bottom welded to the side rails. The peaks of the corrugated bottom shall have a minimum flat cable bearing surface of 2-3/4" and shall be spaced 6" on center. To provide ventilation in the tray, the valleys of the corrugated bottom shall have 2¼" x 4" rectangular holes punched along the width of the bottom.

c. Solid bottom trays shall be of three piece construction consisting of two longitudinal members (side rails) with a solid corrugated bottom welded to the side rails. The peaks of the solid corrugated bottom shall have a minimum flat cable bearing surface of 2-3/4" and shall be spaced 6" on center.

3. Trays shall have an overall nominal depth of 5 inches with a minimum usable loading depth of 4 inches.

4. Straight sections side rails shall be I-beam, C rail or Z rails. All straight sections shall be supplied in standard lengths of 12 feet. Widths shall be 12, 18, 24, 30, or 36 inches.

5. Fitting radius shall be 12 inches minimum. Side rails of straight sections and fittings shall be compatible so that standard splice plates can be used to join straight sections and fittings. Fittings shall have 3" tangents beyond the curved section to accommodate the standard splice plates.

6. Splice plates shall be the bolted type, using either square neck or ribbed-neck carriage bolts and serrated flange lock nuts. The resistance of fixed splice connections between an adjacent section of tray shall not exceed .00033 ohm. The cable tray shall be designed so that a splice plate located anywhere along the span shall not decrease the strength of the cable tray system. Covers and other special accessories shall be furnished as required to protect, support, and install a cable tray system. Specify items in accordance with standards shown in catalog accessories section.

7. Bonding jumpers shall be provided, as required between all vertical channel or tray drops to equipment not rigidly attached to the tray system as required by the N.E.C.

Cable trays shall be manufactured by B-Line Systems, Inc. - a division of Eaton, M.P. Husky Corp., Thomas & Betts – a division of ABB, or equal.

C. Cable Bus

1. General: A complete metal enclosed bus system shall be provided; including all necessary fittings, tap boxes, enclosure connectors, entrance fittings, insulated conductors, electrical connectors, terminating kits, and other accessories as required.

2. System Requirements

a. The bus system shall be suitable for indoor or outdoor use with conductor spacing and ventilation maintained throughout the system. Cable Bus shall be rated for 480 Volts, 60 Hz, 3phase, 3 wire with a current rating as listed in the drawings.

b. All elements of the bus enclosure shall be so designed to eliminate any sharp edges or projections that may injure personnel or conductor insulations.
c. All load carrying members of the bus system shall be fabricated from extrusions of aluminum alloy 6063-T6. The maximum allowable stress used in design shall be 10,000 PSI.
d. Bus enclosure fittings shall have a radius of 24 inches, unless the minimum bending radius of the conductor requires a larger fitting radius.
e. The top and bottom enclosure sections shall be corrugated to provide mechanical strength and slotted for ventilation. The top cover shall be fastened to the enclosure with self tapping screws spaced approximately 2 feet on centers and shall be removed for inspection. The bottom section shall be factory installed by welding.
f. Splice joints between sections of the bus enclosure shall be the high pressure splined bolted type of a design, which avoids any structural weakness at the connection and does not exceed the electrical resistance specified.
g. Conductor support blocks shall be designed in segments to maintain a minimum of one conductor diameter in both the horizontal and vertical planes as required for free air conductor rating. Horizontal runs will have blocks spaced every 36 inches and vertical runs every 18 inches.
h. All current carrying conductors shall be UV and water resistant and have insulation rated for 75 degree Celsius operating temperature for the ampacity and voltage listed in free air as specified in article 310 of the National Electrical Code. Cable Bus shall be listed.
i. The conductors shall be phased and supported to maintain low impedance and assure the mechanical strength necessary to prevent cable movement or damage under short circuit currents up to 100,000 RMS symmetrical amps.
j. Conductors shall be of continuous length and be pulled in after the bus enclosure is in place. Electrical connectors shall be used only at the termination of conductor runs, or, if necessary, at tap points. All electrical connectors shall be provided by Cable Bus system.
k. The bus enclosure shall have a continuous current rating of not less than 1,000 amperes (50-degree Celsius rise) and the resistance across the enclosure section splice shall not exceed 50 microhms.
l. The bus enclosure shall be grounded at sufficient intervals for the purpose of preventing a potential above ground on the bus enclosure in the event of fault.
m. The conductors shall be arranged in a phasing pattern which exhibits minimal interphase and intra-phase imbalance. All transposing of cables must occur at termination points. Transposing of cables will not be done in the bus housing.
n. The bus system shall be as manufactured by MP Husky, MDF, Thomas and Betts, or equivalent.

D. Conductors and Cable

1. All cables to be installed underground shall be UL Listed and Labeled for underground use in wet locations. This applies to all cables, wires and conductors specified and used throughout the project installation.
2. All power wiring conductors (P-X on drawings) shall be insulated for 600 volts, Type XHHW insulation, unless otherwise noted. Conductors shall be standard AWG and KCMIL sizes. Conductors shall be 98 percent copper, stranded, heat and moisture resistant with cross-linked synthetic polymer insulation for all sizes No. 12 AWG and larger. Smaller sizes shall not be used except for communications and special systems. For lighting and receptacle circuits, solid wire may be used in lieu of stranded wire, for No. 12 and No. 10 AWG only. Conductors shall be labeled with U.L. approval and be marked with the manufacturer's name, wire size and insulation type. All underground power cables shall be UL Listed and Labeled for underground use in wet locations. Acceptable Manufacturers: Okonite, Southwire, Pirelli, or equal. Submit power and control conductor colors for review.
3. Variable frequency drive (VFD) motor supply shall be four (4) conductor tinned stranded copper, with cross-linked polyethylene insulation, overall foil (100% coverage) / tinned copper braid (85% coverage) shields, No. 12 AWG tinned copper drain wire, and outer PVC jacket. Cables shall conform to UL specification for 1000 Volt flexible motor supply cable. All underground power cables shall be U.L. Listed and Labeled for underground use in wet locations. Acceptable Manufacturers: Belden, Olflex, Houston Wire & Cable, or equal.
4. Control Wiring:
    a. All control wiring (120 or 24 volt, AC or DC) conductors within buildings or above grade shall be insulated for 600 volts, unless otherwise noted, and shall be No. 14 AWG minimum size, or larger if so indicated on the Drawings. Conductors shall be 98 percent copper, stranded, heat and moisture resistant, and thermal plastic insulated and shall be type THWN/THHN.
    b. All conductors for control wiring located below grade shall be 600V, 98 percent copper, stranded, heat and moisture resistant, with cross-linked synthetic polymer insulation type XHHW. All underground control cables shall be U.L. Listed and Labeled for underground use in wet locations. Acceptable Manufacturers: Okonite, Southwire, Pirelli, or equal.
    c. Submit conductor colors of all control wiring for review.
5. Metal clad cable shall consist of thermal plastic insulated copper conductors, of size and quantity indicated, protected by a positive interlocked armor of galvanized steel. The conductors shall be twisted together and shall have an overall moisture and fire resistant fibrous covering. The cable shall have a grounding conductor of copper. The cable shall meet the requirements of Article 330 of the National Electrical Code for "Type MC" Metal Clad Cable and shall bear the U. L. Label. Acceptable Manufacturers: Okonite, Pirelli, Houston Wire & Cable, or equal.
6. Multi-conductor Instrumentation (600V), Control (600V) and Power (600V) Armored Direct Burial Cable:

a. This specification covers multi-conductor power, control and instrumentation cables designed for service at maximum continuous operating temperatures of 90ºC for installation in wet or dry locations, indoors and outdoors, surface mounted, aerial or in metal trays. Cables with overall jacket are UL Listed for direct burial in earth and UL Listed as sunlight resistant.
b. Cables rated 600V are UL Listed as NEC Type MC-HL, UL 2225 for use in Class 1, Division 1 hazardous locations, pass IEEE-1202/CSA FT4 (70,000 BTU/HR) cable tray flame test and ECEA T-29-520 (210,000 BTU/HR) Ribbon burner flame test, and meets ASTM D746 brittleness temperature at or below -40ºC.
c. Installation shall be cross-linked polyethylene (XLPE) is accordance with ICEA S-95-658 and UL44 for type XHHW-2)
d. Conductor shall be annealed copper, Class "B" strand per ASTM B-3 & B-4. Ground wire(s) shall be annealed copper, Class "B" stand as sized on drawings or per NEC.
e. Armor shall be continuously welded and corrugated aluminum alloy sheath per UL 1569 and UL 225 with a flame retardant polyvinyl chloride (PVC) jacket.
f. Provide the following cables:
    i. Power cables [sized as shown on drawings] used for the Well Pumps shall be 600 volt power cables, direct burial, MC-HL as manufactured by USA Wire & Cable.
    ii. Control cable shall be the same as power cable with #14 AWG wire and number of conductors as shown on the drawings, USA Wire & Cable.
    iii. Instrumentation cables used for the Well Level Sensors and tamper switches shall be two [2] individually shielded pairs 2/C#16 with overall shield and drain wires, overall armor, overall jacket 600 volt, direct burial, MC-HL Instrumentation cable (SPOS) as manufactured by USA Wire & Cable.
g. Cables shall have heat, flame, moisture resistant cross linked polyethylene insulated copper conductors, of size and quantity indicated, non wicking fillers when necessary, binder tape, smooth or corrugated continuously welded sheath, and flame, moisture, sunlight, oil resistant black PVC outer jacket.
h. Conductors shall be Class B stranded (per ASTM B8) bare copper per ASTM B3 or tin coated soft copper per ASTM B33 when requested.
i. Conductors shall be insulated with cross linked polyethylene meeting the requirements of ICEA S-66-524 and Section II. The minimum thickness at any point shall not be less than 90% of the specified minimum average thickness as shown in ICEA S-66-524 Table 3-1A.
j. Identification:
    i. Power Cables: Circuit identification according to ICEA S-19-81 appendix K Method 4.
    ii. Instrumentation Cables: Two conductor pairs---black and white

with printed pair number.

iii. Control Cables: Number of conductors color coded with printed numbers for each conductor.

k. Legend: Cables shall be printed on jackets with manufacturer's name, gauge size, number of conductors, pairs, and voltage sequentially every two feet, pertinent UL information. Reels shall be labeled and tagged.

l. Cable Performance: Cables shall pass IEEE-383/NRC regulation 1.13.1, UL 1581, CSA FT4/IEEE 1202 70000 BTU/hr gas ribbon burner vertical tray flame test, as well as IEEE 383/NELPIA 210000 BTU/hr gas ribbon burner vertical tray corner flame test. Cables shall be in compliance with EPA 40CPR, Part 261.

m. Testing: Cables shall be subjected to insulation resistance test in accordance with ICEA S-66-524.

n. Cable termination fittings shall be suitable for use with jacketed continuous-armor cable. Terminators shall be watertight, and shall be suitable for bottom, side, or top entry into boxes. O-Z/Gedney – a division of Emerson, PLM, or equal.

o. Acceptable Manufacturers: USA Cable and Wire, Rockbestos Guardex, or equal.

7. Tray cable shall consist of 600V copper conductors, of size and quantity as indicated on the Drawings, protected by a positive PVC outer plastic abrasion resistant fire resistant covering. The conductors shall be twisted together and shall have an overall moisture and fire resistant fibrous covering. The cable shall have a grounding conductor of copper. The cable shall meet the requirements of Article 336 of the National Electrical Code for "Type TC" Tray Cable and shall bear the U. L. Label. Acceptable Manufacturers: U.S. Wire & Cable, Houston Wire & Cable, or equal.

8. All instrumentation control cables (4-20 mA signal) referred to on the Drawings as "twisted shielded pairs", shall be rated 600V, 80 deg. C, individually shielded twisted pairs, No. 16 AWG, stranded conductors of tinned copper with polyethylene insulation and aluminum-polyester shielding with #18 awg stranded copper drain wire surrounded by a chrome PVC jacket. Control cable shall be UL listed with 100% shield coverage. All underground instrumentation cables shall be U.L. Listed and Labeled for underground use in wet locations. Provide Houston Wire & Cable HW106 instrumentation control cables or equivalent unless specified otherwise by the instrument manufacturer.

9. Three conductor shielded cable for use with remote potentiometers for varying motor speeds etc. Cable shall be stranded, tinned copper, polyethylene insulated, drain wires with aluminum-polyester shielding with #18 awg stranded copper drain wire surrounded by a chrome PVC jacket. Control cable shall be rated 600 volt and shall be UL listed with 100% shield coverage. Acceptable Manufacturers: Belden, Alpha Wire & Cable or equal. Provide three conductor shielded cables equivalent to Belden type 8618 or equivalent unless specified otherwise by the instrument manufacturer.

10. RTD wiring shall be rated 600V, 60 degree, triads 3C#16TWS, with stranded, tinned copper, polyethylene insulated, drain wires with aluminum-polyester

shielding with #18 awg stranded copper drain wire surrounded by a chrome PVC jacket. Control cable shall be UL listed with 100% shield coverage. Acceptable Manufacturers: Belden, Alpha Wire & Cable, or equal. Provide RTD wiring equivalent to Belden type 8618 or equivalent unless specified otherwise by the instrument manufacturer

11. Thermocouple wire shall be 600V, No. 16 AWG, solid duplex, tinned copper, polyethylene insulated of materials to match the characteristics of the thermocouple. Thermocouple lead wire shall have PVC insulation with PVC jacket.
12. Intercommunication Wiring:
    a. Conductors for intercommunication wiring in indoor applications shall be 150V, 80 deg C, tinned copper, PVC insulated twisted pair, 24 AWG solid conductor with chrome PVC jacket, two-pair minimum. Acceptable Manufacturers: Belden type 9562, Alpha Wire & Cable, or equal.
    b. Conductors for underground intercommunication wiring shall 24 AWG solid bare copper, low smoke PVC insulated (ls PVC), twisted pairs (unshielded) conductor surrounded by a white category 3 ls PVC outer jacket, four-pair minimum, U.L. Listed and Labeled for underground wet locations. Acceptable Manufacturers: Belden type 1245A2, Alpha Wire & Cable, or equal.
13. Data Wiring:
    a. Cables for data wiring shall be Category 6, 4-pair, 24 AWG solid bare copper conductor, unshielded, FEP insulation, plenum rated. Acceptable Manufacturers: Belden Type 7813LC, Alpha Wire & Cable, or equal.
14. Fire Alarm Wiring:
    a. Signaling circuit conductors for fire alarm wiring installed within buildings shall be 300V, 105 deg C, power limited, type FPLR cable, #14 AWG minimum solid bare copper with PVC insulation encased in a red PVC outer jacket. Acceptable Manufacturers: Belden type 9580 (for two conductors), Alpha Wire & Cable, Houston Wire, or equal. See drawings for exact number of conductors.
    b. Fire alarm wiring installed within buildings indicated on the drawings to be shielded shall be 300V, 105 deg C, power limited, type FPLR cable, #14 AWG minimum solid bare copper with PVC insulation, aluminum-polyester shield and a #16 awg stranded tinned copper drain wire encased in a red PVC outer jacket. Acceptable Manufacturers: Belden, Alpha Wire & Cable, Houston Wire, or equal. Provide fire alarm wiring equivalent to Belden type 9581 (for two conductors). See drawings for exact number of conductors.
    c. Conductors for fire alarm wiring installed between buildings either aerially or in underground duct banks, or any location in close proximity with higher voltage wiring, shall be 300V, 105 deg C, power limited, U.L. Listed and Labeled for underground wet locations, type FPLR twisted shielded pair cable. Cables shall be #12 AWG minimum, solid bare copper with PVC insulation, aluminum-polyester shield and a #16 awg stranded tinned copper drain wire encased in a red PVC outer jacket. Acceptable

Manufacturers: Belden, Alpha Wire & Cable, Houston Wire, or equal. Provide fire alarm wiring between buildings equivalent to Belden type 9583 (for two conductors) or equal. See drawings for exact number of conductors.

15. Telephone wiring:
    a. Conductors for telephone wiring in indoor applications shall be 150 V, 80 degrees C, tinned copper, PVC insulated twisted pair, 24 gauge solid conductor with chrome PVC jacket, two-pair minimum or as indicated on the drawings, Belden type 9562, Alpha Wire and Cable or equal.
16. Medium Voltage Cable and Accessories
    a. 5KV cable system shall consist of single-conductor, shielded, ethylene propylene rubber (EPR) insulated, polyvinyl chloride (PVC) jacketed, rated for 5,000 volts, ungrounded neutral (133% insulation level) service. Conductor shall be Class B, compress¬-strand copper, size as indicated on the Drawings. The conductor shall be covered with a layer of semiconducting tape completely covering the conductor and firmly bonded to the EPR insulation. Shielding shall consist of a semi-conducting insulating shield applied over the EPR insulation, and a 5 mil thick bare copper tape with a minimum 12.5% overlap applied over this shield, a non-hygroscopic polyester film tape shall separate the shielding from the cable jacket. A PVC jacket shall be applied overall. All cable shall comply with the latest editions of the following standards: ASTM B-496, ICEA S-68-516, AEIC CS6, and UL 1072 for single conductor cable. Acceptable manufacturers: Okonite, Pirelli, South Wire or equal.
    b. 15KV cable system shall consist of single-conductor, shielded, ethylene propylene rubber (EPR) insulated, polyvinyl chloride (PVC) jacketed, rated for 15,000 volts, ungrounded neutral (133% insulation level) service. Conductor shall be Class B, compress-strand copper, size as indicated on the Drawings. The conductor shall be covered with a layer of semiconducting tape completely covering the conductor and firmly bonded to the EPR insulation. Shielding shall consist of a semi-conducting insulating shield applied over the EPR insulation, and a 5 mil thick bare copper tape with a minimum 12.5% overlap applied over this shield, a non-hygroscopic polyester film tape shall separate the shielding from the cable jacket. A PVC jacket shall be applied overall. All cable shall comply with the latest editions of the following standards: ASTM B-496, ICEA S-68-516, AEIC CS6, and UL 1072 for single conductor cable. Acceptable manufacturers: Okonite, Pirelli, Southwire, Thomas & Betts – a division of ABB Elastimold Cable Accessories, or equal.
    c. Provide medium voltage stress cones rated for the size of conductors shown on the Drawings as required for all medium voltage rated cable installation and as recommended by equipment manufacturer.
17. Fiber Optic Cable:
    a. Provide indoor/outdoor type fiber optic cable with a minimum bending radius of 4 inches and a minimum tensile strength of 300 lb.
    b. Transmission Distance: up to 2000 km

c. Construction: The cable shall be loose tube type design with an inner PVC tube containing the optical fibers and an outer UV resistant, flame retardant Poly jacket.
d. Cables shall be outdoor/indoor rated and suitable for installation in buried conduit.
e. Optical Fibers: A minimum of three (3) channel (six fibers) multimode, 62.5/125 fibers per cable compatible with IEEE 802.3 10/100 Base F standard.
f. Termination: SC connector type to be used on all Fiber connections. Field terminations shall be fused using a splicing device specifically designed for joining fiber optic cable. Chemical fusing shall not be acceptable. The dB loss of each fiber segment shall be tested using appropriately calibrated test equipment and a report shall be submitted to the Engineer of the testing results. Provide calibration certificate showing calibration within past twelve months.
g. Fiber Optic Cable Equivalent to:
    i. Berk-Tek Advetum
    ii. Corning Fiber Optic Freedom Cable
    iii. Hitachi Cable
    iv. Or equal

E. Outlet Boxes
1. Standard, recessed outlet boxes and covers shall be galvanized steel not less than 1-1/2 inches deep, 4 inches square or octagonal, with knockouts. Recessed boxes shall only be used for recessed work. Acceptable Manufacturers: Thomas & Betts, Steel City, OZ Gedney, Raco or equal.
2. Outlet boxes exposed to moisture or used for exposed work shall be cadmium cast alloy complete with hubs and gasketed screw fastened covers.
3. Outlet boxes used in hazardous, Class I, Div 1, Group C & D locations shall be UL Listed Feraloy iron alloy body with electrogalvanized and aluminum acrylic paint or epoxy powder coat complete with hubs as required for the installation. Provide covers to fit the application. Covers to be utilized for pendant mounted light fixtures shall incorporate flexible cushion or ball type fixture hangers rated for the area in which it is to be installed. Acceptable manufacturers: Crouse Hinds, Appleton, or equal.
4. Outlet boxes used in corrosive, NEMA 4X areas, shall have a plastic P.V.C. coating as previously described in the conduit, raceway and tubing section. Acceptable manufacturer shall be Rob-Roy "Plasti-Bond", Thomas & Betts, Ocal, or equal.
5. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for the conductor sizes installed.
6. Acceptable Manufacturers: Thomas & Betts, Steel City, OZ Gedney, Crouse-Hinds, Raco or equal.

F. Pull and Junction Boxes
1. Boxes shall be with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type flush covers. Boxes with hinges and side clips are not acceptable. Boxes installed in damp locations shall be of

watertight construction with gasketed cover and conduit hubs. Refer to the Electrical Drawing E-1 for NEMA rated areas for this project and pullbox type and use required.

2. Boxes installed in Class I, Div 1, Group C & D locations shall be constructed of copper free aluminum (body and cover), extruded aluminum hinges with stainless steel cover bolts and neoprene gasket. The box shall be UL Listed for the location and sized as required for the application. Provide NEMA 4/7 pullboxes when installed in these areas.
3. Boxes used in corrosive, NEMA 4X areas, shall have a plastic P.V.C. coating as previously described in the conduit, raceway and tubing section. Acceptable manufacturer shall be Rob-Roy "Plasti-Bond", Thomas & Betts – a division of ABB/ Ocal, Perma-COTE, or equal.
4. In no case shall boxes be sized smaller than as indicated in Article 317 of the National Electrical Code for Conduit and Conductor sizes installed.

G. Expansion Fittings

1. Expansion fittings for exposed conduit runs shall be watertight expansion type designed to compensate for up to 8" of movement (4" in either direction). Fittings shall be U.L. listed, shall be malleable iron or ductile iron with exterior and interior zinc plating for corrosion protection. With U.L. listed internal bonding jumper constructed of a tinned copper braid, sized to meet UL fault current test requirements and comply with bonding requirements –NEC 250-.98. Acceptable Manufacturer: Thomas Betts – a division of ABB Type XJG-TB O.Z./Gedney - a division of Emerson- Type EX, Crouse Hinds, or equal.
2. Expansion/deflection fittings for concealed conduit runs shall compensate for up to 3/4" of movement in any direction. Fittings shall be U.L. listed and be water, rain and concrete tight. Fittings shall be constructed of bronze end couplings, neoprene sleeve with stainless steel bands and an internal braided tinned copper bonding jumper and Ericson type conduit union. Acceptable manufacturer: O.Z. Gedney type a division of Emerson -DX, Thomas Betts – a division of ABB - type XD, or equal.

H. Wiring Devices

1. Wiring devices shall be specification grade as described herein. Switch handles, receptacles, etc. shall be installed in a single color. New wiring devices installed in existing facilities shall match previous installed devices. Provide device cover plates of satin finish stainless steel in finished areas and cadmium finished sheet steel in unfinished areas. Coordinate cover plate colors and finish with Architect or Engineer in finished office areas. Acceptable manufacturers are: Hubbell Inc., Cooper-Arrow-Hart – a division Eaton, Pass & Semour – a Division of Legrand, Thomas & Betts – a Division of ABB, or equal. Provide devices as indicated by Contract Documents.
2. Toggle Switches
   a. 20 Ampere, 1-pole, 277 Volt: Hubbell 1221
   b. 20 Ampere, 2-pole, 277 Volt: Hubbell 1222
   c. 20 Ampere, 3-way, 277 Volt: Hubbell 1223
   d. 20 Ampere, 4-way, 277 Volt: Hubbell 1224
   e. 20 Ampere, 1-pole, 277 Volt w/Neon Pilot Light: Hubbell 1221-PL

f. 20 Ampere, 2-pole, 277 Volt w/Neon Pilot Light: Hubbell 1222-PL
g. 20 Ampere, 3-way, 277 Volt w/Neon Pilot Light: Hubbell 1223-PL
h. Emergency Boiler Shutoff Switch: Hubbell 1221-RDB w/red device plate and engraved lettering reading "Emergency Boiler Shutoff".

3. Receptacles
   a. 20 Ampere, 125 Volt, Single Receptacle: Hubbell 5361
   b. 20 Ampere, 125 Volt, Duplex Receptacle: Hubbell 5362
   c. 20 Ampere, 125 Volt, Duplex G.F.I. Receptacle: Hubbell GF-5362
   d. 30 Ampere, 125/250 Volt, Dryer Receptacle: Hubbell 9430A
   e. 50 Ampere 125/250 Volt, Range Receptacle: Hubbell 9450A
   f. 20 Ampere, 125 Volt, Duplex, Extra Duty While In Use Cover:: Crouse Hinds WIUM1G1 with GFI receptacle
   g. 20 Ampere, 125 Volt, Duplex, Explosion proof:
      i. Crouse Hinds ENR12201 W/(2) ENP5201 Plugs (Dead End Type)
      ii. Crouse Hinds ENRC22201 W/(2) ENP5201 Plugs (Feed Thru Type)
   h. 30 Ampere, 600 Volt, 2-wire, 3-Pole Welding Receptacle:
      i. Crouse Hinds ARE3322 W/APJ3575 Plug (Surface Mount)
      ii. Crouse Hinds AR332 W/APJ3575 Plug (Flush Mount)
   i. 30 Ampere, 600 Volt, 3-Wire, 4-Pole Welding Receptacle:
      i. Crouse Hinds ARE 3422 W/APJ3485 Plug (Surface Mount)
      ii. Crouse Hinds AR342 W/APJ3485 Plug (Flush Mount)
   j. 60 Ampere, 600 Volt, 2-Wire, 3-Pole Welding Receptacle:
      i. Crouse Hinds ARE6323 W/APJ6385 Plug (Surface Mount)
      ii. Crouse Hinds AR632 W/APJ6385 Plug (Flush Mount)
   k. 60 Ampere, 600 Volt, 3-Wire, 4-Pole, Welding Receptacle:
      i. Crouse Hinds ARE6424 W/APJ6485 Plug (Surface Mount)
      ii. Crouse Hinds AR642 W/APJ6485 Plug (Flush Mount)
   l. Special duty style and type receptacles greater than 20 ampere shall be submitted for specific applications indicated on the drawings specific for each area and load to be connected.
   m. Isolated ground type orange coded receptacles rated 20 ampere, 125 volt duplex shall be submitted for all computer power equipment shown on the drawings.
   n. Metallic and Non-Metallic Pin and Sleeve type devices and Interlocked receptacles shall comply with NEMA 250, UL94, 746C, 840, 1010,1682 and UL1686 and ASTMD570, IEC 309-1 as indicated on detail drawings. Acceptable manufacturers shall be Crouse Hinds – a division of Eaton, Hubbell, Thomas & Betts – a division of ABB, Russell Stoll Max Guard, or equal.

4. Telephone/Intercommunication System Outlets
   a. Provide 4" x 2" outlet box with Hubbell PJ216 telephone plate.
   b. Provide outlet box with telephone RJ11 and data RJ45 for combination telephone / data outlet, as required. Single telephone RJ11 outlets only shall be provided as indicated on the drawings.
   c. Telephone/intercommunication system outlets shall be Hubbell, Crouse-Hinds, or equal.

I. Control Devices and Equipment:
   1. Photoelectric Control:
      a. 120 Volt, SPST, 2000 Watt: Tork Model 2101
      b. 120 Volt, DPST, 6000 Watt: Tork Model 5403
   2. Lighting and Control Contactors:
      a. Contactors shall be electrically operated, electrically held and shall switch a load at 277 volts, 60 hertz and shall have the number of N.O. contacts and N.C. contacts shown on the Drawings. Minimum number of contacts shall be 5 N.O. and 1 N.C. contact.
      b. The contactor shall be continuously rated 20 amperes per pole for all types of ballast and tungsten lighting and resistance loads, and shall not be de-rated for use on high-inrush loads. The coil should be continuously rated and encapsulated.
      c. The contactor shall have double-break, silver-cadmium-oxide power contacts. Auxiliary arcing contacts are not acceptable. All power contacts shall be convertible from N.O. to N.C. or vice-versa. All contacts shall have clearly visible N.O. and N.C. contact-status indicators.
      d. The contactor shall be approved per UL 508 and CSA.
      e. The contactor shall be designed in accordance with NEMA ICS2-211B. They shall be industrial-duty rated for applications to 600 volts maximum.
      f. The contactor shall have a NEMA Type 1 enclosure unless noted otherwise on the Drawings.
      g. Refer to Drawings for location, wiring schematics and details.
      h. Acceptable manufacturers: Square D, Cutler-Hammer, or equal.
      i. Provide complete system lighting and control panel layout and wiring diagrams for review and approval.

J. Motor Starters
   1. For Single Phase Motors: Fractional Horsepower Manual Motor Starter with Thermal Overload(s) and a red running indicating light unless noted otherwise:
      a. 120 Volt Single-Pole, Surface Mounted: Square-D FG-1P
      b. 120 Volt Single-Pole, Flush Mounted: Square-D FS-1P
      c. 120 Volt, Single-Pole, Surface Mounted, Explosion Proof: Square-D FR-1H
      d. 120 Volt, Single-Pole, H-O-A Selector, Surface Mounted: Square-D FG-71P
      e. 120 Volt, Single-Pole Two-Speed, Surface Mounted: Square-D FG-11P
      f. 240 Volt, Two-Pole, Surface Mounted, Explosion Proof: Square-D FR-2H
      g. 240 Volt, Two-Pole, Surface Mounted: Square-D FG-2P
      h. 240 Volt, Two-Pole, Two-Speed, Surface Mounted: Square-D FG-22P
      i. 240 Volt, Two-Pole, H-O-A Selector, Surface Mounted: Square-D FG-72P
   2. For Three Phase Motors: Shall be combination starter/disconnect type, employing magnetic starter (NEMA Size 1 minimum), rated to match the equipment served, with thermal overload protection for each phase and with an M.C.P. type circuit breaker/disconnect sized per the circuit breaker

manufacturer's recommendations for coordination with the thermal overload protection, lights, relays and auxiliary devices. Combination starters shall be provided with a 480, 240 or 208-120 volt control power transformer with primary and secondary fusing. Provide 2 N.O. and 2 N.C. auxiliary contacts.

3. Refer to control wiring diagrams on the drawings for specific requirements and devices.
4. Acceptable Manufacturers: Square-D, Cutler-Hammer, Allen-Bradley, or equal.

K. Safety Switches

1. All safety switches shall be NEMA Type HD and Underwriters Laboratories Listed.
2. The handle position shall indicate whether the switch is "ON" or "OFF".
3. All current carrying parts shall be plated to resist corrosion and promote cool operation. Switches shall have removable arc suppressers where necessary to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 60°C or 75°C, aluminum or copper wires.
4. Provisions for padlocking the switch in the "OFF" position with at least three locks shall be provided.
5. Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door when the handle is in the "ON" position, and to prevent closing of the switch mechanism with the door open.
6. Disconnect switches, indicated on the drawing to be used for motors controlled by variable frequency drives shall be as indicated above, except shall be 4 pole type switches. The fourth pole shall be wired directly to the disable input, in series with the safety e-stop, in order to lock-out and immediately shutdown the drive. The auxiliary 4th pole shall open prior to any of the other three power poles and shall be designed for proper use with VFD type load circuits.
7. Enclosures
   a. Safety switch enclosures for non-hazardous locations painted galvanized steel for NEMA 12 area and stainless steel for NEMA 4X areas. Enclosures shall be provided with "ON" and "OFF" position identification and lockable in the “OFF” position.
   b. Switches specified as NEMA 7 Class 1, Division 1 shall be furnished in cast aluminum enclosures with conduit provisions as specified. Enclosures shall be provided with a bolted cover and with sealing means for hazardous location protection. "ON" and "OFF" position identification shall be cast into the cover, not painted on or applied with an adhesive.
8. Acceptable Manufacturers: Square-D, Cutler-Hammer, General Electric, Siemens, or equal.

L. Fusible Disconnect Switches

1. Switches shall be horsepower rated for ac and/or dc as indicated by the plans. All fusible switches rated 100 thru 600 amperes at 240 volts and 30 thru 600 amperes at 600 volts shall have a UL approved method of field conversion from standard Class H fuse spacing to Class J fuse spacing. The switch also must accept Class R fuses and have provisions for field installation of a UL listed rejection feature to reject all fuses except Class R. The UL listed short circuit

rating of the switches shall be 200,000 rms symmetrical amperes when Class R or Class J fuses are used with the appropriate rejection scheme. The UL listed short circuit rating of the switch, when equipped with Class H fuses, shall be 10,000 rms symmetrical amperes. The cost of any conversion kit and labor associated with conversion to accommodate the required fuses shall be included in the base bid. In general, U.L. Class H fuses are not to be used. Refer to the paragraph on fuses, this section on further requirements for fuses.

2. Enclosures
   a. Safety switch enclosures for non-hazardous locations painted galvanized steel for NEMA 12 area and stainless steel for NEMA 4X areas. Refer to Drawing E-1 for NEMA classifications.
   b. Switches specified as NEMA 7 & 9 shall be furnished in cast aluminum enclosures with conduit provisions as specified. Enclosures shall be provided with a bolted cover and with sealing means for hazardous location protection. "ON" and "OFF" position identification shall be cast into the cover, not painted on or applied with an adhesive.
3. Acceptable Manufacturers: Square-D, Cutler-Hammer, General Electric, Siemens, or equal.

M. Manual Transfer Switch
1. The manual transfer switch shall meet NEMA rating where equipment is to be installed as shown on drawings. Manual transfer switch shall be heavy duty, double throw, quick-make, quick break with voltage, number of poles and ampere rating as noted on the Drawings.
2. A manual transfer switch manufacturer shall have been regularly engaged in the production of U.L. (Underwriters Laboratory) Standard 1008 Listed transfer switches. The transfer switches shall be documented, and have been offered for sale on the open market for a minimum of five (5) years. The manufacturer shall provide factory trained parts and service support through a factory authorized distributor that is regularly doing business in the area of the installation.
3. The manufacturer shall supply literature containing diagrams, parts lists and descriptions sufficient for the owner's personnel, or subcontract supplier to install, operate and perform normal maintenance on the equipment.
4. Manual transfer switch shall be as manufactured by Square D, General Electric, Cutler-Hammer or equal.

N. Enclosed Circuit Breakers
1. Circuit breakers shall be molded case, thermal-magnetic type, ratings as noted, with over-center, trip-free, toggle-type operating mechanism, quick-make, quick-break action and positive handle indication unless otherwise noted. Multiple pole breakers shall be common trip type. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Breakers shall be calibrated for operation, an ambient temperature of 40*C and shall be suitable for mounting and operating in any position. Breakers shall have removable lugs, U. L. listed for copper and aluminum conductors.

2. Breakers shall be installed in enclosures as specified in Section 16160, with NEMA ratings as indicated on the Drawings.
3. Breakers shall be provided with manufacturer installed neutral and ground kits and shall be U.L. listed and labeled for service entrance duty as noted on the drawings and where required by the N.E.C. Short circuit ratings of equipment shall be as noted on the drawings or shall be rated equal to the equipment or motor control center which they feed. The minimum rating shall be 42,000 A RMS symmetrical unless otherwise noted or determined by the Engineer.
4. Enclosures for circuit breakers shall meet the NEMA requirements where being installed and have side handle operating mechanism.
5. All side mounted handle operators shall be pad-lockable in both the "ON" and the "OFF" position.
6. Acceptable Manufacturers: Square-D, Cutler-Hammer, General Electric, Siemens, or equal.

O. Power Distribution Fuses
1. All fuses rated 600 volts and below shall be rejection type dual-element, time-delay type. Acceptable Manufacturers are Bussman, Littlefuse and Shawmut or equal.
2. Fuses shall be U.L. Class and rating as shown on the drawings or as required by the manufacturer of the equipment they are protecting. In general, fuses shall be:
   a. U.L. Class RK1 for service entrances and feeders supplying combination motor loads.
   b. U.L. Class RK5 for motor branch circuits.
3. Provide two (2) complete sets of fuses for all fusible disconnect switches.

P. Ground Rods, Ground Cable, Ground Fittings
1. Ground Rods shall be copper-clad steel at least 3/4-inch in diameter and 10 feet long. The rods shall have a hard, clean, smooth, continuous, surface throughout the length of the rod.
2. Ground System Cable and taps shall be copper stranded, sized as indicated on Drawings and/or in Section 16450. Exothermic welding connections shall be required for underground connections; mechanical fittings are acceptable for above ground connections only. Acceptable manufactures are Erico-Cadweld, Thomas & Betts-Blackburn, Galvan, or equal.
3. Irreversible compression connectors must be factory filled with an oxide inhibitor and installed with the same manufacturers die so that the die index matches the listed index on the connectors. Connector must be fully crimped with a 14 ton or larger hydraulic tool so that the index number is indented on the connector. Connectors must comply with IEEE837, UL467 and CSA22.2. As manufactured by: Thomas & Betts-Blackburn, Hubbell-Burndy, Erico, or equal.

Q. Phase Failure Relay
1. Phase failure relays shall be three phase, three wire rated for use at the voltage indicated on the Drawings. When the relay is in an energized condition, a loss of power or a phase unbalance of more than 10% and/or phase reversal shall cause the output relay to de-energize, returning NO contacts to their passive

state. The relay shall automatically reset when the correct conditions are re¬-established. Phase failure relays shall be equipped with a built-in 0.2 second time delay to prevent nuisance tripping. Phase failure relays shall be open-type to be mounted within motor starter compartments. Relays shall be Cutler-Hammer Type P, Square D, or equal.

R. Electrical and Telephone Manholes Conduit Racks:
   1. Each manhole structure shall be provided with PVC heavy duty cable racks, cable supports, cable wraps, and mounting hardware for grounding each manhole.

S. Link Seal
   1. Conduit wall and floor seals for cored holes and sleeved openings shall be Link Seal, Innerlynx, Crouse Hinds, or equal. Refer to the contract drawings for additional requirements.

T. Cable Seals
   1. Conduit sealing bushings shall be OZ Gedney Co., Type CSB Series, Crouse Hinds, Killark, or equal.

U. Conduit Seals-Offs
   1. Provide Class I, Div. 1, Group D and Class 1, Div. 2 seals as required by the N.E.C. Material shall match the conduit in which being installed. Acceptable manufacturers are Appleton, Crouse-Hinds, Killark, or equal.

V. Hand Hole
   1. Electrical hand holes shall be Composolite as manufactured by Strongwell Corporation or equivalent. Precast concrete hand holes as detailed on the Drawings shall also be acceptable. Hand holes shall be sized per the N.E.C. according to number and sizes of entering conduits. All hand holes shall be rated for ANSI H-2O wheel loading in roadways, and parking areas, and Tier 22 for all other locations. Separate hand holes and conduit systems shall be provided for power, control, and instrumentation systems.

W. Terminal Cabinet
   1. The enclosure shall meet NEMA rating listed on Drawing E-1 which shall include a fully hinged door with a key lockable handle with no side clips around the edge. In no case shall enclosure be sized smaller than as indicated in the National Electrical Code for Conduit and Conductor sizes installed.
   2. Provide a lamacoid Name Plate at the top center of the cabinet.
   3. All terminal strips shall be numbered on both sides and numbering shall not be repeated within the same enclosure. Provide tags to indicate destination of cable on either side of terminal connections.
   4. Provide an internal backboard for all enclosures
   5. Provide separate terminal strips for power, control, and signal wiring. Also provide separation between all terminal strips. In addition, separation and separate terminal strips shall be provided for 120V and 24V control wiring.
   6. Enclosure shall be free standing with the minimal dimensions as follows:
      a. 90 inches high, 36 inches wide, and 24 inches deep. This will allow for future equipment to be installed.
      b. Three point lockable handle.
      c. Large nameplate at top center of panel.

d. 60 spare terminals.
e. Create terminal strips to allow for additional equipment to be mounted on back panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise noted, wiring for all systems indicated in the Contract Documents shall consist of insulated conductors installed in raceways in accordance with the manufacturer's instructions.
   1. Raceways shall be continuous from outlet box to outlet box and from outlet box to cabinet, junction or pull box. Secure and bond raceways to all boxes and cabinets such that each system of raceways will be electrically continuous throughout.
   2. Contract drawing E-1 NEMA CLASSIFICATIONS FOR ELECTRICAL EQUIPMENT AND ENCLOSURES indicates the NEMA ratings of each location at the facility.

B. Unless otherwise indicated on the Drawings and Conduit Installation Schedule on E-1, install all wiring in the following applicable raceway system**:**
   1. Wiring above 600 volts in indoor dry locations (NEMA 1 or 12) Heavywall aluminum conduit. Galvanized heavy duty rigid steel conduit as approved by the Engineer.
   2. Wiring 600 volts or less in dry concealed non hazardous locations [hung above ceilings, attic areas, or within CMU block walls] (NEMA 1 or 12): Galvanized electrical metallic tubing (for raceway sizes up to and including 2" trade size) or galvanized rigid heavy wall steel conduit.
   3. Wiring 600 volts or less in dry exposed indoor locations (NEMA 1 or 12): Rigid heavy wall aluminum conduit. Galvanized rigid heavy wall steel conduit as approved by the Engineer.
   4. Wiring 600 volts or less in indoor wet locations or outdoor above grade locations (NEMA 3R or 4X): Rigid heavy wall aluminum conduit. Galvanized rigid heavy wall steel conduit as approved by the Engineer.
   5. Wiring 600 volts or less in indoor or outdoor corrosive chemical areas (NEMA 4X Corrosive): use PVC-coated rigid steel conduit in these areas less than 8 feet from finished floor. Use PVC Schedule 80 conduit in these areas 8 feet or more from finished floor in corrosive chemical areas. Where conduits transition, a NEMA 4X stainless steel or PVC coated junction box or pull box must be installed. The metal conduit shall be provided with a grounding bushing and the metal conduit and metal box shall be bonded to the ground conductor within the raceway per NEC.
   6. Wiring 600 volts or less in hazardous locations (NEMA 7, Class 1, Div.1):, PVC coated galvanized rigid steel conduit, installed per Article 501 of NEC. Attics and other concealed locations adjacent hazardous locations shall be considered hazardous areas as well unless otherwise defined by the Engineer.
      a. PVC coated rigid galvanized steel (RGS) conduit: manufacturer shall provide field installers certification training. All installers shall be field

certified from manufacturer and provide proof of certification for installation upon request.

b. All field installation and repairs of PVC coated rigid galvanized steel (RGS) conduit shall conform to manufacturer's recommendation and use of manufacturer patch and repair kits in order to guarantee certified products are used and compliance with all factory warranty guidelines are met.

7. Wiring 600 volts or less in hazardous locations (NEMA 7, Class 1, Div.2): Galvanized rigid heavy wall steel conduit or heavy wall aluminum conduit installed per Article 501 of NEC. Attics and other concealed locations adjacent hazardous locations shall be considered hazardous areas as well unless otherwise defined by the Engineer.
8. Use of Miscellaneous Conduit Types
   a. Flexible "liquid tight" metal conduit shall be used for final connection to the following:
      * all motors * rotating or vibrating equipment
      * dry type transformers * recessed lighting fixtures
      Lengths of liquid tight flexible metal conduit shall be kept to a minimum (12 to 18 inches) and maximum length of 2'-6" except when dictated otherwise by a particular installation approved by the Engineer and as allowed by NEC.
   b. PVC Schedule 80 non metallic conduit shall be used as shown on drawings.
   c. Conductors for fire alarm circuits shall be routed in rigid galvanized steel conduit unless otherwise noted on the drawings. Minimum conduit size shall be ¾".
   d. Armored direct burial cable shall be installed underground to equipment as shown on drawings.
   e. Metal Clad cable (MC) shall be installed in the following locations:
      i. Used for whips for concealed lights above hung ceiling limited to 3' in length.
      ii. Within studded concealed wood frame walls for receptacles and light switching.
9. All signal wiring shall be installed in rigid galvanized steel or PVC coated rigid galvanized steel conduit.

C. Cable Tray
1. When shown on drawings, cable tray system shall be utilized for routing conductors.
2. Provide bonding and grounding, as required of all raceway systems to ensure electrical continuity back to the power source for a complete system.
3. Conductor drops to electrical loads from the tray system shall be accomplished using either tray, channel or conduit with approved pullbox transition section and fittings and bonding to the tray system to maintain electrical continuity for a complete system.
4. Cable tray shall be installed level, parallel or perpendicular to walls, ceilings and floors.

5. Cable trays installed in a stacked manner shall leave a minimum of 9 inches between top of tray and bottom of additional trays.
6. Fittings and hardware used in connection of tray sections or supports shall be constructed of the same materials as the tray system.
7. Refer to the contract drawings for general cable tray layout and requirements.

D. Conduits Installed Below Grade or in Slab

1. Underground raceways
   a. All underground raceways shall be Schedule 80 heavy wall PVC.
   b. All underground conduits where they are directed toward a building or structure shall transition from non-metallic conduit to metallic rigid galvanized conduit of the same diameter 15'-0" from the respective building or structure for all locations. The same type of metallic conduit shall continue to its final location per the NEMA rating of the areas that it is installed in. Provide proper transition connections for this change in conduit type. No exceptions will be allowed.
2. Underground Raceways in Duct Banks:
   a. All underground raceways shall be Schedule 40 heavy wall PVC conduit unless otherwise noted on the drawings. All signal conduits shall be installed within rigid galvanized steel conduit.
   b. Encase all underground raceways in a concrete envelope.
   c. Refer to drawings for specific encasement duct bank details and requirements.
   d. All underground duct banks where they are directed toward a building or structure shall transition from non-metallic conduit to metallic rigid galvanized conduit of the same diameter 15'-0" from the respective building or structure for all locations. The same type of metallic conduit shall continue to its final location per the NEMA rating of the areas that it is installed in. Provide proper transition connections for this change in conduit type. No exceptions will be allowed.
   e. For all underground raceways, bottom of trench shall be solid undisturbed earth. Earth showing extensive signs of peat, cinders, rubble or any conditions not suitable for a stable foundation should be reported to the Engineer for recommendation. Small packets (up to 1 cu. yd.) of unsuitable soil shall be excavated and replaced with compacted gravel borrow maximum rock size 2 inches. In areas which have had fill work completed during the progress of work under this contract, verify that the bottom of trench is 95 percent compaction minimum. If compaction is less than 95 percent provide additional compaction in bottom of trench.
   f. Provide underground electrical marking tape for the full length of all trenches for underground raceways. Marking tape shall be SETON #85517 Electrical, Telephone, or equal.
   g. Raceways extending vertically out of slab or grade shall transition to PVC coated rigid galvanized steel sweeps and remain the same material 12 inches past the penetration, where it shall transition to approved materials per the area classification. Such conduit shall be encased using flowable fill to ensure high compaction.

h. PVC raceways installed under slab shall be buried no more than 36” from the bottom of the slab to the top of the raceway. Raceways buried deeper shall be rigid galvanized steel.

3. Raceways in Slabs:
   a. Raceways for embedment within a slab, wall or beam, other than those merely passing through, shall satisfy the following:
      i. Power and control conduits shall be rigid heavy wall Schedule 40 PVC conduit.
      ii. Instrumentation conduits shall be rigid galvanized steel or PVC-coated rigid galvanized steel conduit.
      iii. Shall not be larger in outside diameter than one-third (1/3) the thickness of the slab, wall or beam.
      iv. Raceways shall not be spaced closer than 3 diameters on center.
      v. Shall not impair significantly the strength of the concrete.
      vi. Conduits installed in slab on grade shall have a 3 inch concrete envelope and reinforcing and coverage all sides poured monolithic with the slab. Where raceways are going to remote locations it shall not be required to pour the envelope monolithic with the floor slab.
   b. Raceways beneath above grade concrete slabs shall be supported from the underside of the structural slab by means of galvanized pipe hangers spaced 5'-0" on center, maximum. After installation pipe hangers shall be coated with asphalt mastic. Installation shall maintain integrity of waterproofing membrane.
   c. Raceways which extend out from a slab, penetrate concrete floor slabs, walls, ceilings, etc., shall transition from PVC to PVC coated rigid galvanized steel 90 degree bends and shall extend a minimum of 12-inches on both sides of the concrete structure prior to transitioning to an approved raceway material as specified for the specific location and NEMA area designated.
4. General Concrete Encasement of Raceways:
   a. All concrete work required for concrete encasement of electrical duct banks shall be provided under Division 3 - Concrete, including all reinforcing steel requirements. All excavation and backfill for electrical duct banks shall be provided under Division 2 - Site Work. This Contractor shall coordinate all requirements noted herein with those Divisions for proper installation.
   b. For all underground raceways, bottom of trench shall be solid undisturbed earth. Earth showing extensive signs of peat, cinders, rubble or any conditions not suitable for a stable foundation should be reported to the Engineer for recommendation. Small packets (up to 1 cu. yd.) of unsuitable soil shall be excavated and replaced with compacted gravel borrow maximum rock size 2 inches. In areas which have had fill work completed during the progress of work under this contract, verify that the bottom of trench is 95 percent compaction minimum. If compaction is less than 95 percent provide additional compaction in bottom of trench.

c. Form concrete envelope around raceways, 3-inch minimum thickness concrete at top, bottom and sides of duct bank 3 inch minimum (outside to outside) spacing between raceways. Concrete shall be full width of trench. Top raceway shall be not less than 30 inches below finished grade, except where under building slabs. Open trench for its complete length before concrete is poured; if any obstructions are encountered, make provisions to avoid them. Support raceways minimum 3 inches above bottom of trench before pouring concrete. Provide 12" separation between Power and Control/Signal conduits.

d. Refer to structural drawings for specific concrete encasement and reinforcing requirements and details. All duct banks shall be formed with wooden forms and no other method of installation shall be allowed. Coordinate with Division 2 and 3 for final installation.

e. Furnish and install precast concrete, plastic or fiber spacers in order to achieve consistent spacing between raceways. Stagger couplings. Securely tie raceways in place to prevent floating. Pour concrete as soon as possible after placing and securing of raceways.

f. Pull iron-shod mandrel, not more than l/4 inch smaller than bore of raceway, through each raceway to remove concrete and other obstructions. Clean raceway by drawing through properly sized cylindrical brushes as many times as necessary to remove dirt.

g. All duct banks shall be installed to slope back to the respective manholes, handholes, etc. and away from buildings or structures.

E. General Raceways Installation Requirements:

1. Sized as indicated on the Drawings. Where sizes are not indicated, raceways shall be sized per the National Electrical Code in accordance with the quantity, size, type and insulation of conductors to be installed. However, raceways shall be minimum three quarter (3/4") trade size for all installation unless otherwise noted.
2. Provide adequate grounding between all outlets and the established electrical system ground. Bond conduit systems per NEC.
3. Cut square, free of burrs due to field cutting or manufacture, and bushed where necessary. Spray all ends of threaded conduit with cold galvanizing spray compound.
4. Installed with exterior surfaces not less than six inches (6") from any surface with a temperature of 200 degrees F or higher.
5. Plugged at the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.
6. Concealed throughout except where exposure is permitted by the Engineer.
7. Installed parallel or perpendicular to floors, walls and ceilings.
8. Installed with a minimum of bends and offsets. All bends shall be made without kinking or destroying the cross section contour of the raceway. Factory made bends shall be used for raceways one-inch (1") trade size and larger.
9. Installed with U. L. Listed raintight and concrete-tight couplings and connectors.

10. Firmly fastened within three feet of each outlet box, junction box, cabinet or fitting. Raceways shall not be attached to or supported by wooden plug anchors or supported from Mechanical Work such as ductwork, piping, etc.
11. Arranged in a neat manner for access and allow for access to work installed by other trades.
12. If it is necessary to burn holes through webs of beams or girders, call such points to the attention of the Engineer and receive written approval both as to location and size of hole before proceeding with work. All holes shall be burned no larger than absolutely necessary.
13. Where raceways puncture roof, install pitch pockets as required in order that the roof warranty is maintained.
14. Where raceways penetrate fire-rated walls, floors, or ceilings, install firestops equal to the rating of the wall, floor, or ceiling, per specification section 07270, "Fireproofing".
15. For Raceways installed outdoors:
    a. Conduit entry shall not extend from above and turn down to the equipment causing a path of moisture or liquid to follow down to the equipment.
    b. Install drip loops in liquid tight conduit connections and extend up to equipment to avoid moisture or liquid travel to the equipment.
    c. Seal all conduits with duct seal or cable seals that extend from heated to non-heated locations at both ends of all conduits.

F. Wiring Methods
1. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Engineer and receive written approval for splicing prior to installation of feeder(s). Refer to Splicing Methods listed below.
2. Do not pull conductors into raceways until raceway system, including all outlets, cabinets, bushings and fittings, is completed. Verify that all work of other trades which may cause conductor damage is completed. Use only U.L. approved cable lubricants when necessary. Do not use mechanical means to pull conductors No. 8 or smaller.
3. In general, conductors shall be the same size from the last protective device to the load.
4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified. Connect branch circuit wiring at panelboards, as required, in order to provide a "balanced" three-phase load on feeders.
5. All feeder connections shall be made to bus and other equipment using solderless, pressure type terminal lugs, as manufactured by Burndy, National, O.Z., T. & B., or equal.
6. All conductors shall be carefully handled to avoid kinks or damage to insulation.
7. Alarm wires shall be uniquely identified at each end with wire markers. A typed list of the numbers used and their function (alarm served) shall be submitted to the Engineer by the Contractor.
8. After installation of service conductors seal conduits with duct seal.

9. Contractor may group certain wiring with the approval of the Engineer, as follows.
   a. Power 120V may be grouped with power 120V
   b. Control 120V may be grouped with control 120V
   c. Control 24V may be grouped with control 24V
   d. Instrumentation may be grouped with instrumentation
   e. Specialty wiring may be grouped with like systems
   f. Power wiring at 480V shall not be grouped
   g. Fire alarm system wiring shall not be grouped with other systems

   The installation shall be installed in accordance with all requirements of the NEC (including wire ampacity derating factors), manufacturer's requirements, and the Engineer. Excessive grouping which interferes with functionality and reliability will not be allowed. The wiring configuration as shown on the drawings is the baseline requirement for the work.

G. Conduit Support

1. Support adequately by malleable iron pipe clamps or other approved methods. **In exterior or wet locations and along outside wall supports shall allow not less than 1/4 inch air space between raceway and wall.** Firmly fasten raceway within 3 feet of each outlet box, junction box, cabinet or fitting. The following table lists maximum spacing between supports. Additional supports may be required due to field conditions, strength of supporting members, etc. Furnish and install such supports at no additional cost to Owner.

Conduit Trade Size	Type of Run	Horizontal Spacing in Feet	Vertical Spacing in Feet
¾"	Concealed	7	10
1", 1-1/4"	Concealed	8	10
1-1/2" & lgr.	Concealed	10	10
¾"	Exposed	5	7
1", 1-1/4"	Exposed	7	8
1-1/2" & lgr.	Exposed	10	10

H. Installation of Concrete Envelope

1. Wherever a cluster of four or more raceways rise out of floor exposed, provide neatly formed 6" high concrete envelope with chamfered edges around raceways.

I. Installation of Spare Conduits

1. At each flush mounted panel-board, terminal cabinet, control cabinet, etc., provide four (4) spare three-quarter inch (3/4) raceways from panel-board, etc. to an area above the nearest accessible ceiling space and floor space in the specific room location. Make 90 degree turn above the ceiling or below the floor and cap all conduits.
2. Where drawings indicate a "Spare" conduit, install a #14 AWG fish wire in all runs to facilitate future installation of conductors.

J. Installation of Grounding Bushings

1. Provide grounding type insulated bushings on all power conduits regardless of size.
2. Provide grounding type insulated bushings on all control conduits and signal conduits regardless of size.

3. Install duct-seal in conduits for all outdoor locations and NEMA 4X locations to prevent moisture from entering enclosures and equipment.
4. Install duct-seal in all conduits where there is a change in temperature such as transitioning from a room to the attic.
5. Provide a bushing at each conduit termination unless fitting at box where conduit terminates has hubs designed in such a manner to afford equivalent protection to conductors.
6. Any installations not provided with these requirements shall be removed and reinstalled at no additional cost to the Owner.

K. Myers Hubs
1. Myers Hubs shall be of grounding type and installed on junction boxes and enclosures which do not have cast hubs in non-classified areas. All Myers Hubs shall be capable of receiving wire bonding jumper regardless of conduit size.

L. Expansion Fittings
1. All conduit installations where conduits extend up out of the ground at buildings, structures or equipment shall be provided with expansion fittings.
2. Expansion/deflection type fittings shall be provided at all horizontal or vertical expansion joints, located in new or existing buildings and structures.
3. Expansion fittings shall be watertight expansion type, designed to compensate for conduit movement. Expansion fittings shall be provided to allow movement of 4 inches in both directions for a total of 8 inches. Fittings shall have flexible copper braid bonding jumpers, neoprene sleeve and stainless-steel bands. Acceptable Manufacturer: O.Z./Gedney Type EX, Thomas & Betts, or equal.

M. Conduit Seals
1. Conduit seals shall be installed in all explosion proof areas Class 1 Division 1, and Class 1, Division 2 areas. The conduit seal shall be installed per the National Electric Code Article 501.15 as well as what is shown on the drawings.
2. Upon installation of sealant, the Contractor shall mark the conduit seal with glyptal or permanent marker to indicate that the conduit seal is filled properly.

N. Link Seals
1. All penetrations through existing and new concrete floors, and walls shall be core drilled and sleeved, and installed with a link seal.
2. Refer to all details shown on the Contract Drawings for conduit sealing fittings and weatherproof conduit seals. All conduit penetrations are required to be provided with seals as noted on the Contract Drawings and as specified. Any installations not provided with these requirements shall be removed and reinstalled at no additional cost to the Owner.

O. Raceways through Wall Bond Outs
1. In specific areas wall bond outs have been designed and shown on the electrical and structural drawings for conduit installations.

P. Splicing Methods
1. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Engineer and receive written approval for splicing prior to installation of feeder(s).
2. For splices and taps, No. 10 AWG and smaller, use solderless "Thread-On" connectors having spiral steel spring and insulated with a vinyl cap and skirt, as manufactured by 3M Co. (pre- insulated "Scotch-Lock") or Ideal ("Wing-Nuts").
3. For splices and taps, No. 8 and larger, use solderless "Split Bolt" type connector as manufactured by Anderson, Burndy, Kearney, Thomas & Betts, or equal.
4. Use cast connections, Cadweld or Thermoweld, for ground conductors.
5. Make all splices and connections in accessible boxes and cabinets only.
6. Cover uninsulated splices, joints and free ends of conductor with rubber and friction tape or PVC electrical tape. Plastic insulating caps may serve as insulation.
7. Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors as near equal as possible.
8. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using "Ty-Raps" or equal.
9. Underground Splicing
    a. This work will require that all splices be tested and also provide the splices with a compression connector on the conductor. Insulate and waterproof using one of the following methods which are suitable for continuous submersion in water:
    b. Provide cast-type splice insulation by means of molded casting process employing a thermosetting epoxy resin insulation in a packaged form ready for convenient mixing without removing from the package.
    c. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be spliced when the mold is in place around the joined conductors, prepare the resin mix and pour into the mold.
    d. Provide heavywalled heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which shall be applied by a clean burning propane gas torch.
    e. Provide a cold-shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation shall not require heat or flame, or any additional materials such as coverings or adhesives. It shall be designed to be used with in-line compression type connectors, indoor, outdoor, direct-burial or submerged locations.

Q. Installation of Ceiling Hung Devices
1. Lighting fixtures, detectors, etc., in Mechanical Equipment, Boiler and Pump Rooms shall be installed with exposed conduit after equipment, ductwork, piping, etc., are in place.

R. Light Switches
   1. All light switches shall be installed in close proximity of the door opening where indicated on drawings. Where lights are shown adjacent to strike side of door, locate edge of switch box approximately 6 inches from door frame.
   2. Install cover plates for all single and multi-gang switch boxes for all light switches.

S. Outlet Boxes
   1. On termination at branch circuit outlets, leave a minimum of eight inches (8") free conductor for installation of devices and fixtures.
   2. Consider location of outlets shown on Drawings as approximate only. Study Architectural, Mechanical, Plumbing, Process, and Structural Drawings and note surrounding areas in which each outlet is to be located. Locate outlet so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet will serve its desired purpose. Where conflicts are noted between Drawings, contact Engineer for decision prior to installation. Comply with Article 314 of National Electrical Code relative to position of outlet boxes in finished ceilings and walls.
   3. Prior to installation, relocate any outlet location a distance of five feet in any direction from location indicated on Drawings if so directed by the Engineer. Prior to completion of wall construction, adjust vertical height of any outlet from height indicated if so directed by Engineer. The above modifications shall be made at no additional cost to the Owner.
   4. Where outlets at different mounting heights are indicated on Drawings adjacent to each other (due to lack of physical space to show symbol on Drawings), install outlets on a common vertical line.
   5. Where switch outlets are shown adjacent to strike side of door, locate edge of outlet box approximately 3 inches from door frame.
   6. Outlet boxes in separate rooms shall not be installed "back-to- back" without the approval of the Engineer.
   7. Outlet boxes installed in plaster, gypsum board or wood paneled walls shall be installed with raised plaster covers or raised tile covers.
   8. Outlet boxes installed in tile, brick or concrete block walls shall be installed with extra-deep type raised tile covers or shall be 3-l/2 inches deep boxes with square corners and dimensions to accommodate conductors installed.
   9. Surface ceiling mounted outlet boxes shall be minimum 4 inches square, l-l/2 inches deep, galvanized sheet metal.
   10. Surface wall mounted outlet boxes shall be cast type boxes having threaded or compression type threadless hubs. Exterior boxes shall be cast type with threaded hubs and gasketed cover plates secured by non-ferrous screws.
   11. Install a device cover plate over each and every outlet indicated on Drawings. Do not install plates until painting, cleaning and finishing of surfaces surrounding the outlet are complete. Cover plates shall completely cover all edges of openings in the wall around the outlet box for a neat/finished installation.

T. Junction and Pull Boxes

1. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and as required by the National Electrical Code, Article 314.

U. Equipment Mounting Heights

1. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment base as follows: (Device base to be set at CMU joint unless otherwise noted. The Contractor shall verify all dimensions noted with the Engineer for final approval prior to performing or installing any of this work.)

A.	Toggle switches (up position "on")	48"
B.	Receptacle outlets (long dimension vertical,	
C.	ground pole nearest floor)	16"
D.	Receptacle outlets, above baseboard heaters	30" min.
E.	Receptacle outlets, hazardous areas	48"
F.	Receptacle outlets, at countertops	48"
G.	Receptacle outlets, weatherproof, above grade	24" min.
H.	Telephone/intercommunication outlets,	
I.	wall mounted	48"
J.	Telephone and data outlets and cable T.V. outlets	16"
K.	Fire alarm manual station	48"
L.	Fire alarm Audio/Visual Station	96"
M.	Branch circuit panelboards, to top of backbox	72"
N.	Distribution panelboards, to top of backbox	72"
O.	Terminal cabinets, control cabinets, annunciator	
P.	panels, to top of backbox	72"
Q.	Disconnect switches, motor starters, enclosed	
R.	circuit breakers, to top of box	60"

2. Where structural or other interferences prevent compliance with mounting heights listed above, consult Engineer for review to change location before installation.

V. Identification of Conduit Systems

1. Provide lamacoid nameplates to mark intrinsically safe conduit systems for all applicable conduit systems for project.

W. Grounding Connections

1. Exothermic welding connections shall be provided for underground connections.
2. Mechanical fittings and irreversible compression fittings shall be provided for above ground connections.
3. Make connections to equipment with mechanical connections shall be made by means of approved bronze clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or equal.

3.2 TESTS

A. For testing requirements, refer to Section 16950.
B. For grounding requirements, refer to Section 16450.

END OF SECTION

SECTION 16060

ELECTRICAL EQUIPMENT ENCLOSURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide enclosure to house electrical equipment. Enclosure configuration may be either a double door single sided enclosure or a back to back enclosure with single doors.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.
B. Equipment to be UL Listed and Labeled.
C. Work determined by the Engineer to be unsatisfactory according to industry standards shall be redone at the Contractor's expense, with no additional compensation.
D. Acceptable manufacturers are Hoffman, Saginaw, or equal.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop drawings are required for all items provided under this section. Submit shop drawings in accordance with Sections 01340, 16010 and as specified in this section.
B. Submit a final, dimensioned layout plan with all equipment and conduit shown for verification by the engineer and coordination of final sizing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide a free standing heavy-duty 316 stainless-steel weather tight and corrosion resistant pedestal enclosure. The enclosure shall not have any side clips around the edges and the only means of entrance shall be a key lockable handle. Devices requiring mechanical coins or quarter turn latches are not acceptable.
B. Pedestal enclosure shall be made of 12 gauge 316 stainless-steel with ¼ inch by 2 inch by 2 inch channel support on walls, roof and base. The enclosure shall be sized to house all equipment as shown on the Drawings and shall be located as shown on the Drawings. Final sizing shall be submitted as a shop drawing with all equipment shown to scale and dimensioned for performing a final review. The Contractor is responsible to coordinate and provide the correct sizing at no additional cost to the Owner.
C. The enclosure shall be U.L. listed and labeled as a complete assembly. The final sizing of the enclosure based on the supplied equipment to be selected by the Contractor shall be the responsibility of the Contractor.

D. Enclosure shall have full height hinged doors. Doors shall have vault type key lockable operating handles with three-point latch.
E. Doors shall be fully gasketed with opening of sufficient size to permit ready removal of any of the equipment installed in the compartments. Number of doors and arrangement shall be based on overall width of enclosure. Support posts shall not interfere with clearance access between doors to equipment. The enclosure shall have an aluminum mounting backboard with ground lug assembly mounted to backboard and enclosure for system grounding.
F. Six sets of keys for each lock shall be furnished.
G. Pedestal roof shall slant to the rear of the enclosure.
H. Drip shield shall extend over door opening.
I. All exposed hardware shall be stainless steel.
J. Dimensions if shown on the drawings are for reference only. The electrical enclosure shall have sufficient space to mount all equipment with proper clearances and height requirements as required per NEC. The final sizing is the responsibility of the Contractor.
K. Heat dissipation is required to remove excess heat from within the enclosure for all locations and side of the enclosure. The system supplier shall provide a complete heat rejection study and report for the heat rejection based upon all equipment to be installed within the enclosure. The heat rejection study shall provide individual and complete heat rejection calculations. It shall also include maximum heat reduction based upon the highest outdoor temperature determined for the area to be installed. Provide a complete system to include thermostat, fan, in-take louver, and out-take louver required to properly cool the enclosure. This has not been shown on the drawings for clarity. The system specified below is manufactured by Hoffman/miscellaneous equipment:
    1. Cooling Fan Package, Hoffman Catalog #TFP61SS (115 volt, Type 1 washable foam filter, 140 CFM @ 60 HZ, SS grille, composite air plenum, finger guard).
    2. Exhaust Grille, Hoffman Catalog #TEP6SS (stainless steel w/ Type 1 washable foam filter).
    3. 2-fan shroud kits, (1 on intake and 1 on exhaust), Hoffman Catalog #T103RSS.
    4. Line voltage thermostat: Honeywell T631C1103.
    5. Fractional 120V Manual Motor Starter: Square-D FG-1P
    6. The fan shall be controlled by a thermostat and power shall be obtained from a circuit breaker from the lighting panel within the electrical equipment enclosure.
    7. The enclosures shall be insulated and heated as a factory-installed requirement. Field installations after the fact will not be acceptable. Insulate the inside of all exterior surfaces with 1 inch thick rigid fiberglass insulation board having a maximum thermal conductivity ("k" value) of 0.35 BTU-in/hr-ft²-°F. The insulation shall be finished with Manufacturer's standard all service jacket. Coverings containing foil will not be acceptable.
    8. For outdoor locations, heat/sun shields fabricated from 0.125 marine grade aluminum shall be installed on front, back and sides of enclosures and control panels that house electrical components. Holes shall be cut in shield for alarm light and horn. Heat shields shall also have white polyester powder coat finish

on all sides. Provide cut-outs in the back of the enclosure to accept VFD aluminum mounting plates. Mounting plates shall be attached to studs on the back of the enclosure and gasketed. VFD enclosures located outside shall be NEMA 12 vented with the VFD heat sinks vented out the back. Consult VFD Manufacturer's installation guide for flange mount cut-out dimensions and recommended instructions. The rear sunshield shall have a removable cover with handles to allow access to the VFD heat sinks for cleaning and maintenance. The heat shield shall have studs with wing nuts for attached the removable cover. Seal all penetrations

PART 3 - EXECUTION

3.1 INSTALLATION

A. Enclosure is to be installed on an outdoor concrete pad.
B. Enclosure is to be anchored to the concrete pad with epoxy anchors as recommended by the Manufacturer.
C. Ground equipment enclosure as required by Article 250 of the National Electric Code.

END OF SECTION

SECTION 16061

MODIFICATIONS TO EXISTING ELECTRICAL EQUIPMENT ENCLOSURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section includes modifications to existing electrical equipment enclosures as specified herein and as shown on the contract drawings.

B. Modifications to existing electrical equipment enclosures are not required to be of the same manufacturer as the motor control centers provided for the project as applicable. These devices take exception to the Quality Assurance Statement of Specification 16010.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. 16010 Electrical General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that manufacturer. Equipment of other acceptable manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Modifications to Existing Electrical Equipment Enclosures:

1. The modifications to the existing motor control centers and the manufacturer are shown on the contract drawings.
2. This Contractor shall visit the site to become thoroughly familiar with the work required and specified herein. All modifications shall be performed without jeopardizing the integrity of the existing equipment. All work to be performed

shall be complete and shall meet with all standards and guidelines for installation to this equipment.

3. The contract drawings indicate that specific equipment in enclosures is to be modified. The modifications shall include new equipment and/or modifications to existing equipment installed. All new equipment and modifications to existing equipment to complete the work shown in the contract drawings shall be provided.
4. The short-circuit ratings of all new and modified devices shall be equal to or greater than that of the existing equipment. This is to be verified by this Contractor and the information furnished and included in the shop drawing submittals for this equipment.
5. The Contractor shall be allowed to replace equipment as required in its entirety. This shall be verified with the Contractor and brought to the attention of the Engineer prior to final cost submittal.
6. Provide lamacoid nameplates for all revised items as required for all devices and as noted on contract drawings.
7. The requirements noted have been outlined for this section. If any information on existing equipment cannot be verified then this shall be brought to the attention of the Engineer and verified prior to submitting bid for this project.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's instructions, contract drawings and National Electrical Code.
B. Ground all enclosures in accordance with the National Electric Code and as specified in section 16450.
C. Enclosures shall be installed on outdoor concrete pads.
D. Enclosure is to be anchored to the concrete pad with epoxy anchors as recommended by the manufacturer.
E. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16070

ELECTRICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes
   1. Support channel
   2. Fastening hardware
   3. Anchor bolts

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. 16010 Electrical General (and as referenced)

1.3 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.4 SUBMITTALS

A. Submit shop drawings, product data, and reports.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNEL

A. Channel for all locations shall be roll formed from stainless steel AISI Type 316. Channel shall be 1-5/8” and comply with the following industry standards: NFPA70, Fed Spec: W-C-582, WW-H-171, MFMA-4, and ASTM B633
B. Metal Channel framing in Class 1, Div. 1 areas and NEMA 4X-corrosive areas shall be fiberglass or PVC Coated.
C. Use 316 stainless steel fittings and hardware of the same material as channel. Fittings shall be by same Manufacturer.
D. All metal framing channel ends shall be furnished and installed with plastic caps for the entire installation of this project at all ends of framing.
E. Provide a complete 4" "C" angle 316 stainless steel channel mounting channel and hardware system as shown on the drawings and for all vertical supports. Refer to the electrical detail drawings for structural sizing and rigidity of "C" channel.
F. Metal framing shall be B-Line Systems, Inc., Thomas & Betts-Super Strut, Unistrut, or equal.

2.2 FASTENING HARDWARE

A. All fastening hardware shall be 316-stainless steel unless noted otherwise.

2.3 ANCHOR BOLTS

A. Anchor bolts, nuts, washers, bolt sleeves, and assembly hardware shall be Type

316 stainless steel. Expansion bolts shall be "Kwik Bolt II" or "HVA Adhesive Anchor" by Hilti, Tulsa, OK; Redhead "Trubolt Wedge" or "Epcon Adhesive Anchor" by ITW Ramset / Red Head, Wood Dale, IL; or Parabolt as manufactured by the Molly Division Emhart Corp., or approved equal.

B. All expansion/adhesive bolts and associated hardware are to be stainless steel.

2.4 PIPE CLAMPS AND STANDOFFS

A. Pipe clamps and standoffs shall be one hole type. They shall be of the same manufacturer and shall be designed to be used together.

B. The finish shall be 316 stainless steel type suitable for the piping system being supported. If PVC or PVC coated conduit is being supported, PVC coated clamps and standoffs shall be used.

2.5 THREADED RODS

A. Threaded hanging rods shall be 316 stainless steel and be one piece. The size shall be suitable for the loads being supported.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion or epoxy anchors, preset inserts or beam clamps. Do not use spring steel clips and clamps.

B. Use expansion or epoxy anchors or preset inserts in solid masonry walls; self-drilling, expansion, or epoxy anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors.

E. Fabricate supports from 316 stainless steel channel rigidly welded or bolted to present a neat appearance. Use 316 stainless steel hexagon head bolts with spring lock washers under all nuts.

F. Install freestanding electrical equipment on 4-inch concrete housekeeping pads.

G. Install surface-mounted cabinets and panelboards with minimum of four 316 stainless steel anchors or as shown on drawings. Provide stainless steel channel supports to stand cabinet 1 inch off wall.

H. Bridge studs top and bottom with 316 stainless steel channels to support flush-mounted cabinets and panelboards in stud walls.

I. Use standoffs on surface mounted conduit to maintain ¼" inch space between conduits and walls.

J. Light fixtures which are pendant mounted shall be supported with ¾" conduit supports and 360' swivel connectors at cast boxes. All fixtures shall be installed with weathertight conduit hubs.

K. Provide 316 stainless steel angles, channels, and other materials necessary for the proper support and erection of motor starters, distribution panelboards, large disconnect switches, pendent-mounted lighting fixtures, etc.

L. All vertical supports for stanchion mount structures and control stations shall be 4" 316 stainless steel angle channels.

M. Panelboards, cabinets, large pull-boxes, cable supports boxes and starters shall be secured to ceiling and floor slab and not supported from conduits. Small panelboards, etc., as approved by Engineer, may be supported on walls. Racks for support of conduit and heavy electrical equipment shall be secured to building construction by substantial structural supports.

N. Provide PVC end caps for all protruding angles, channels, struts, etc. for personal safety for the entire project installation.

END OF SECTION

SECTION 16075

CONDUIT, CABLE, AND WIRING IDENTIFICATION AND TAGGING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labels and tags to identify all conductors, conduits, and equipment in accordance with designations specified in this Section and in the contract documents.

B. Identification:

1. All distribution equipment (switchboards, motor control centers, distribution panelboards, transformers, transfer switches, disconnects, starters, control panels, control stations, etc.) shall have an engraved lamacoid tag, permanently mounted adjacent to the Manufacturer's nameplate, indicating the equipment's designation (as called out on the Drawings) and identification number per the Contract Documents.
2. All switchboard and distribution panel overcurrent devices, motor control center devices, individually mounted motor controllers, disconnect switches, control devices, etc., shall be provided with permanently attached engraved lamacoid tags indicating the equipment which they serve or control per the equipment designation and identification number indicated in the Contract Documents, and in accordance with OSHA requirements.
3. All branch circuit panelboards shall have, on the inner side of the door, a permanently attached, engraved lamacoid tag with the identification number of that panelboard. Provide and mount under plastic, in the directory frame of each panelboard, a neatly typewritten directory identifying the branch circuit overcurrent devices and the circuits, devices and areas which they serve.
4. All individually mounted panelboards, disconnects, motor controllers, control stations, etc. shall have a second engraved lamacoid tag below the first one which identifies from where the equipment is receiving power. This second label shall be smaller in height.
5. Label and identify with branch circuit and source panel all light switches, manual motor starters, and receptacles
6. Nomenclature on these nametags shall be project specific and wherever possible shall be full and complete. Excess abbreviations will not be allowed.
7. Power conductors shall be continuously polarized and color coded throughout using the following scheme:
   a. White - All neutral conductors, 208/120V systems
   b. Gray - All neutral conductors, 480/277 volt systems.
   c. Green - All ground conductors
   d. Phase Conductors

208/120V Systems	**240/120V Systems**	**480/277V Systems**
Phase A - Black	Phase A - Black/(Red)	Phase A - Brown
Phase B - Red	Phase B - Red/(Blue)	Phase B - Orange
Phase C - Blue		Phase C - Yellow

e. Regardless of conductor size, conductor insulation color shall correspond to the color coding required in this section.

8. Control Conductors shall be continuously polarized and color coded throughout using the following scheme:
   a. 120 Volts – Red
   b. DC Controls – Dark Blue
   c. Intrinsically Safe – Light Blue
9. All individual conductors shall be identified using unique numerical tags corresponding to conductor designations indicated on approved shop drawings of schematic diagrams for all terminations. This includes all process- and non-process-related wiring done as part of the work, such as fire alarm panels. Conductors shall be clearly identified at each terminal block, equipment connection and junction. Markings shall utilize the equipment designation and terminal block number in the device higher upstream in the system hierarchy. Markings shall follow the format "Device Tag-Equipment Served Tag-Device Terminal Block No." Refer to Division 13 for communication and Manufacturer instrument cable labeling requirements.
   a. System hierarchy shall be defined as follows:
      i. Master Terminal Unit
      ii. Remote Terminal Unit
      iii. Motor Control Center
      iv. Transmitters, Local Control Stations
      v. Elements
   b. Refer to attached figure showing sample wire labeling convention.
10. Conductor colors for power and control wiring shall be submitted for review.
11. All feeder cables shall be marked indicating load for each feeder for all junction boxes, handholes, and manholes.
12. Conduits shall be marked at both ends utilizing a stamped tag manufactured from 316 stainless steel with designations corresponding to the conduit schedule on approved drawings. Attach tags to conduits with 316 stainless steel wire. Such marking shall include the designation of the conduit, the destination of the conduit, and the type of conductors in the conduit, being power (P), control (C), or signal (S). The format for the marking shall be "Conduit Designation-Equipment Designation."
   a. For example, conduit P79 provides a power connection from Control Panel CP-CF to LIT-172. The marking at CP-CF shall therefore read "P79-LIT712." The corresponding marking at LIT-712 shall read "P79-CPCF."
   b. Conduit C90 provides a control connection from Motor Control Center MCC-1 to Control Panel CP-M. The marking at MCC-1 shall therefore

read “C90-CPM.” The corresponding marking at CP-M shall read “C90-MCC1.”

c. Conduit S37 provides a signal connection from Control Panel CP-CF to CFP-800. The marking at CP_CF shall therefore read “S37-CFP800.” The corresponding marking at CFP-800 shall read “S37-CPCF.”

d. Refer to Table 1 – Cable Identification and Tagging Schedule. A copy of this schedule will be supplied to the Contractor. The attached Table 1 located at the end of this specification section has been provided as an example of the requirements to be provided as an example of the requirements to be provided for the project. They shall be provided for all cables which are power, control, and signal to be supplied for the entire project.

13. The following safety signage shall be provided for the following equipment. Signage shall be lamacoid plastic (Large Letters) yellow background with red engraved letters:

a. All switchboards, motor control centers, VFD equipment, automatic transfer switches, solid-state, reduced-voltage starters, enclosed circuit breakers, etc., shall be provided with signage to read "DANGER - HIGH VOLTAGE". Each section (vertical component of multi-section enclosure) shall be furnished with an individual signage. Final requirements shall be determined at the discretion of the Engineer.

b. All motor control center motors starters, individual motor starters and/or control panels shall be provided with signage to read "CAUTION - This Enclosure Contains Voltage Sources from Outside of This Enclosure".

c. All switchboards, motor control centers, panel boards, transformers control panels, etc., shall have Arc Flash labels as provided and determined by the Arc Flash Study.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. 16010 Electrical General (and as referenced)

1.3 QUALITY ASSURANCE

A. Supply all new materials, devices and equipment in conformance with:

1. Underwriter's Laboratory, Inc.
2. National Electrical Manufacturers Association.
3. American National Standards Institute.
4. National Electrical Code (NEC).
5. Local Power Company.
6. Local Telephone Company
7. Local Internet Provider
8. OSHA

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this

section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wire Markers:
   1. Provide Perma Sleeve Heat Shrink Tubing by Brady or equal. All markers to be type written.

B. Labels and tags shall be typewritten and pre-manufactured for the intended purpose. Labels and tags with “tails” will not be accepted. All labels and tags must be installed prior to site acceptance.

C. Lamacoid tags shall be nominal 1" x 4" with 3/8" white lettering on black background, unless specified otherwise.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Labels and tags shall be installed per Manufacturer guidelines to maximize the life of the label.

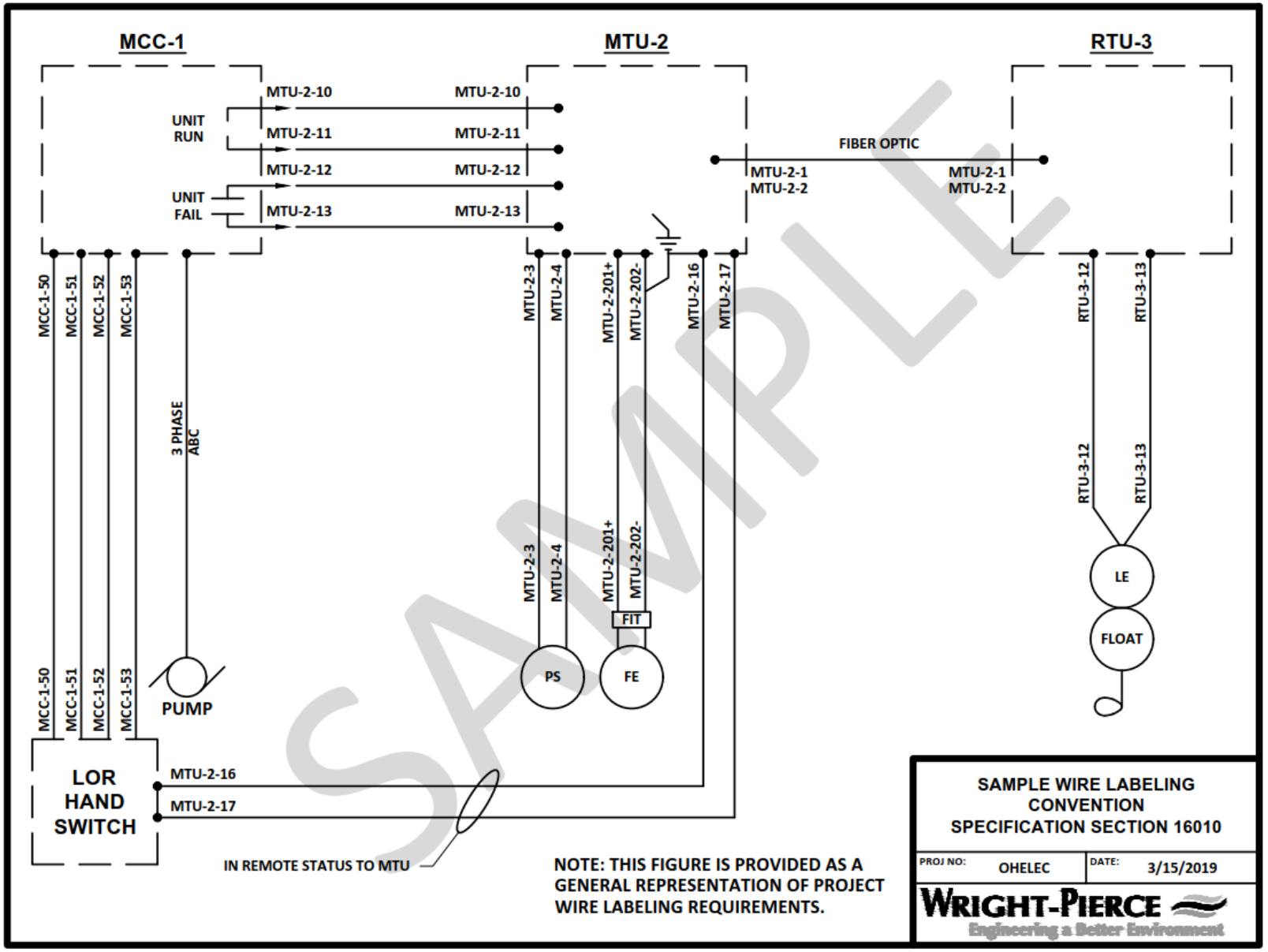

MCC-1
MTU-2
RTU-3
MTU-2-10
MTU-2-10
UNIT RUN
MTU-2-11
MTU-2-11
MTU-2-12
MTU-2-12
UNIT FAIL
MTU-2-13
MTU-2-13
FIBER OPTIC
MTU-2-1
MTU-2-2
MTU-2-1
MTU-2-2
MCC-1-50
MCC-1-51
MCC-1-52
MCC-1-53
3 PHASE ABC
MTU-2-3
MTU-2-4
MTU-2-201+
MTU-2-202-
MTU-2-16
MTU-2-17
RTU-3-12
RTU-3-13
RTU-3-12
RTU-3-13
MTU-2-3
MTU-2-4
MTU-2-201+
MTU-2-202-
FIT
LE
FLOAT
PS
FE
PUMP
MCC-1-50
MCC-1-51
MCC-1-52
MCC-1-53
LOR HAND SWITCH
MTU-2-16
MTU-2-17
IN REMOTE STATUS TO MTU
NOTE: THIS FIGURE IS PROVIDED AS A GENERAL REPRESENTATION OF PROJECT WIRE LABELING REQUIREMENTS.
SAMPLE WIRE LABELING CONVENTION SPECIFICATION SECTION 16010
PROJ NO: OHELEC
DATE: 3/15/2019
WRIGHT-PIERCE
Engineering a Better Environment

TABLE 1 – CABLE IDENTIFICATION AND TAGGING SCHEDULE

Internal Recycle Pump - 1	*IRP-6010*

	PLC-1		MCC-6A		VFD-IRP-6010		LCS-6010		Disconnect IRP-1				LOOP √	PURPOSE
	Term #	Wire #	Term #	Wire #	Term #	Wire #	Term #	Wire #	Term #	Wire #	Term #	Wire #		
DISCRETE	**6010-1**	1			**11**	1								Run Status
	6010-2	2			**12**	2								Rub Status
	6010-3	3			**13**	3								VFD Fault
	6010-4	4			**14**	4								VFD Fault
	6010-5	5							**NC**	5				Disconnect Off
	6010-6	6							**NC**	6				Disconnect Off
	6010-7	7			**17**	7								Seal Leak
	6010-8	8			**18**	8								Seal Leak
	6010-9	9			**19**	9								Overtemp
	6010-10	10			**20**	10								Overtemp
CONTROL	**6010-11**	11			**21**	11								Run Command
	6010-12	12			**22**	12								Run Command
	6010-13	13			**23**	13	**LOR**	13						Local
	6010-14	14			**24**	14	**LOR**	14						Remote
	6010-15	15					**NC**	15						In Remote
	6010-16	16					**NC**	16						In Remote
ANALOG	**6010-AI-1**	Cable 1			**25**	Cable 1								Speed
	6010-AI-1	Cable 1			**26**	Cable 1								Speed
	6010-AO-1	Cable 2			**27**	Cable 2								Speed Reference
	6010-AO-1	Cable 2			**28**	Cable 2								Speed Reference

PROJECT NAME: _____

CHECKED BY: _____ **DATE:** _____

END OF SECTION

SAMPLE

SECTION 16160

CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this Specification is to provide details of cabinets and enclosures for non-hazardous indoor and outdoor locations which will protect internal equipment from environmental conditions. This section is also to intend to provide consistency between enclosures supplied under different Divisions of this Contract. An exception is control panels provided by Division 11 and Division 13 which are specified within their specifications.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. Supply cabinets and enclosures in accordance with the following:
   1. Underwriter's Laboratory, Inc. listed.
   2. National Electrical Manufacturers Association Standard 250-1991.
   3. American National Standards Institute.
   4. National Electrical Code.

B. Cabinets and enclosures supplied under this Section shall conform to the requirements of Specification Section 16010, "Quality Assurance".

C. Stock cabinets and enclosures shall be manufactured by Hoffman Engineering Company, Saginaw Control and Engineering or approved equal. Custom fabricated enclosures shall be equal in quality, appearance and performance to stock enclosures. All enclosures shall be subject to the review of the Engineer.

1.4 RELATED WORK

A. Additional details for panels and enclosures associated with process equipment are provided in the individual specification sections in Division 11.

B. Additional details for panels and enclosures associated with HVAC equipment are provided in the individual specification sections in Division 15.

C. Miscellaneous panel and enclosure auxiliary equipment, such as lights, switches, receptacles, fuses, etc. are contained in Section 16050, 16900, and as noted on the Contract Drawings.

1.5 REFERENCES

A. ASTM C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM D149 - Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

C. ASTM D256 - Test Methods for Determining the Izod Pendulum Impact Resistance

of Plastics.

D. ASTM D495 - Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation.
E. ASTM D570 - Test Method for Water Absorption of Plastics.
F. ASTM D638 - Test Method for Tensile Properties of Plastic.
G. ASTM D648 - Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
H. ASTM D790 - Test Method of Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
I. ASTM D792 - Test Method for Density and Specific Gravity (Relative Density) of Plastic by Displacement.
J. UL94 - Test for Flammability of Plastic Materials for Parts in Devices and Appliances.
K. UL508A - Industrial Control Panels.
L. The enclosures shall meet all requirements for UL508A - Industrial Control Panels as follows:
    1. All components within the enclosures shall be UL Listed and Labeled.
    2. The enclosure and all components as an entire "assembly as a system" shall be UL Listed and Labeled as UL508A compliant.

1.6 SUBMITTALS TO THE ENGINEER

A. Shop drawings for this section are not required. The items listed below shall be included with the specific control being submitted to show compliance with this section in order to perform a complete review for equipment being submitted.
    1. Provide documentation, as applicable, from a UL certified fabricator that the control panel has been tested, fabricated, and labeled as a complete functioning system and is in compliance with all UL listings and standards.
    2. Scaled and dimensioned enclosure layout drawings (internal and external) along with catalog cut sheets shall be provided.
    3. Enclosure NEMA ratings, project specific identification, where located, etc., shall be clearly and properly identified on each panels cut sheet.
    4. Listing of all accessories to be furnished with each panel and properly identified.
    5. Provide a complete wiring diagram for all items located within the enclosure such as panel lights, duplex receptacles, panel heaters, cooling fans, relays, control devices, protective devices, etc., where applicable.
    6. Provide heating requirement calculations for all exterior panels and panels located in unheated spaces, and cooling requirement calculations for heat dissipation from panels containing VFD's and other heat generating equipment as necessary.
    7. Submit all control panel faceplate arrangements for review and acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General for all Enclosures:

1. NEMA classifications for panels and enclosures shall be as noted on Drawing E-1, unless otherwise specifically called out within the Drawings or Specifications.
2. Panels and enclosures shall be furnished factory-wired and tested with all equipment and appurtenances mounted thereon.
3. Control panels and enclosures shall be U.L. listed and labeled as a complete and functioning system.
4. Panels larger than 36-inches in any dimension shall not be wall mounted.
5. Provide two doors if panel is larger than 36-inches wide.
6. Refer to the drawings and pertinent specifications for minimum control panel faceplate requirements. In the absence of specific details, faceplates shall be arranged in such a manner as to provide a neat, workable and operator friendly panel.
7. Doors shall have side mounted, stainless steel, continuous length, piano-type hinges and pins.
8. Latches shall be T-handle or quick-release type only. Latches which require use of tools or coins for access, utilize wing-nuts, clips around the outside of enclosure etc., will not be acceptable.
9. Panels/enclosures shall be equipped with map pockets located on the inside of the door.
10. Enclosures shall be equipped with provisions for locking the access doors.
11. Enclosures shall be sized as required to contain the necessary apparatus for the particular installation except as noted on the drawings. Final panel/enclosure dimensions shall provide for easy access and workability to all internal components with ease of maintenance and future modifications considered. Conflicts with panel sizing and available spacing shall immediately be brought to the attention of the Engineer prior to proceeding.
12. Provide door and body stiffeners where necessary for a rigid enclosure. Large enclosures shall be provided with lifting eyes and, where floor-mounted, with 12-inch floor stands. No floor stands are to be provided for free-standing models.
13. Enclosures larger than 16 inch in any dimension shall utilize a three point latching system.
14. Enclosures 16 inch wide and larger shall be equipped with heavy duty, zinc plated stop arm kits to lock the external door in the open position.
15. Panel front-mounted pilot lights, selector switches, push button control stations and appurtenances shall be provided in accordance with Section 16900.
16. Where required, enclosures shall be provided with an interior panel, painted white, for mounting of internal components.

B. General NEMA Class and Requirements for Indoor Installations:
   1. NEMA Type 1 Enclosures
      a. Enclosures shall be sheet steel, 16 gauge for box widths up to and including 18", 14 gauge for box widths of 24", and 12 gauge for box widths of 30" and greater. Enclosures shall have continuously welded seams ground smooth; supplied with or without knockouts and shall have door and body stiffeners where necessary for a rigid enclosure.

b. Panels/enclosures shall be factory coated inside and out with ANSI 61 gray polyester powder coating over phosphatized surfaces.

2. NEMA Type 12 Enclosures:
   a. Enclosures shall be sheet steel, 16 gauge for box sizes up to and including 24" by 24", 14 gauge for box sizes larger than 24" by 24" up to 60" by 36", and 12 gauge for box sizes greater than 60" by 36". Free-standing enclosures shall be 12 gauge minimum. Enclosures shall have continuously welded seams, ground smooth, supplied with no holes or knockouts and a rolled lip around door and enclosure opening. Enclosures to be installed in areas with the potential for dripping liquids shall be provided with drip shields.
   b. Provide oil-resistant door gaskets.
   c. Enclosures shall be coated inside and out with ANSI 61 gray over phosphatized surfaces.
3. NEMA Type 3R Enclosures:
   a. Type 3R enclosures shall not be used to house controls or electronics that require heating. See the specific “Special Requirements” for outdoor panels below.
   b. Enclosures shall be steel, 16 gauge for box widths up to and including 12", 14 gauge for box widths between 15" and 24", and 12 gauge for box widths of 30" and greater. Free-standing enclosures shall be 12 gauge minimum. Enclosures shall have drip shield top; seam free sides, front, and back; and furnished with knockouts or factory installed cut outs in bottom only.
   c. Panels/enclosures shall be factory coated inside and out with prime and finish coats. Finish coat color to be ANSI 61 gray. Two prime coats shall be applied. Prime coat shall be rust inhibitive primer equal to Koppers Inertol Rust inhibitive Primer 621. Finish coat shall be compatible with prime coat and shall be an alkyd applied in two coats with a minimum dry film thickness of 1.5 mils per coat. Alkyd coating shall be equal to Koppers Glamortex 501 Enamel. Surface preparations shall be in accordance with manufacturer's requirements.
4. NEMA Type 4 Enclosures:
   a. Enclosures shall be sheet steel, 16 gauge for box sizes up to and including 24" by 24", 14 gauge for box sizes larger than 24" by 24" up to 60" by 36", and 12 gauge for box sizes greater than 60" by 36". Free-standing enclosures shall be 12 gauge minimum. Enclosures shall have continuously welded seams ground smooth; supplied with no holes or knockouts. Provide with door and body stiffeners as required for a rigid installation and with rolled lip around door and enclosure opening. Enclosures to be installed outdoors shall be provided with drip shields.
   b. Provide oil-resistant, water tight door gaskets.
   c. Enclosures shall be factory coated inside and out with prime and finish coats. Finish coat color to be ANSI 61 gray. Two prime coats shall be applied. Primer shall be rust inhibitive primer equal to Koppers Inertol Rust inhibitive Primer 621. Finish coat shall be compatible with prime coat and shall be an alkyd applied in two coats with a minimum dry film

thickness of 1.5 mils per coat. Alkyd coating shall be equal to Koppers Glamortex 501 Enamel. Surface preparations shall be in accordance with manufacturer's requirements.

5. NEMA Type 4X Enclosures:
   a. Type 4X enclosures shall be 316 stainless steel or aluminum. No other metals will be allowed.
      i. Type 316 stainless steel enclosures shall be 16 gauge for box sizes up to and including 24" by 24", 14 gauge for box sizes larger than 24" by 24" up to 36" width, and 12 gauge for box widths greater than 36 inches. Free-standing enclosures shall be 12 gauge minimum.
      ii. Aluminum enclosures shall be type 5052 H-32 aluminum, minimum 0.080-inch thick.
   b. Metal enclosures shall have continuously welded seams, ground smoothed.
   c. Enclosures shall be supplied with no holes or knockouts; shall have door and body stiffeners where necessary for a rigid installation and a rolled lip ground door and enclosure opening.
   d. Enclosures to be installed outdoors shall be provided with drip shields.
   e. Provide oil-resistant door gaskets all around door openings. All enclosure hinges, clamps, etc. shall be stainless steel.
   f. Enclosures shall be provided unpainted, with metal enclosures having a smooth brushed finish.

C. Special Requirements
1. Enclosures located in unheated spaces or general outdoors
   a. When components requiring a minimum temperature in which to operate, such as solid state devices, are to be installed inside the enclosure, the enclosure shall be NEMA 4X or NEMA 4 minimum when not available.
   b. The enclosures shall be insulated. Insulate the inside of all exterior surfaces with 1-inch thick rigid fiberglass insulation board having a maximum thermal conductivity ("k" value) of 0.35 BTU-in/hr-ft²-ºF. The insulation shall be finished with manufacturer's standard all service jacket. Coverings containing foil will not be acceptable.
   c. Enclosures shall be equipped with a factory installed built-in heater and adjustable thermostat with low temperature alarm. Field installations after the fact will not be acceptable. The heater shall be sized to maintain the temperature inside the panel at 40ºF (or higher if required) with an outside ambient temperature of -30ºF and a 15 MPH wind. The heater shall include a fan to circulate the air within the enclosure to prevent hot spots. Thermostat shall measure air temperature, not surface temperature. Heater shall be similar to Hoffman Engineering Co. series D-AH, Genesis automation, or approved equal.
   d. Provide strip heater with thermostat for condensation control.
   e. Provide heating requirement calculations for review and acceptance to be included as part of the shop drawing review for this equipment.

f. Enclosures shall have a lockable outer door with a separate hinged NEMA 1 dead front inner door.
g. The panels inner door latches shall be T-handle or quick release type only.
h. All control devices and the main circuit breaker operating handle shall be mounted through the interior panel door. The main circuit breaker handle shall have a lock arrangement to prevent the inner door from being opened when in the "on" position.
i. Enclosures 16-inch wide and larger shall be equipped with heavy duty, zinc plated stop arm kits to lock the external door in the open position.

2. Instrument and Control Panels
   a. All instrument and control enclosures shall have the proper NEMA rating for the areas in which they will be installed or as specified in Division 11.
   b. All front-mounted instruments and devices shall be installed in such a way as to maintain the NEMA rating of the enclosure.
   c. Panels which are to be installed outdoors shall meet the special requirements of "Outdoor Control Panels and Panels located in Unheated Spaces".
   d. Panels shall be supplied with a GFI type duplex convenience receptacle and a panel light with an easily accessible on-off switch. The receptacle and panel light shall be provided with a separate overcurrent protective device and connected in such a manner so as to not disconnect control, instrumentation, or PLC power in the event that the GFI outlet should trip.
   e. Panel lights for panels located in outdoor or unheated spaces shall be LED and suitable for the installation.
   f. Panel lights for panels located in heated spaces shall be LED and suitable for the installation. The length of the lamp shall be a minimum of 75% of the width of the enclosure.
   g. Provide a separate, dedicated, single pole receptacle for connection of the UPS System as required. This receptacle shall be labeled - "For UPS System Only".
3. Special Cooling Requirements
   a. Enclosures which contain Variable Frequency Drives or other heat-producing equipment shall be provided with modifications and/or accessories designed to dissipate excess heat and allow for proper equipment cooling, while maintaining the enclosures NEMA rating. Following are several accessories which may be used, depending upon the ambient temperature and NEMA rating of the area installed.
      i. Cooling fans with dust filters, for NEMA 1 enclosures.
      ii. Heat exchangers with circulating fans and filters, for NEMA 12 enclosures.
      iii. Air conditioners, for NEMA 12 enclosures in areas with high ambient temperatures.
      iv. Air Conditioners, for NEMA 4X enclosures in both 4X areas and 4X-corrosive areas shall be cooled with the use of a side mounted air conditioner. The air conditioner shall be controlled by an internal thermostat in parallel with the run contact.

v. Air conditioners shall have a drain tubing installed in order to drain to the nearest floor drain. Tubing shall be plastic PVC flex tube or PVC schedule 40.

b. Cooling fans shall be wired such that they only operate when the VFD or heat producing equipment is running.

c. Air conditioners where used in enclosures shall operate off of an internal thermostat.

d. Provide heat dissipation calculations and cooling method proposal for review and acceptance to be included as part of the shop drawing review for this equipment. Design ambient air temperature shall be 95°F.

4. Heat Shields

a. For outdoor installations, heat/sun shields fabricated from 0.125 marine grade aluminum shall be installed on front, back and sides of enclosures and control panels that house electrical components. Holes shall be cut in shield for alarm light and horn. Heat shields shall also have white polyester powder coat finish on all sides. Provide cut-outs in the back of the enclosure to accept VFD aluminum mounting plates. Mounting plates shall be attached to studs on the back of the enclosure and gasketed. VFD enclosures located outside shall be NEMA 12/3R with the VFD heat sinks vented out the back. Consult VFD manufacturer's installation guide for flange mount cut-out dimensions and recommended instructions. The rear sunshield shall have a removable cover with handles to allow access to the VFD heat sinks for cleaning and maintenance. The heat shield shall have studs with wing nuts for attached the removable cover. Seal all penetrations

D. Nameplate/Identification:

1. All panels/enclosures, and all contained equipment/instrumentation shall be provided with a nameplate providing project specific identification of the unit or device. Identification wording shall be as noted on the drawings. In the absence of specific identification of name tag wording, provide general descriptive information of unit function.
2. Provide nametags as specified in 16010.
3. Name tags shall be permanently mounted below panel mounted items (interior and exterior as appropriate), or in as appropriate location as to clearly identify its function.

E. Control Panel Wiring:

1. All wiring shall conform to the latest requirements of NEC, all state and local code requirements, and as described on the Drawings and in the Contract specifications.
2. All control wires internal to panels shall be minimum No. 14 AWG. Wires carrying line voltage shall be minimum No. 12 AWG. All conductors shall be copper. Wiring in close proximity to heating devices shall be Type AVA U.L. approved. All wiring shall be run in PVC wiring channels and bundled with nylon cable ties. Line voltage wiring must be run separately from control, signal and intrinsically safe wiring. PVC wiring channels shall be properly sized

for the capacity of wires being installed based on the overall project needs and shall not be over filled.

3. Bundles of wires must be secured to the panel structure every 8 inches minimum. All interior wiring will be point to point with no splices.
4. Shielded wire shall be separated from other wires and equipment with suitable barriers and with terminal blocks for continuous shield grounding to the connecting cables.
5. Intrinsically safe wiring shall be separated by barriers from all other wiring and shall be identified as required by the N.E.C. and installed with proper separation per U.L. 508A requirements.
6. Wires to the front of panel devices shall be looped, extra flexible, bundled and located in a manner to prevent damage due to opening and closing the door.
7. All wires shall be marked at both ends with numbers by Perma Sleeve Heat Shrink tubing by Brady slip-on style markers or equal. All markers are to be type written. Color coding shall include the following:
    a. Red wires - Interior control circuits
    b. Orange wires - Interlocks powered from external sources
    c. Dark Blue wires - DC voltages
    d. See Section 16075 for additional color coding.
8. Terminals shall be arranged in alphabetic and numeric order in columns on removable subplates. A maximum of two connections shall be made to each side of a terminal, including jumpers. Provide an additional 20 percent spare terminals with the following minimum requirements:
    a. Power terminals - 2 spares
    b. Control terminals - 10 spares
    c. Signal terminals - 12 spares
9. Provide ground terminal for each panel.
10. All control panels shall be provided with spare mountings for additional relays. Number of spare mountings will correspond to 5% of the total number of relays within each panel, with a minimum of one (1) spare mounting.
11. All control panels shall be provided with an appropriately sized surge arrester to protect panel internals. Surge arrester shall be equal to Square D Model SDSA1175 or Model SDSA3650 (as applicable) in quality and appropriately sized for function.
12. All control panels will be suitable for use with 120V, 1 phase power, unless noted otherwise on the Drawings. The panels shall be equipped with an internal power supply fuse or circuit breaker and a thru-the-door, lockable, disconnect switch. Fuse blocks will be provided as required to allow a separate fuse for each piece of equipment within the panel requiring power.
13. Provide complete "As Built" wiring diagrams to be provided with the O&M manuals and in the enclosures for all control panels.
14. All wiring entering and leaving control panels shall be terminated on field terminal blocks and labeled.
15. Provide large letter lamacoid plastic name plate as specified in Section 16075 at the top center of each control panel with properly identified nametag which

corresponds to the contract designation name. Verify final name designation with the Engineer prior to installation.

F. Spare Parts/Materials:
   1. Provide 1 gallon of paint for each enclosure/panel topcoat color utilized.
   2. Provide the following spare parts for each panel/enclosure provided. Spare parts shall be contained in the panel/enclosure in such a manner as to permit accessibility and prevent accidental damage without interfering with internally mounted equipment.
      a. Provide 10 of each lamp type used.
      b. Provide one of each type relay used.
      c. Provide one control switch, indicating light and/or push-button of each type used.
      d. Provide 1 set of each fuse type and size used.
      e. Provide 1 of each color and type light lens used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All interconnecting wiring between panels, unless specifically detailed otherwise on the drawings, shall be installed by the Electrical Contractor regardless of source of the panel itself. All conduit, wiring and installation requirements for each enclosure shall be completely and thoroughly coordinated with all applicable trades prior to equipment installation.

B. Install enclosures in locations as shown on the Drawings.
   1. All floor mounted enclosures either free standing or on floor stands shall be mounted on a 4" high, concrete, maintenance pad.
   2. Securely fasten each floor mounted enclosure to the maintenance pad.
   3. Small enclosures may be supported on walls using stainless steel metal framing channels or similar hardware to provide a minimum 1/4-inch air space between enclosure and wall.

C. Equipment Mounting
   1. All framing channels and mounting hardware shall be 316 stainless steel - no exception.
   2. Use 316 stainless steel fittings and hardware of the same material as the channel. All fittings supplied shall be by same manufacturer as the channel.
   3. Provide cross bracing as required using unistrut securely fastened to the mounting structure or building structure to provide for a rigid mounting assembly.
   4. The ends of all framing channels/strut shall be provided with PVC end caps for protection of personnel.
   5. Backboards used for mounting of equipment shall be constructed of ¾ inch thick fiberglass, unless otherwise specified on the drawings.
   6. All channels or unistrut installed in such a manner that parts are located below grade shall be coated with a black bitumastic waterproofing material for the below grade portion and extending a minimum of 6 inches above grade. The exposed portion of the channel shall be taped off prior to coating for a neat, even, finished appearance.

7. NEMA 4X installations require a 1/4" spacer between the enclosure and mounting support to prevent moisture from collecting.

D. Equipment mounting heights shall be as shown on the contract drawings or the tops placed a maximum of 72 inches above finished floor or platform when the elevation is not shown.

E. Provide special protection for all devices and terminal blocks when cutting, drilling, and/or installing any device in the control panel.

F. All conduits entering exterior enclosures or in NEMA 4X environments shall be suitable gasketed on the outside and conduits shall be sealed (inside) using a pliable duct seal to prevent the entrance of water.

G. All lifting eyes, hooks, brackets, devices etc., used to install, lift, transport, etc., the control panel shall be removed after installation and all resultant holes shall be plugged with threaded bolts for a finished, permanent installation. All methods of plugging the holes shall maintain the NEMA rating of the enclosure.

3.2 TESTS

A. Testing of the enclosures themselves is not required, however, all equipment and controls which are mounted in or on the enclosures shall be tested as a complete assembly as specified in the applicable sections of DIVISIONS 11, 14, 15 and 16.

B. Each enclosure shall be fully tested by the manufacturer.

3.3 CLEANING

A. Do not allow excess debris, water or other fluids to accumulate inside the enclosures during the course of construction.

B. Upon completion of the work, remove all debris and surplus materials from inside the enclosures and leave them clean.

C. Clean all enclosure surfaces and touch up any scratched or damaged areas to the satisfaction of the Engineer.

D. Clean or replace all filters located in enclosures which contain ventilation fans.

END OF SECTION

SECTION 16406A

LOW VOLTAGE SWITCHBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish and install, where indicated, a free-standing, dead-front type low voltage distribution switchboard, utilizing group mounted circuit protective devices as specified herein, and as shown on the contract drawings and indicated on the "Single Line Diagrams". Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

B. For additional required identification nameplates for all distribution equipment, refer to Section 16010.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that manufacturer. Equipment of other acceptable manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory and guaranteed by the manufacturer. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Switchboard shall be submitted to the utility company for approval prior to purchase and installation**.** The manufacturer of the assembly shall be the manufacturer of the major components within the assembly. All equipment shall be UL Listed.

E. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

F. Equipment shall comply with the latest applicable standards of NEMA PB2 and UL 891

G. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

H. Refer to equipment manufacture requirements under 16010, Section 1.2.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Distribution Switchboard(s) (480/277V)

1. General:
   a. The low voltage distribution switchboards and all components shall be designed, manufactured and tested in accordance with the latest applicable following standards:
      i. NEMA PB-2
      ii. UL Standard 891
   b. Switchboard shall be UL Listed and labeled.
   c. Switchboard(s) shall be manufactured by Eaton/Cutler-Hammer, Square D, General Electric/ABB, or Siemens.
      i. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.
   d. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.
   e. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips.
   f. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
2. Ratings:
   a. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current (KAIC symmetrical) at rated voltage as indicated on drawings.
   b. Voltage, Hertz, current, and minimum short circuit ratings shall be as indicated on the drawings.
3. Construction:
   a. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly as shown on drawings. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed.
   b. All sections of the switchboard shall be front and rear aligned with depth as shown on the drawings. All protective devices shall be group mounted

or as specified. Devices shall be front removable and load connections front accessible enabling switchboard to be mounted against a wall.

c. Provide adequate ventilation within the enclosure.

4. Bus:
   a. All bus bars shall be tin-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on NEMA standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).
   b. Provide a full capacity tin-plated copper neutral bus where a neutral bus is indicated on the drawings.
   c. A tin-plated copper ground bus (minimum 1/4 x 2 inch) shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard.
   d. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring-type washers.
5. Wiring/Terminations:
   a. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.
   b. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the drawings.
   c. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.
   d. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle type terminals are provided integral to a device. All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.
6. Protective Devices:
   a. Insulated Case Breakers (MCB-1)
      i. Protective devices as shown shall be circuit breakers providing complete circuit overcurrent protection by having inverse time and instantaneous tripping characteristics, and where applicable, be current limiting. All breakers shall be U.L. Listed for application in their intended enclosure for 100% of their continuous ampere rating. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip free. Automatic tripping of the breaker shall be clearly indicated by handle position. Contacts shall be non-

welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes or equivalent. Circuit breaker interrupting capacities shall be as indicated on the drawings or as specified hereinafter.

ii. Breakers shall be provided with solid-state trip complete with built-in current transformers, solid-state trip unit and flux transfer shunt trip. Breakers shall have trip rating plugs with ratings as indicated on the drawings. Rating plugs shall be interlocked so they are NOT interchangeable between frames and interlocked such that a breaker cannot be latched with the rating plug removed.

iii. Trip units shall have adjustable short time setting with a fixed instantaneous override for circuit protection. Main breakers shall be provided with additional short delay trip time adjustment for increased system coordination. Breakers shall have built-in test points for testing long delay, instantaneous and ground fault functions of the breaker by means of a 120 volt operated test kit.

iv. Provide one test kit capable of testing the breakers.

v. Provide ground fault protective and sensing for the main circuit breaker as required per NEC.

b. Molded Case Breakers (Feeder Section):

i. Provide 1000A and below molded case breakers sized as shown on drawings.

ii. Circuit breakers shall be rated (KAIC symmetrical) at voltage and symmetrical rating as indicated on drawings.

iii. Circuit breakers shall be 80% rated.

7. Automatic Transfer Switch:
   a. Provide an automatic transfer switch as part of the switchboard configuration as shown on contract drawings. This shall be provided and warranted by the generator supplier. Refer to section 16620 for additional requirements.
8. Power Monitor:
   a. Where indicated on the drawings, provide a separate customer metering compartment with a front facing hinged door and include the following:
   b. Current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.
   c. Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.
   d. Provide microprocessor metering as shown on the drawings for power metering and loss of normal power monitoring. Metering shall be Allen-Bradley #1426 Power Monitor 5000 or equivalent.
9. Enclosures:
   a. NEMA 1 Enclosure
   b. Enclosure shall have flat roof. Outer sections shall be the same widths as indoor structures, except each end of the outdoor assembly shall have an end trim.
   c. The enclosure shall be provided with bolt-on rear covers for each section

d. Doors shall have provisions for padlocking.
e. Ventilating openings shall be provided complete with replaceable fiber glass air filters.
f. Provide space heaters thermostatically controlled for each structure with adequate wattage to prevent the accumulation of moisture.
g. Power for space heaters, lights and receptacles shall be obtained from a control power transformer within the switchboard. Supply voltage shall be 120 volts AC.

10. Nameplates:
    a. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.
    b. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.
    c. Refer to section 16010 for additional requirements.
11. Finish:
    a. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchboard shall be ANSI 61 light gray.
12. Transient Voltage Surge Suppression:
    a. Provide transient voltage surge suppression and circuit breaker as shown on Drawings. Refer to section in 16408 for additional requirements.
13. Factory Testing:
    a. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
        i. The switchboard shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to ensure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of 2200 volts for one (1) minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground
    b. The manufacturer shall provide three (3) certified copies of factory test reports.
14. Manufacturer's Certification:

a. A certified test report of all standard production tests shall be available to the Engineer upon request.

15. Training:
    a. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal work day at a job site location determined by the owner.
16. Installation Hardware:
    a. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to the floor without the use of floor sills provided the floor is level to 1/8 inch per 3-foot distance in any direction.
    b. All necessary hardware to secure the assembly in place shall be provided by the Contractor.
17. Anti-Static and Non-Conductive Floor Mats
    a. Floor mats shall meet minimum stands Type II, ASTM D178 Class 2. Minimum thickness shall be ¼" and 3 feet wide, black rubber with corrugated surface pattern. Provide Northax electrical hazardous mat Model 830C0036-75 or equivalent. Provide customized lengths to be installed in front of all new switchboards. Contractor to coordinate the location and installation of floor mating with the Owner at each building.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's instructions, contract drawings and National Electrical Code.

B. Ground all motor control centers in accordance with the National Electric Code and as specified in section 16450.

C. Switchboards shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Install two continuous runs of Unistrut the entire width of the switchboard in the concrete pad with 1/16" reveal to provide a level mounting surface. Strut installation to be coordinated with Concrete Contractor. Use shims where necessary.

D. Install Safety Labels in compliance with NEMA 260.

E. A manufacturer's qualified representative shall conduct the training session. The training program shall consist of instruction on operation of the assembly, circuit breakers, fused switches, and major components within the assembly.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16406C

LOW VOLTAGE SWITCHBOARDS WITH GROUND FAULT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish and install, where indicated, a free-standing, dead-front type low voltage distribution switchboard, utilizing group mounted circuit protective devices as specified herein, and as shown on the contract drawings and indicated on the "Single Line Diagrams". Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first manufacturer named after the phrase "Acceptable Manufacturers". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory and guaranteed by the Manufacturer. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Switchboard shall be submitted to the utility company for approval prior to purchase and installation.

E. The Manufacturer of the assembly shall be the Manufacturer of the major components within the assembly and UL Listed and Labeled.

F. For the equipment specified herein, the Manufacturer shall be ISO 9001 or 9002 certified.

G. Equipment shall comply with the latest applicable standards of NEMA PB2 and UL 891

H. The Manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

I. Refer to equipment manufacture requirements under 16010.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

B. Provide copies of all correspondence including verbal communications with the utility company to the Engineer. Correspondence shall verify approval of the utility company for the proposed service, as designed. This must be submitted as soon as possible based on the intended design indicated on the Contract Drawings and part of the approval process for this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Distribution Switchboard(s) (480/277V)

1. General:
   a. The low voltage distribution switchboards and all components shall be designed, manufactured and tested in accordance with the latest applicable following standards:
      i. NEMA PB-2
      ii. UL Standard 891
   b. Switchboard shall be UL Listed and labeled.
   c. Switchboard(s) shall be manufactured by Square D, Eaton/Cutler-Hammer, General Electric/ABB, or Siemens.
   d. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.
   e. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.
   f. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips.
   g. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
2. Ratings:
   a. Voltage, Hertz, current, and minimum Short Circuit ratings shall be as indicated on the drawings.
3. Enclosure: Type 1 - General Purpose.
   a. Sections shall be aligned front and rear, dead front type, self-supporting structure.
   b. Removable steel base channels (1.5-inch floor sills) shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

c. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.
d. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
e. Top and bottom conduit areas shall be clearly indicated on shop drawings.
f. Rear access to this equipment shall not be allowed. All connections to the switchboard shall be accessible from the front of the equipment.
g. The side and bus connection sections shall be covered with removable screws-on plates.
h. All edges of front cover panels shall be formed.
i. Provide the required number of vertical sections bolted together to form one rigid switchboard.
j. Each switchboard shall be split sectional and arranged for shipping in order to allow this equipment to be appropriately installed within the space as indicated on the Contract Drawings.

4. Nameplates:
   a. Provide 1-inch high x 3 inches engraved laminated (Gravoply) nameplates for each device. Furnish black letters on a white background for all voltages.
   b. Refer to section 16010 for additional requirements
5. Bussing:
   a. All bus bars shall be silver-plated cooper with bolted connections at joints. The bus bars shall be of sufficient size to limit the temperature rise to 65 degree C rise based on UL tests, and rated to withstand mechanical forces exerted during short circuit conditions when directly connected to a power source having an available fault current as indicated on contract drawings.
   b. A ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. An incoming ground lug shall be furnished. Other ground lugs for feeder circuits shall also be supplied as shown in the schedules on the drawings.
   c. All hardware used on conductors shall be high-tensile strength and plated. All terminals shall be of the anti-turn solderless type suitable for copper or aluminum cable of sizes indicated for 75 degree C cable.
   d. Ground bus shall be plated copper. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements.
   e. The phase and neutral through-bus shall have an ampacity as shown in the plans. Tapered bus is not acceptable.
   f. Full provisions for the addition of future sections shall be provided.
   g. Bussing shall include all necessary hardware to accommodate splicing for future additions.
   h. Ground Bus shall be sized per NFPA70 and UL 891 Tables 25.1 and 25.2.
   i. Provide all required number of lugs/phase at all equipment as required by the installation and as shown on the Drawings.
6. Automatic Transfer Switch:

a. Provide an automatic transfer switch as part of the switchboard configuration as shown on contract drawings. Refer to section 16620 for additional requirements.

7. Cable Pull Section:
   a. Furnish cable pull sections complete with cable tie down supports as shown on the Drawings. Review contract drawings for configuration, quantities and entrance of conduits and cables.
      i. Provide section to match depth, height and width of equipment for proper alignment.
8. Utility Metering Section:
   a. The power company utility metering equipment will be housed in the switchboard. Provided all required spacing and configuration which meets the power company standards.
   b. Coordinate all requirements of equipment with the power company.
   c. Refer to 16010 for additional information and requirements.
9. Manual Transfer Control:
   a. Kirk interlocks in a main-tie-main configuration shall be provided as indicated on the Contract Drawings.
10. Protective Devices - Main Circuit Breaker (MCB):
   a. Two-step stored energy, fixed mounted, electronic trip circuit breaker
      i. Circuit protective devices shall be two-step stored energy circuit breakers - Square D type Masterpact NW or equivalent.
      ii. Circuit breaker trip system shall be a microprocessor-based true RMS sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawings.
      iii. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
      iv. Circuit breakers 1200 amps and over shall have Reduced Arc Flash Energy Let Though or RELT capability
      v. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.
      vi. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100% of their ampere rating continuously.
      vii. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent from all other adjustments.
      Long Time Pickup & Long Time Delay
      Short Time Pickup & Short Time Delay (I^2t IN & I^2t OUT)
      Instantaneous Pickup
      Ground Fault Pickup & Ground Fault Delay (I^2t IN & I^2t OUT)

viii. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

ix. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

x. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True RMS with 2% accuracy.

xi. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

xii. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

xiii. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Provide one (1) Universal Equipment Test Set for this project job for final inspection. This test set shall be suitable for testing all electric circuit breakers specified for this project. No disassembly of the circuit breaker is required for testing.

xiv. Communications capabilities for remote monitoring of circuit breakers trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings and trip history information shall be provided. Also include normally open dry contact which closes on breaker tripped open for remote indication to SCADA System.

xv. True two-step stored energy mechanism with five (5) cycle closing time shall be provided. All circuit breakers shall have multiple CHARGE/CLOSE provisions allowing the following sequence:

xvi. CHARGE, CLOSE, RECHARGE, OPEN/CLOSE/OPEN

xvii. Local control pushbuttons to OPEN and CLOSE circuit breaker shall be provided. Color coded visual indication of contact position (OPEN or CLOSED) shall be provided on the face of the circuit breaker. Local manual charging following CLOSE operation shall be provided. Color coded visual indication of mechanism CHARGED and DISCHARGED position shall be provided on the face of the circuit breaker. Visual indicator shall indicate CHARGED only when closing springs are completely charged.

xviii. Each circuit breaker shall be electrically operated to permit remote CHARGE, CLOSE, and OPEN capabilities. Electrically operated circuit breaker shall be equipped with charge contact switch for remote indication of mechanism charge status.

xix. All circuit breakers shall be equipped with electrical accessories as noted on drawings.

xx. Provide Key interlock as indicated on contract drawings.

xxi. Equipment Ground Fault Protection:

(1) Circuit breaker(s) shall be provided with integral equipment protection for grounded systems.

(2) The ground fault system shall be of the residual type.

(3) Circuit breaker(s) shall be provided with zone selective interlocking (ZSI) on the Ground Fault function in order to limit thermal stress caused by a fault yet permit optimum coordination with all other electronic trip circuit breakers.

xxii. Terminations:

(1) All lugs shall be UL Listed to accept solid and/or stranded copper and aluminum conductor. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating in the NEC. Provide required number of lugs/phase as indicated by the contract drawings and cabling requirements.

(2) All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs.

11. Protective Devices - (Feeder Breakers):

a. Group mounted circuit breakers through

i. Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.

ii. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.

iii. Circuit breaker(s) equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breaker(s) shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breaker(s) of different frame sizes shall be capable of being mounted across from each other.

iv. Line-side circuit breaker connections are to be jaw type.

v. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

vi. Electronic trip molded case standard function 80% rated circuit breakers

(1) All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, [Short Time Pickup], [Short Time Delay], [Ground Fault Pickup] [Ground Fault Delay] and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.

(2) Circuit breaker trip system shall be a microprocessor-based true RMS sensing designed with sensing accuracy through

the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawing.

(3) Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.

(4) Circuit breakers 1200 amps and over shall have Reduced Arc Flash Energy Let Though or RELT capability.

(5) Furnish thermal magnetic molded case circuit breakers for 250A frames and below.

(6) Overcurrent devices shall have a minimum interrupting rating as specified for each of the switchboards noted within this Section.

(7) Circuit breakers shall be electrically operated type where indicated by the contract drawings and as required for the load shedding application for this system design. Refer to additional requirements within this Section.

(8) The distribution Section circuit breakers shall be either electronic type or molded case type based on the following criteria:

(a) Complete review of the overall single line diagrams and distribution system layout and configuration.

(b) Final coordination system study which will allow complete selectability and system coordination based on the overall distribution network.

(c) Arrangement and space consideration of overall equipment sizing, layout and existing allocated space where equipment will be installed.

(d) Breaker selection shall be as follows:

(i) Molded case inverse time and instantaneous trip characteristics

(ii) Solid-State series thermal magnetic type

(iii) Solid-State series with built-in solid state trip, current transformers, adjustable short time, etc. as specified.

(9) All circuit breakers shall be provided with handle extensions for ease of operation. Provide one test kit capable of testing all breakers 600 ampere and above.

(10) Where indicated on the drawings, provide built-in ground fault protection with adjustable pick-up rating not exceeding 1200 amperes; ground fault time delay shall be adjustable 0.1 to 0.5 seconds. Provide neutral ground fault current transformer for four wire system.

(11) Where indicated on the drawings, provide zero sequence ground fault protection system with necessary sensor, monitor, test panel, shunt trip and control power source for use with breakers indicated.

(12) Nameplates: Engraved nameplates shall be furnished for all mains and feeder circuit with designation and circuit number as indicated on the drawings. Furnish Master Nameplate giving voltage, ampere rating, short circuit rating, Manufacturer's name, general order number and item number.

(13) Enclosures: Enclosures shall be of indoor ventilated construction as shown on the drawings. Control power shall be obtained from an internal control power transformer.

(14) Finish: All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibition phosphatized coating. Color and finish of the switchboard shall be ANSI 61 and use the Manufacturer's standard process.

(15) Control Power Transformers: Control power transformers with primary and secondary protection shall be provided as indicated on the drawings or where required to operate ground fault systems, adequately sized for required burdens.

12. Power Monitor:
    a. Where indicated on the drawings, provide a separate customer metering compartment with a front facing hinged door and include the following:
    b. Current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.
    c. Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.
    d. Provide microprocessor metering as shown on the drawings for power metering and loss of normal power monitoring. Metering shall be Allen-Bradley #1426 Power Monitor 5000 or equivalent.
13. Transient Voltage Surge Suppression Device
    a. TVSS equipment and requirements to be installed within the switchboard(s). Refer to section 16408 for additional requirements.
14. Nameplates:
    a. Nameplates shall be provided for all equipment.
    b. Engraved nameplates shall be provided as specified under Division 16075.
    c. Engraved nameplates shall be furnished for all mains, feeder circuits and transfer switch with designation and circuit number as indicated on the drawings.
    d. Furnish Master Nameplate giving voltage, ampere rating, short circuit rating, Manufacturer's name, general order number and item number.
15. Condensation Heater:
    a. Provide 120V condensation heater for each separate switchgear section. Each heater shall be sized and rated to protect each individual section from condensation.
    b. Provide a single feeder circuit breaker in its own compartment, sized as required, for overcurrent protection for the condensation heaters.

c. Provide a single, 120V thermostat mounted on the door of the feeder circuit breaker to regulate and control the condensation heaters. Provide lamacoid nameplates labeling its function.

16. Electrically Operated Circuit Breakers:
    a. The contract drawings indicate electrically operated circuit breakers for load shedding requirements as part of the design of this project. Provide electrically operated circuit breakers for both the switchboard feeders and motor control center feeders as indicated on the contract drawings.
    b. Electrically operated circuit breakers shall be completely operational for both closing and opening based on contact closures from the load shedding control system. All contacts shall be rated for the proper ampacity to control and operate this equipment for a complete and properly rated installation.
17. Factory Testing:
    a. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
        i. The switchboard shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to ensure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of 2200 volts for one (1) minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground
    b. The Manufacturer shall provide three (3) certified copies of factory test reports.
18. Manufacturer's Certification:
    a. A certified test report of all standard production tests shall be available to the Engineer upon request.
19. Training:
    a. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal work day at a job site location determined by the owner.
20. Installation Hardware:
    a. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to the floor without the use of floor sills provided the floor is level to 1/8 inch per 3-foot distance in any direction.
    b. All necessary hardware to secure the assembly in place shall be provided by the Contractor.
    c. Upon installation, lifting eyes shall be removed and replaced with flush mounted threaded bolts for a finished look to equipment.
21. Anti-Static and Non-Conductive Floor Mats

a. Floor mats shall meet minimum stands Type II, ASTM D178 Class 2. Minimum thickness shall be ¼" and 3 feet wide, black rubber with corrugated surface pattern. Provide Northax electrical hazardous mat Model 830C0036-75 or equivalent. Provide customized lengths to be installed in front of all new switchboards. Contractor to coordinate the location and installation of floor mating with the Owner at each building.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and National Electrical Code.

B. Ground all motor control centers in accordance with the National Electric Code and as specified in section 16450.

C. Switchboards shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Install two continuous runs of Unistrut the entire width of the switchboard in the concrete pad with 1/16" reveal to provide a level mounting surface. Strut installation to be coordinated with Concrete Contractor. Use shims where necessary.

D. Install Safety Labels in compliance with NEMA 260.

E. A Manufacturer's qualified representative shall conduct the training session. The training program shall consist of instruction on operation of the assembly, circuit breakers, fused switches, and major components within the assembly.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16408

INTEGRATED TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICE(S) LOW VOLTAGE SWITCHBOARDS AND MOTOR CONTROL CENTER

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the materials and installation requirements for an integrated Surge Protective Device (SPD), also referred to as Transient Voltage Surge Suppressor (TVSS), in a Low Voltage Motor Control Center (MCC) and Low Voltage Switchboards (SWBD). These devices are used to protect AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturers". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified. The electrical basis of design indicated on the Contract Documents is based on equipment layouts and modifications as provided by Square D Company. Suppliers deemed or equal shall be responsible to support and supply or equal equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

B. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

1.4 REFERENCES

A. UL 1283 Electromagnetic Interference Filters

B. UL 1449 Surge Protective Device 3rd Edition

C. ANSI/IEEE C62.41 - 1991 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits and ANSI/IEEE C62.45 – 992 – IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits

1.5 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

1.6 WARRANTY

A. Devices shall have a warranty for a period of ten (10) years, incorporating unlimited replacement of suppressor parts. Warranty shall be the responsibility of the electrical distribution equipment Manufacturer and shall be supported by their respective field services organization

PART 2 - PRODUCTS

2.1 MATERIALS

A. Surge Protective Device - TYPE 1
   1. Integral Surge Protection Device (SPD):
      a. Devices shall be Listed and Component Recognized in accordance with UL 1449 to include Section 37.3 highest short circuit current rating (SCCR) of 200kA. TVSS devices shall be UL 1283 listed.
      b. Devices shall be independently tested with the Category C3 high exposure waveform (20kV-1.2/50μs, 10kA-8/20μs) per ANSI/IEEE C62.41 – 1991.
      c. The Manufacturer of the SPD shall be the same as the Manufacturer of the MCC in which the devices are installed and shipped.
      d. Devices shall provide surge current diversion paths for all modes of protection; L-N, L-G and N-G in MCCs with neutral connected loads or L-L and L-G in MCCs without neutral connections.
      e. Devices shall be modular in design. Each mode including N-G shall be fused with a 200kAIR UL recognized surge rated fuse and incorporate a thermal cutout device.
      f. The unit shall include a UL Recognized circuit breaker disconnect switch and shall connect to the MCC vertical power bus through a spring reinforced stab-on connector.

B. Transient Voltage Surge Suppression Device Surge Protective Device :
   1. Integral Surge Protection Device (SPD):
      a. Devices shall be Listed and Component Recognized in accordance with UL 1449 Third Edition to include Section 37.3 highest short circuit current rating (SCCR) of 200kA. TVSS devices shall be UL 1283 listed.
      b. Devices shall be independently tested with the Category C3 high exposure waveform (20kV-1.2/50μs, 10kA-8/20μs) per ANSI/IEEE C62.41 – 1991.
      c. The Manufacturer of the SPD shall be the same as the Manufacturer of the MCC in which the devices are installed and shipped.
      d. Devices shall provide surge current diversion paths for all modes of protection; L-N, L-G and N-G in MCCs with neutral connected loads or L-L and L-G in MCCs without neutral connections.
      e. Devices shall be modular in design. Each mode including N-G shall be fused with a 200kAIR UL recognized surge rated fuse and incorporate a thermal cutout device.
      f. The unit shall include a UL Recognized circuit breaker disconnect switch and shall connect to the MCC vertical power bus through a spring reinforced stab-on connector.

g. The unit mounting shelf shall include hanger brackets to support the unit weight during installation and removal. The TVSS plug-on units shall be installable without the assistance of a camming device so as to allow maximum accessibility with the unit installed.
h. A cast metal handle operator must be provided on the disconnect. With the unit stabs engaged into the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit disconnect with clear indication of the disconnects status. The circuit breaker operator shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.
i. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.
j. A non-defeatable interlock shall be provided between the handle operator and the structure to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position.
k. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors. The grounded stab-on connector shall be cabled directly to the modules.
l. Provisions shall be provided for locking the disconnect in the OFF position with up to three padlocks.
m. Handle mechanisms shall be located on the bottom left side of the unit and operate horizontally to encourage operators to stand to the left of the unit being switched.
n. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.
o. Devices shall meet or exceed the following criteria:
    i. Minimum surge current capability (single pulse rated) per phase shall be per phase
    ii. UL 1449 3rd Edition Suppression Voltage Ratings:

VOLTAGE	**L-N**	**L-G**	**N-G**	**L-L**
208Y/120V	700V	700V	700V	1200
480Y/277V	1200V	1200V	1200V	2000
600Y/347V	1500	1500	1500	2500

p. Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE C62.41 Category C3 transients without failure or degradation of clamping voltage by more than 10%
q. TVSS shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

r. Devices shall have a minimum EMI/RFI filtering of -50dB at 100kHz using MIL-STD-220A methodology.
s. Devices shall be provided with one set of NO/NC dry contacts. The output of the dry contacts shall indicate a failure of a phase or the entire unit.
t. The MCC shall include a neutral and ground connection terminals for MCC neutral (when specified) and necessary ground connections.
u. There shall be a display panel mounted on the door of the TVSS unit which shall display the status of the unit and shall contain pushbuttons to control the function of the audible alarm.
v. Visible indication of proper SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each SPD module shall be monitored on the front cover of the MCC as well as on the module. A push-to-test button shall be provided to test each phase indicator.
w. The display panel shall clearly indicate in English or appropriate pictograms/icons each component on the display. Markings on the display shall contrast with the background color so as to be easily read.
x. The display shall have LED's to indicate the surge suppression status of each phase: Green = Full protection to that phase, Red = No protection to that phase.
y. The unit shall be equipped with an audible alarm which shall activate when any one of the surge current modules has failed. An alarm on/off button shall be provided to silence the alarm. A button shall be mounted on the display to test the audible alarm. The buttons and alarm shall be located on the front cover of the MCC. The alarm shall emit a minimum sound level of 50dB at one (1) meter from the front of the unit.
z. A surge counter shall provide a means to record the total number of transient line to ground, line to neutral, and line to line voltage surges since the counter was last reset.
aa. The surge counter shall be physically located on the diagnostic display panel and display digits from 0 to 999,999 at a minimum in clearly readable text.
bb. A reset switch shall control the surge counter. When pressed the surge counter will reset to zero.
cc. In the event of a power loss to all phases the surge counter will retain the last number in its memory for a minimum of 30 days after such a power loss.

2. Manufacturers are Square D Company IMA Series, Cutler Hammer, General Electric, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and National Electrical Code.
B. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section includes the furnishing and installing of all panelboards as specified herein and as shown on the drawings. All panelboards shall be indoor type unless otherwise noted on the drawings. Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Refer to equipment Manufacturer requirements under 16010.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010, and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Panelboards - Lighting and Distribution 480Y/277 volt, 208Y/120 volt, 240/120 volt
   1. General
      a. Panels identified for use as service entrance equipment shall be so labeled.
      b. Panelboards shall comply with the applicable sections of UL, NEC and NEMA.
      c. Acceptable manufactures are Squared D, Cutler-Hammer, General Electric or equal.
   2. Interiors

a. Interior shall be completely factory assembled with bolt-on devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
b. Unless otherwise noted, full size insulated tin-plated copper neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
c. Main bus bars shall be tin-plated copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient of 40 degrees C maximum.
d. A ground bus shall be included in all panels.
e. Main circuit breakers located within panelboards shall be center mounted, separate from the feeder section. Main circuit breakers installed as part of the feeder section are not acceptable.

3. Boxes
   a. Boxes shall be at least 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electrical Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
   b. Boxes shall be provided with removal blank ends.
4. Trims
   a. Trims for lighting and appliance panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi-flush cylinder lock and catch assembly. Doors over 48 inches in height shall have auxiliary fasteners.
   b. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
   c. Surfaces of the trim assembly shall be properly cleaned, primed and a finish coat of gray ANSI 61 paint applied.
   d. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
   e. A typed directory card with clear plastic cover shall be supplied mounted on the inside of each door.
   f. Provide an engraved nameplate for each panel section.
5. Panelboard Ratings
   a. Panelboards rated 240 VAC or less shall have short circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes rms symmetrical.
   b. Panelboards rated 480 VAC shall have short circuit ratings as shown on the drawings or as herein scheduled, but not less than 14,000 amperes rms symmetrical.

c. Breakers shall be a minimum of 100 ampere frame. Breakers 15 through 100 amperes trip size shall take up the same pole spacing.
d. GFCI circuit breakers shall be a minimum of 100 ampere frame when indicated on the panelboard schedule. Breakers 15 through 100 amperes trip size shall take up the same pole spacing.
e. Panelboards shall be labeled with a UL short circuit rating. When series ratings are applied with integral or remote upstream devices, a label shall be provided. Series ratings shall cover all trip ratings of installed frames. It shall state the conditions of the UL series ratings including:
    i. Size and type of upstream device
    ii. Branch devices that can be used
    iii. UL series short circuit rating

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and the latest edition of the National Electrical Code accepted by the Authority Having Jurisdiction.
B. All panelboards shall be installed so that the top circuit breaker handle is not higher than 6'-6" above finished floor.
C. Panel shall be mounted to unistrut stainless steel framing channels. Panels shall not be hung directly off walls.
D. Panels to be installed in finished areas shall be recessed with flush trim covers.
E. Loads shall be balanced on all phases and branch circuiting rearranged, if balancing is required.
F. All wiring connections shall be made in accordance per Manufacturer's requirements.
G. Install panelboards as shown on the Drawings.
H. At each flush mounted panelboard, provide four (4) spare three-quarter inch (3/4) raceways from panel-board, etc. to an area above the nearest accessible ceiling space and floor space in the specific room location. Make 90 degree turn above the ceiling or below the floor and cap all conduits.
I. Install panelboards in accordance with Manufacturer's instructions.
J. Install Safety Labels in compliance with NEMA 260.
K. Ground all panelboard in accordance with the National Electric Code and as specified in section 16450.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16443

MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section includes the furnishing, installing, and testing of motor control centers as specified herein and as shown on the contract drawings and indicated on the "Single Line Diagrams" and “Motor Control Elevations”. Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

B. The contract drawings provide elevations for each motor control center for the project. The number of “Spaces” shown in the elevation(s) are to be provided as part of the motor control center. These spaces will be utilized for future expansion.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Motor Control Center(s) shall have been tested in a high power laboratory to prove adequate mechanical and electrical capabilities. All major components shall have been individually design tested and guaranteed by the Manufacturer.

E. Refer to equipment manufacture requirements under 16010.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010, and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Motor Control Centers:

1. General
   a. Motor Control Center(s) shall be Square D, Cutler-Hammer Freedom Series 2100 Design, General Electric(ABB), or Siemens. Wiring shall be NEMA Class 2B+2S.
   b. The type of enclosure shall be in accordance with NEMA Standards for Type 1A with gasketed doors. All enclosing sheet steel, wireways and unit doors shall be gasketed.
   c. The Motor Control Center shall be 600 volt class suitable for operation on a three phase, 60 Hertz system. The system operating voltage and number of wires shall be as indicated on the drawings.
   d. Equipment shall meet the applicable NEMA, ANSI and UL standards.
2. Structure Arrangement
   a. Structures shall be totally enclosed deadfront, free standing assemblies. They shall be 90 inches high, 20 inches wide, and 20" deep unless otherwise noted on the contract drawings.
   b. Structures shall contain a horizontal wireway at the top and bottom, isolated from the horizontal bus and shall be readily accessible through a hinged cover. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.
   c. Compartments for mounting control units shall be incrementally arranged such that not more than six size 1 starters can be mounted within each vertical structure. Guide rails shall be provided.
   d. A vertical wireway with minimum of 35 square inches of cross sectional area shall be adjacent to each vertical unit and shall be covered by a hinged door. Wireways shall contain steel rod cable supports.
3. Bus Arrangement
   a. Each structure shall contain a main horizontal tin-plated copper bus, with minimum ampacity of 600 amperes or rated as shown on the drawings. Vertical busses feeding unit compartments shall be tin-plated copper and shall be securely bolted to the horizontal main bus. All joints shall be front accessible for ease of maintenance. The vertical bus shall have a minimum rating of 300 amperes for front mounted units.
   b. The vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier. It shall effectively isolate the vertical busses to prevent any fault generated gasses to pass from one phase to another.
   c. Busses shall be braced for 65,000 amperes rms symmetrical (minimum), or as shown on drawings.
   d. All MCCs shall contain a fully rated tin-plated copper neutral bus.
4. Unit Construction
   a. All full voltage starter units through NEMA size 5 shall be of the draw out type which include a positive guide rail system and stab shrouds. Drawout units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend into the bus compartment.
   b. All drawout units shall be secured by a spring loaded quarter turn indicating type fastening device located at the top front of the unit.

c. Interior of all units shall be painted white. Units shall be equipped with side-mounted, pressure pull-apart type control terminal blocks rated 480 volts. Provisions shall be made for the addition of future terminal blocks.
d. Each unit compartment shall be provided with an individual front door.
e. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock.
f. An interlock shall be provided to prevent inadvertent closing of the disconnect when the door is opened. A second interlock shall be provided to prevent removal or re-insertion of the unit while in the ON position.
g. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one to three padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

5. Combination Starters
   a. Combination starter units shall be full voltage non-reversing (FVNR), full voltage reversing (FVR) or two speed two winding (2S2W) as shown on the Drawings and shall utilize Motor Circuit Protectors Type HMCP.
   b. The HMCP shall provide adjustable magnetic protection and be provided with pin insert to stop the magnetic adjustment at 1300% motor nameplate full load current to comply with NEC requirements. All HMCP combination starter units shall have a "tripped" position on the unit disconnect and a push-to-test button on the HMCP. Type HMCP motor circuit protectors shall include transient override feature for motor inrush current.
   c. Each combination unit shall be rated 65,000 AIC symmetrical at 480V.
   d. Linestarters shall be electrically operated, electrically held, three pole assemblies with arc extinguishing characteristics and shall have silver-to-silver renewable contacts. They shall have provisions for a total of eight NO or eight NC auxiliary contacts.
   e. The overload relay assembly shall be of the thermal bimetallic type. Overload relays shall be reset from outside the enclosure by means of an insulated button. The overload relay shall have a built-in push-to-test button.
6. Reduced Voltage Solid State Motor Starters
   a. Provide reduced voltage solid state starters where shown on Drawings. Refer to section 16407 for requirements.
7. Feeder Circuit Breakers
   a. Individual feeder breakers shall be molded case type sized as shown on contract drawings.
   b. Interrupting capacity shall be a minimum of 65,000 AIC or as indicated on the drawings.
   c. Circuit breakers 1200 amps and over shall have Reduced Arc Flash Energy Let Though or RELT capability.
8. Variable Frequency Drives

a. Various Variable Frequency Drive units have been specified as being installed within the motor control center(s). The MCC Manufacturer shall be responsible for providing a completely UL Listed MCC which contains VFD's and related devices as specified in Section 16469 and as shown on the Drawings.

9. Power Monitor
   a. Provide microprocessor metering as shown on the drawings for power metering and loss of normal power monitoring. Metering shall be Allen-Bradley #1426 Power Monitor 5000.
10. Finish
   a. The control center shall be given a phosphatizing pretreatment. The paint finish shall be an anionic, thermoset acrylic. Manufacturer's standard color shall be used.
11. Nameplates
   a. Each unit will have 1.0 x 2.5 inch hot stamped nameplate. The lettering shall be white 3/16 inch high, in a black background.
12. There are specific circuit breakers which are required to be electrically operate for load shedding purposes and are to be installed within specific motor control centers as shown on the contract drawings. Refer to switchboard section for description and operation of these breakers.
13. Anti-Static and Non-Conductive Floor Mats
   a. Floor mats shall meet minimum stands Type II, ASTM D178 Class 2. Minimum thickness shall be ¼" and 3 feet wide, black rubber with corrugated surface pattern. Provide Northax electrical hazardous mat Model 830C0036-75 or equivalent. Provide customized lengths to be installed in front of all new motor control centers. Contractor to coordinate the location and installation of floor mating with the Owner at each building.
14. The MCC supplier shall refer to the drawing single line diagrams and Section 16469 for specific variable frequency drive sizing, ratings, and requirements. In addition, the MCC supplier is responsible to provide and submit the VFD Parameter Set-Up Checklist and Testing forms to be completed and performed during start-up and testing. Upon completion, the forms along with the signed testing forms shall be submitted in a bound hard copy and electronically to the engineer for final record.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and the latest edition of the National Electrical Code accepted by the Authority Having Jurisdiction.

B. Ground all motor control centers in accordance with the National Electric Code and as specified in section 16450.

C. Motor control centers shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Install two continuous runs of Unistrut the entire width of the

MCC in the concrete pad with 1/16" reveal to provide a level mounting surface. Coordinate strut installation with Concrete Contractor. Use shims where necessary.

D. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16445

MODIFICATIONS TO EXISTING MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section includes the furnishing, installing, and testing of modifications to existing motor control centers as specified herein and as shown on the contract drawings as indicated on the "Single Line Diagrams". Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

B. Modifications to existing motor control centers are not required to be of the same Manufacturer as the motor control centers provided for the project as applicable. These devices take exception to the Quality Assurance Statement of Section 1.2.E of Specification 16010.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Motor Control Center(s) shall have been tested in a high power laboratory to prove adequate mechanical and electrical capabilities. All major components shall have been individually design tested and guaranteed by the Manufacturer.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Modifications to Existing Motor Control Centers:

1. The modifications to the existing motor control centers and the Manufacturer are shown on the contract drawings.
2. This Contractor shall visit the site to become thoroughly familiar with the work required and specified herein. All modifications shall be performed without jeopardizing the integrity of the existing equipment. All work to be performed shall be complete and shall meet with all standards and guidelines for installation to this equipment.
3. The contract drawings indicate that specific compartment section(s) are to be modified. The modifications shall include new equipment and/or modifications to existing equipment installed. Each compartment is to be replaced and/or existing equipment modified in order to retrofit the compartment sections as required by the contract documents.
4. The short-circuit ratings of all new and modified devices shall be equal to or greater than that of the existing equipment. This is to be verified by this Contractor and the information furnished and included in the shop drawing submittals for this equipment.
5. The Contractor shall be allowed to replace the sections as required in their entirety. This shall be verified with the Contractor and brought to the attention of the Engineer prior to final cost submittal.
6. Provide screwed on nameplates for all revised sections as required for all front compartment devices and as noted on contract drawings.
7. All new equipment shall maintain the UL listing of the MCC.
8. The requirements noted have been outlined for this section. If any information on existing equipment cannot be verified then this shall be brought to the attention of the Engineer and verified prior to submitting bid for this project.
9. Refer to Section 16900 for control device and equipment requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer’s instructions, contract drawings and the latest edition of the National Electrical Code accepted by the Authority Having Jurisdiction.

B. Ground all motor control centers in accordance with the National Electric Code and as specified in section 16450.

C. Motor control centers shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Install two continuous runs of Unistrut the entire width of the MCC in the concrete pad with 1/16” reveal to provide a level mounting surface. Coordinate strut installation with concrete Contractor. Use shims where necessary.

D. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16446

MODIFICATIONS TO EXISTING MEDIUM VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section includes the furnishing, installing, and testing of modifications to existing switchboards as specified herein and as shown on the contract drawings as indicated on the "Single Line Diagrams". Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

B. All equipment shall have been tested in a high power laboratory to prove adequate mechanical and electrical capabilities. All major components shall have been individually design tested and guaranteed by the Manufacturer.

C. All equipment to be submitted such as low voltage switchboards, motor control centers, panelboards, dry-type transformers, motor starters, disconnect switches, etc. shall be furnished by the same single Manufacturer unless otherwise noted. Substitutions of multiple Manufacturers for this equipment shall be rejected.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Modifications to Medium Voltage Switchboards:
   1. Equipment:
      a. The existing 4160V main switchgear Manufacturer is (TBD) as shown on the contract drawings. This equipment has been configured on the basis of design as manufactured by (TBD). No substitutions or alternate suppliers will be allowed. No exceptions. All (TBD)V cells to be furnished shall be interchangeable.
      b. Refer to the Contract Drawings for layout and configuration of the (TBD)V existing switchgear and modifications.
   2. Medium Voltage Retrofit to Vacuum Circuit Breaker:
      a. Scope:

i. This specification serves to define requirements for the retrofitting of existing metering compartments to accept new circuit breakers as shown on the Contract Drawings with the same or greater interrupting rating using vacuum interrupters. The circuit breakers shall be fully compatible with the existing switchgear controls.
ii. This specification serves to define the requirements for providing new digital type metering and monitoring devices.

b. Standards:
i. All supplied equipment shall conform to, and tests shall be conducted in accordance with the latest applicable standards of the American National Standards Institute (ANSI), National Electrical Manufacturer Association (NEMA), and the Institute of Electrical and Electronics Engineers, Inc. (IEEE) unless otherwise stated herein.

c. General Requirements:
i. The 3-pole vacuum interrupter housing assembly shall be mounted in the existing metering cubicle as shown on the existing and modified single line diagrams. The retrofitted cubicle shall be suitable for use in the existing metalclad switchgear. Only vacuum interrupter and housing assemblies that have passed appropriate ANSI design tests shall be used in the retrofit. Acceptable interrupter and housing assembly Manufacturers are: (TBD) only.
ii. The existing switchboard main bus bars shall be modified as required to extend into this retrofitted compartment to accommodate the installation of the new vacuum circuit breaker and all associated metering equipment as shown on the modified single line diagram and as specified herein.
iii. Main current-carrying parts, insulators, supports, and housings of the retrofitted cubicle shall have sufficient mechanical strength to withstand, without incurring damage, the effect of rated short circuit currents.

d. Circuit Breakers:
i. Unless otherwise specified, the vacuum circuit breakers shall be rated in accordance with the latest issues of ANSI C-37.04 and table 2 of ANSI C37.06.
ii. The circuit breaker shall be stored-energy-closing mechanism. The mechanism shall discharge the stored energy before or during withdrawing from or inserting into the circuit breaker compartment. The mechanism shall open, and remain in a trip-free state between the test and connected position.
iii. Electrically operated mechanisms shall be designed to match the existing air magnetic circuits. Closing and tripping mechanisms shall operate satisfactorily over the voltage range in accordance with ANSI C37-06, table 1 0.
iv. All primary current paths and fingers shall be silver or tin plated.
v. Each circuit breaker mechanism shall be equipped with the

following:

(1) Operation counter
(2) Main contact position indicator or target
(3) Manual tripping and closing devices
(4) Spring charged and discharged indicator or target.

vi. Each retrofitted cubicle shall have a bolted copper bus connection.

vii. The circuit breaker shall be equipped with a new electrically operated mechanism. All springs, coils, and motors shall be of new manufacture.

viii. The circuit breakers and retrofitted housings shall be designed and routine tested according to ANSI C37.09, C37.20.2, and C37.55 standards. Certified test reports on the identical circuit breakers may be submitted for acceptance in lieu of performing design tests.

ix. The following additional ANSI C37.09 design tests on the circuit breaker and housing, mounted within the existing cubicle frame shall be performed:

(1) Rated Continuous Current-Carrying Test
(2) Dielectric Tests (BIL and Low-Frequency Withstand)
(3) Momentary Current Test
(4) Mechanical Endurance Test

Certified test results may be submitted for acceptance in lieu of performing tests (a) through (d) above only if the vendor has performed similar retrofits on the equipment listed in the purchase order.

x. The operating mechanisms shall be readily accessible for customer maintenance.

xi. Specific data and technical specifications requirements for the existing circuit breakers has been noted on the drawings. Refer to the drawings for this information. All new circuit breakers shall meet or exceed these ratings.

e. Control and Indicating Devices:

i. Control relays, auxiliary contacts, and small mechanisms shall be enclosed, protected and accessible for maintenance.

ii. All control relays, coils, motors, and mechanisms shall be new equipment.

f. Tests and Inspection:

i. Production tests shall be made in accordance with ANSI C37.09, article 5.1 and C37.20.2, article 5.3

ii. The purchaser shall have the right to inspect at the factory all equipment covered by these specifications, at any time during manufacture and assembly, and shall have the right to be present during any tests made on the equipment.

iii. The vendor, upon request, shall furnish the purchaser with advance notice of final assembly and testing.

iv. The supplier shall have in place a dedicated Quality Assurance Department that is separate from production.

g. Drawings:
   i. Schematic Diagrams and nameplate information will be submitted to Vendor within (30) days of date of purchase order. Within thirty (30) days after receipt of schematic diagram and nameplate information from Purchaser, Vendor shall submit the following ACAD reproducible drawings for approval:
      (1) Schematic control diagrams of the retrofitted circuit breaker and cubicle.
      (2) Verification of nameplate designations as submitted by Purchaser.

h. Descriptive Materials and Test Reports:
   i. Instruction and maintenance books, certified tests reports, complete parts list, recommended spare parts lists and final as-built control and single line diagrams shall be furnished with the retrofitted breakers and cubicles.
      (1) Installation:
   ii. The vendor shall provide qualified installation technicians for installation conformance.

i. Insurance:
   i. Qualified converters/installers shall carry the following minimum insurance with insurance carriers rated A- or better by A.M. Best Company.

Description of Coverage	Limit of Liability
Comprehensive General Liability Insurance	$2 Million Combined Single Limit Bodily Injury and Property Damage
Automobile Liability Insurance	$2 Million Combined Single Limit Bodily Injury and Property Damage
Workers' Compensation	Statutory
Employer's Liability Comprehensive Liability Coverage	$2 Million

3. Medium Voltage Replacement Circuit Breakers
   a. Scope:
      i. This specification serves to define the requirements for a direct replacement medium voltage circuit breaker as shown on the Contract Drawings with the same or greater interrupting rating, using vacuum technology. The direct replacement circuit breaker shall be compatible with the existing switchgear cubicles, with identical connections and interlocks.

ii. This specification serves to define the requirements for replacement of existing analog power metering and equipment with new digital type metering and monitoring devices. The existing switchgear metering compartment door shall be replaced to accommodate this installation.

b. Standards:
   i. The equipment shall conform to and tests shall be conducted in accordance with the latest applicable standards of the American National Standards Institute (ANSI), National Electrical Manufacturers' Association (NEMA), and the Institute of Electrical and Electronic Engineers, Inc. (IEEE) unless otherwise stated herein.

c. General Requirements:
   i. The replacement circuit breaker shall be suitable for use in the existing metalclad switchgear, and have been fully tested in accordance with ANSI C37.59. Only vacuum interrupters and mechanism assemblies that have passed appropriate ANSI design tests listed in C37.09 shall be used in the circuit breakers. Approved interrupter and mechanism Manufacturers are: (TBD) only. No exceptions.
   ii. Main current-carrying parts, insulators, supports, and housings of the circuit breakers shall have sufficient mechanical strength to withstand, without incurring damage, the effect of rated short circuit currents.

d. Replacement Circuit Breakers:
   i. Unless otherwise specified, the circuit breakers shall be rated in accordance with the latest issues of ANSI C37.04 and table 2 of ANSI C37.06.
   ii. The mechanism shall be sized to operate the existing circuit breaker interlocks and shall be fully function tested according to ANSI C37.20.2, article 5.3.
   iii. The replacement circuit breaker shall have a stored-energy closing mechanism. The mechanism shall discharge the stored energy before or during the process of withdrawing from or inserting into the circuit breaker compartment.
   iv. The electrical operated mechanism shall be designed to match the existing air-magnetic circuits. Closing and tripping mechanisms shall operate satisfactorily over the voltage range in accordance with ANSI C37.06, table 10.
   v. All primary current path components shall be manufactured of silver-plated copper.
   vi. Each circuit breaker mechanism shall be equipped with the following:
      (1) Operating counter
      (2) Main contact position indicator or target
      (3) Manual tripping and closing devices

(4) Spring charged and discharged indicator or target

vii. Each circuit breaker shall retain the existing size and style copper connection to the ground bus.

viii. The circuit breaker shall retain the existing style racking mechanism and interlocks. The cell mechanism must be capable of moving the replacement circuit breaker, and operating the mechanical interlocks between the connected, test, and disconnected positions as originally designed.

ix. Replacement circuit breakers safety and racking interlocks shall be constructed of ridged steel construction. No interlocks using flexible cables will be allowed.

x. The replacement circuit breakers shall be of new construction.

xi. The replacement circuit breakers shall be design and routine tested according to ANSI C37.09 and C37.20.2.

xii. As an alternative to this requirement, design tests on the vacuum sealed interrupter module may be submitted in lieu of performing the design tests listed in C37.09. The following ANSI C37.09 design tests would then be required on the complete replacement circuit breaker, consisting of the interrupter module mounted in a new frame manufactured to adapt the module to the existing air-magnetic circuit breaker configuration:

(1) Rated Continuous Current-Carrying Test
(2) Rated Full Wave Impulse Withstand Voltage Test
(3) Momentary Current Test
(4) Low Frequency Voltage Withstand Test
(5) Interlock and Auxiliary Function Test

xiii. Certified test results may be submitted for acceptance in lieu of performing tests (16a) through (16d) above only if the supplier has tested circuit breakers identical to those specified.

xiv. Primary bushings shall be silver-plated copper insulated with cycloalphatic epoxy material or equal. Bushings rated above 5,000 V shall contain shields.

xv. Replacement circuit breaker frames shall be constructed with steel of the same or greater gauge as the original air-magnetic frame (0.25-in. thickness).

xvi. Provide new front door with equipment as shown on the drawings.

(1) Tests and Inspection:

xvii. Production tests shall be made in accordance with ANSI C37.09, article 5.1 and C37.20.2, article 5.3.

xviii. The purchaser shall have the right to inspect at the factory all equipment covered by these specifications, at any time during manufacture and assembly, and shall have the right to be present during any testing made on the equipment.

xix. The vendor, upon request, shall furnish the purchaser with advance notice of final assembly and testing.

xx. The vendor must have a dedicated quality assurance department that

is separate from production, answerable only to the president of the company, to insure the quality workmanship of the production department. A copy of the vendor's quality assurance program must be included with the proposal.

(1) Drawings, Descriptive Materials, and Test Reports:

xxi. Within 15 days ARO the vendor will supply the schematic diagram of the replacement circuit breaker.

xxii. Instruction and maintenance books, certified test reports, complete parts list, recommended spare parts list and final "as-built" control and single line diagrams shall be furnished with the replacement circuit breaker.

(1) Installation:

xxiii. The vendor will provide qualified installation technicians for installation conformance.

(1) Insurance:

xxiv. Qualified converters/installers shall carry the following minimum insurance with insurance carriers rated A- or better by A. M. Best Company:

Description of Coverage	Limit of Liability
Comprehensive General Liability Insurance	$2 Million Combined Single Insurance Bodily Injury and Property Damage
Automobile Liability Insurance Insurance	$2 Million Combined Single Limit Bodily Injury and Property Damage
Workers' Compensation	Statutory
Employer's Liability	$2 Million
Comprehensive Liability Coverage	

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and the latest edition of the National Electrical Code accepted by the authority having jurisdiction.

B. Ground all equipment in accordance with the National Electric Code and as specified in section 16450.

C. Install Safety Labels in compliance with NEMA 260.

D. Maintain UL Listing of equipment.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install all grounding and appurtenances as shown on the Drawings, Manufacturer's installation manuals and guidelines, and as specified herein.

B. The Contractor is responsible to provide a complete interconnected grounding system which provides for a common potential grounding system. All components shall be bonded to the same potential via the grounding system for the entire facility. Review all connections and drawings along with requirements of the Authority Having Jurisdiction's accepted edition of the National Electrical Code (NEC) for final grounding requirements. A complete and integrated grounding system shall be the responsibility of the Contractor to furnish, install, and integrate into the sequence of construction for this the facility. All work shall be in compliance with NEC requirements and as indicated on the drawings.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. In General, the workmanship of the electrical installation shall be as described in the N.E.C.A. Electrical Design Guidelines. All methods of construction, details of workmanship, etc. that are not specifically described therein or indicated in the Contract Documents, shall be subject to the control and approval of the Engineer.

B. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the Specifications.

C. Work determined by the Engineer to be unsatisfactory according to industry standards shall be redone at the Contractor's expense, with no additional compensation.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Section 16050 - Basic Materials for material to be used under this section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grounding electrode conductors shall be run in rigid steel conduits. All metal conduit used for the installation of the grounding electrode conductor shall be bonded with the use of a bonding bushing at both ends.
B. Grounding conductors shall be run with feeders where shown on the drawings or hereinafter specified.
C. Conduits stubbed-up below a motor control center shall be fitted with insulated grounding bushings and connected to the motor control center ground bus. Boxes mounted below motor control centers shall be bonded to the motor control center ground bus. The grounding wire shall be sized in accordance with article 250 of the National Electric Code.
D. Liquid tight flexible metal conduit in sizes 1 inch and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with plastic tie wraps. Tie wraps shall be installed 12 inches apart and not more than 6 inches from ends.
E. Connect the following equipment by separate wire or cable directly to the grounding system:
    1. Frame of each transformer
    2. Neutral of each transformer for a separately derived system as defined by NEC article 250.
    3. Service entrance line compartment
    4. Low voltage switchgear
    5. Cable tray system
    6. Boiler stacks and the like
F. Connect the following equipment by separate wire or cable to the ground bus in the distribution equipment servicing the equipment:
    1. Motor Control Centers and Switchboards
    2. Panelboards
    3. 480 Volt motors
    4. Control panels
    5. Bus Duct
    6. All feeders and branch circuit installed in non-metallic raceways
    7. Receptacle circuits
G. The following equipment shall be grounded through the metallic raceway systems with permanent and effective ground connections:
    1. All metal cases and support frames
    2. Lighting system
    3. All motors
    4. Radio Antennas
H. Bond the following N.E.C. approved electrodes together to form a ground system:
    1. Metallic water main
    2. Building steel frame
    3. Steel reinforcing rods
    4. Grounding rods and plates
    5. Buried bare copper conductors
I. Grounding electrodes shall be driven where shown on the drawings. Spacing between electrodes shall be equal to or greater than the length of the electrodes. Exposed

grounding connections shall be made by means of approved bronze clamps. Exposed connections between different metals shall be sealed with No. Oxide Paint Grade A, or equal.

J. Make connections to equipment with mechanical connections by means of approved bronze clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or equal. Make connections for all service entrance ground connections and all ground rods with an exothermic welding process. All buried connections shall be made by an exothermic welding process equal to Cadweld. Molds used for the welding process shall be new having no prior usage. Molds shall be the specific type for the connection to be made. Added section under installation section of 16050 to specify types of connections for grounding.All buried conductors shall be laid slack in trenches. The earth surrounding the cables shall be void of sharp objects which may injure the cables. Backfill material shall be natural earth. Where cables are exposed to mechanical injury they shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard. Connections shall be made as hereinbefore specified.

N. Manholes shall be furnished with a grounding point. Cast-in-place manholes shall be furnished with a driven ground rod extending 8 inches above the finished floor.

O. Precast manholes shall be furnished with a 6 inch by 1 inch by inch ground bus. The ground bus shall be connected to an external grounding electrode. The interconnecting cable shall be fitted with a cable water seal fitting to prevent water leakage.

P. Do not allow water main connection to be painted. If the connections are painted, they shall be disassembled and remade with new fittings.

Q. Bond and ground all conduit systems. Ground conduit system and neutral conductor of wiring system with a connection at the main electrical service switchboard.

R. Furnish and install all main service grounding systems, building grounding systems and supplemental grounding systems as required by NEC and as shown on the drawings for a complete grounded system for the entire facility.

S. Ground all motor frames (operating on Variable Frequency Drives) and VFD shielded cable per the recommendations of the Manufacturer of the Variable Frequency Drive. Also, the Contractor shall bond the motor, VFD cable, etc. per the recommendations of the VFD Manufacturer to create a path back to the VFD drive.

T. Equip and install all exposed "pigtails" or grounding electrode conductors with an armored sheath.

U. Group and bond ground wires to panel boxes, light fixtures, receptacles, etc., not to system neutral.

V. Ground shield of a twisted-pair cable at one end only, at the power source for the device or instrument.

W. Ground all lightning arresters and exterior conduit risers.

X. Furnish and install a #4/0 bare copper ground conductor within the manhole systems and connect to the system ground grid. Connect and exothermic weld to ground rod and rack support mounting for proper grounding at each manhole as required by this contract.

3.2 TESTING

A. Tests shall be performed before loaming and seeding or paving work has been performed. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16461A

LOW VOLTAGE DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install, single phase and three phase general purpose individually mounted dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as shown on the contract drawings and indicated on the "Single Line Diagrams".

B. Coordination, Short Circuit and Arch Flash studies are required for this equipment, refer to Section 16010 for requirements.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Transformers shall be designed, m

E. manufactured, and tested in accordance with all the latest applicable ANSI, NEMA, DOE, and IEEE standards.

F. The following tests shall be made on all transformers:

1. Ratio tests on the rated voltage connection and on all tap connections.
2. Polarity and phase-relation tests on the rated voltage connection.
3. Applied potential tests

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Dry Type Distribution Transformers (150 kVA and Below)

1. General
   a. Transformers shall be designed, manufactured, and tested in accordance with all the latest applicable ANSI, NEMA, DOE (Department of Energy), and IEEE standards.
   b. All 600 volt class transformers shall be UL listed and bear the UL label.
   c. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
   d. Transformer efficiency shall meet or exceed the latest DOE 2016 Efficiency Standard requirements.
2. Insulation Systems
   a. Transformers shall be insulated as follows:

KVA	Insulation Class	Average Winding Temperature Rise (ºC)	Maximum Ambient Temp. (ºC)	Hot Spot Differential (ºC)	Total Temperature Rise (ºC)
≤ 2 KVA	F	80	40	15	150
3 KVA - 29 KVA	H	125	40	20	185
≥ 30 KVA	R	150	40	30	220

   b. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degree C maximum ambient, with a 30 degree C average ambient over 24 hours.
   c. All insulation material shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.
3. Induced potential test

B. Refer to equipment manufacture requirements under 16010.
1. Core and Coil Assemblies
   a. Transformer core shall be constructed with high grade, non-aging, grain-oriented silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the highest tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade copper with continuous wound construction.
   b. On units rated below 30 kVA, the core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moisture-proof, shock resistant seal.
   c. On units rated 30 kVA and above, the core and coil assembly shall be impregnated with a non-hydroscopic, thermo-setting varnish and cured to reduce hot spots and seal out moisture.
2. Enclosures
   a. The enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed, and finished with ANSI 61 color weather-resistant

enamel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees C.

b. On units rated below 15 kVA, the enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.

c. On units rated 15 kVA and above, the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting holes. All ventilation openings shall be protected against falling dirt. On outdoor units, provide suitable weather shields over ventilation openings.

3. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self cooled ratings:

KVA Rating	Maximum Sound Ratings
Up to 9 KVA	40 dB
10 to 50 KVA	45 dB
51 to 150 KVA	50 dB

4. Nameplates: Provide 1 inch high x 3 inches engraved lamocoid nameplates for each transformer. Furnish white letters on a black background. Identify primary and secondary voltages and feeder source designation on the nameplate.
5. Terminations: All lugs shall be UL Listed to accept solid and/or stranded copper and aluminum conductor. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating in the NEC. Provide required number of lugs/phase as indicated by the contract drawings and cabling requirements.
6. Manufacturers
7. Transformers shall be manufactured by Square D, Cutler-Hammer, General Electric, Hevi-Duty, Acme or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer’s instructions, contract drawings and the latest edition of the National Electrical Code accepted by the Authority Having Jurisdiction.

B. Ground all transformers in accordance with the National Electric Code and Section 16450.

C. Floor mounted dry-type transformers shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides.

D. Install dry-type transformers with adequate clearances for proper ventilation.

E. Bolt floor mounted transformer to concrete pad utilizing neoprene vibration damping pads. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Use shims where necessary.

F. Disconnecting Means:

1. Transformers, other than class 1 and class 2, shall have a disconnecting means located on the primary side either in sight of the transformer or in a remote location. Where remotely located, the disconnecting means shall be lockable and the location shall be field marked on the transformer via a lamacoid nameplate.

G. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16461B

MEDIUM VOLTAGE LIQUID FILLED TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide a liquid filled pad mounted transformer(s) sized as shown on the single line diagrams.

B. Coordination, Short Circuit and Arch Flash studies are required for this equipment, refer to Section 16010 for requirements.

C. Refer to the site plan for location of transformer(s).

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturers". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Transformers shall be designed, manufactured, and tested in accordance with all the latest applicable ANSI, NEMA, and IEEE standards.

E. The following tests shall be made on all transformers:

1. Ratio tests on the rated voltage connection and on all tap connections.
2. Polarity and phase-relation tests on the rated voltage connection.
3. Applied potential tests
4. Induced potential test

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items in this Section. Submit Shop Drawings in accordance with Sections 01340, 16010, and as specified in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pad-mounted Transformers, Liquid-filled:

1. The following standards shall apply to all liquid-filled pad-mounted transformers:
   a. ANSI C37.47 - Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses.
   b. IEEE C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers (ANSI).
   c. ANSI C57.12.26 - Standard for Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase, Distribution Transformers for use with Separable Insulated High Voltage Connectors: High Voltage, 34,500 GrdY/19,920 Volts and Below; 2,500 kVa and Smaller.
   d. ANSI C57.12.28 - Switchgear and Transformers, Pad-Mounted Equipment - Enclosure Integrity.
   e. IEEE C57.12.90 - Standard Test Code for Liquid-Immersed Distribution Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers (ANSI).
   f. IEEE C57.13 - Requirements for Instrument Transformers.
   g. ANSI/IEEE 386 - Separable Insulated Connector Systems for Power Distribution Systems above 600 V.
   h. ASTM D877 - Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
   i. NEMA AB1 - Molded Case Circuit Breakers.
   j. CAN/CSA-C88-M90 - Electrical Power Systems and Equipment.
2. General:
   a. The transformer(s) shall be compartment type, self-cooled, for mounting on a pad and shall comply with the latest applicable standards.
   b. The average temperature rise of the windings, measured by the resistance method, shall be 65°C when the transformer is operated at rated kVA output in a 40°C maximum ambient, as defined by ANSI C57.12.00 without loss of service life expectancy.
   c. Coolant and insulating fluid shall be inhibited mineral oil.
   d. The high and low voltage compartments shall be located side by side, separated by a steel barrier. When facing the transformer, the low voltage compartments shall be on the right. Terminal compartments shall be full height, air-filled, with individual doors. The high voltage door fastenings shall not be accessible until the low voltage door has been opened.
   e. The following accessories shall be provided as standard on all transformers:
      i. Nameplate in low voltage compartment, 1-inch upper filter press and filling plug, 1 inch drain valve with sampling device.
      ii. Drain valve provided on units rated 750 kVA and above.
      iii. Tap changer, for de-energized operation only, which is externally operable and padlockable. The front of both compartments shall be removable to allow the transformer to be rolled or skidded into position over conduit stubs. ANSI tank grounding provisions shall be furnished in both compartments.

f. The transformer(s) shall be rated 1000 kVA as indicated on the Drawings self cooled (OA). Primary voltage 13.8kV. Secondary voltage 480V wye, 4-wire, 60 Hz with two 2-1/2% full capacity above normal and two 2-1/2% below normal taps. Impedance shall be 5.75% +/- 7-1/2 %. Basic impulse level of the primary winding shall be 60kV.

g. The transformer shall be of sealed-tank construction of sufficient strength to withstand a pressure of 7 psi without permanent distortion. The cover shall be welded and the fastenings tamper-resistant. The transformer shall remain effectively sealed for a top oil temperature range of -5°C to 105°C. Lifting eyes and jacking pads shall be provided.

h. Coils shall be wound with copper conductors.

i. Core and coil assembly shall be the five-legged wound core type, using high grade, grain-oriented silicon steel laminations carefully annealed after fabrication to restore high magnetic permeability. Magnetic flux is to be kept well below the saturation point.

j. The high voltage terminations and equipment shall be dead front and conform to ANSI C57.12.26.

k. Dead front bushings shall be either universal wells or one-piece integrated for use with separable connectors. Bushings shall be externally clamped and front removable.

l. The low voltage bushings shall be molded epoxy and provided with blade-type spade terminals with NEMA standard hole spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing, grounded to the tank by a removable ground strap.

m. Wye-wye transformers shall have the high and low voltage neutrals internally tied, with a removable strap.

n. Surge Protection - Provide three 5 kV distribution class lightning arresters for surge protection. Arresters are to be mounted in the high voltage compartment.

o. Additional Accessories:
   i. 1-inch drain valve with sampling device.
   ii. Dial type thermometer.
   iii. Magnetic liquid-level gauge.
   iv. Pressure vacuum gauge.
   v. Pressure relief valve.
   vi. Automatic pressure relief device (self resealing with indicator).
   vii. Bushing well inserts.
   viii. MOVE elbow arrestors.
   ix. Pentahead bolts for compartment doors.

p. Testing - Tests shall be conducted in accordance with the provisions of ANSI C57.12.90 and shall include, as a minimum, the following tests:
   i. Ratio
   ii. Polarity
   iii. Phase Rotation
   iv. No-Load Loss
   v. Excitation Current

vi. Impedance Voltage
vii. Load Loss
viii. Applied Potential
ix. Induced Potential
x. QA Impulse Test

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and National Electrical Code.
B. Ground all transformers in accordance with the National Electric Code and Section 16450.
C. Bolt floor mounted transformer to concrete pad utilizing neoprene vibration damping pads. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Use shims where necessary.
D. Disconnecting Means:
   1. Transformers, other than class 1 and class 2, shall have a disconnecting means located on the primary side of the transformer in a remote location. Where remotely located, the disconnecting means shall be lockable and the location shall be field marked on the transformer via a lamacoid nameplate. This applies to the feeder breakers located in the existing main switchgear MSI in the Operations Building.
E. Install Safety Labels in compliance with NEMA 260.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16469

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all variable frequency drives (VFD) as indicated on the "Single Line Diagram". Contractor shall coordinate variable frequency drive Manufacturer selection with all equipment Manufacturers. Coordination, Short Circuit and Arch Flash studies are required for this gear, refer to Section 16010 for requirements.

B. Variable frequency drives located within MCC's shall be provided by the respective MCC supplier for this project. Contractor shall coordinate variable frequency drive Manufacturer selection with all equipment Manufacturers and shall be solely responsible for ensuring that the individual variable frequency drives furnished are completely compatible with all requirements and intended functions of the driven equipment.

C. Variable frequency drives which are shown to be located in a standalone enclosure are not required to be of the same Manufacturer as the variable frequency drives installed within the motor control center.

D. Acceptable Manufacturers are Toshiba, Square D, Cutler Hammer, ABB, or equal.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)
2. Section 16160 – Cabinets and Enclosures
3. Section 16900 - Controls

1.3 QUALITY ASSURANCE

A. The equipment specified herein is based upon the first Manufacturer named after the phrase "Acceptable Manufacturer's". Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by that Manufacturer. Equipment of other acceptable Manufacturers shall be equivalent in every way to that of the equipment specified.

B. Suppliers deemed equivalent shall be responsible to support and supply equivalent equipment which shall meet the intended design. Any extensive modifications or rework of the design drawings in order to facilitate acceptability shall be the responsibility of this Contractor at no additional cost to the Owner.

C. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

D. Refer to equipment Manufacturer requirements under 16010, Section 1.2.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this

section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Variable Frequency Drives (VFD's)

1. The drive shall be capable of varying the speed of a standard or inverter duty rated NEMA Design B induction motor from a virtual standstill to the standard speed of the motor. The unit shall transform input power into a variable voltage, adjustable frequency three phase output of suitable capacity and waveform.
2. Input voltage shall be as indicated on the Drawings and/or as specified in the equipment specification sections. Frequency shall be 60 Hz.
3. Output shall be three (3) phase voltage as indicated on the Drawings and/or as specified in the equipment specification sections.
4. The drive shall be a PWM (Pulse Width Modulated) transistorized invertor.
5. The drive Manufacturer shall have not less than five years of experience in the manufacture of drives in the United States.
6. MCC Enclosure type shall be as required for the specific application as shown on the Drawings and/or as specified in the equipment specification sections.
7. The drives shall be rated for constant or variable torque applications (460V - 1 HP to 150 HP), depending on the individual driven load requirements. For constant torque applications, the output transistors shall be low-gain, fully rated. Derated high-gain transistors are not acceptable.
8. Power Line Considerations
    a. Each VFD or multiple sets of VFD's shall be designed and installed such that: the total harmonic distortion reflected back to the power source is a maximum of 5%, the notch depth reflected back to the power source is a maximum of 20%, and the notch area reflected back to the power source is a maximum of 22,800 volt-microseconds. The total harmonic distortion, notch depth and notch area shall be as defined by IEEE-519-2014.
    b. Line reactors and other required devices shall be provided for individual VFD's where indicated on the Drawings and/or in the VFD schedule.
9. Enclosures
    a. Unless otherwise noted in drive schedule, all variable frequency drives and all associated equipment and control devices shall be located within motor control centers or contain within their respective individual enclosure as shown on the Drawings. Separately submitted and mounted devices will not be accepted.
    b. Refer to schematic diagrams and VFD schedule for further information.
10. Filtering
    a. RFI/EMI filters shall be provided by supplier and shall be rated for, and compatible with, each VFD. They shall function as a complete system. Additional line reactors beyond those shown on drawings may be required in order to comply with the above parameters.
    b. 5% line reactors shall be mounted inside the respective VFD enclosure reactors and shall be TCI Harmonic Guard or equivalent.

c. Harmonic matrix filters and switching capacitor shall be provided where shown on drawings. Refer to single line diagrams and schematics for additional information.

11. System Analysis
    a. The VFD supplier shall perform a computer simulated power system study to verify compliance with the parameters as stated herein. The results of this study shall be submitted to the engineer. At a minimum the submitted results of this study shall include:
        i. A brief summary of the equations and calculation procedures used in the study.
        ii. A results summary sheet which briefly describes the power system configuration analyzed and which states the calculated values of total harmonic distortion, notch depth and notch area.
        iii. Computer generated graphs which illustrate the voltage and current waveforms of the power system with the VFD's operating. These waveform graphs shall directly illustrate the results of the power system computer model study.
        iv. Detailed list of the amplitude of harmonic currents and voltages to the 50th harmonic.
    b. The Contractor shall supply the VFD supplier with all power system data required to perform the above described study. These data may include but are not limited to:
        i. A complete one line diagram of the subject electrical distribution system. The diagram must show the lengths of all bus and cable runs, impedance values of all types of bus and cable used, and number of conductors per phase.
        ii. Complete electrical data on all equipment shown on the one line diagram is required. At a minimum this data shall consist of: Transformers - kVA, Primary voltage, Secondary voltage, Short circuit capacity or impedance. Motors - Stator resistance, No load RMS current, No load kVA, No load kW, Locked rotor RMS current, Locked rotor kVA, Locked rotor kW, Horsepower, Base speed, Number of poles, Efficiency at relevant speeds, Power factor at relevant speeds, Full load RMS current. Generators - Short circuit capacity or Subtransient reactances (Xd), Power factor, kW, X/R Ratio.
        iii. If the distribution system can function in more than one configuration, the configuration(s) to be analyzed shall be clearly defined. Any other information which may affect the behavior of the distribution system shall also be provided.

12. Ambient Conditions
    a. Environment - Indoors, NEMA rating to match areas as depicted on the NEMA CLASSIFICATION SCHEDULE on Drawing E-1.
    b. Ambient Temperature - 10 degrees C to 40 degrees C
    c. Altitude - Less than 3,300 feet
    d. Relative humidity - 90% maximum

e. Vibration - less than .5G

13. Control System
    a. Input power:
        i. Main circuit: 460V/60Hz or as shown on drawings
        ii. Control circuit: no external power for input shall be required.
    b. Tolerance: Voltage + 10%. Frequency + 2 Hz.
    c. Control method: Sinusoidal PWM control
    d. Output Voltage: 3PH 460 Volt.
    e. Output Frequency: 0.01 Hz to 60 Hz
    f. Frequency resolution: 0.01 Hz Operating panel input; 0.03 Hz Analog input; 0.01 Hz Computer interface input
    g. Frequency accuracy: + 0.5% of max frequency at 25 deg. C + 10 deg.C
    h. Volts/Hz characteristics:
        i. Either constant V/f or variable V/f (user selectable)
        ii. Base frequency adjustable from 25 Hz to 60 Hz
        iii. Voltage boost adjustable from 0% to 30%
        iv. Starting frequency adjustable from 0 Hz to 10 Hz
    i. Overload current: 150% for 1 minute (constant torque applications).
    j. Frequency command signal: 3k Potentiometer 0-10 VDC; 0-5 VDC; 4-20 mA
    k. Frequency jump - 3-point settings: Setting jump frequency (0 to Max frequency), and width (0 to max frequency).
    l. Upper/lower limit frequencies: Upper limit 0 to Max frequency. Lower limit 0 to upper limit.
    m. PWM carrier frequency: Adjustable from 400Hz to 2000Hz.
14. The drive shall provide a minimum displacement power factor of 0.95 throughout the speed range.
15. Minimum lead length to motors for VFD drive without requiring an additional output filter shall be 250 feet.
16. The efficiency of the drive at full speed shall be a minimum of 98 percent.
17. The drive shall be provided with an MCP type circuit breaker to serve as a disconnect, and coordinated with the drive protective features for the motor to form a complete combination type starter/controller. If necessary, the drive shall also be provided with current limiting fuses on the input side of the drive, sized and rated as required by the drive Manufacturer, so that the drive is rated for the available fault current.
18. The drive shall contain relays, push buttons, timers, and all other appurtenances necessary for the specific application as specified in the equipment specification sections, and as shown on the Electrical and Instrumentation Drawings.
19. Operational Functions:
    a. Acceleration/deceleration times: 0.1 to 600 seconds, 2 separate acceleration and deceleration times.
    b. Forward or reverse run can be chosen.
    c. Jogging
        i. Running - 0 to 20 Hz
        ii. Braking - Deceleration, DC injection, or coasting

d. Multispeed run: up to 7 preset speeds can be chosen.
e. VFD shall be capable of accepting a 4-20 mA input signal and adjusting speed accordingly.
f. Automatic Restart: Recovers a normal run of a coast-stopping motor.
g. Soft Stall: Sustains a run in overload mode. (90% - 150% adjustable)
h. Overload: Adjustable from 60 - 100%
i. Complete adjustment of parameters gives thousands of volt/frequency patterns.

20. Protective Features:
    a. Functions individually identified by 18 fault codes:
        Overcurrent during acceleration (OC1)
        Overcurrent during deceleration (OC2)
        Overcurrent during run (OC3)
        Overcurrent detected at start-up (OCA)
        Short circuit at load (OCL)
        Overcurrent in regenerative discharge resistor (OCr)
        Overvoltage during deceleration (OP2)
        Overvoltage (OP)
        Overload (OL)
        Overload of regenerative discharge resistor (OLr)
        Overhead (OH)
        Ground Fault (EF)
        Emergency Stop (E)
        Frequency Setting Signal Abnormality (Err.1)
        EE Prom abnormality (EEP, EEP2, EEP3)
        Computer link abnormality (Err.t)
    b. Drive shall have an external fault trip input terminal.
    c. Drive shall reset when a designated contact is closed on the terminal strip.
21. Monitor Functions
    a. The drive shall have display scaler of monitoring frequency. (Range 0.10 to 200)
    b. The drive shall be able to monitor different parameters.
    c. The drive shall have an LED on the front panel showing that the main DC circuit capacitor is charged.
22. Controller
    a. All parameters should be adjustable from the keypad.
    b. One key shall toggle between panel control and terminal control.
    c. The drive shall have a reset to factory settings.
    d. The keypad shall match enclosure NEMA rating.
    e. The keypad shall allow for parameters to be changed while drive is running.
    f. Most common used parameters should be labeled on the keypad.
23. Variable Frequency Drive Shutdown
    a. The drive shall be able to accept a 4th pole auxiliary contact (from a local disconnect) to be wire directly to an input of the drive. Upon opening of

the auxiliary contact, the drive shall be programmed to function such that the drive stops the motor immediately rather than coasting to a stop.

24. All models shall be UL listed.
25. The drive shall be provided with thermal overload function.
26. The drive shall be provided with auxiliary run contact to indicate running status.
27. Variable frequency drive vendor must be a local distributor which has factory-trained personnel and warranty authorization; capable of testing unit(s) with motor loads.
28. Individual control panels: provide a complete VFD system and a customized and modified control panel for each pump motor installation. Refer to schematic diagram on the Contract Drawings for additional requirements.
29. Provide each of the VFD control panels with the following:
    a. Single VFD NEMA rated as depicted on NEMA CLASSIFICATION SCHEDULE ON E-1 vented type enclosure control panel for each piece of equipment. No separately mounted devices and equipment outside of this enclosure. Refer to acceptable Manufacturers list in section 1.1.D.
    b. Line reactor 5%, matrix filter, RFI/EMI filter, and/or dv/dt filter as specified and as shown. Provide a matrix harmonic filter switching contactor for capacitor portion of filter as applicable
    c. Through the door disconnect operator.
    d. Front panel mounted keypad, run light, elapsed time meter and all specified items.
    e. The application shall provide for a 480, 3 phase input to each of the three (3) respective VFD control panels shall be based on motor ampacity and not strictly HP rating. The following information is being supplied for :
        - Motor Horsepower = __ HP
        - Full Load Current = __ Ampere
        - Maximum Full Load Current at Service Factor = __ Ampere
        - Locked Rotor Current = ___ Ampere
    g. The following information is being supplied for
        - Motor Horsepower = __ HP
        - Full Load Current = __ Ampere
        - Maximum Full Load Current at Service Factor = ___Ampere
        - Locked Rotor Current = ___ Ampere
    h. Provide three (3), 8 hour days of start-up and training for commissioning and final acceptance of this VFD equipment. All equipment must be pre-started, testing and certified ready for testing prior to any of these days being used. Provide a two week written schedule ahead of time to the Engineer and Owner to schedule final start-up and testing as well as training. Training will not be held the same day as start-up and shall be scheduled only upon start-up completion and acceptance.
    i. VFD shall be calibrated to the input signal based upon minimum and maximum flow settings.
    j. Provide VFD Parameter Setup and Verification. See Part 3 of this specification.

2.2 VARIABLE FREQUENCY DRIVE SCHEDULE:

Equipment Name	Motor HP	Constant or Variable Torque	Harmonic Traps/Line Reactors/ RFI/EMI/ dv/dt long lead filters	Supplier MCC Manufacturer / Electrical Contractor	Notes
VFD-RSLP-6	200	VT	5% Line Reactors	EC	
VFD-RSLP-7	200	VT	5% Line Reactors	EC	
VFD-RSLP-8	200	VT	5% Line Reactors	EC	
VFD-RSLP-9	200	VT	5% Line Reactors	EC	
VFD-RSLP-10	200	VT	5% Line Reactors	EC	
VFD-WSTP-1	10	VT	5% Line Reactors	MCC	
VFD-WSTP-2	10	VT	5% Line Reactors	MCC	
VFD-WSTP-3	10	VT	5% Line Reactors	MCC	
VFD-GBT-1	5	VT	5% Line Reactors	MCC	
VFD-GBT-2	5	VT	5% Line Reactors	MCC	
VFD-WWBP-1	10	VT	5% Line Reactors	MCC	
VFD-WWBP-2	10	VT	5% Line Reactors	MCC	
VFD-WSTP-1	10	VT	5% Line Reactors	MCC	
VFD-WSTP-2	10	VT	5% Line Reactors	MCC	
VFD-WSTP-3	10	VT	5% Line Reactors	MCC	
VFD-TWSP-1	15	VT	5% Line Reactors	EC	
VFD-TWSP-2	15	VT	5% Line Reactors	EC	
VFD-TWSP-3	15	VT	5% Line Reactors	EC	
VFD-SEBP-1	5	VT	5% Line Reactors	EC	
VFD-SEBP-2	5	VT	5% Line Reactors	EC	

Notes:

1. The cable size for the application is oversized for the size motor due to the distance to account for voltage drop. The VFD supplier shall review the capacitance effect of the cable from oversized feeders when sizing the dv/dt long lead filter and VFD drive. Provide calculations for sizing dv/dt filter to the system will operate properly. Refer to conduit and wire schedule for size of wire being provided.
2. Electrical Contractor and VFD Manufacturer shall be responsible for the final sizing of the VFDs based on the actual equipment submitted for the project. VFDs shall meet both the horsepower, torque and amperage needs.
   a. 110% of continuous output current.
   b. 250% of overload current for 2 minutes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractors shall install all equipment per the Manufacturer's instructions, contract drawings and the latest edition of the National Electrical Code accepted by the Authority Having Jurisdiction.
B. Ground all motor control centers in accordance with the National Electric Code and as specified in section 16450.
C. Freestanding variable frequency control panels shall be mounted on 4" high concrete pads which shall extend 2" on exposed sides. Securely bolt each unit to its pad for proper horizontal and vertical alignment. Use shims where necessary.
D. Ground all motor frames (operating on Variable Frequency Drives) and VFD shielded cable per the recommendations of the Manufacturer of the Variable Frequency Drive.
E. Install Safety Labels in compliance with NEMA 260.
F. Inspect all bus bolts prior to energization to check for looseness developed during shipment or handling.
G. Refer to Section 16050 for equipment mounting heights.

3.2 TESTS

A. Refer to Section 16950 for testing requirements.
B. VFD Start-Up, Testing and Parameter Setup and Verification
    1. Responsibility and Coordination: The VFD supplier/electrical Contractor is responsible for adjusting all of the VFD parameters for a fully functional system integrated with the instrumentation and control systems for this project. The VFD supplier/electrical Contractor is responsible for coordinating with the instrumentation Contractor and the instrumentation programmer so the control systems function as intended as described in the instrumentation control descriptions.
    2. VFD Parameter Setup: Complete the VFD Parameter Setup Checklist and Verification below in the presence of the specifying engineer.
    3. The electrical Contractor shall be responsible to coordinate an onsite meeting with the VFD supplier and the specifying engineer. This meeting shall take place prior to the initial startup of the equipment.

VFD PARAMETER SETUP CHECKLIST

[ENTER NAME OF FACILITY]

- ☐ 1. Ramp up speed _____
- ☐ 2. Ramp down speed _____
- ☐ 3. Min speed (Hz) _____
- ☐ 4. Max speed (Hz) _____
- ☐ 5. 4-20mA setting at min speed (mA) _____
- ☐ 6. 4-20mA setting at max speed (mA) _____
- ☐ 7. Output scale calibration _____
- ☐ 8. Auto restart after power failure (yes/no) _____
- ☐ 9. Auto restart after overcurrent fault (yes/no) _____
- ☐ 10. Speed reference (internal/external) _____
- ☐ 11. If external - signal source _____
- ☐ 12. If external - signal type _____
- ☐ 13. Restart after E-Stop (yes/no) _____
- ☐ 14. Discrete outputs - Run (yes/no) _____
- ☐ 15. Discrete outputs - Fault (yes/no) _____
- ☐ 16. Analog outputs - Amps (absolute units) _____
- ☐ 17. Analog outputs - KW (absolute units) _____
- ☐ 18. Analog outputs - Speed (Hz) _____
- ☐ 19. Analog outputs - Speed (RPM) _____
- ☐ 20. Analog inputs - 4mA set to 0Hz (yes/no) _____
- ☐ 21. Analog inputs - 20mA set to 60Hz (yes/no) _____
- ☐ 22. Analog inputs - min speed limit set (yes/no) _____
- ☐ 23. Analog inputs - max speed limit set (yes/no) _____
- ☐ 24. Voltage boost (%) _____
- ☐ 25. Starting frequency (Hz) _____
- ☐ 26. PMW carrier frequency (Hz) _____
- ☐ 27. Acceleration time (sec) _____
- ☐ 28. Deceleration time (sec) _____
- ☐ 29. Forward run (yes/no) _____
- ☐ 30. Reverse run (yes/no) _____
- ☐ 31. Overload (60%-100%)

VFD PARAMETER SETUP VERIFICATION

[ENTER NAME OF FACILITY]

Date: _____

General Contractor: _____

Electrical Subcontractor: _____

VFD Supplier: _____

This certifies that the VFD parameters have been coordinated per the specifications and the requirements of Section 16469.

_____ _____
(Authorized Representative of the General Contractor) Date

_____ _____
(Authorized Representative of the Electrical Subcontractor) Date

_____ _____
(Authorized Representative of the VFD Supplier) Date

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide complete interior and exterior lighting systems, including fixtures, standards, poles, hangers, supports, fittings, lamps, wiring, connections and controls, as indicated in the Contract Documents.

B. The lighting layouts on the DRAWINGS are diagrammatic only. Lighting fixtures, in general, have been specified for the particular type of ceiling in which they are to be installed. Refer to Architectural "Reflected Ceiling Plans" for exact location of recessed interior fixtures. Verify the ceiling construction details and provide fixtures and mounting hardware suitable for the respective ceiling types.

C. Manufacturer's lighting fixture catalog numbers as indicated on the "Lighting Fixture Schedule" indicate quality, type, efficiency and style but may not cover special, required design details. Provide lighting fixtures having such special details as noted in the "Lighting Fixture Schedule" and as required for proper installation.

D. Verify the availability of all fixtures proposed to be used in the execution of the work prior to submitting same for the Engineer's review. The discontinuance of production of any fixture after such review shall not relieve the Contractor from furnishing an alternate fixture of equivalent quality and design without additional cost to the Owner.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.

1. Section 16010 – Electrical – General (and as referenced)

1.3 QUALITY ASSURANCE

A. All fixtures shall be new and shall bear the U.L. label for the service and location intended.

B. Lighting fixtures shall be standard products of Manufacturers regularly engaged in the manufacture of the specific type lighting fixture specified as one of their principal products and shall be the Manufacturer’s latest standard design that complies with the specification requirements.

C. Lighting fixtures shall be as specified in the "Lighting Fixture Schedule" as shown on the contract drawings. Although only one Manufacturer has been named, the phrase "or equal" may be applied to each fixture listed, unless otherwise noted. The lighting design is intended to be of the highest electrical efficiency and fixtures have been selected to provide the best illumination, at the lowest life cycle cost. The Engineer reserves the right to disapprove any lamp or fixture type submitted which is, in the Engineer’s opinion, not equal in quality, appearance, efficiency or performance to the fixture specified.

1.4 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.
B. All lighting fixture types shall be submitted in a single complete brochure which shall be in the form of a hard cover binder with each fixture separated by an identified index tab. Catalog cut sheets shall indicate fixture identification, i.e., type A, D, J, etc., and shall indicate where it will be used. Information on each fixture shall include:
    1. Manufacturer and Catalog Number
    2. Dimensioned Construction Drawing(s)
    3. Standard Catalog "Cut" Sheet modified to show any options/accessories to be provided
    4. Photometrics of each fixture
    5. Lens/Louver Type for each fixture
    6. Power Requirements
    7. Ballast Type, Quantity and Rating
    8. Socket Type/Position
    9. Lamp Type, Quantity and specifications
    10. Mounting Type and details of mounting equipment
    11. Lighting Occupancy Sensors / Controls
    12. Interior Lighting Control Panel (ILCP), controls and wiring diagrams
    13. Exterior Lighting Control Panel (ELCP), controls and wiring diagrams
    14. Exterior Lighting Poles and Hardware
    15. Exterior Pole Bases

PART 2 - PRODUCT

2.1 MATERIALS

A. Fixtures shall be identical in construction features, options and appearance to the fixtures specified in the Lighting Fixture Schedule as shown on the contract drawings. All fixtures shall be able to be pendant mounted.
B. Lamps
    1. Lamps shall be LED, suitable for long life operation.
    2. Acceptable Lamp Manufacturers: General Electric, Osram/Sylvania, Phillips or approved equal.
C. Emergency Lighting System (12 VDC System)
    1. Power Units
        a. Dry locations:
            i. Each power unit shall be commercial grade, UL listed, completely self-contained and consist of twin lighting heads (where indicated on the Drawings) mounted on multi-directional swivels.
            ii. Shall be furnished with a sealed, maintenance-free, nickel cadmium battery.
            iii. Shall be furnished with a solid state fully automatic, voltage limited battery charger with solid state switching, brownout sensitivity, low voltage battery disconnect and overload/short circuit protection.
            iv. Each battery shall be capable of supplying power to the unit lights and all connected remote fixtures for a period of 90 minutes per

NEC, to an end voltage of 87.5% of nominal battery voltage.

v. The unit shall contain an AC "ON" light, high charge pilot light, and test switch to check transfer to DC lamps.

vi. Unit shall mount on standard 4 inch octagonal or square outlet box.

vii. Each lamp shall be LED.

viii. Remote heads shall be flame and impact resistant thermoplastic lampholders. Lamps shall be LED.

b. Wet Locations:

i. Each power unit shall be commercial grade, UL wet location listed, completely self-contained and consist of twin lighting heads (where indicated on the Drawings) mounted on multi-directional swivels.

ii. Each unit shall be furnished with a sealed, maintenance-free, nickel cadmium battery.

iii. Each unit shall be furnished with a solid state fully automatic, voltage limited battery charger with solid state switching, brownout sensitivity, low voltage battery disconnect and overload/short circuit protection.

iv. Each battery shall be capable of supplying power to the unit lights and all connected remote fixtures for a period of 90 minutes per NEC, to an end voltage of 87.5% of nominal battery voltage.

v. Lights shall be provided which form an integral part of the component chassis.

vi. The power unit shall be in a watertight, corrosion resistant, NEMA 4X housing.

vii. The housing shall contain an AC "ON" light, high charge pilot light, and test switch to check transfer to DC lamps.

viii. The unit shall mount on standard 4 inch octagonal or square outlet box.

ix. Each lamp shall be LED.

x. Remote heads shall be flame and impact resistant thermoplastic lampholders suitable for use in wet locations.

xi. Lamps shall be LED.

c. Hazardous Locations:

i. Where possible, or as shown on the Contract Drawings, provide and locate a suitably rated battery unit without lighting heads in a non-classified environment to power remote (Class I, Div. 1) lighting heads.

ii. The lighting head(s) shall be rated for the Class I, Div. 1 environment as specified below.

iii. Each power unit shall be commercial grade, UL listed for use in Class I, Division 1, Group C & D locations, completely self-contained and consist of twin lighting heads (where indicated on the Drawings);

iv. Each unit shall be furnished with a sealed, maintenance-free, nickel cadmium battery.

v. Each unit shall be furnished with solid state fully automatic, voltage

limited battery charger with solid state switching, brownout sensitivity, low voltage battery disconnect and overload/short circuit protection.

vi. Each battery shall be capable of supplying power to the unit lights and all connected remote fixtures for a period of 90 minutes per NEC, to an end voltage of 87.5% of nominal battery voltage.

vii. The power unit and lighting heads shall be in a NEMA 7/9 copper-free aluminum housing with hinged cover and neoprene gasket.

viii. A pilot light, and test switch to check transfer to DC lamps shall be located adjacent to the power unit connected with approved fittings for the area.

ix. The power unit shall contain a one-way breather and drain.

x. Each lamp housing shall be constructed of copper-free aluminum with aluminum guard and pendant style mounting for both unit and/or remote mounting.

xi. Lamps shall be 12V DC medium base A-lamp, 15W.

2. Exit Signs:

a. Dry Locations

i. Exit sign light fixtures shall be of the self-powered LED type, constructed of high impact polycarbonate material, and shall normally be powered by 120-277V AC.

ii. Each unit shall have a solid state fully automatic, voltage limited battery charger with the following:

(1) solid state switching

(2) brownout sensitivity

(3) low voltage battery disconnect and overload/short circuit protection

(4) test switch and power indicator light

iii. The battery shall be sealed, maintenance-free, nickel cadmium battery.

iv. Fixtures shall have 6-inch high red lettering with aluminum stencil face and matte black housing.

b. Wet Locations

i. Exit light fixtures shall be of the self-powered LED type, constructed of die-cast aluminum material, and shall normally be powered by 120-277V AC.

ii. The shield shall be constructed of injection molded, clear polycarbonate material to protect against moisture, rain, dust and vandalism.

iii. The fixture shall be UL listed and labeled as being suitable for use in wet and corrosive environments.

iv. Each unit shall have a solid state fully automatic, voltage limited battery charger with the following

(1) solid state switching, brownout sensitivity

(2) low voltage battery disconnect and overload/short circuit protection

(3) test switch and power indicator light

v. The battery shall be sealed, maintenance-free, nickel cadmium battery.

vi. The fixture shall be self diagnostic with photocell testing. Testing shall be accomplished using a laser pointer. A minimum of one laser pointer shall be supplied for the project.

vii. Fixtures shall have 6-inch high red lettering with aluminum stencil face and matte black housing.

c. Hazardous Locations

i. Exit lighting fixture shall be factory sealed with housing constructed of copper free aluminum and faceplate being constructed of impact resistant acrylic with 6-inch high red letters.

ii. Two 60 watt, LED lamps shall be utilized to illuminate the sign. Unit shall be UL listed for use in Class I, Division 1, Groups C and D Locations.

D. Exterior Lighting Control Panels (ELCP)

1. The control panel shall operate on 120-277 volts and be U.L. Listed and Labeled as a complete assembly.
2. Shall be furnished with a main circuit breaker.
3. NEMA rating of control panels shall be based on the areas in which they are installed. Refer to Drawing E-1 for the NEMA classifications for Electrical Equipment and Enclosures.
4. For enclosure construction information refer to specification 16160.
5. For control equipment (i.e. contactors, selector switches, etc.) refer to specifications 16050 and 16900.
6. Refer to schematic diagrams on the contract drawings for description of operation and control equipment required for the exterior lighting.
7. Provide individual device and panel labeling as required by the contract drawings and specification 16010.
8. All components of the lighting control panel, contactors, relays, switches, indicating lights, etc., as required by the contract drawings shall be submitted under this specification as a complete and operational lighting control system.

E. Interior Lighting Control Panel (ILCP)

1. The control panel shall operate on 120-277 volts and be U.L. Listed and Labeled as a complete assembly.
2. The control panel enclosure shall be rated for the area in which it is to be installed as defined in the NEMA Classification Schedule on Drawing E-1.
3. The control panel shall contain a sufficient number of contactors to provide the lighting control operation as shown on the Contract Drawings. Provide a minimum of one spare contactor mounted in the control panel for the Owners use.
4. Contactors located within the control panel shall be four pole rated for 30A ballast and 20A Tungsten Loads.
5. LED indicators shall be supplied with the panel to indicate each channel operation.
6. On/Off/Auto override switches shall be provided for each channel.

7. The control panel shall have the option of adding a system time clock with individual channel override switches.
8. All components of the lighting control panel as required by the contract drawings shall be submitted under this specification for a complete and operational lighting control system.
9. Shall be furnished with a main circuit breaker.
10. The control panel shall be catalog #HINCP1216Y-115 as manufactured by Watt Stopper, Inc. or equal.

F. Lighting Occupancy Sensor
1. The passive infrared sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy.
2. The sensor shall examine the frequency, duration, and amplitude of the signal received by the sensor to respond only to those signals caused by human motion.
3. Sensor shall utilize mixed analog and digital processing into a one chip package, to provide immunity to RFI and EMI.
4. Sensor shall utilize a temperature compensated dual element sensor and a multi-element Fresnel lens.
5. Fresnel lens shall be a Poly IR 4 based material (for standard and Long Range lens). The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.
6. The sensor shall have a standard 30 element lens with 15 layers horizontally and 4 layers vertically; a 14 element Long Range lens with 9 layers horizontally and 4 layers vertically; a 9 element 1-sided Aisle Way lens with 9 layers vertically; or an 18 element 2-sided Aisle Way lens with 9 layers vertically.
7. Sensor shall cover up to 2000 square feet with the Standard Lens, up to 90 linear feet with the Long Range Lens for walking motion when mounted at a ceiling height of 10 feet.
8. The sensor shall have two outputs; one output is based on occupancy only and one is based on occupancy with a hold OFF and an internal photocell setting when a minimum light level is present (adjustable from 3 to 200 footcandles).
9. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay adjustable from 15 seconds to 30 minutes with user-adjustable sensitivity settings.
10. Sensor shall be furnished with a DIP switch override-ON function for use in the event of failure.
11. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering of adjustments and hardware.
12. Sensor can be wired in parallel to allow coverage of large areas.
13. Sensor shall be U.L. Listed.
14. The sensor shall be Model CX100 as manufactured by Watt Stopper or equal.

G. Underwater Tank LightingUnderwater tank lighting shall operate on a 120 volt supply and be UL listed and labeled for underwater applications.
2. Provide a timer and circuitry as shown on the contract drawings for operation of the pool tank lighting.

3. The lens of the fixture shall be adjustable from a standard beam to a wide angle beam.
4. The lamp shall be replaceable without lowering the water level.
5. The fixture shall contain an automatic water cut-off circuit for low water protection.
6. The fixture housing, face ring and niche shall be constructed of corrosion resistant stainless steel.
7. The lens of the fixture shall be a prismatic tempered glass lens.
8. The tank lighting fixture shall be manufactured by Pentair Pool Products - Amerlite or approved equal.

H. Fixture Standards - [Specifier - may not be required for all jobs - edit as necessary]
1. Poles shall be hinged tapered steel fixed tenon type, with a yield strength in tension of 25 K.S.I.
2. The poles, including the hand hole, shall have a minimum yield safety factor of 1.5 when subjected to a wind load resulting from the 25-year mean recurrence interval wind velocity for the site and adjusted upwards 30% for gusts.
3. The deflection shall be limited to 5% under the design conditions so that at lower wind levels, the luminaire movement on the poles will not cause apprehension.
4. Provide vibration dampeners on poles as recommended by the pole Manufacturer.
5. The finish shall be, Class 1, 0.7 mil minimum, architectural anodic coating, utilizing a process to produce a dark bronze, or black, sun-fast protection.
6. Provide a grounding terminal, accessible from the hand-hole, which shall accept up to #4 AWG stranded wire.
7. Provide fixture mounting arms for mounting the quantity of fixtures as shown on the Contract Drawings.
8. Provide a lowering device which consists of a winch, arm and a rotating steel drum with a two way ratchet lock and 35' of stranded, flexible aircraft cable.
9. Refer to Lighting Fixture Schedule for manufacturer and catalog number.

I. Fixture Supports and Hangers
1. Provide all necessary mounting brackets and boxes, suitable for the area in which it is to be installed, as required for a complete functioning installation for all lighting for project.
2. Provide all necessary hangers and supports for proper fixture installation.
3. Fixture supports shall be capable of supporting a minimum of two and one-half times the load normally carried at point of support.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the contract documents for fixture mounting heights.
B. Mount fixtures in true vertical and horizontal alignment.
C. Fixture locations shown on the drawings are diagrammatic only. They are shown for quantity and approximate locations only. Adjust the location of any lighting fixture as required to avoid interferences with existing conditions, equipment, and of the work of other trades.

D. Each fixture provided shall be a completely finished unit with all components, mounting and/or hanging devices necessary for the proper installation of the particular fixture.
E. Mount all emergency lighting, exit signs, and light fixtures as indicated on the contract drawings when possible.
F. Ground all lighting fixtures and lighting poles per the National Electric Code, Article 250, as shown on drawings, and specification 16450.
G. Hangers and supports shall be anchored to channels in the ceiling construction, to the structural slab or to structural members above the suspended ceiling.
H. Fixtures mounted in suspended "lay-in" ceilings shall be supported from inverted "tee-bars" using "Caddy" clips suitable for the fixture type installed.
I. All suspended fixtures shall be pendant mounted and be suspended from the ceiling using cast swivel type connectors and 3/4 inch rigid galvanized steel conduit minimum, unless otherwise specified by the fixture Manufacturer.
J. Provide all necessary accessories for "end-to-end" mounting where continuous rows of fixtures are indicated.
K. Coordinate all recessed fixtures with the ceiling grid system prior to installation of the ceiling grid system where applicable. Lighting fixtures and mounting shall be compatible with the ceiling grid system.
L. Where multiple switching of fixtures is indicated, the outside two (2) lamps of each fixture in the controlled area shall be switched separately from the interior (center) lamp(s).
M. Adjust as necessary any occupancy sensor for the automatic lighting controls such that all areas in the space being luminated is covered.
N. Install Exterior Lighting Control Panel at an accessible height for convenient access and operation.
O. Interior Lighting Control Panel:
    1. Install Interior Lighting Control Panel at an accessible height for convenient access and operation.
    2. Lighting occupancy sensor shall be located and mounted as recommended by the equipment Manufacturer.
    3. Position and adjust occupancy sensors as required for optional performance.
P. Underwater Tank Lighting
    1. Install underwater tank lighting fixtures as shown on the contract drawings.
    2. Location (elevation) and Installation of the tank lighting fixture shall be in strict accordance with the NEC and the Manufacturer's recommendations.
    3. Provide all required grounding (#8 AWG min.) of the fixture as recommended by the Manufacturer.
    4. Provide a ground fault circuit interrupter and appropriately sized circuit breaker as recommended by the Manufacturer.
    5. Provide and install a timer for the lighting circuit as shown on the contract drawings.
Q. Foundations for exterior lighting standards shall be as detailed on the DRAWINGS. Anchor bolts shall be of minimum diameter and length as shown, four (4) per standard, and installed per the pole Manufacturer’s pole base requirements. Foundations shall be formed of concrete of 4000 psi minimum compressive strength

at 28 days. All corners of foundations above grade shall be chamfered l inch. Each foundation shall be equipped with galvanized rigid conduit elbows and nipples of appropriate length to connect between pole base and under-ground wiring system. Provide grounding type bushings on each conduit.

R. All wiring within exterior poles and luminaires shall be minimum No. 10 AWG copper with approved insulation.

3.2 TESTING

A. Refer to Section 16950 for testing requirements.

END OF SECTION

SECTION 16900

CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and install all panel and enclosure components and appurtenances as shown on the Drawings as Local Control Stations as specified herein. All components shall meet NEMA ratings as indicated on drawing E-1 for the specific area where they are to be installed.

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 SUBMITTALS TO THE ENGINEER

A. Shop drawings are required for all items provided under this Section. Submittals shall be in accordance with Sections 01340 and 16010.

PART 2 - PRODUCT

2.1 MATERIALS

A. Control Station Enclosures:
   1. General:
      a. Control stations shall be heavy duty oil-tight/watertight type stainless steel enclosure and shall consist of operators with contact blocks and indicator lights as indicated on the contract drawings. Enclosures shall have sufficient depth to accommodate mounting four Class 9001 KA-1 contact blocks side-by-side and in tandem behind a single operator for a maximum of eight circuits, four normally open and four normally closed.
      b. Enclosures shall have the required number of holes for the number of operators pre-manufactured as shown on the contract drawings.
   2. NEMA 12 and NEMA 4X
      a. Enclosures shall be 16-gauge Type 316 stainless steel gasketed enclosures.
      b. Acceptable Manufacturers are Allen Bradley, General Electric, Square D, or equivalent.
   3. Class I, Division I and Class 1, Division 2 Enclosures
      a. Enclosures and covers shall be iron or aluminum and gasketed with premanufactured devices installed by Manufacturer.
      b. Acceptable manufactures are Cooper Crouse-Hinds Flex Station Control Stations, Allen-Bradley, Square D, or equivalent.

B. Operators:
   1. General:
      a. All operators used in control stations shall be Square D type K or Allen Bradley and shall be suitable for cover mounting in a 1-7/32-inch diameter

notch type cover hole and shall be held in place by the locking thrust washer. All operators shall be heavy duty oil/water tight, be 30mm in size, and maintain the NEMA rating of the enclosure.

b. Push buttons shall have removable inserts in eight different colors for function color coding. Push-button inserts shall be removable from the front of the control station without disturbing the wiring or mounting of the control units.

c. Selector switches shall have removable knobs in eight different colors for function color coding. Selector switch knobs shall be removable from the front of the control station without disturbing the wiring or mounting of the control units. Operators for selector switches shall be bat wing type.

d. Emergency stop pushbutton operators shall be large operator head type, red mushroom-head, maintained type switch with push to open and pull to re-engage control circuit. Provide multiple output contact type as shown on the drawings.

e. Indicator lights shall be heavy duty, oiltight and have the following requirements:

i. Designed to operate at 120 volts, 60 Hz AC.

ii. Provided with a chrome-plated metal or anodized-aluminum mounting rings, engraved as indicated on the Drawings.

iii. Lens color shall be as indicated on drawings.

iv. Shall be 30 mm LED lamp type, with “Push to Test” requirements.

f. Provide legend plates which describe function of each device on control station.

2. Contact blocks used in heavy duty oil-tight control stations shall be of Square D Type K, Cooper Crouse Hinds or Allen Bradley single-pole, single-throw (SPST), single-pole, double-throw (SPDT). Contact blocks shall be suitable for mounting side by side and/or in tandem to the base of the operator with these following requirements:

a. mounting screws shall be captive with a drilled and tapped head to permit easy tandem mounting of contact blocks.

b. Terminals shall be pressure wire type with a self-lifting pressure clamp that will compensate for wire of different size ranging from #12-#18 solid or stranded.

c. Contacts shall be double break, and silver plated.

3. Class 1 Division 2 operators shall meet all requirements of section 2.1.B.1 with the addition of devices being hermetically sealed by the factory.

C. Control Circuit Fuses

1. Fuses shall be 3AB ceramic body fuses rated for at least 125 volts at the current ratings shown on the Drawings. Fuse size shall be ¼” x 1¼”.

2. Blow time shall be:

a. 110%, 4 hours minimum;

b. 135%, 1 hour maximum;

c. 200%, 15 seconds maximum for 1/8-12 amp fuses

d. 200%, 60 seconds maximum for 15-30 amp fuses.

3. Fuses shall be Littlefuse, Bussmann, or approved equal.

D. Relays
   1. Industrial Control Relays - Industrial control relays shall be utilized where specifically called for on the Drawings or within the Specifications. Industrial control relays with 10 ampere contact rating shall be Square D, Class 8501 Type X, Allen-Bradley or approved equal. Relays with 30 ampere contact rating shall be Square D, Class 8501, Type C or equal.
   2. Pilot Duty Relays - Unless specifically noted otherwise, relays shall be general purpose relays. General purpose relays shall be IDEC RH Series, 10A contact rating, 4 Form "C" contacts, Allen-Bradley or approved equal, provided with internal indicating light. Pilot duty control isolating relays for PLC inputs and outputs shall be suitable for the application and shall be submitted for approval by Engineer.
   3. Relays shall be electrically held, electrically operated with 120 volt coils except as noted otherwise on the Drawings. Contacts shall be rated 600 volt, 10 ampere and shall be convertible from Normally Open to Normally Closed. Where relays are used to control single-phase, fractional horsepower motors, contacts shall be rated in accordance with the N.E.C. for the motor to be controlled. Where relays are not installed within system control panels, provide a suitable enclosure as specified in Section 16160, with NEMA ratings as indicated on the Drawings.
   4. Dry contacts used for instrumentation and SCADA inputs or other low current inputs, shall be bifurcated cross bar gold overlay silver and rated dry circuit. These contacts will be provided through dedicated interposing relays as shown on the schematic diagrams of the Drawings or as specified herein. Relays shall be provided with plug-in type sockets with screw terminal wiring connections to facilitate relay change out and wiring. Relays shall be Potter and Brumfield type KHAU-17A16 - 120 or 12V, IDEC, or approved equal as shown on Drawing.

E. On-Delay & Off-Delay Timing Relays
   1. Solid State - Unless specifically noted otherwise, time delay relays shall be general purpose time delay relays. General purpose time delay relays shall be IDEC RTE, Potter-Brumfield, or approved equal.
   2. Delay timing relays shall be solid state type rated for use at 120 volts. Contacts shall be normally open (NO) or normally closed (NC) as detailed shown on the Drawings or within the Specifications, and shall be rated 5 amperes (minimum). Minimum time range shall be adjustable from 1 second to 1 minute. Other ranges as required by function and as indicated on the Drawings or within the Specifications. Where mounted external to control panels, delay timing relays shall be provided with enclosures as specified in Section 16160, with NEMA ratings as indicated on the Drawings.

F. Fuse Blocks
   1. Fuse blocks shall be rated for at least 30 amps and 300 volts. The clips shall be high tensile spring brass, electro-tin plated. The base shall be polyester, glass reinforced with a UL-94VO flammability rating.
   2. At least four spare sets of clips shall be provided on each fuse block and shall be labeled "SPARE".

3. Fuse block switches shall be din rail mounted.
4. Fuse blocks shall be Littlefuse Omni-block, Bussmann, or considered equal.

G. Terminal Strips
1. Terminal strips with box type connectors shall be supplied to make all power and control connections. All terminals shall be clearly marked for easy identification. A ground terminal strip shall also be provided. At least 20 percent of terminals supplied shall be spare. All wiring shall be terminated on field terminal blocks.

H. Control Power Transformers
1. Supply all control power transformers necessary to make panel functional. All transformers shall have both primary legs and all "hot" secondary legs fused. One secondary leg shall be grounded. Fuse sizing shall be as recommended by the equipment Manufacturer for the particular installation.
2. Final sizing of the control power transformer shall be based on the application and control equipment to be operated on this equipment. The Supplier/Contractor shall review all system schematics and provide the appropriate size CPT for each application. Oversized CPT will be required where necessary for the installation.

I. Emergency Stop Pushbuttons (E-Stops)
1. Pushbutton control station shall be red, large mushroom-head maintained switch with pull-on and push-off type. Provide multiple output contact type as shown on the drawings. Device shall maintain the NEMA rating for area in which it is being installed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All items incorporated into the work shall be installed in accordance with the Drawings and Specifications. Where detailed drawings or technical specifications are not provided, the items shall be installed in accordance with the Manufacturer's preferred recommendations and confirming to the best practice of the trade involved.

B. All installations shall be in accordance with the applicable sections of Division 11, 13, 14, 15 and 16 (where applicable).

3.2 TESTS

A. All items shall be factory tested.

B. Refer to section 16950 for additional testing requirements.

END OF SECTION

SECTION 16950

START-UP AND TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Test and demonstrate, to the satisfaction of the Engineer, all electrical devices in accordance with Division 13, Specification 01800 and the following requirements. All testing and checkout of equipment specified under this Section shall be performed by an independent testing agency. The testing agency shall be an independent and qualified field services company regularly engaged in the testing of electrical equipment and apparatus. The following company has been listed:

Electrical Engineering & Service Co., Inc.
289 Center Street
Holbrook, MA 02343
Tel: 781-767-9988

CE Power
40 Washington Street
Westborough, MA 01581
Tel: 855-881-3911

The testing agencies noted are a qualified entity. Additional or equally qualified companies shall be considered as or equal.

B. During the checkout and startup period, the Electrical Contractor shall provide sufficient personnel to aid with the start-up of all electrical equipment, to remove any faults, and to make the necessary adjustments for the proper operation of electrical equipment and installation.

C. A 1000 volt "megger" insulation test shall be available during the testing of power feeders and motor wiring and 2500 volt "megger" test for heat trace cable.

D. All electrical equipment, wiring, switches, and insulators found to be defective or to have failed due to poor workmanship shall be replaced promptly at no additional cost to the Owner.

E. The testing agency shall be responsible for setting and adjusting all required setting to all electrical equipment based upon the final coordination, short circuit and arc flash study for the entire facility and associated building structures for the electrical distribution system. Signoff and certification sheets shall be submitted and documented for final acceptance.

F. The Contractor will not be allowed to perform any testing, set any equipment parameters, or perform any megohm cable testing as this is the responsibility of a third- party testing agency as specified herein.

G. Provide NETA Acceptance testing of feeder breakers in switchboards, main distribution panels and motor control centers.

H. Provide certificates for all testing equipment that shows calibration has been completed within the past 12 months

1.2 REQUIREMENTS SPECIFIED ELSEWHERE

A. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
   1. Section 16010 – Electrical – General (and as referenced)

1.3 SUBMITTALS TO THE ENGINEER

A. Shop Drawings are required for all items provided under this section. Submittals shall be provided in accordance with Sections 01340, 16010 and as specified in this section.
B. It should be the Contractors responsibility to provide all required forms/direction as to submittal procedures for this contract and to verify compliance prior to submitting to the Engineer for review.
C. A record of all insulation values shall be properly recorded as listed in worksheet attached to the back of the section. All time intervals shown shall be recorded for each conductor being tested.
D. Ground testing results shall be properly recorded, witnessed, and reported to the Engineer.
E. All circuit breaker settings and testing shall be provided in order to check for proper cable connections, impedance testing and infra-red testing of all connections of all electrical equipment, cables, devices and distribution system equipment for the entire project at all locations.

1.4 TESTING REQUIREMENTS

A. Prior to the start of check out and testing, ensure that all equipment is properly and permanently identified according to Section 16010.
B. Before energizing any electrical equipment or apparatus, thoroughly check all equipment for the following:
   1. All equipment and materials shall be clean, dry and free of foreign materials.
   2. Vacuum clean to make free from filings, foreign matter or other materials left inside equipment or enclosures. Particular attention shall be given to bus conductors, conductors, terminal blocks, and windings.
   3. Check for tools inside equipment or enclosures. All screw, bolt, and terminal connections shall be checked for tightness as specified by the equipment manufacturer.
   4. Check the bearings of all rotating electrical apparatus and, if required, have supplier fill with the grease or oil as recommended by the manufacturers.
   5. All motors, contacts, relays, bus, insulators and other electrical apparatus shall be cleaned and dried out if required and/or needed. Drying out methods will be such that the insulation temperature of the apparatus does not exceed 90°C.
C. Prior to applying voltage to any apparatus or circuit, make insulation resistance tests and, if necessary, dry the apparatus until resistance values conform to the standards of IEEE.
D. In case of a low resistance circuit insulation, eliminate the problem before the circuit is energized.
E. Provide 1000 volt "Megger" insulation testing on all 600 volt feeder conductors and

motor power conductors. This shall include any and all of the existing electrical feeder cables at the facility which shall remain and shall be reconnected. Motors shall be meggered from the starters.

F. Provide 2500 volt "Megger" insulation testing for all heat trace cabling to be installed at all locations as shown on the Drawings.

G. "Megger" test all required service feeder cables and circuit wiring at the existing facility in their entirety and submit a complete test report. Test voltage shall be applied until readings reach a constant value, and until three (3) equal readings, each one (1) minute apart, are obtained. Minimum megger reading shall be 45 megohms for feeder conductors.

H. Panelboard's line currents shall be balance to within 10% of each other.

I. Three phase motors shall be checked for rotation and, if necessary, reverse the connections at the starter. Single phase and DC motors at motor connection box.

J. All main plant building loops and major equipment grounds shall be tested to remote earth or directly referenced to an extremely low resistance (approximately 1 ohm) reference ground bench-mark. Tests shall be made with ground testing ohm meter or "megger" approved by the Engineer for the purpose.

K. The ground resistance of the individual networks shall be measured at two points with the cables at all the test points disconnected.

L. Test the grounding system to assure continuity and to assure that resistance to ground does not exceed specified limits or form any ground loops.

M. The entire grounding network resistance shall be meggered. Resistance shall not exceed 25 ohms. Drive additional ground rods if necessary.

N. The Contractor shall provide load readings for all equipment, switchgear, motor control centers and panelboards.

O. Set all coordination, short circuit and arc fault settings to study provided for this facility for final set up of the electrical system.

P. Test and set all motor circuit protectors, motor overload heaters to the nameplate horsepower of the equipment; and all circuit breaker settings in all electrical equipment shall be tested and verified operational.

Q. Adjust all settings on protective equipment and verify, check and establish with the power company that the secondary voltage is within 2% of rated voltage.

R. Provide and check all overload relays settings and sizing for all motors and submit this data to the Engineer for final approval. This shall include settings and adjustments to MCP devices for each motor starter.

S. The Contractor shall maintain a complete marked up drawing set and all written documentation of all changes at the job site. These documents shall be always made available to the Engineer.

1.5 DEMONSTRATION AND START UP

A. All equipment shall be properly identified as indicated in SECTION 16010.

B. When directed by the Engineer, demonstrate the total system operation and make final adjustments to the system. If any system or piece of equipment within a system fails to function properly, rectify such defects or inadequacies and make a final demonstration as directed by the Engineer.

C. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation of each partial or complete system

installed under this Contract.

D. Pay all charges or fees, including the cost of any special test equipment, factory engineers, etc. necessary for the proper performance of the specified tests, demonstrations, and instructions.

E. All demonstrations and instructions shall be scheduled at the convenience of the Engineer and the Owner and shall be scheduled with at least seventy-two (72) hours written notice.

F. Set all circuit breaker and overcurrent devices based on overall system coordination and short circuit study. Final acceptance will not be allowed until all settings and protective devices are set, checked, tested, and verified in the field in the presence of the Engineer.

G. All control circuits shall be functionally checked to see that their operation and sequence are correct. Any adjustable switches such as float switches, limit switches and timers shall be adjusted for proper operation.

H. System Integrator to provide all revised drawings prior to startup. Drawings to incorporate all red-lined drawings received from Electrical Contractor

I. Just prior to acceptance of the lighting facilities, clean all lighting fixtures and re-lamp where required at no additional cost to the Owner.

J. All local control stations and control panels for equipment specified in DIVISIONS 11, 13, 14, 15 and 16 shall be demonstrated to function properly of all items under simulated operating conditions unless otherwise specified elsewhere.

MEGGER TEST RESULTS

Project: _____ **Temperature:** _____
Date: _____ **Weather:** _____
Location: _____ **Test Equipment:** _____

Equipment/feeder Under Test: _____ **Start Time:** _____ **End Time:** _____
Test Equipment: Make: _____ **Serial No.:** _____ **Test Voltage:** _____

	0.5 min	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	P.I.
Phase A-Gnd.												
Phase B-Gnd.												
Phase C-Gnd.												
Phase A-PhaseB												
Phase A-PhaseC												
Phase B-PhaseC												

Equipment/feeder Under Test: _____ **Start Time:** _____ **End Time:** _____

	0.5 min	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	P.I.
Phase A-Gnd.												
Phase B-Gnd.												
Phase C-Gnd.												
Phase A-PhaseB												
Phase A-PhaseC												
Phase B-PhaseC												

Notes: Megger test only should record 5 minutes value…
Polarization Index (P.I.) is 10 min reading divided by 1 min reading
Note: If a neutral is provided, this will also need to be tested

END OF SECTION

Appendix A
Subsurface Utility Exploration Report

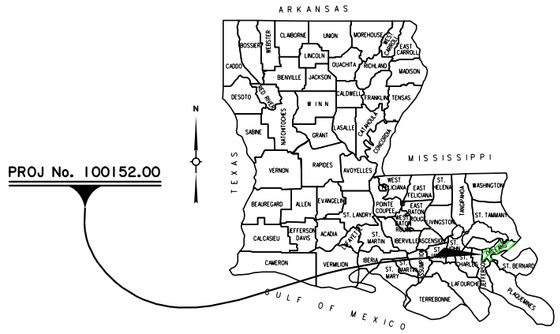
SUBSURFACE UTILITY ENGINEERING MAP

INFINITY ENGINEERING CONSULTANTS, LLC

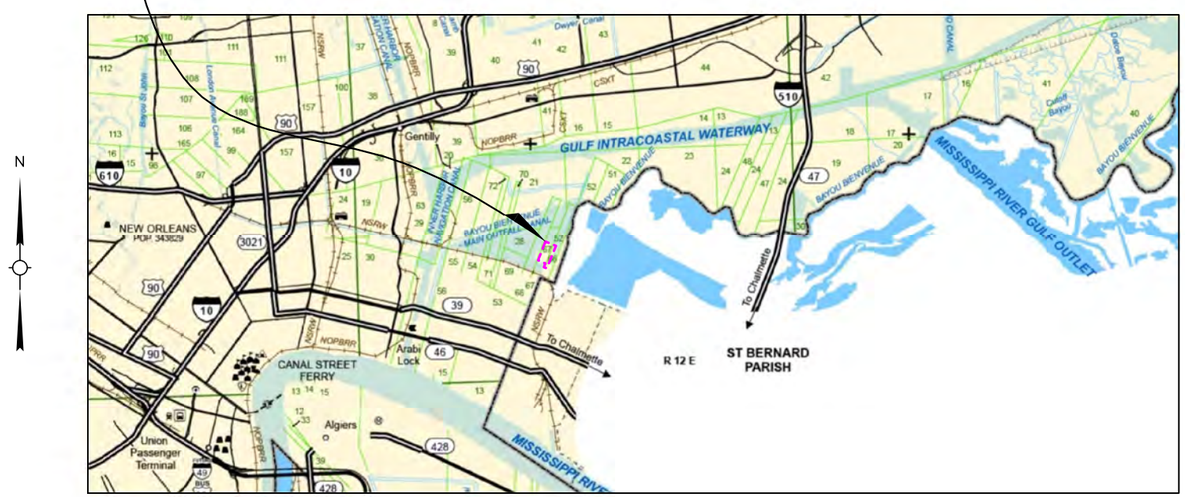
SJB GROUP PROJECT No. 100152.00

EAST BANK SEWAGE TREATMENT PLANT

ORLEANS PARISH



VICINITY MAP



LAYOUT MAP

SCALE: 1 INCH = 1 MILE

1 0 1 2 3

STATE OF LOUISIANA
AUSTIN W. LACOMBE
License No. 47563
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

06/29/2023

SHEET NUMBER	
PARISH	ORLEANS
CONTROL SECTION	N/A
SJB GROUP PROJECT	100152.00
COMPUTED / CHECKED	AWL / KMK
DETAILED / CHECKED	TTF / AWL
DATE / SCALE	06/29/2023 / 1"=1 MILE

SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

SJB GROUP, LLC

BY | REVISION DESCRIPTION | DATE

FILE NO. XX-XX-X-XXX | S.U.E. SHEET NO. TITLE

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LEGEND:

UTILITY LINES:

- E(B) — UNDERGROUND POWER LINE (QL-B)
- E(C) — UNDERGROUND POWER LINE (QL-C)
- E(D) — UNDERGROUND POWER LINE (QL-D)
- SFM(B) — SEWER FORCE MAIN (QL-B)
- SFM(C) — SEWER FORCE MAIN (QL-C)
- SFM(D) — SEWER FORCE MAIN (QL-D)
- S(B) — STORM DRAIN (QL-B)
- S(C) — STORM DRAIN (QL-C)
- S(D) — STORM DRAIN (QL-D)
- W(B) — UNDERGROUND WATER LINE (QL-B)
- W(C) — UNDERGROUND WATER LINE (QL-C)
- W(D) — UNDERGROUND WATER LINE (QL-D)
- G(B) — UNDERGROUND GAS LINE (QL-B)
- G(C) — UNDERGROUND GAS LINE (QL-C)
- G(D) — UNDERGROUND GAS LINE (QL-D)
- TFO(B) — UNDERGROUND TELEPHONE FIBER OPTIC (QL-B)
- TFO(C) — UNDERGROUND TELEPHONE FIBER OPTIC (QL-C)
- TFO(D) — UNDERGROUND TELEPHONE FIBER OPTIC (QL-D)
- TFO(B) — TFO(B) — MULTIPLE UNDERGROUND TELEPHONE FIBER OPTIC (QL-B)
- TFO(C) — TFO(C) — MULTIPLE UNDERGROUND TELEPHONE FIBER OPTIC (QL-C)
- TFO(D) — TFO(D) — MULTIPLE UNDERGROUND TELEPHONE FIBER OPTIC (QL-D)
- T(B) — UNDERGROUND TELEPHONE LINE (QL-B)
- T(C) — UNDERGROUND TELEPHONE LINE (QL-C)
- T(D) — UNDERGROUND TELEPHONE LINE (QL-D)
- T(B) — T(B) — MULTIPLE UNDERGROUND TELEPHONE LINE (QL-B)
- T(C) — T(C) — MULTIPLE UNDERGROUND TELEPHONE LINE (QL-C)
- T(D) — T(D) — MULTIPLE UNDERGROUND TELEPHONE LINE (QL-D)
- T/FO(B) — UNDERGROUND TELEPHONE AND FIBER OPTIC (QL-B)
- T/FO(C) — UNDERGROUND TELEPHONE AND FIBER OPTIC (QL-C)
- T/FO(D) — UNDERGROUND TELEPHONE AND FIBER OPTIC (QL-D)
- TV(B) — UNDERGROUND TV LINE (QL-B)
- TV(C) — UNDERGROUND TV LINE (QL-C)
- TV(D) — UNDERGROUND TV LINE (QL-D)
- TVFO(B) — UNDERGROUND TV FIBER OPTIC (QL-B)
- TVFO(C) — UNDERGROUND TV FIBER OPTIC (QL-C)
- TVFO(D) — UNDERGROUND TV FIBER OPTIC (QL-D)
- TRP(B) — UNDERGROUND TRAFFIC POWER (QL-B)
- TRP(C) — UNDERGROUND TRAFFIC POWER (QL-C)
- TRP(D) — UNDERGROUND TRAFFIC POWER (QL-D)
- TRFO(B) — UNDERGROUND TRAFFIC FIBER OPTIC (QL-B)
- TRFO(C) — UNDERGROUND TRAFFIC FIBER OPTIC (QL-C)
- TRFO(D) — UNDERGROUND TRAFFIC FIBER OPTIC (QL-D)
- O(B) — UNDERGROUND PIPELINE (QL-B)
- O(C) — UNDERGROUND PIPELINE (QL-C)
- O(D) — UNDERGROUND PIPELINE (QL-D)
- UNK(B) — UNKNOWN LINE (QL-B)
- UNK(D) — UNKNOWN LINE (QL-D)
- LIMITS OF SURVEY

SYMBOLOGY:

GAS UTILITY SYMBOLS

- R — GAS RISER
- GAS VENT
- PLM — PIPELINE UTILITY MARKER
- PIPELINE VENT
- GSM — GAS UTILITY MARKER
- GAS METER
- GAS VALVE
- GAS/PIPELINE TEST HOLE

WATER UTILITY SYMBOLS

- WUM — WATER UTILITY MARKER
- WATER VALVE VAULT
- FIRE HYDRANT
- WATER METER
- WATER VALVE
- WATER SPIGOT
- WATER TEST HOLE
- WATER MANHOLE TOP

SEWER UTILITY SYMBOLS

- STP — SEWER TREATMENT PLANT POINT
- SEWER MANHOLE TOP
- SLP — SEWER LIFT STATION POINT
- SEWER CLEANOUT
- SEWER PUMP
- SWM — SEWER UTILITY MARKER
- SEWER TEST HOLE

MISCELLANEOUS SYMBOLS AND LINES

- END OF UTILITY SIGNAL
- UTILITY DROP
- END OF UTILITY INFORMATION

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ELECTRIC UTILITY SYMBOLS

- POWER DROP
- T — POWER TRANSFORMER
- P — POWER VAULT
- P — POWER JUNCTION BOX
- GUY POLE
- COMBINATION POLE
- POWER POLE
- LIGHT STANDARD
- POWER TEST HOLE
- POWER MANHOLE TOP
- HH — POWER HAND HOLE

TELEPHONE UTILITY SYMBOLS

- TLM — TELEPHONE UTILITY MARKER
- TELEPHONE POLE
- TELEPHONE MANHOLE TOP
- TELEPHONE PEDESTAL
- TX — TELEPHONE CROSSCONNECT BOX
- TPB — TELEPHONE PRESSURE BOX
- TELEPHONE TEST HOLE
- HH — COMMUNICATIONS HAND HOLE

TELEVISION UTILITY SYMBOLS

- TV MANHOLE TOP
- TV — TV PEDESTAL
- TVM — TV UTILITY MARKER
- TV TEST HOLE

TRAFFIC UTILITY SYMBOLS

- TPB — TRAFFIC PULL BOX
- TCB — TRAFFIC CAMERA CONNECT BOX
- TRAFFIC CAMERA POLE
- LSP — LIGHT STANDARD POWER VAULT
- LIGHT STANDARD
- TRAFFIC SIGN CONNECT BOX
- TSP — TRAFFIC SIGNAL POWER VAULT
- CANTILVER TRAFFIC SIGNAL POLE
- CABLE SUSPENDED TRAFFIC SIGNAL POLE
- TRAFFIC SIGNAL STANDARD

UTILITY NOTES:

THE SUBSURFACE UTILITIES SHOWN ON THE MAP OF SURVEY WERE IDENTIFIED USING THE INDUSTRY STANDARD DETECTION METHODOLOGIES IN ACCORDANCE WITH THE AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA.

QUALITY LEVELS AND DEFINITIONS PER CI/ASCE STANDARD NO. 38-02:

QUALITY LEVEL "D" - DEPICTED ACCORDING TO UTILITY RECORD INFORMATION AND IN-FIELD VISUAL INSPECTION. NO ELECTRONIC DESIGNATING INFORMATION WAS OBTAINED.

QUALITY LEVEL "C" - EXISTING UTILITY STRUCTURES HAVE BEEN FIELD LOCATED AND SURVEYED TO ASSIST IN THE DEPICTING OF THE UTILITIES SHOWN ON THE RECORDS. NO ELECTRONIC DESIGNATING INFORMATION WAS OBTAINED.

QUALITY LEVEL "B" - INFORMATION WAS OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF THE SUBSURFACE UTILITIES. QL-B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR DEPICTION.

QUALITY LEVEL "A" - OBTAIN PRECISE HORIZONTAL AND VERTICAL POSITION OF THE UTILITY LINE BY EXCAVATING A TEST HOLE. THE TEST HOLE SHALL BE DONE USING VACUUM EXCAVATION OR COMPARABLE NON-DESTRUCTIVE EQUIPMENT IN A MANNER AS TO CAUSE NO DAMAGE TO UTILITY LINE.

1. UTILITIES ARE DEPICTED ON THESE PLANS IN ACCORDANCE WITH THEIR ACHIEVED "QUALITY LEVELS" AS DEFINED IN THE AMERICAN SOCIETY OF CIVIL ENGINEER'S DOCUMENT ASCE 38-02, "STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."

2. UTILITIES WITH A QUALITY LEVEL "D" LABEL ARE DEPICTED ON THE PLANS USING JUDGMENT IN INTERPRETING AVAILABLE THIRD-PARTY RECORDS OR OTHER INFORMATION.

3. UTILITIES WITH A QUALITY LEVEL "C" LABEL ARE DEPICTED ON THE PLANS USING JUDGMENT IN INTERPRETING AVAILABLE THIRD-PARTY RECORDS OR OTHER INFORMATION AND THEN CORRELATING THAT INFORMATION TO EXISTING SURVEYED STRUCTURES.

4. UTILITIES WITH A QUALITY LEVEL "B" LABEL ARE DEPICTED ON THE PLANS USING JUDGMENT IN SELECTING AND INTERPRETING APPROPRIATE GEOPHYSICAL DATA, SURVEYING TO APPROPRIATE PROJECT ACCURACIES THE PROJECTION OF THAT DATA ON THE GROUND SURFACE, AND THEN USING JUDGMENT TO CORRELATE THIRD-PARTY AVAILABLE RECORDS OR OTHER INFORMATION, IF ANY, AS PERTAINING TO THESE QL-B DEPICTIONS.

5. UTILITY SIZE AND TYPE FOR QUALITY LEVEL "B" DEPICTIONS ARE DETERMINED THROUGH AVAILABLE UTILITY OWNER INFORMATION OR IN-FIELD VISUAL INSPECTION. UTILITIES LABELED AS UNKNOWN HAVE NO CORRELATED RECORDS OR VISIBLE APPURTENANCES TO DETERMINE FUNCTION OR TYPE.

6. AN ATTEMPT TO ACHIEVE QUALITY LEVEL "B" DATA WAS MADE FOR ALL UTILITIES WITHIN THE PROJECT LIMITS EXCEPT FOR GRAVITY SEWERS, IRRIGATION LINES, AND STORM DRAINS.

7. UTILITY MAPPING WAS COMPLETED ON 06/09/2023. UTILITIES MAY HAVE BEEN CHANGED OR ADDED AFTER THIS DATE.

8. RELIANCE UPON THIS DATA FOR RISK MANAGEMENT PURPOSES DURING BIDDING DOES NOT RELIEVE THE EXCAVATOR OR UTILITY OWNER FROM FOLLOWING ALL APPLICABLE UTILITY DAMAGE PREVENTION STATUTES, POLICIES, AND/OR PROCEDURES DURING EXCAVATION.

9. IT IS IMPORTANT THAT THE CONTRACTOR INVESTIGATES AND UNDERSTANDS THE SCOPE OF WORK BETWEEN THE PROJECT OWNER AND THEIR ENGINEER REGARDING THE SCOPE AND LIMITS OF THE UTILITY INVESTIGATIONS LEADING TO THESE UTILITY DEPICTIONS.

10. UTILITY RECORD DRAWINGS WERE NOT AVAILABLE FOR BORE LOCATIONS 3 AND 4 FROM THE FOLLOWING UTILITY OWNERS: SEWER AND WATER BOARD OF NEW ORLEANS. MULTIPLE EFFORTS WERE MADE TO OBTAIN THESE RECORD DRAWINGS AND THESE ATTEMPTS WERE UNSUCCESSFUL. THE CONTACT INFORMATION FOR THESE UTILITY OWNERS IS PROVIDED, BUT ANY OF THEIR UTILITIES THAT MAY BE PRESENT WITHIN THE PROJECT LIMITS MAY NOT BE SHOWN.

11. UTILITIES WITH NO ASSIGNED QUALITY LEVEL DEPICTED ON THESE PLANS ARE QL-D UNLESS OTHERWISE NOTED.

12. ALL UTILITES SHOWN ARE OWNED BY THE SEWER AND WATER BOARD OF NEW ORLEANS (SWBNO) UNLESS OTHERWISE NOTED.

SHEET NUMBER

PARISH	CONTROL SECTION	SJB GROUP PROJECT
ORLEANS	N/A	100152.00

COMPUTED	CHECKED	DETAILED	CHECKED	DATE	SCALE
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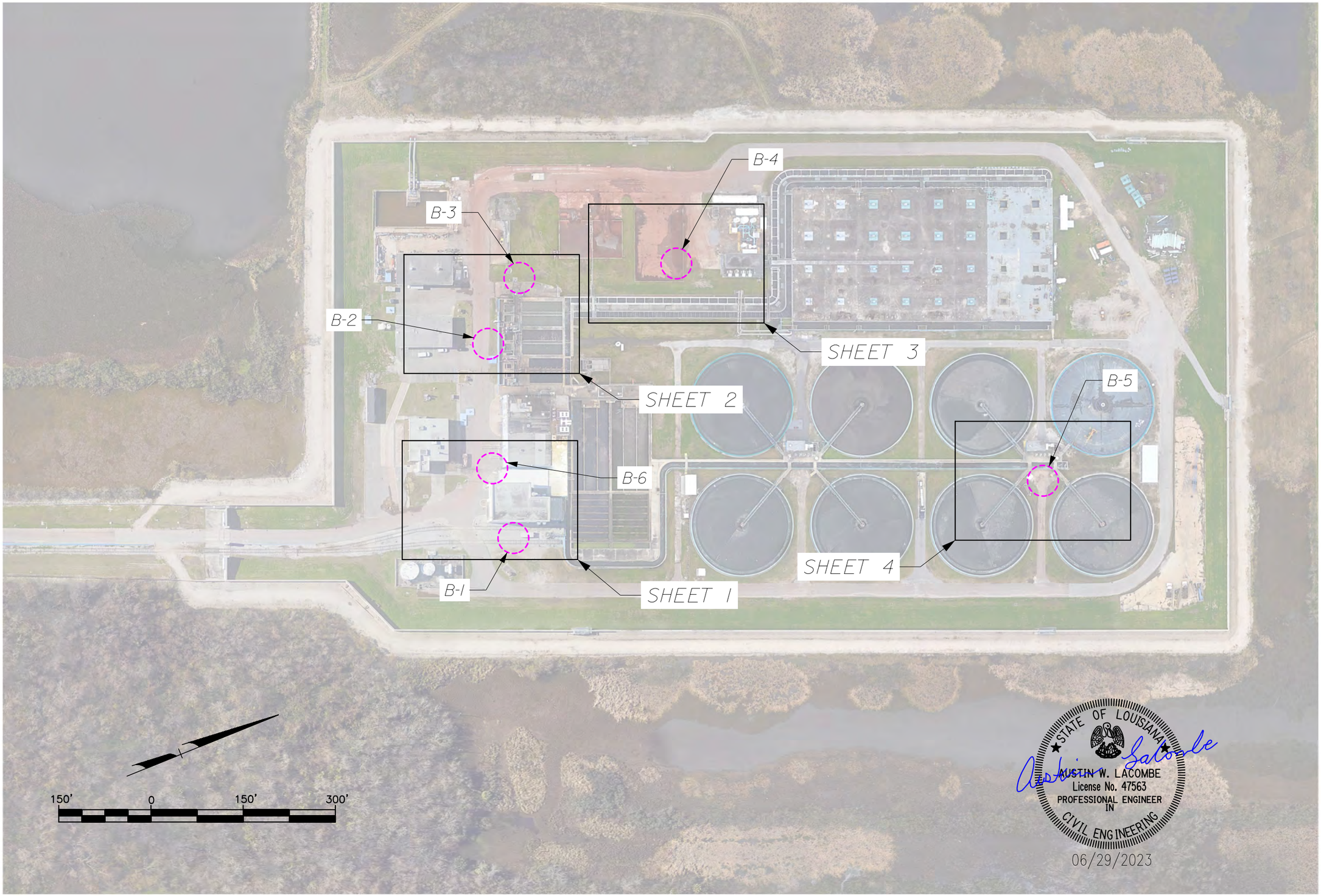
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SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

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SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

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CONTROL SECTION	N/A
SJB GROUP PROJECT	100152.00
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COMPUTED / CHECKED	AWL / KMK
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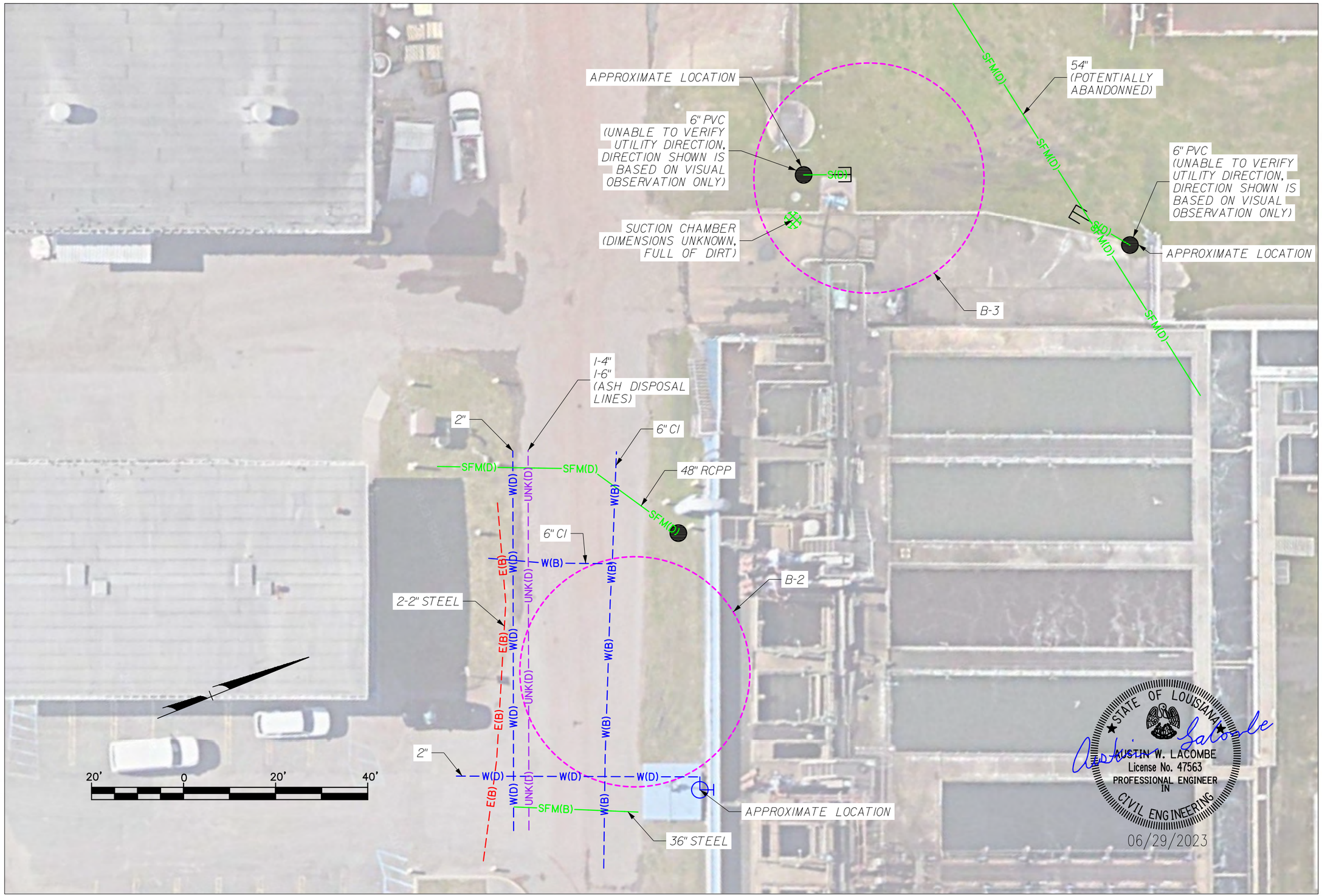
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SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

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SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

SHEET NUMBER		
PARISH	CONTROL SECTION	SJB GROUP PROJECT
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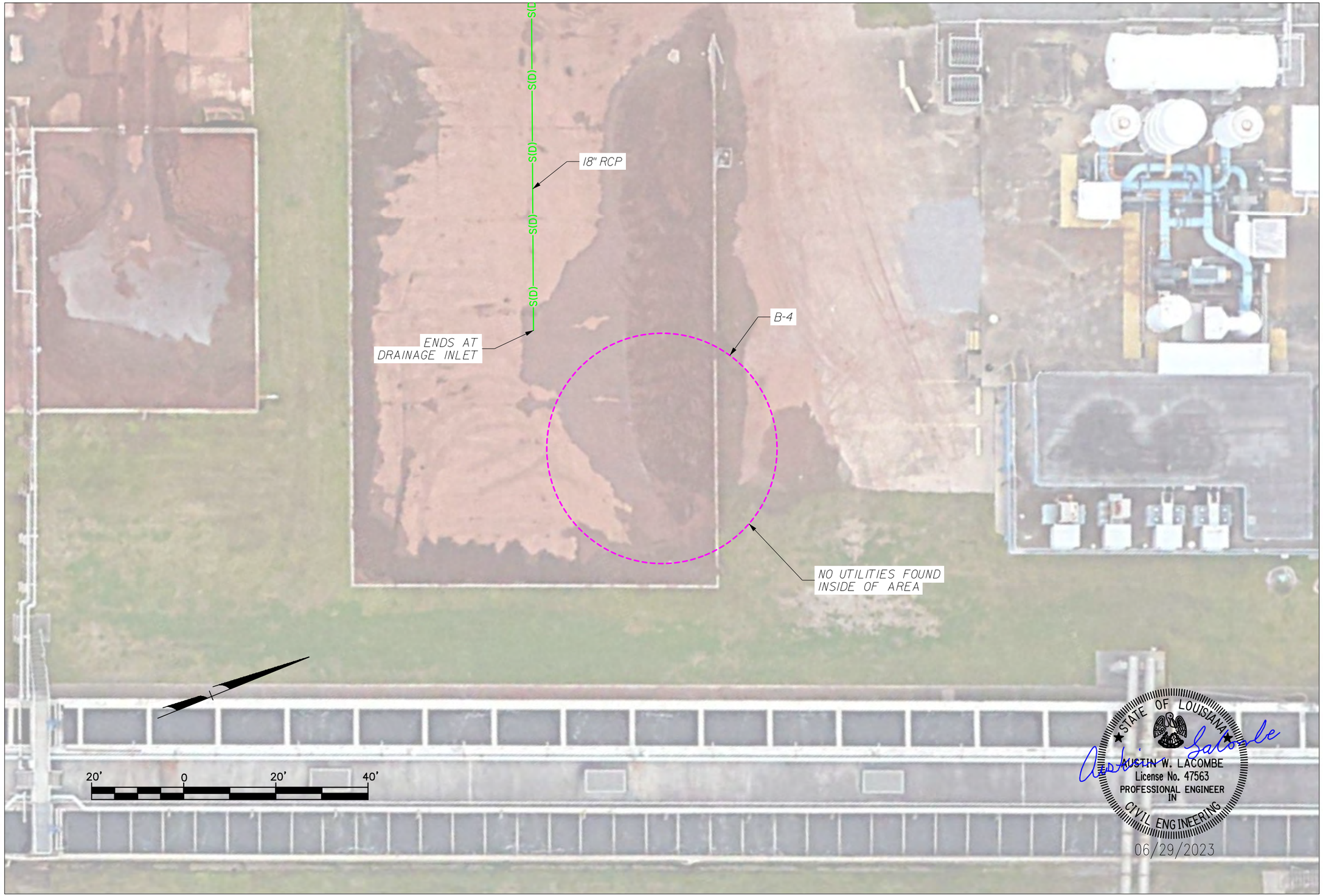
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SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
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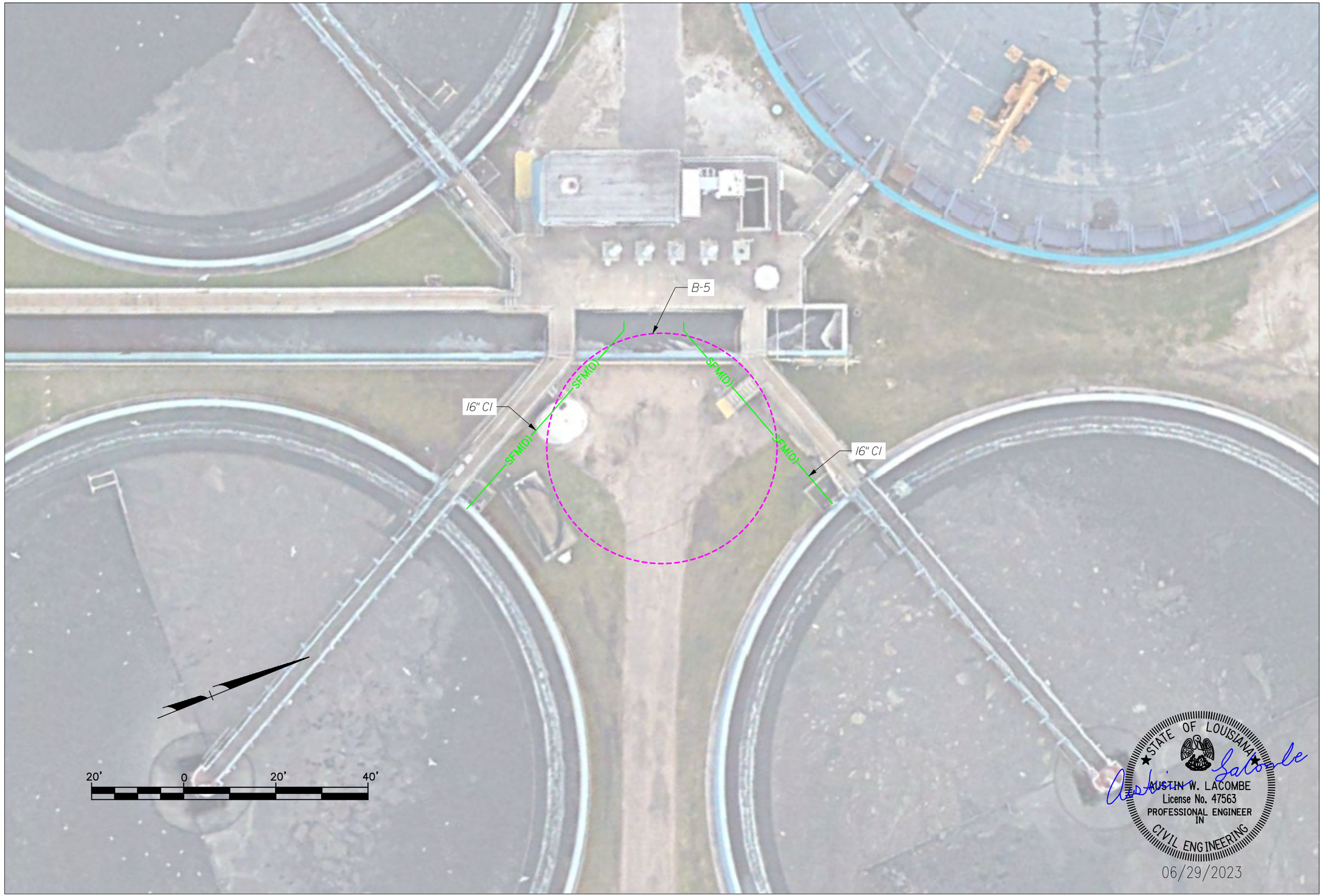
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CONTROL SECTION	N/A
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SUBSURFACE UTILITY ENGINEERING MAP
SJB GROUP PROJECT No. 100152.00
EAST BANK SEWAGE TREATMENT PLANT
ORLEANS PARISH
INFINITY ENGINEERING CONSULTANTS, LLC

Infinity Engineering Consultants

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DETAILED	TTF
CHECKED	AWL
DATE	06/29/2023
SCALE	1"=20'

PARISH	ORLEANS
CONTROL SECTION	N/A
SJB GROUP PROJECT	100152.00

SHEET NUMBER

SJB GROUP, LLC

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Appendix B
Subsurface Geotechnical Exploration Report

6 February 2026

Wright-Pierce, Inc.
Suite 2151
600 Federal Street
Andover, Massachusetts 01810

Attention Mr. Steven C. Hallowell, P.E. and Mr. Will Edgerton, P.E.
Emails steven.hallowell@wright-pierce.com and will.edgerton@wright-pierce.com

Ladies and Gentlemen:

Geotechnical Plans and Specifications Review
Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Secondary Treatment and Solids Upgrade
New Orleans, Louisiana
W-P Project No. 21163
Eustis Engineering Project No. 25026.01

Eustis Engineering L.L.C. (Eustis Engineering) is providing this letter to transmit the results of requested geotechnical engineering evaluation and recommendations for the Phase I upgrade designs for the Sewerage & Water Board of New Orleans (SWBNO) East Bank Sewage Treatment Plant (EBSTP) in New Orleans, Louisiana. This letter was prepared in general accordance with the scope of service outlined in Eustis Engineering's proposal dated 30 May 2024. Authorization to proceed with this scope was provided by execution of Amendment No. 1, dated 6 June 2024, to a prior agreement between Eustis Engineering and Wright-Pierce, Inc. (W-P) dated 21 April 2023. W-P is the consulting engineer assisting Veolia Water North America Operating Services, LLC (Veolia) with proposed upgrade designs for the EBSTP. Veolia operates the EBSTP on behalf of the SWBNO. SWBNO is the project owner.

Background Information and Scope

Eustis Engineering previously performed the geotechnical exploration for the wastewater treatment facility improvements portion of the subject project and published the results in our report titled "Geotechnical Exploration, Sewerage & Water Board of New Orleans, East Bank Sewage Treatment Plant, Phase I, Wastewater Treatment Facility Improvements, New Orleans,

Louisiana, W-P Project No. 21163, Eustis Engineering Project No. 25026," dated 19 October 2023. As described in our proposal, Eustis Engineering has performed a general Plans and Specifications (P&S) review and presented our comments in multiple email communications and telephone conferences with W-P. During our most recent communications, W-P indicated that the only portion of the project currently preparing for construction is the area defined as the "Clarifier Area" in our geotechnical report. In addition to the P&S review, W-P has requested detailed recommendations for the test pile program (TPP) for this portion of the project.

Furnished Information

W-P furnished a pile layout drawing for the improvements to be constructed in the Clarifier Area, indicating this portion of the project is the only area slated for construction of new foundations at this time. This drawing is presented in the Appendix. Review of this drawing indicates that the piles for the Clarifier Area improvements are generally broken down into three load cases based on design compressive loads of 20 kips, 30 kips, and 50 kips. The 20-kip pile load case will comprise 28 piles, with a pile cutoff at approximate el -19.5 (NAVD 88). The 30-kip pile load case will comprise 7 piles, with a pile cutoff at approximate el -2. The 50-kip pile load case will comprise 11 piles, with pile cutoffs at approximate el -1.3 and el -9.3.

The current scope of work will also include installation of new 24-in. diameter ductile iron pipe beneath an existing timber pile-supported wastewater effluent channel and into the basement level of the North RAS Pump Station building.

Revised Foundation Recommendations

Based on the furnished information and the existing subsurface conditions, the proposed EBSTP improvements in the Clarifier Area may be supported on deep foundations provided the deep foundations/piles are designed to support all structural loads (both in compression and tension), assuming an acceptable factor of safety and our estimates of settlement can be tolerated. The recommendations presented in this letter assume a TPP will be performed with dynamic pile load testing (DPT) only to verify the capacity estimates presented herein.

All loads associated with each structurally isolated feature should be supported on piles having the same approximate tip embedment below the existing ground surface to minimize differential settlement. Slabs should be integrally cast with pile caps to provide rigidity and to minimize the potential for differential settlement.

Given the close proximity of the proposed new project features to existing facility elements, we recommend the sequence of construction be carefully considered. Pile driving has the potential to add increased stresses on adjacent temporary retaining structure (TRS) walls and on already constructed permanent walls of below-grade features before new piles are installed. Fill placement above existing grade will also induce additional stresses on TRS walls and permanent walls if construction excavations are made before the site grading fill is placed.

Groundwater Management and Site Preparation

All recommendations regarding groundwater management and site preparation described in our 19 October 2023 report remain valid.

Revised Allowable Pile Load Capacity Estimates – Clarifier Area. We are providing revised estimates of allowable pile load capacity (compressive and tensile) for open-end steel pipe (OSP) piles considering three pile cutoff conditions at el -19.5, el -9.3, and el -2. The results of these analyses are presented on Enclosures 1 through 3, respectively. Our estimates of allowable capacity neglect frictional capacity to a depth of 2 feet below each of these pile cutoff elevations for embedment of the piles within a pile cap and assume pile installation will be vertical.

Factors of Safety. The allowable pile load capacity estimates presented on Enclosures 1 through 3 utilize a factor of safety of 2.5. DPT is required to verify our estimates of allowable load capacity if a factor of safety of 2.5 is utilized for design and existing, pertinent static or dynamic load test data are not available. DPT may also be used to mathematically correlate frictional capacity adjustments for piles installed at alternative embedment conditions. If neither static nor DPT is available to confirm allowable pile capacity estimates for a given condition, the allowable pile load capacity estimates presented on Enclosures 1 through 3 must be adjusted to a factor of safety of at least 3.0. A one-third increase in vertical load can be used for temporary loads as allowed by applicable codes and appropriate testing.

Open-End Steel Pipe Piles. We recommend OSP piles meet the requirements outlined in Section 1013.11 of the Louisiana Standard Specifications for Roads and Bridges (LSSRB), 2026 edition. The steel piles should be designed to have wall thicknesses that are structurally sufficient to withstand handling and driving stresses. The pile dimensions assumed in our analyses for the pipe piles shown on Enclosures 1 through 3 are based primarily on the outside pile diameter. The actual wall thicknesses selected for the OSP piles will not generally affect our estimates of vertical capacity. However, if a closed-end pile is considered, Eustis Engineering should evaluate the effect on the capacity and driveability. The estimates of capacity shown on Enclosures 1 through 3 do not include the weight of the pile.

Protrusion of Connections or Welds. Pile connections that protrude beyond the surface of the outside wall of the pile reduce the frictional resistance acting on the pile surface above the protrusion. For this reason, your specifications should require all welds to be machined and/or ground such that no more than a ⅛-in. protrusion is present. This includes machined bead thicknesses for spiral weld piles and manual full penetration segmented pile section welds, as well as splice collars. If the welds or splice collars protrude past the pile's outside dimensions, the soil-pile adhesion is disturbed during installation of the pile and the pile's capacity may be reduced.

Structural Capacity. The estimates of load capacity provided are based only on a soil-pile relationship. The structural capacity of the individual piles to transmit these loads, and any connections between the piles and the structures, should be determined by a structural engineer.

Pile Weight. The allowable load capacity estimates presented do not include the weight of the piles. When computing the resultant net compressive capacity for OSP piles shown graphically on Enclosures 1 through 3, a net capacity considering the weight of the steel piles and soil contained within the pipe piles (i.e., the "soil plug") should be used for the weight of the pile (weight of the pile minus the weight of soil removed). The full buoyant weight of the piles may be used to determine the tensile capacity of the piles provided they are designed to transmit these loads.

Test Pile Program Recommendations

Based on the number of piles currently required for the project and with consideration for the spatial limitations of the site and difficulties simulating pile embedment cases well below natural grade, it is our opinion the TPP can be performed utilizing only DPT in lieu of static pile load testing.

After reviewing the furnished pile layouts, including design loads and pile cutoffs, we recommend the TPP comprise two piles to be tested dynamically. Based on the allowable capacity curves presented on Enclosures 1 through 3, we estimate minimum pile tip embedments for three load cases presented will range from el -60.4 to el -81.5. Thus, we recommend one test pile be installed to the minimum tip embedment, presumably for the 20-kip load case (compression), and one test pile be installed to the deepest tip embedment for the 50-kip load case (compression). We recommend these test piles be positioned at opposite ends of the pile layout footprint, with the test pile with the deepest tip embedment positioned near Boring B-5 performed for our prior geotechnical exploration (Eustis Engineering Project No. 25026).

Test piles tested dynamically may be installed from the existing ground surface. Frictional capacity within upper strata above select pile cutoff elevations can be evaluated with DPT and these resistances subtracted mathematically to evaluate pile capacity for piles installed at alternative cutoffs. The test piles should be the same type and embedment anticipated for the job piles and installed with the same equipment and techniques proposed for the job piles.

The initial installation of OSP piles should be monitored and evaluated by DPT using a Pile Driving Analyzer® (PDA). A PDA can monitor driving stresses during installation and evaluate pile integrity during or after installation. A PDA can also monitor energy transferred to the pile by the hammer to evaluate pile installation efficiency. In order to evaluate pile capacity, "restrike" DPT should be performed a minimum of 14 days after its initial installation for friction piles, or 7 days after initial installation for end bearing piles. Shorter restrike set times may be considered, but shorter restrikes may not indicate the full ultimate capacity. In any case, we do not recommend a restrike set time less than 3 days to evaluate capacity. In addition, a larger hammer

may be required for the restrike DPT to fully mobilize restrike DPT piles. Data from this restrike should be further evaluated by Case Pile Wave Analysis Program (CAPWAP®) analyses (signal matching). Eustis Engineering is available to perform and evaluate the results of DPT and CAPWAP analyses.

Additional Considerations

Longer piles will tend to refuse as the skin friction and/or end bearing capacity components increase. We recommend a practical refusal criteria for termination of pile driving of 120 blows per foot for OSP piles using the recommended pile driving energies presented in our 19 October 2023 geotechnical report; however, the structural engineer of record should establish these criteria. If refusal is encountered prior to the pile reaching the pile cutoff elevation or if deformation of the pile top occurs, provisions should be made for cutting off the pile top at the cutoff elevation. As mentioned previously, the pile should be designed to withstand the driving stresses. A Wave Equation Analysis of Piles (WEAP) should be performed to evaluate the proposed pile driving hammer's ability to install the piles to pile cutoff elevations.

P&S Review and Comment Resolution

Ductile Iron Pipe Installation. W-P has indicated that, in general, the contractor will be required to isolate the section of the channel they will be working beneath with a TRS to remove the liquid load and for additional safety precautions. They will need to excavate beneath the channel to depths of approximately 8 to 10 feet, exposing two separate rows of existing untreated timber piles to remove two existing pipes and install two new pipes beneath the channel. After the new piles are installed, they will backfill beneath the channel. W-P has requested guidance on requirements for treatment of the exposed untreated timber pile sections and for backfilling beneath the channel.

Responses. Eustis Engineering has not performed an assessment of any existing piles subject to impacts from the proposed construction. We provide general guidance to be used as best practice for minimizing impacts to existing foundations from the proposed construction; however, we recommend engaging the engineers of record responsible for all structures and foundations potentially impacted by new construction activities. Generally, untreated timber piles are utilized in environments where all of these piles will remain submerged and surrounded by soil that presents an inhospitable environment for pile destroying organisms, such as fungal infestations. We recommend that once the untreated timber piles are exposed, the exposed areas be visually inspected for damage (either from demolition activities or from wood-rot) at a minimum.

The need to treat the exposed untreated timber pile surfaces prior to backfilling is beyond the standard of care for a geotechnical engineer-of-record (GEOR). If the structural engineer-of-record (SEOR) for these features cannot be consulted, we recommend the current SEOR make an independent determination on the risks of pile degradation after the completion

of the current project construction. We are aware of some post-manufacturing treatment options used to essentially "seal" a pile from the surrounding environment; however, these measures are generally used in tidal zones subject to frequent wetting and drying cycles. We suggest consulting with timber pile manufacturers to determine appropriate products and requirements for specification language if treatment of these exposed untreated timber piles is deemed appropriate.

Voids created for the ductile pipe installation may be backfilled using either a clean structural sand fill and/or flowable fill. A select granular material, such as locally available river sand (AASHTO A-3), should be non-plastic and free of roots, clay lumps, and other deleterious materials and have a maximum organic content of 5% by weight. Sand fill (A-3) should have no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve. Structural fill used as backfill or form fill beneath the pile-supported channel should be placed in loose lifts of 12 inches and compacted to at least 92% of its maximum dry density in accordance with ASTM D698. Compaction may be performed using hand-operated equipment or by tamping with the excavator bucket if spatial limitations will not allow for compactors.

A flowable fill may also be considered to backfill these voids, or to be used where placement of sand fill is impractical. In addition, flowable fill will provide a more stable working surface for the subsequent construction activities as compared to clean sand backfill. Flowable fill should meet the material and placement requirements given in Section 710 of the LSSRB.

Closing

This letter should be used as a supplement to our 19 October 2023 geotechnical report. The results and recommendations from our 19 October 2023 geotechnical report not specifically addressed in this letter remain applicable. Thank you for asking us to perform these geotechnical services. If you have any questions or require further clarification, please do not hesitate to contact us.

Yours very truly,

EUSTIS ENGINEERING L.L.C.

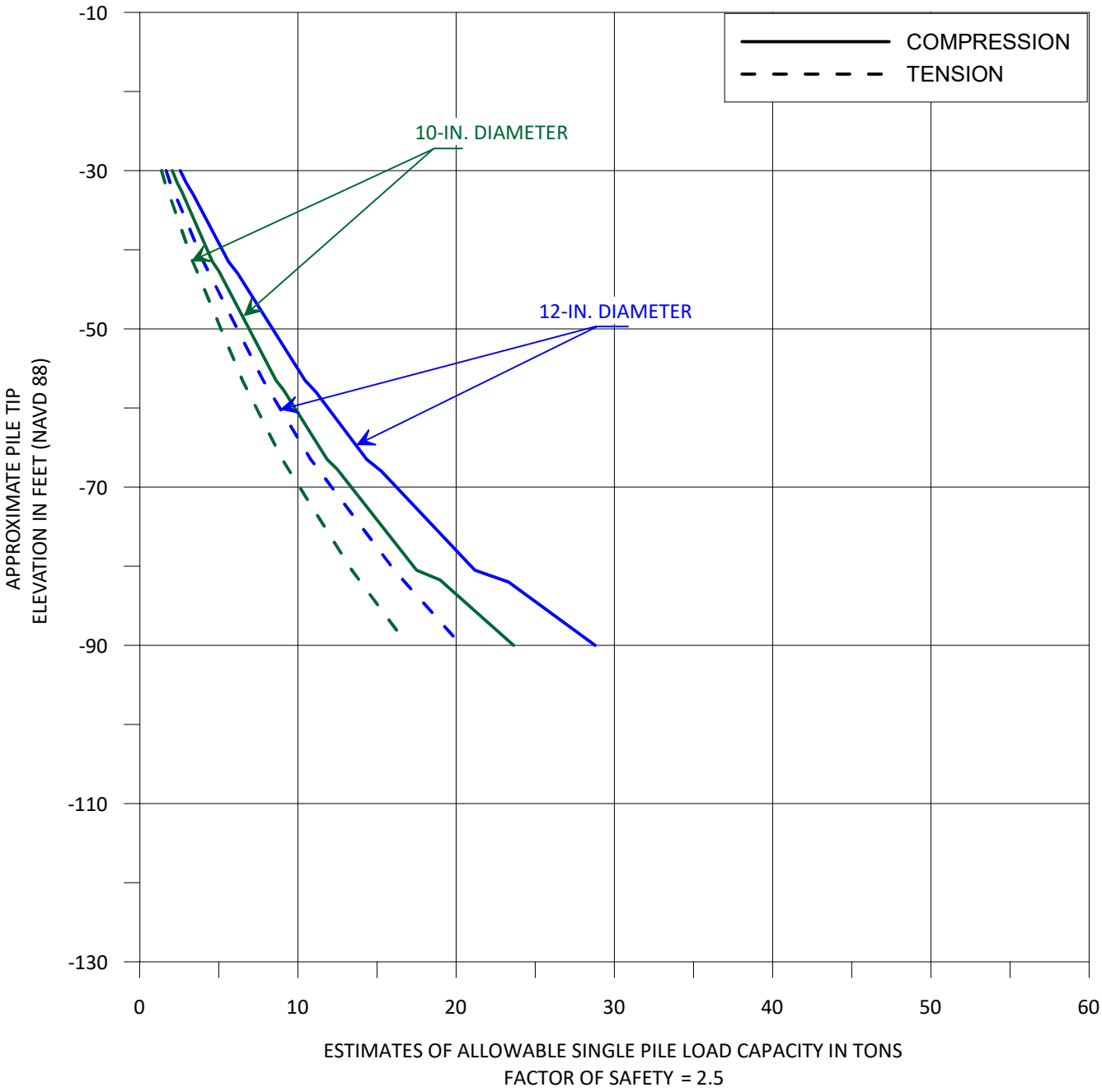
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BENJAMIN M. CODY, P.E.

STATE OF LOUISIANA
BENJAMIN M. CODY
License No. 30292
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

BMC:ssp/sec

Enclosures 1 through 3
Appendix



NOTES:

1) DESIGN OF PILE LENGTHS SHOULD CAREFULLY CONSIDER SETTLEMENT POTENTIAL AND PILE INSTALLATION REQUIREMENTS/CONSTRAINTS.

2) PILES ARE ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM VIBRATORY EQUIPMENT.

3) PILE CAPACITY ESTIMATES DO NOT INCLUDE PILE WEIGHT.

4) USE OF A FACTOR OF SAFETY OF 2.5 ASSUMES A DYNAMIC PILE LOAD TEST WILL BE PERFORMED.

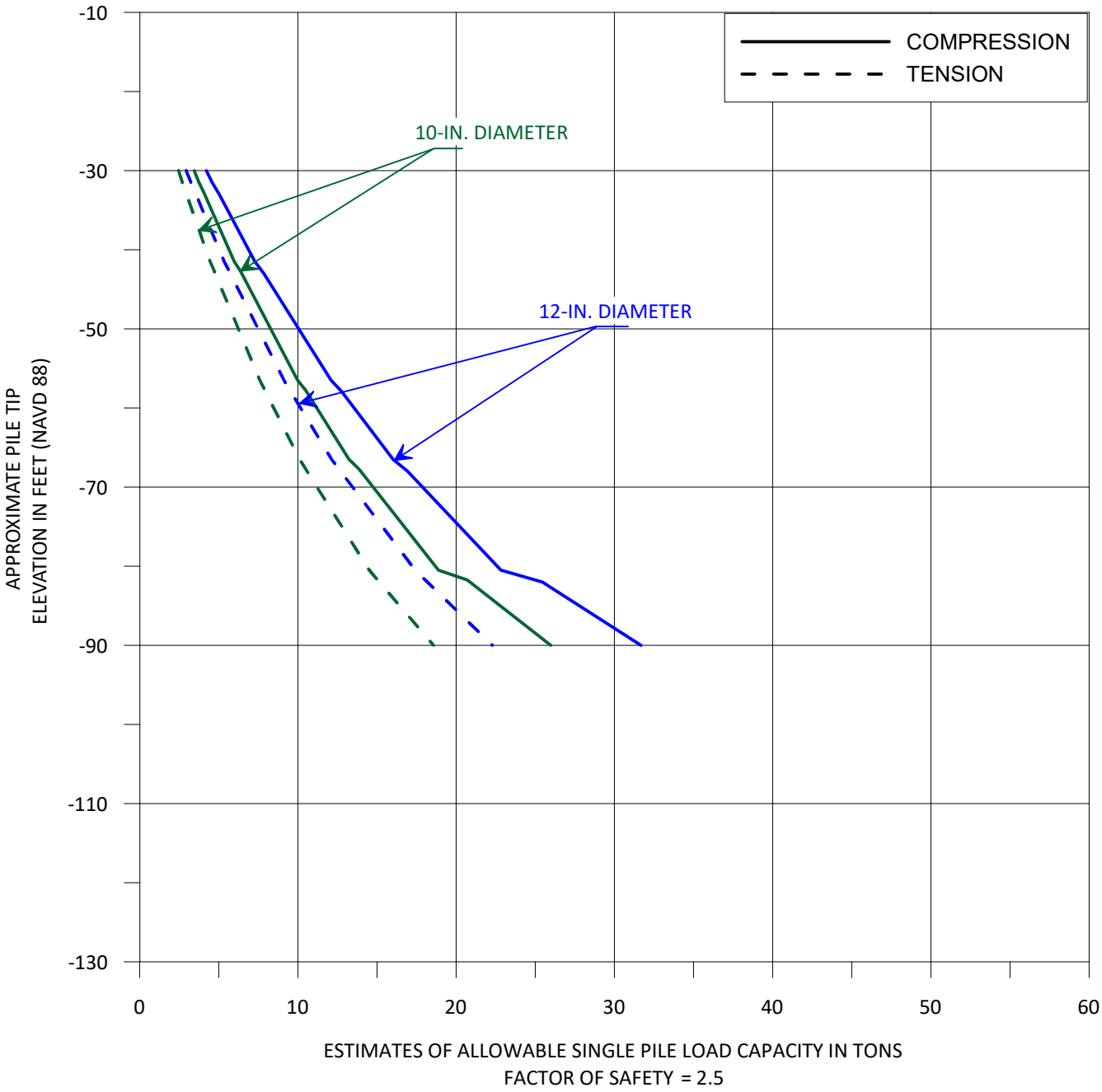
5) ESTIMATES OF CAPACITY INCLUDE A CAPACITY REDUCTION FOR A 2-FT EMBEDMENT WITHIN A PILE CAP.

PRELIMINARY ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
OPEN-END STEEL PIPE PILES
CLARIFIER AREA, PILE CUTOFF AT EL -19.5

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
SECONDARY TREATMENT AND SOLIDS UPGRADE
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: C.W.R.	JOB NO.: 25026.01
CHECKED BY: B.M.C.	DATE: 4 FEB 2026
FILE NAME: OSP APLC	ENCLOSURE 1



NOTES:

1) DESIGN OF PILE LENGTHS SHOULD CAREFULLY CONSIDER SETTLEMENT POTENTIAL AND PILE INSTALLATION REQUIREMENTS/CONSTRAINTS.

2) PILES ARE ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM VIBRATORY EQUIPMENT.

3) PILE CAPACITY ESTIMATES DO NOT INCLUDE PILE WEIGHT.

4) USE OF A FACTOR OF SAFETY OF 2.5 ASSUMES A DYNAMIC PILE LOAD TEST WILL BE PERFORMED.

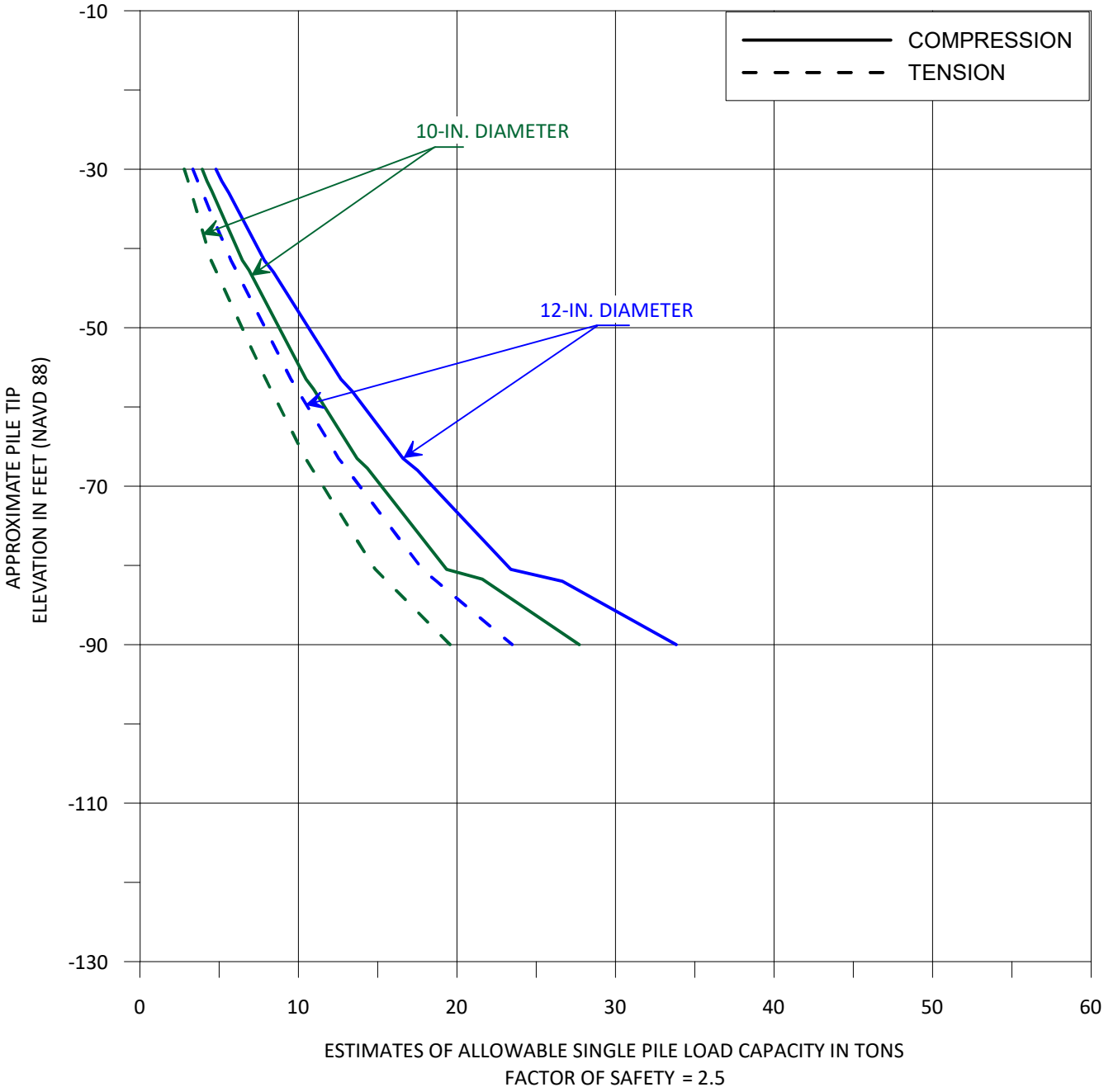
5) ESTIMATES OF CAPACITY INCLUDE A CAPACITY REDUCTION FOR A 2-FT EMBEDMENT WITHIN A PILE CAP.

PRELIMINARY ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
OPEN-END STEEL PIPE PILES
CLARIFIER AREA, PILE CUTOFF AT EL -9.3

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
SECONDARY TREATMENT AND SOLIDS UPGRADE
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: C.W.R.	JOB NO.: 25026.01
CHECKED BY: B.M.C.	DATE: 4 FEB 2026
FILE NAME: OSP APLC	ENCLOSURE 2



NOTES:

1) DESIGN OF PILE LENGTHS SHOULD CAREFULLY CONSIDER SETTLEMENT POTENTIAL AND PILE INSTALLATION REQUIREMENTS/CONSTRAINTS.

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3) PILE CAPACITY ESTIMATES DO NOT INCLUDE PILE WEIGHT.

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5) ESTIMATES OF CAPACITY INCLUDE A CAPACITY REDUCTION FOR A 2-FT EMBEDMENT WITHIN A PILE CAP.

PRELIMINARY ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
OPEN-END STEEL PIPE PILES
CLARIFIER AREA, PILE CUTOFF AT EL -2.0

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
SECONDARY TREATMENT AND SOLIDS UPGRADE
NEW ORLEANS, LOUISIANA

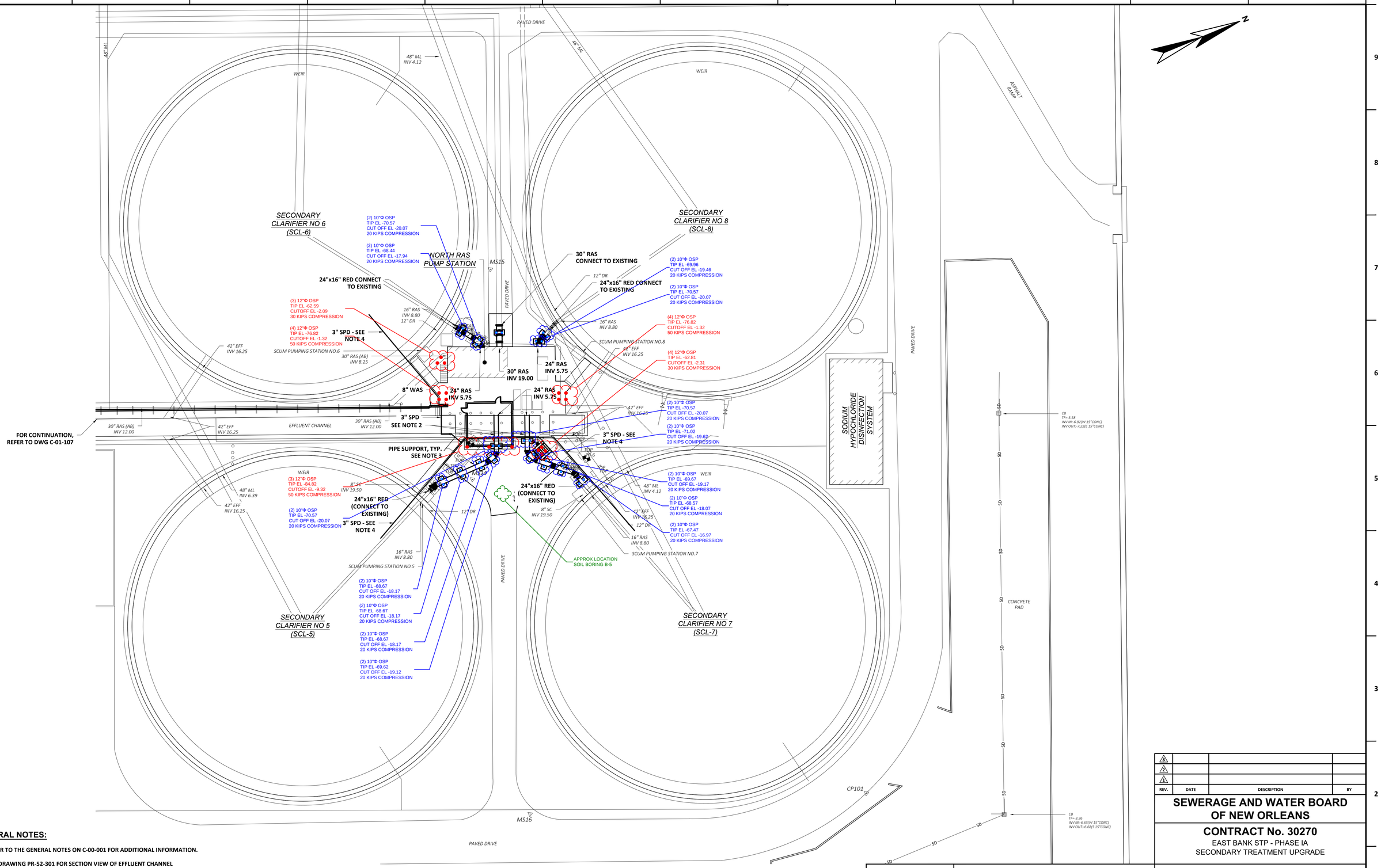
EUSTIS ENGINEERING SINCE 1946

DRAWN BY: C.W.R.	JOB NO.: 25026.01
CHECKED BY: B.M.C.	DATE: 4 FEB 2026
FILE NAME: OSP APLC	ENCLOSURE 3

APPENDIX

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GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. SEE DRAWING PR-52-301 FOR SECTION VIEW OF EFFLUENT CHANNEL
3. CONTRACTOR TO MODIFY OR REHABILITATE THE EXISTING PIPE SUPPORTS TO FACILITATE THE INSTALLATION OF THE NEW RAS PIPE TO BE SUPPORTED.
4. CONTRACTOR TO FIELD ROUTE NEW SUMP PUMP DISCHARGE PIPING FROM WHERE THE EXISTING PIPING EXITS THE NORTH RAS PUMP STATION TO SECONDARY CLARIFIERS NO. 5, 6, AND 7. PROVIDE ISOLATION BALL VALVES AT PIPING BRANCH LOCATIONS. REFER TO PR-50-102 FOR TYPICAL PIPE ROUTING AND DISCHARGE ARRANGEMENT.
5. REFER TO STRUCTURAL DRAWINGS FOR INFORMATION ON THE INSTALLATION OF PILES AND CONCRETE PILE CAPS.

SITE PIPING AND PAVING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 5, 6, 7, 8

SCALE: 1"=20'

0 20 40

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SITE PIPING AND PAVING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 5, 6, 7, 8

DR. C.HINKLEY	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: NOVEMBER 2025

C-01-108

DWG. No. 12221-W-33

SET NO. | SHEET NO. 14 OF 91

19 October 2023

Wright-Pierce, Inc.
Suite 2151
600 Federal Street
Andover, Massachusetts 01810

Attention Mr. Steven C. Hallowell, P.E. and Mr. Ryan Cyr, P.E.
Emails steven.hallowell@wright-pierce.com and ryan.cyr@wright-pierce.com

Ladies and Gentlemen:

Geotechnical Exploration
Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility Improvements
New Orleans, Louisiana
W-P Project No. 21163
Eustis Engineering Project No. 25026

Transmitted is an electronic copy of our report covering professional geotechnical services for the subject project. Hard copies are available upon request.

Thank you for asking us to perform these geotechnical services. If you have any questions or require further clarification, please do not hesitate to contact us.

Yours very truly,

EUSTIS ENGINEERING L.L.C.

BENJAMIN M. CODY, P.E.

BMC:ssp/asp

STATE OF LOUISIANA
BENJAMIN M. CODY
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IN
CIVIL ENGINEERING

GEOTECHNICAL EXPLORATION

SEWERAGE & WATER BOARD OF NEW ORLEANS

EAST BANK SEWAGE TREATMENT PLANT

PHASE I

WASTEWATER TREATMENT FACILITY IMPROVEMENTS

NEW ORLEANS, LOUISIANA

W-P PROJECT NO. 21163

EUSTIS ENGINEERING PROJECT NO. 25026

FOR
WRIGHT-PIERCE, INC.
ANDOVER, MASSACHUSETTS

BY



EUSTIS
ENGINEERING L.L.C.
SINCE 1946

METAIRIE, LOUISIANA

19 OCTOBER 2023

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GEOTECHNICAL EXPLORATION
SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE I
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
W-P PROJECT NO. 21163
EUSTIS ENGINEERING PROJECT NO. 25026

INTRODUCTION

1. This report contains the results of the geotechnical exploration performed for the proposed Phase I upgrade designs for the Sewerage & Water Board of New Orleans (SWBNO) East Bank Sewage Treatment Plant (EBSTP) in New Orleans, Louisiana. The project vicinity is presented on Figure 1. The exploration was performed in general accordance with Eustis Engineering L.L.C.'s proposal dated 6 March 2023, which was authorized by execution of an agreement between Eustis Engineering and Wright-Pierce, Inc. (W-P) dated 21 April 2023. W-P is the consulting engineer assisting Veolia North America Regeneration Services, LLC (Veolia) with proposed upgrade designs for the EBSTP. Veolia operates the EBSTP on behalf of the SWBNO. SWBNO is the project owner.

SCOPE OF SERVICE

2. The exploration included the drilling of five soil borings to evaluate subsoil conditions and stratification in the vicinity of the proposed Phase I improvements for the EBSTP. Samples were recovered from the various substrata. Soil mechanics laboratory tests performed on samples obtained from the soil borings were used to evaluate the physical properties of the various substrata. Engineering analyses, based on the soil borings and laboratory tests from the current exploration as well as existing data collected by Eustis Engineering from a prior subsurface exploration at the site, were made to estimate allowable pile load capacities and settlement due to structural loads for deep foundation support for the proposed structures. Soil-pile interaction analyses for laterally loaded piles were also performed. General construction recommendations regarding site preparation, drainage, placement and compaction of structural fill, lateral earthen pressures, and hydrostatic uplift have also been provided.

AVAILABLE SUBSURFACE DATA

3. Eustis Engineering previously performed a geotechnical exploration at the EBSTP in the vicinity of the current project features. Our findings from this exploration are summarized in our report entitled "Geotechnical Investigation, Sewerage & Water Board of New Orleans, Generator Building and Fuel Tank, East Bank Sewage Treatment Plant, New Orleans, Louisiana, Eustis Engineering Project No. 20446," dated 9 March 2009. The soil boring log and laboratory test data from this study are presented in Appendix I. The approximate location of the soil boring performed for this study is presented on Figure 2.

CURRENT FIELD INVESTIGATION

General

4. Five soil borings, designated as B-1 through B-5, were each drilled to a depth of 100 feet for the current exploration on 2 through 11 August 2023 using a truck-mounted rotary-type drill rig. The approximate locations of these borings are shown on Figure 2. Upon completion of our field operations, the borings were grouted in accordance with current regulatory requirements. Detailed descriptive logs of the borings and laboratory tests are shown in both tabular and graphical form in Appendix II. GPS coordinates were obtained at the boring locations using a handheld unit and should be considered approximate. These coordinates are shown on the boring logs in the form of latitude and longitude in Appendix II.

Sampling

5. Cohesive or semi-cohesive subsoils were sampled at close intervals or changes in stratum using a 3-in. diameter thinwall Shelby tube sampling barrel. The undisturbed samples were immediately extruded from the sampling barrel in the field. Pocket penetrometer tests were performed on trimmed ends of the extruded samples to provide a general indication of the soil's shear strength or consistency. The results of these tests are shown on the boring logs in Appendix II under the column heading "PP." All samples were inspected and visually classified by Eustis Engineering's soil technician. Representative portions of the samples were placed in moisture-proof containers and returned to Eustis Engineering's laboratory for additional testing.

6. Cohesionless samples were obtained during the performance of in-situ Standard Penetration Tests (SPTs). This test consists of driving a 2-in. diameter splitspoon sampler 1 foot into the soil after first seating the sampler 6 inches. A 140-lb weight dropped 30 inches is used to advance the sampler. The number of blows required to drive the sampler through the final 1-ft increment is indicative of the relative density or approximate consistency of the subsoils tested. The results of the SPT are shown on the log of Boring B-5 in Appendix II under the column heading "SPT." The samples were placed in a moisture-proof container for preservation of their natural moisture content and returned to Eustis Engineering's laboratory for additional testing.

LABORATORY TESTS

7. Soil mechanics laboratory tests, consisting of natural water content, unit weight, unconfined compression shear (UC), and unconsolidated undrained triaxial compression shear (OB), were performed on undisturbed samples obtained from the borings. These tests are necessary to estimate the relative strength and compressibility of the subsoils. In addition, Atterberg liquid limits tests and plastic limits tests, and the test establishing the percent passing a U. S. Standard No. 200 mesh sieve (-#200) were performed on selected samples to aid in classification. The results of these laboratory tests are tabulated on the boring logs in Appendix II.

8. Consolidation tests (CON) were also performed on selected representative samples. These tests were performed to help define the stress history and settlement parameters. Separate plots of these test results are provided in Appendix II after the boring logs.

DESCRIPTION OF EXISTING SITE CONDITIONS

Site Conditions

9. At the time of our field operations, the project site was observed to be an active sewage treatment plant constructed within a levee/berm system and wall system protecting the facility from the surrounding main Outfall Canal in New Orleans, Louisiana. The EBSTP facility features comprise clarifiers, sedimentation basins, storage tanks, flow meter vaults, pump stations, and other miscellaneous buildings and unit structures.

Stratigraphy

10. General. Our interpretations of the stratigraphy at the locations of Borings B-1 through B-5 performed for the current study are shown on the boring logs in Appendix II. Review of the boring logs indicates the near-surface soils at the site may generally be separated into two areas/reaches, the Sludge and Septage Area (Borings B-1 through B-4) and the Clarifier Area (Boring B-5).

11. Sludge and Septage Area (Borings B-1 through B-4). Information furnished by W-P indicates the ground surface at the locations of Borings B-1 through B-4 generally ranges from el -0.3 to el -2.0 (NAVD 88). Review of the logs of Borings B-1 through B-4 indicates the near-surface conditions at these boring locations are miscellaneous fill to depths of 6 to 12 feet (approximately el -7 to el -13). This miscellaneous fill generally comprises loose gray fine poorly graded gravel with coarse to fine sand; loose to medium dense brown fine silty sand; fine to medium poorly graded sand with silt; medium compact brown and gray fine sandy silt with few clay pockets; clayey sand with few shell fragments,

fine gravel, and brick fragments; and stiff gray and brown lean clay with few shell and sand pockets. Below this miscellaneous fill, an organic stratum generally comprising extremely soft to soft gray, dark brown, and black organic clay with wood, sand, and trace roots was encountered to depths of 15 to 20 feet (approximately el -16 to el -21). Next in the stratigraphy, extremely soft to medium stiff gray fat clay and lean clay interbedded with thin strata of fine sandy lean clay and fine silty sand were generally encountered to the Pleistocene interface identified at depths of 59 to 65 feet (approximately el -59 to el -67). Pleistocene soils encountered below this depth range generally comprise very soft to medium stiff gray and greenish gray fat clay, lean clay, and sandy lean clay that continue to the terminal depth of exploration at 100 feet (approximately el -100 to el -102).

12. Clarifier Area (Boring B-5). Information furnished by W-P indicates the ground surface at the location of Boring B-5 is approximately el -1.5. Review of the log of Boring B-5 indicates the near-surface conditions at this boring location are miscellaneous fill to a depth of 10 feet (approximately el -11.5). This miscellaneous fill generally comprises loose to medium dense gray fine silty sand and poorly graded sand with silt, fine gravel, shell fragments, and trace clay pockets. Below this miscellaneous fill, very soft gray, brown, and black fat clay and organic clay were encountered to a depth of 20 feet (approximately el -21.5) that overlies very soft to soft gray fat clay that continues to the Pleistocene interface identified at a depth of 65 feet in Boring B-5 (approximately el -66.5). Pleistocene soils encountered below this depth comprise medium stiff to stiff greenish-gray fat clay to a depth of 79 feet (approximately el -80.5) that overlies medium dense gray fine silty sand that extends to a depth of 93 feet (approximately el -94.5). Below this depth, medium stiff gray fat clay was encountered to the terminal depth of exploration at 100 feet in Boring B-5 (approximately el -101.5).

Groundwater

13. To determine the groundwater conditions at the time of the field exploration, observations were made in auger borings drilled adjacent to Borings B-2 and B-5. The auger borings were initially drilled to a depth of 5.0 feet below the ground surface without the addition of water, where groundwater was initially observed. After an observation period of 24 hours, the depth of water below the ground surface was observed to be 2.0 feet in the auger boring near Boring B-2 and 1.5 feet in the auger boring near Boring B-5. The depth to groundwater should be expected to vary with climatic conditions; drainage improvements; water levels in the nearby Mississippi River, Inner Harbor Navigation Canal, and main Outfall Canal; and other factors. The depth to groundwater should be determined by those persons responsible for construction immediately prior to beginning work.

FOUNDATION ANALYSES

Furnished Information

14. Furnished information indicates that Veolia operates the EBSTP on behalf of the SWBNO. Eustis Engineering was requested to conduct a geotechnical exploration associated with Phase I of this project to assess the subsoil suitability for the intended loads for proposed facility improvements.

15. W-P furnished a project layout that included improvements within two general areas, referred to as the Sludge and Septage Area and the Clarifier Area. Structures in the Sludge and Septage Area will include proposed Merchant Sludge/Seepage receiving

facilities and future structures including the Flow Splitter Box, Headworks (Channels 7 and 8), and Primary Settling Tanks. Structures in the Clarifier Area will include an electrical building, new clarifiers (5 and 7, required air flow [RAF] lines), and a future Scum Pump Station.

16. The proposed facility upgrades will include numerous below-grade features. During a meeting between Eustis Engineering and W-P on 5 September 2023, preliminary drawings were reviewed and a range of pile cutoff conditions were discussed. Copies of these preliminary drawings are presented in Appendix III. A summary of the pile foundation cutoff conditions developed from this discussion is presented in Table 1. The elevations presented in Table 1 reflect a furnished existing ground surface elevation at approximately el -1 within the Sludge and Septage Area, and approximately el -1.5 within the Clarifier Area.

TABLE 1: SUMMARY OF POTENTIAL DEEP FOUNDATION CONDITIONS

AREA	VICINITY OF BORINGS	TOP OF SLAB/CAP ELEVATION (NAVD 88)	BOTTOM OF SLAB/CAP ELEVATION (NAVD 88)
Sludge and Septage Area	B-1 through B-4	-3.5	-5.5
		-7.8	-9.8
Clarifier Area	B-5	-1.0[(1)]	-3.0[(1)]
		-8.6	-10.6
		-14.5	-16.5

[(1)] Existing ground surface estimated to be at el -1.0. Surface features are primarily pipe rack foundations.

17. We understand an existing 66-in. diameter pipeline in the vicinity of the new foundations, to be installed by the Thickened Sludge Pump Gallery, will be removed during construction. This horizontal pipeline has a centerline elevation at approximately el -10.75.

Foundation Recommendations

18. Based on the furnished information and the existing subsurface conditions, the proposed EBSTP improvements may be supported on deep foundations provided the deep foundations/piles are designed to support all structural loads (both in compression and from buoyancy when below-grade features are empty or nearly empty), assuming an acceptable factor of safety and our estimates of settlement can be tolerated. All loads associated with each structurally isolated feature (floors, walls, and columns) should be supported on piles having the same approximate tip embedment below the existing ground surface to minimize differential settlement. Slabs should be integrally cast with pile caps to provide rigidity and to minimize the potential for differential settlement.

19. Given the close proximity of the proposed new project features to existing facility elements, we recommend the sequence of construction be carefully considered. Pile driving has the potential to add increased stresses on adjacent temporary retaining structure (TRS) walls and on already constructed permanent walls of below-grade features before new piles are installed. Fill placement above existing grade will also induce additional stresses on TRS walls and permanent walls if construction excavations are made before the site grading fill is placed.

20. Hydrostatic uplift forces must be considered either by designed foundation resistance (dead load or tension pile resistance) or by a drainage system implemented to alleviate hydrostatic pressures beneath the below-grade features extending below the water table during periods of minimal loading. If post-construction drainage/pressure relief is selected to alleviate hydrostatic uplift pressures, Eustis Engineering should be notified, and additional analyses may be required for the design of such a system.

21. The effect of construction of the proposed below-grade features on existing facility elements has not been evaluated and is beyond the scope of service for this report. Generally, excavations that are located within a distance of a grade bearing foundation equal to the excavation depth may have a negative impact on the bearing support of the existing grade bearing feature. Likewise, grade bearing loads in close proximity to new excavations will also generate additional lateral stresses on the TRS used for construction, and on permanent below-grade features. Proximity to existing grade bearing features should be considered in the design of the TRS as well as on permanent walls for new below-grade features.

22. In order to maintain rotational stability of excavations for individual below-grade project features, surface loads from any existing grade bearing features in close proximity to the excavation must be incorporated into the TRS design. Excavations should not be performed until all the TRS sheeting is installed. Construction excavations should also be evaluated for seepage and heave potential for temporary conditions prior to implementation of final post-construction elements that can resist seepage and heave, in addition to potential unbalanced forces if surface loads are present that are not symmetrical for the excavation. Appropriate pre-construction documentation, as well as construction monitoring, should be performed to monitor the effects of pile driving, sheetpile installation, and dewatering on existing features near the new construction at the EBSTP.

23. The near-surface soils at the site are subject to a reduction in shear strength and excessive settlement once exposed to inclement weather. Therefore, proper site drainage should be established prior to construction to minimize delays caused by deteriorated site

conditions due to inclement weather or negative impacts to existing grade bearing features or pavements.

24. Consideration should be given to differential settlement between any pile-supported structure and adjacent sidewalks, ramps, parking areas, and other structures which are not pile-supported. We recommend ancillary features that are required to remain Americans with Disabilities Act (ADA) compliant be supported by pile foundations if they adjoin pile-supported structures or buildings. Long-term recurring maintenance of pavements and sidewalks should be anticipated where surface-supported features adjoin pile-supported features.

25. We have assumed minimal site grading fill will be required to raise existing grades, and the site appears to be relatively level in the vicinity of the proposed new project features. Any site grading fill placed above existing grades should be placed as far in advance of construction as possible to reduce the undesirable effects of subsoil consolidation from fill on the structure. Eustis Engineering should be notified if more than 6 inches of site grading fill is placed at the site above existing grades.

26. Your structural engineer should determine the appropriate foundation support based on an assessment of construction practices, estimates of pile capacity, settlement estimates, and settlement tolerances. Estimates of settlement for both structural loads and fill placement should be considered when selecting the foundation type.

27. Sheeting and bracing should be used as a TRS to maintain stability of excavations for the proposed below-grade project features. Excavations of 4 feet or less may be stabilized by timber sheeting. Deeper excavations will likely require the use of steel sheetpiles.

The installation of sheeting and sheetpiles may cause vibrations which could affect nearby structures, pavements, and underground utilities, and dewatering of excavations has the potential to induce settlements of nearby structures. If vibration damage is a concern, vibrations should be monitored during construction. Care should be taken to locate all utilities in the vicinity prior to performing any construction operations.

Groundwater Management

28. Drainage During Construction. The initial step to prepare the site for construction should be to establish adequate temporary and permanent drainage to prevent ponding of water and to manage stormwater runoff. We recommend the contractor maintain adequate surface drainage away from all foundation and pavement areas during and after construction. This may be accomplished by utilizing existing drainage features and by setting grades to ensure positive drainage of water away from the foundations and pavements. Sumps and pumps may be required to remove rainfall and groundwater from shallow excavations. Deeper excavations may require special dewatering methods as described subsequently. Throughout construction, the contractor should exercise caution during those times in which the subgrade may be saturated to ensure soil support is not degraded by construction operations.

29. Permanent Drainage. The near-surface soils are subject to a reduction in shear strength and excessive settlement if the moisture content increases (naturally or as a result of construction operations). We recommend adequate permanent drainage be provided to collect rainfall away from foundations and pavements after the completion of construction. Water should not be allowed to collect near foundation or pavement areas.

Site Preparation

30. Demolition. Removal and/or demolition of existing structures associated with the existing EBSTP within the proposed construction areas should be carefully considered. Existing tie-back cables, anchors, or deadmen (if present) for existing below-grade features that interfere with construction should be left in place, and either the new foundation designs be modified or the existing critical structural elements be reconfigured. All miscellaneous remnant structures that interfere with the new construction should be demolished or at least temporarily removed from the site. Existing footings or abandoned pipes encountered within the footprint of the new foundation areas (including the existing 66-in. diameter pipeline in the vicinity of the new foundations to be installed by the Thickened Sludge Pump Gallery proposed for removal) should be excavated and removed from the site. These structures could impact the performance of new foundations or pavements if not properly removed, proofrolled, and backfilled with structural fill material. Existing piles or drilled shafts should generally not be removed. We recommend these features be cut off 3 feet below the lowest elevations of any proposed pile caps or slabs, or 5 feet below the natural ground surface, whichever is greater. If existing piles or shafts are encountered, their locations should also be documented to identify potential conflicts with the new structure. Removal and relocation of structures and obstructions should also comply with Section 202 of the Louisiana Standard Specifications for Roads and Bridges (LSSRB), 2016 edition.

31. Clearing and Stripping. Beneath new grade level project features, the existing ground surface should be stripped of vegetation, debris, loose topsoil or fill, organic matter, and any other deleterious materials. Stripping should be to a depth necessary to remove debris, vegetation, and roots to reach firm undisturbed soil. The exact depth of stripping

should be determined during construction. Clearing and stripping should also comply with Section 201 of the LSSRB.

32. Swales. Special care should be taken to demuck any existing swales or ditches which will be abandoned and filled with soil. Muck excavation should comply with Section 203.04 of the LSSRB. These features may require relocation to provide adequate drainage for the site. Once demucked to the surface of firm undisturbed soil, these features should be backfilled with a select fill material placed and compacted under controlled conditions.

33. Subgrade Preparation. After the demolition, clearing, and stripping operations, the exposed ground surface beneath new surface grade level features should be proofrolled with a bulldozer, roller compactor, or tracked vehicle exerting a ground pressure between 10 and 15 psi after the demolition, clearing, and stripping operations. The vibratory system on the compactor, if present, should not be used during proofrolling. Alternative proofrolling techniques may be proposed, but these methods should be approved by Eustis Engineering prior to their use at the site. Any depressions or weak areas identified should be thoroughly cleaned out to the surface of firm undisturbed soil and backfilled with a select structural fill material placed and compacted under controlled conditions.

34. Structural Fill. A select granular material, such as locally available river sand (AASHTO A-3), should be used as form fill, backfill, and/or fill required to reach design grade. All select fill should be non-plastic and free of roots, clay lumps, and other deleterious materials and have a maximum organic content of 5% by weight. Sand fill (A-3) should have no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve.

35. Compaction. Structural fill used as backfill or form fill beneath a pile-supported structure should be placed in loose lifts of 8 to 10 inches and compacted to at least 95% of its maximum dry density within ±2% of optimum moisture content in accordance with ASTM D698. Structural fill or general fill used for non-structural grading may be spread in loose lifts of 10 to 12 inches and compacted by several passes of a bulldozer.

36. Quality Control. Prior to transporting structural fill to the site, a sample should be tested to verify its conformance to the project specifications. Density tests should be performed on each lift of the compacted structural fill to determine if the contractor has achieved the recommended density. All clearing and compaction operations should be performed only during periods of dry weather. The contractor should exercise caution during and after inclement weather to ensure subsoil support is not degraded by construction operations.

Fill Settlement

37. Very little, if any, additional fill (i.e., less than ½ foot) is anticipated to be required to raise the site to construction grades. Generally, less than ½ foot of fill will not appreciably affect consolidation of the underlying subsoils above and beyond settlements caused by the foundation load of the structure. Should more than ½ foot of site grading fill be added to the site, Eustis Engineering should be notified immediately to review our recommendations and revise as necessary.

Areal Subsidence

38. Areal subsidence is a result of past filling of a site and lowering of the groundwater level over large areas. Areal subsidence is considered a background condition over which people have no control and should be relatively uniform in the project area. Sufficient information is not available in this geotechnical exploration to make accurate estimates of areal subsidence in the project area. Ongoing areal subsidence can result in differential settlement of grade-supported structures and pavements. Additional settlement of pile-founded structures may also be observed. Areal subsidence can also result in differential settlement magnitudes between grade-supported and pile-supported structures that are larger than what would be estimated by consolidation settlement theory.

In-Situ Properties

39. Based on the borings and laboratory test data, the site was classified in accordance with the 2012 International Building Code (IBC). Using Table 20.3-1 of ASCE 7, referenced in the IBC, this site may be categorized as Site Class E, a "soft soil profile." This classification is based on the IBC criteria that there is more than 10 feet of soil in the upper 100 feet of the site with a plasticity index greater than 20, a moisture content greater than 40%, and an undrained shear strength of less than 500 psf.

Excavations and Dewatering

40. All structural excavations in excess of 4 feet should be sheeted and, if necessary, braced. Sheeting and bracing should also act to prevent migration of fine-grained soils and water

into the excavations. Strut loads, sheeting material properties, and sheeting penetration will depend on the excavation depth, width, duration, construction techniques, and bracing system. In accordance with OSHA Standard No. 1926, Subpart P, Appendix A, the subsoils encountered may be classified as Type C. This classification should be used to ensure all excavation operations comply with OSHA requirements. Shallow excavations having a maximum depth of 4 feet may be opencut. OSHA requires temporary opencut slopes no steeper than 1 vertical on 1.5 horizontal (1V:1.5H) for Type C soils. Opencut excavations should be accomplished in a controlled manner.

41. Dewatering. As described previously, subsurface conditions within the depths of the proposed excavations are primarily miscellaneous sand fills from approximately el -7 to el -13 overlying fat clay, lean clay, and organic clay. Construction sheetpiles may be used to cut off and control seepage through these permeable sand fills. In general, a series of pumped sumps should be sufficient to remove rainwater and incidental seepage of groundwater for sheeted shallow excavations. Note, the organic clay strata encountered in our borings may also be sufficiently permeable to require special measures to relieve pressures in these materials during dewatering activities. If a pressure relief system is used, it should be designed by a professional engineer licensed in the State of Louisiana and installed and operated by a contractor experienced and qualified in the field of pressure relief. The boring logs in Appendices I and II may be used in the design of a pressure relief system. Piezometers should be installed and monitored to verify performance of any pressure relief system.

42. Lateral Movement and Settlement of Adjacent Ground Surface. Settlement of the ground surface in the vicinity of the excavations for the project should be monitored during and after construction. Excavation, bracing, and dewatering systems employed

by the contractor during construction should be properly designed to maintain a stable excavation in order to prevent lateral movement of the surrounding soils. The subsidence and lateral movement of the soils surrounding the excavations should be controlled and minimized by careful attention to all details of the excavations, bracing, dewatering, backfilling, and installation and removal of the sheetpiles. Lateral movement and settlement of the ground surface can occur due to improper placement and compaction of the bedding and backfill materials. Lowering of the groundwater during dewatering may also cause settlement of the ground within and surrounding the excavations. The magnitude and lateral extent of ground settlement will be a function of the duration of the dewatering and groundwater control operations. The duration of dewatering should be as short as possible to minimize settlement of the adjacent ground surface due to groundwater lowering. If settlement due to drawdown of the groundwater surface becomes a problem, dewatering should be discontinued, and other construction methods considered.

43. Even with careful attention to the above details, available literature indicates settlement adjacent to sheetpile cofferdams (TRSs) can be as much as 2% of the excavation depth. ***Removal of sheetpiles will likely result in additional settlement of a grade-supported structure within the TRS, the surrounding ground surface, and adjacent structures.*** As previously stated, if any structures, pavements, or utilities present within a horizontal distance away from the excavation equal to the overall sheetpile length are sensitive to lateral movement or additional settlement, we recommend leaving temporary sheetpiles in place after construction.

Earthen and Water Pressures

44. At-Rest Pressures. Lateral pressures for structures experiencing no lateral movement should be estimated using at-rest lateral earthen pressure coefficients. At-rest lateral earthen pressure coefficients for various materials are presented in Table 2.

TABLE 2: AT-REST LATERAL EARTHEN PRESSURE COEFFICIENTS

MATERIAL	AT-REST LATERAL EARTHEN PRESSURE COEFFICIENT(K_O)
Granular Structural Backfill	0.55
In-Situ Clay Soils (Near-Surface, 0 to 22 Feet)	1.00

45. Active and Passive Pressures. Methodologies to estimate active and passive pressures for in-situ soils and granular backfill is described below. Suggested values for undrained shear strength and effective unit weights are shown below for in-situ soils between the ground surface and approximate el -20. Suggested values are also given for sand backfill. Active and passive lateral earthen pressure coefficients for various materials are presented in Table 3.

$$P_A = \gamma' H K_A - 2c' (K_A)^{1/2}$$

$$P_P = \gamma' H K_P + 2c' (K_P)^{1/2}$$

$$P_O = \gamma' H K_O$$

Where:

P_A = Active Pressure in psf.

P_P = Passive Pressure in psf.

P_O = At-Rest Pressure in psf.

c’ = Effective Cohesion. For granular fill, use effective cohesion = 0 psf. For in-situ clays, see Table 3 for c’.

γ' = Effective Unit Weight

K_A = Active Pressure Coefficient

K_P = Passive Pressure Coefficient

H = Depth (in feet)

TABLE 3: ACTIVE AND PASSIVE LATERAL EARTH PRESSURE COEFFICIENTS

MATERIAL	C' = EFFECTIVE COHESION IN PSF	ANGLE OF INTERNAL FRICTION ϕ IN DEGREES	γ = TOTAL UNIT WEIGHT (AND EFFECTIVE UNIT WEIGHT) IN PCF	ACTIVE PRESSURE COEFFICIENT (K_A)		PASSIVE PRESSURE COEFFICIENT (K_P)	
				LONG TERM	SHORT TERM	LONG TERM	SHORT TERM
SLUDGE AND SEPTAGE AREA (BORINGS B-1 THROUGH B-4)							
Structural Sand Fill (Existing or Newly Placed) Near Ground Surface[1] to El -7	0	28	128 (66)[2]	0.36	0.36	2.77	2.77
Existing Sand Fill El -7 to El -12	0	28	120 (57)[2]	0.36	0.36	2.77	2.77
In-Situ Organic Clay Soils (El -12 to El -18)	200	0	82 (19)[2]	0.44	1.00	2.28	1.00
In-Situ Lean Clay Soils (El -18 to El -20	300	0	108 (46)[2]	0.44	1.00	2.28	1.00
CLARIFIER AREA (BORING B-5)							
Structural Sand Fill (Existing or Newly Placed) Near Ground Surface [3] to El -6.5	0	28	120 (58)[4]	0.36	0.36	2.77	2.77
Existing Sand Fill El -6.5 to El -11.5	0	28	124 (62)[4]	0.36	0.36	2.77	2.77
In-Situ Fat Clay Soils (El -11.5 to El -16.5	175	0	110 (47)[4]	0.44	1.00	2.28	1.00
In-Situ Organic Clay Soils (El -16.5 to El -20)	225	0	76 (13)[4]	0.44	1.00	2.28	1.00

(1) Estimated ground surface at Sludge and Septage Area is at el -1.

(2) Effective unit weight for use with soils below groundwater table, estimated at el -3 in Sludge and Septage Area.

(3) Estimated ground surface at Clarifier Area is at el -1.5.

(4) Effective unit weight for use with soils below groundwater table, estimated at el -3.5 in Clarifier Area.

46. Uplift Pressure. The proposed below-grade features will potentially be subjected to hydrostatic uplift pressure during a sudden drawdown event or during dewatered conditions. The pile-supported below-grade features should be designed to prevent the base slab foundations from floating upward when the groundwater level is located at or near the existing ground surface, particularly during construction and when the structure is experiencing minimal loading. This may be accomplished by designing the pile foundations to resist the uplift forces in tension (pile embedment for estimated tension load as well as structural connections to resist the tensile loads). Stability of the structure against hydrostatic uplift during construction will be assured if dewatering operations provide adequate pressure relief. For the end of construction and post-construction cases, stability of the structure against hydrostatic uplift should be assessed using the following formula.

$$\text{UPLIFT SAFETY FACTOR} = \frac{W_T + W_W + W_S}{P_U}$$

Where:

W_T = Permanent weight of structure in pounds (including cover, walls, mat, and appurtenances) excluding the weight of any contents and any effects of buoyancy.

W_W = Weight of water in pounds contained in the structure during minimal loading conditions.

W_S = Weight of backfill in pounds within the zone directly above the effective bearing area of the foundation. These quantities should be computed from wet unit weights.

P_U = Uplift force of water in pounds equal to head distance between the applicable groundwater location and base of the foundation multiplied by weight of water and the effective bearing area of the foundation.

47. To prevent hydrostatic uplift, the uplift factor of safety (estimated as described above) should equal or exceed a value of 1.1 during and after construction. In this evaluation, we recommend the groundwater level be assumed at the existing ground surface.

48. Preparation of the Excavation Base. The excavations should be to sufficient depths to allow for the safe construction of the base slab bedding or working platform for the base slab installation. A minimum bedding layer/working surface layer for the base slab has been assumed. The bedding layer may comprise crushed stone. We also recommend material separation be provided between the working surface and natural clay subgrade. This may be accomplished with a geotextile stabilization fabric. The geotextile should meet or exceed the material requirements for Class C geotextile presented in Section 1019.01 of the LSSRB. The geotextile should be placed directly on the in-situ soils in accordance with the manufacturer's construction recommendations. Sufficient geotextile should be placed to line the excavation along its bottom and sides up to a level corresponding to the top of the stone bedding.

49. Bedding. Crushed stone bedding should conform to the requirements of Table 1003.03.4, in Section 1003-9 of the LSSRB. The crushed stone should be placed in lifts of 6 to 8 inches loose measured and compacted to 75% of its relative density determined in accordance with ASTM D4253 and D4254. If material other than crushed stone is selected for the project, Eustis Engineering should be notified to participate in assessing its suitability and developing applicable compaction criteria.

50. Sealant Slab. To provide a stable working platform during construction, a sealant slab may also be considered at the base of the prepared excavation as an alternative to the

crushed stone bedding. Flowable fill for a sealant slab should meet the material and placement requirements given in Section 710 of the LSSRB.

Deep Foundations

51. Allowable Pile Load Capacities. Analyses have been made to estimate the estimated allowable single pile load capacities in compression and tension for treated ASTM D25 quality timber piles; square, precast concrete (SPC) piles; and open-end steel pipe (OSP) piles considering subsurface conditions within two soil reaches (Sludge and Septage Area and Clarifier Area) and considering multiple pile cutoff elevations as described previously. The results of our analyses are shown in Figures 3 through 8 and summarized in Table 3. Our allowable pile load capacities neglect the capacity within the top 2 feet below the existing ground surface or cutoff elevation for embedment of the piles within the pile caps and assume installation of the piles will be vertical.

TABLE 3: SUMMARY OF POTENTIAL DEEP FOUNDATION CONDITIONS

PILE TYPE	PILE CUTOFF (NAVD 88)	AREA	FIGURE NUMBER
Treated ASTM D25 Quality Timber	-3.5	Clarifier	3 Sheet 1
	-7.8		3 Sheet 2
	-1.0[(1)]	Sludge/Septage	4 Sheet 1
	-8.6		4 Sheet 2
	-14.5		4 Sheet 3
Square, Precast Concrete	-3.5	Clarifier	5 Sheet 1
	-7.8		5 Sheet 2
	-1.0[(1)]	Sludge/Septage	6 Sheet 1
	-8.6		6 Sheet 2
	-14.5		6 Sheet 3
Open-End Steel Pipe	-3.5	Clarifier	7 Sheet 1
	-7.8		7 Sheet 2
	-1.0[(1)]	Sludge/Septage	8 Sheet 1
	-8.6		8 Sheet 2
	-14.5		8 Sheet 3

[(1)] Estimated existing ground surface at el -1.0.

52. Factors of Safety. Our estimates of allowable capacity presented in Figures 3 through 8 contain a factor of safety of 2.0. A test pile program with static load testing is required to verify our estimates of allowable load capacity if a factor of safety of 2.0 is utilized for design and existing, pertinent static load test data are not available. As an alternative, dynamic pile testing (DPT) may be performed to confirm the estimated pile load capacities of driven piles in lieu of static load testing. If only DPT is used to verify capacity of SPC and/or OSP piles, the allowable capacities presented in Figures 5 through 8 must be adjusted for a factor of safety of at least 2.5. DPT may also be used to mathematically correct frictional capacity adjustments for piles installed at alternate embedment conditions. If neither static nor DPT data are available to confirm allowable pile capacity estimates for a given condition, the allowable pile load capacities presented in Figures 3 through 8 must be adjusted for a factor of safety of at least 3.0. A one-third increase in vertical load can be used for temporary loads as allowed by applicable codes and appropriate testing.

53. Timber Piles. We recommend the treatment of timber piles meet the current American Wood Preservers Association Standards as outlined in Section 1014 of the LSSRB, for both preservative and quality assurance. Treatment should also follow Section 812.06 where applicable. Furthermore, we recommend the timber piles meet the quality (clean peeled, straightness, etc.) requirements outlined in ASTM D25 and size requirements outlined in Table X1.5 of ASTM D25 for minimum pile tips. The timber pile dimensions assumed in our analyses are given in Figures 3 and 4.

54. Square, Prestressed, Precast Concrete Piles. We recommend the SPC piles meet the requirements outlined in Section 805.14 of the LSSRB. Precast concrete piles should be designed to have a strand prestress that is structurally sufficient to facilitate driving of the

piles without damage. Our analyses are based on single intact sections or spliced sections having square cross-sections. Pile splices should not protrude beyond the perimeter of the pile cross-section. Alternate precast concrete pile configurations (pipe, triangle, etc.) should be further evaluated. The estimated capacities shown in Figures 5 and 6 do not include the weight of the pile.

55. Open-End Steel Pipe Piles. We recommend OSP piles meet the requirements outlined in Section 1013.11 of the LSSRB. The steel piles should be designed to have wall thicknesses that are structurally sufficient to withstand handling and driving stresses. The pile dimensions assumed in our analyses for the pipe piles shown in Figures 7 and 8 are based primarily on the outside pile diameter. The actual wall thicknesses selected for the OSP piles will not generally affect our estimated vertical capacities. However, if a closed-end pile is considered, Eustis Engineering should evaluate the effect on the capacity and driveability. The estimated capacities shown in Figures 7 and 8 do not include the weight of the pile.

56. Pile Weight. The allowable load capacities presented in Figures 3 through 8 do not include the weight of the pile. When computing the resultant net compressive capacity for SPC piles, a net load of 40 pcf may be used for the weight of the concrete (weight of the concrete minus the weight of soil removed). The full buoyant weight of the concrete of 87 pcf may be used to estimate the tensile capacity of the piles, provided they are designed to transmit these loads. Similar procedures may be utilized to estimate the net load of the steel piles. The weight of timber piles may be considered negligible.

57. Temporary Lateral Load Capacity. Limited lateral capacity may be used on piles subjected to transient loads. Treated ASTM D25 quality timber piles with minimum tip

diameters of 6 inches and minimum butt diameters of 8 inches may be assumed to provide a temporary lateral resistance of ½ ton per pile. Treated ASTM D25 quality timber piles with minimum tip diameters of 7 inches and minimum butt diameters of 12 inches may be assumed to provide a temporary lateral resistance of 1 ton per pile. SPC and OSP piles with side dimensions/nominal diameters of 10, 12, and 14 inches may be assumed to provide a temporary lateral resistance of 1.5, 2.0, and 2.5 tons per pile, respectively. All piles resisting temporary lateral loads should have a minimum tip embedment of 30 feet (i.e., depth below pile cutoff). We recommend soil-structure interaction analyses be performed if design lateral loads are greater than the lateral load resistances provided or if piles other than those considered in this report are used for the project.

58. Soil Response of Single Piles to Lateral Loads. Eustis Engineering was asked to evaluate the effects of lateral loads on an individual composite pile comprising a 12-in. diameter OSP pile filled with concrete to an estimated depth of 20 feet below the pile head. The OSP is estimated to have a ½-in. wall thickness. For our analyses, the pile was assumed to be installed to a tip embedment of approximately 74 feet below the ground surface without a pile stickup to allow for estimating the point of fixity in the pile (i.e., the depth below which additional embedment does not significantly impact pile resistance or deformation from lateral loads). We anticipate vertical pile load capacity requirements in compression and/or tension will govern the pile design. Our analyses were performed using the computer program LPILE® for Windows, Version 2022-12.009, by Ensoft, Inc.

59. Lateral Load Analyses – Design Assumptions. For these analyses, we assumed cyclic loading conditions and pile cutoffs at el -14.5 (Sludge and Septage Area) and el -7.8 (Clarifier Area) with 1 foot of stickup. Elastic moduli of 3,600,000 psi and 29,000,000 psi

were assumed for the concrete and steel components of the composite pile. Piles were assumed to be 75 to 82 feet long. We evaluated soil response to laterally loaded piles with compressive loads of 72 kips (Sludge and Septage Area) and 80 kips (Clarifier Area) based on the allowable capacity curves presented in Figures 7 and 8. A conservative lateral load of 8 kips was provided. Analyses were performed to estimate the soil response to this lateral load for piles in both design areas, as well as to estimate the lateral loads required to produce a predicted lateral displacement of ¼, ½, ¾, and 1 inch at the pile top. Our analyses assumed the lateral loads were applied at the top of a pile cap approximately 1 foot above the estimated pile cutoffs described previously. Pile head fixity may be either restrained or free to rotate. A fixed pile-head condition provides restraints against all directions of movement, and this assumption is dependent on the pile fixity within the cap. A pile head that is free to rotate is sometimes referred to as a "pinned" condition. This model provides restraints against translational movements without restraint against rotational movement. Should these assumptions not be valid, Eustis Engineering should be contacted to revise our analyses.

60. Lateral Load Analyses – Results. A summary of the results of our analyses are provided on Figure 9. Typically, we define fixity as the location of the second zero deflection point in the plots of bending moment with depth presented in Appendix IV. The depth to fixity for the evaluated piles was estimated to occur at approximately 30 feet below the pile cutoffs (approximately el -45 for the Sludge and Septage Area and el -38 for the Clarifier Area).

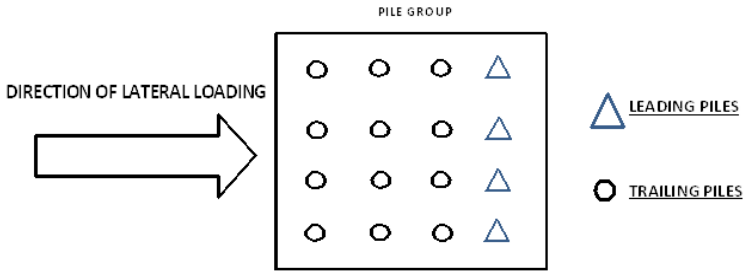
61. The analyses performed are for laterally loaded single piles or piles installed in groups widely spaced relative to the direction of lateral loading. Limitations to our results are necessary because we utilized unfactored soil parameters (friction angles, undrained

shear strengths, and lateral strain factors) in our analyses. Appropriate factors of safety should be applied by the structural engineer. If other loading conditions or complex group configurations are planned, or if the assumptions made for these analyses are invalid, Eustis Engineering should be consulted to provide additional lateral load analyses. The analytical tools used for analyses of laterally loaded piles are intended to predict the soil response to laterally loaded piles and are not to be used independently for structural analyses of the piles.

62. Reduction Factors for Lateral Group Effects. Evaluation of lateral loads applied to a single pile do not account for the effects of pile groups. Group effects (sometimes referred to as shadowing) will reduce lateral pile capacity if piles are spaced closer than seven pile diameters center-to-center in the direction of loading. For pile group spacings closer than seven pile diameters in the direction of lateral load, reduction factors should be applied to the sum of the horizontal loads in the direction of lateral loading. These reduction factors, known as p-multipliers, are presented in Table 4. For piles spaced a minimum of five pile diameters apart in the direction perpendicular to lateral loading, there is no reduction for interaction among adjacent piles during lateral loading. For piles spaced a minimum of three pile diameters apart in the direction perpendicular to lateral loading, a reduction factor of 0.8 should be applied to the sum of the horizontal loads in the direction of lateral loading.

TABLE 4: REDUCTION FACTORS FOR LATERALLY LOADED PILE GROUPS

PILE SPACING IN DIRECTION OF LATERAL LOADING	GROUP REDUCTION FACTORS FOR LATERAL LOADS	
	LEADING PILES	TRAILING PILES
7.0 Diameters	1.00	1.00
6.0 Diameters	1.00	0.93
5.5 Diameters	1.00	0.90
5.0 Diameters	1.00	0.84
4.5 Diameters	0.97	0.78
4.0 Diameters	0.96	0.71
3.5 Diameters	0.93	0.65
3.0 Diameters	0.90	0.58



63. Limitations to Lateral Response Analyses. Connections required to transmit the furnished loads to the proposed foundations should be determined by a structural engineer licensed in the State of Louisiana with a suitable factor of safety for structural components. The necessity of a lateral load test should also be determined by the structural engineer based on the factors of safety for the structural components, magnitude of the peak loads evaluated in these analyses compared to typical service loads, and allowable deflection for the foundations. The results of these analyses should be reviewed by the structural engineer of record to ensure the design requirements have been met. If any of our assumptions are invalid, Eustis Engineering should be notified to revise our lateral load analyses.

64. Batter Piles. The estimated pile capacities provided in Figures 3 through 8 are for piles installed vertically and may be used to estimate the pile load capacities for batter piles. The vertical component of batter piles will be equal to the capacity for a vertical pile installed to the same tip elevation (from the same pile cutoff). From this relationship, geometry may be used to estimate the axial capacity and horizontal component of the batter piles. This geometric relationship is shown on Figure 10.

65. Structural Capacity. The estimated load capacities provided are based only on a soil-pile relationship. The structural capacity of the individual piles to transmit these loads, and any connections between the piles and the structure, should be determined by a structural engineer.

66. Pile Group Vertical Capacity. For piles firmly seated in the sand deposits encountered below approximate el -81.5 in Boring B-5 (Clarifier Area), it will not be necessary to consider group effects with regard to their compressive capacity. However, the effects of group action should be considered when evaluating the tensile capacity of all pile groups and for pile groups with compressive loads and tip embedments shallower than el -81.5 in the Clarifier Area, or for all piles in the Sludge and Septage Area (vicinity of Borings B-1 through B-4) that will derive the majority of their supporting compressive capacity from skin friction. In this regard, the supportive compressive value of friction piles installed in groups and all pile groups subject to tension loads should be investigated based on group perimeter shear by the formula shown on Figure 11. For group effects on tensile capacities, the second term of the equation should be neglected.

67. Pile Spacing. All groups should be evaluated for perimeter shear. The minimum center-to-center pile spacing within a pile group or row of piles should be established in

accordance with the pile/shaft spacing formula shown on Figure 11. This spacing generally only considers the spacing required to achieve the estimated vertical capacity and avoid interference during construction. We recommend soil-structure interaction analyses be performed to evaluate group effects or spacing requirements to resist lateral loads, if applicable.

68. Estimated Settlement Due to Structural Loads. We estimate single piles, or single piles installed in widely spaced rows to tip embedments of 30 to 50 feet, will settle approximately ½ to 1 inch, and settlement of piles installed to tip embedments of 55 to 75 feet will be ½ to ¼ inch. We estimate settlement of single piles installed to a tip embedment of 80 feet or deeper will be ¼ inch or less. These estimates do not include elastic deformation of the piles which should be added to the settlement. Elastic deformation of friction piles may be estimated as 67% to 75% of the static column strain acting as a column. Elastic deformation of end bearing piles in the Clarifier Area (installed to a tip embedment at el -81.5 or deeper) may be estimated as 100% of the static column strain of the pile acting as a column. Note, piles installed in large groups and heavily loaded can experience settlements greater than that of a single pile or those in small groups.

69. Our estimates of settlement due to structural loads are based on the assumption that piles will be installed in small groups or widely spaced rows. We have assumed the largest group dimension will be no greater than 20% of the pile embedment, and the center-to-center spacing between groups will be no closer than twice the largest group dimension. We have assumed the center-to-center spacing between rows of piles will be no closer than 8 feet or 9 pile diameters or side dimensions, whichever is greater. In the event any of our assumptions are not met, Eustis Engineering should be contacted to

reevaluate the potential settlement of the pile foundations. ***Settlement due to structural loads is also additive to settlement due to fill placement if fill placement above existing grades will exceed 6 inches.***

70. Differential Settlement. All piles for each structurally isolated project feature should be installed to the same approximate tip elevations, and concrete for the pile caps should be structurally integrated with the concrete for the first-floor slab. These recommendations are made to minimize the potential for differential movements. Eustis Engineering should be contacted to reevaluate pile settlement if any of our assumptions are not met.

71. Your design should recognize the potential for differential settlement between pile-supported features and grade-supported features as well as adjoining, integrated features supported on different deep foundation conditions (pile type, size, tip embedment, cutoff/ embedment conditions, etc.). A joint considering these movements should be provided between any grade-supported and pile-supported features to accommodate or disguise potential differential settlement. In addition, the structure should be designed as rigid as possible to minimize the potential for differential settlements.

72. Utilities. We recommend flexible-type connections be specified for all piping and utilities going to and from pile-supported project features. Also, pipes and conduits beneath pile-supported features should be structurally supported by hangers attached to the structural floor slab.

Installation of Driven Piles

73. Quality Control. All pile driving operations should be supervised by experienced personnel to ensure proper procedures are followed and accurate records are kept during all pile driving operations. The driving records should include the date, type of pile, pile size (outer diameter and wall thickness, side dimension, or tip and butt diameter), depth and diameter of predrill, overall pile length, hammer model, driving energy, and number of blows per foot of penetration for the full embedment of the pile. An accurate driving record is especially important to verify piles are installed to the required tip embedment and to give an indication of any unusual driving characteristics which may include pile breakage. We recommend Eustis Engineering be retained to observe, record, and evaluate all pile driving operations with respect to the recommendations presented in this report.

74. Hammers. Small treated ASTM D25 quality timber piles with minimum tip diameters of 6 inches and butt diameters of at least 8 inches may be driven with a drop hammer or a single-acting air hammer having a manufacturer's rated energy of 7,250 ft-lbs per blow. If a drop hammer is used, the ram weight should not exceed 3,000 pounds and the drop should not exceed 3 feet. Larger ASTM D25 quality timber piles, having minimum tip diameters of at least 7 inches and minimum butt diameters of at least 12 inches, may be driven with a single-acting air hammer having a manufacturer's rated energy of 15,000 ft-lbs per blow. For these piles, the ram weight should not exceed 5,000 pounds and the maximum stroke should be limited to 3 feet.

75. We recommend a single-acting air hammer be used to install SPC and OSP piles. The manufacturer's rated energy required to drive the piles will depend on the piles'

allowable compressive capacity. A tabulation of the estimated hammer energy versus allowable compressive capacity (factor of safety ≈ 2.0) is provided in Table 5. For precast concrete piles, we also recommend the hammer weigh one-third to one-half of the weight of the pile.

TABLE 5: RECOMMENDATIONS FOR SINGLE-ACTING AIR HAMMER DRIVING ENERGIES

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD COMPRESSIVE CAPACITY IN TONS FACTOR OF SAFETY ≈ 2.0	APPROXIMATE RATED SINGLE-ACTING HAMMER ENERGY IN FT-LBS/BLOW
Up to 60 60 to 120	19,500 24,000

76. Alternate Hammers. A diesel or hydraulic hammer may also be used for the installation of concrete or steel piles. We recommend a diesel hammer have a rated energy of 1½ times the energy recommended for a comparable installation with a single-acting air hammer. Similarly, a hydraulic hammer should have a rated energy that is equated to the air hammer based on efficiency. Other impact hammer types may also be suitable for pile impact installation. If the hammer type is not an air hammer, we recommend Wave Equation Analysis of Piles (WEAP) analyses be performed for hammer selection and approval. In addition, DPT should be conducted if a diesel hammer or other variable energy hydraulic hammer is proposed for installing concrete piles. This testing will reduce the risk of overstressing the piles which can occur during soft driving (i.e., excessive tensile stresses can develop when concrete piles advance rapidly through soft soils, particularly when driven by a diesel hammer). We do not recommend a diesel hammer be used to install timber piles.

77. Pile Refusal. Using this driving energy, timber piles should be driven no harder than 25 blows per foot (refusal) to minimize structural damage to the piles. Refusal criteria should be evaluated with dynamic analyses and further evaluated during the test pile program.

78. Dynamic Analyses. The piles should be designed by a structural engineer to have cross-sections which are structurally sufficient to facilitate driving of the piles without damage. WEAP analyses may be performed to evaluate driving stresses, pile cushion, and driveability once the hammer and equipment have been selected. Structural requirements can then be verified by a structural engineer and installation criteria can be established. Eustis Engineering recommends hammer approval by WEAP analyses in accordance with Section 804.03.1.2 of the LSSRB.

79. Alternative Installation Methods. We do not recommend vibratory methods be utilized for pile installation. If a vibratory hammer is selected for the project, Eustis Engineering should be contacted to evaluate the reduction in the estimated allowable pile load capacities presented in Figures 3 through 8. If any other alternative installation methods are selected, Eustis Engineering should be contacted to evaluate the impact on the estimated capacities.

80. Predrilling. Predrilling may be considered to minimize vibrations or to penetrate near-surface crusts or fill soils. Shallow predrilling may be performed by dry auger methods to depths of 6 feet below grade. Dry auger predrilling should be performed with the auger bit diameter sized no larger than the butt diameter of the timber piles or 75% of the side width of SPC piles. Deeper predrilling (if necessary) should be performed by wet rotary methods with a fishtail bit sized no larger than the tip diameter of the

timber piles, or 75% of the side width of precast concrete piles. In all cases, piles should be embedded a minimum of 10 feet beyond the predrill depth. We anticipate OSP piles may be installed to the tip embedments presented in Figures 7 and 8 without the need for predrilling. Actual requirements for predrilling should be assessed during a test pile program.

81. Pile Installation Sequence. Timber piles and SPC piles are considered displacement piles because soil is displaced laterally when the piles are driven into the subsurface. These piles could cause adjacent piles to refuse at shallower depths or, more likely, could result in heaving of piles previously installed. For these reasons, we recommend pile driving take place from the center of large foundations working outward.

82. Vertical and lateral movement of the pile heads should be monitored to identify pile heave. If pile heave is identified, piles should be re-tapped to their original tip elevations. Identification and remediation of piles heaving in excess of 2 inches should comply with Section 804.07.9 of the LSSRB. DPT may be performed during the initial reseating of heaved piles to assess the piles' capacity. DPT is discussed subsequently in this report.

Test Piles and Load Tests

83. Eustis Engineering considers a test pile program (TPP) and pile load tests as an extension of our geotechnical exploration. Therefore, Eustis Engineering should be retained to perform these services. Driven probe piles may be incorporated into a TPP to delineate depths to a significant bearing stratum, if present. A TPP may also include multiple test piles to assess installation conditions across the site, even if all of these piles will not be

load tested. If driven piles are designed to be end bearing piles firmly embedded in the sand deposits encountered below approximate el -81.5 in the Clarifier Area, we recommend at least three probe piles be installed over the footprint of the features in this area to verify the depths of these sand deposits and installation conditions. Additional probe piles may be considered in the Sludge and Septage Area to assess installation conditions given the large footprint of this project area. The actual number of probe piles should be established based on the number and type of piles proposed for use in the project foundations. The probe piles may be installed at job pile locations. Eustis Engineering should be consulted to further develop a TPP consistent with the project's scope.

84. If probe/test piles are installed from the ground surface to model conditions for below-grade project features, special measures will be required to simulate the design condition of the piles installed within the eventual excavations. Piles may be installed within casing with the soils removed to simulate these conditions. Frictional capacity within upper strata above select elevations below grade can also be evaluated with DPT and these resistances subtracted mathematically to evaluate pile capacity for piles installed at alternate cutoffs. Alternative approaches may be proposed but should be approved by Eustis Engineering.

85. The probe piles should be the same type and embedment anticipated for the job piles and installed with the same equipment and techniques proposed for the job piles. Driven probe piles will provide definitive information regarding the anticipated driving resistance, vibrations from pile driving, requirements for predrilling, and possible refusal criteria.

86. Static Load Testing. If the basis for design will be a factor of safety of 2.0 and existing, pertinent static load test data are not available, the driven probe pile with the lowest resistance to driving (blow counts) for each installation condition (project area, pile type and size, pile cutoff and tip embedment conditions, etc.) should be subjected to static load testing. The test pile should be allowed to set for at least 14 days subsequent to the installation of the reaction system for friction piles, or at least 7 days subsequent to the installation of the reaction system for end bearing piles. The structural and geotechnical engineers should select the piles to be used for performance of static load test(s). The piles should then be load tested to failure in accordance with ASTM D1143 assuming the governing load case is the compressive capacity. Job piles may also be subjected to tension and lateral loads; therefore, it may also be necessary to perform tension (ASTM D3689) and/or lateral (ASTM D3966) static load tests on a selected test pile(s). The results should be evaluated by Eustis Engineering to verify the estimates of pile load capacity presented in this report.

87. Dynamic Pile Testing. As an alternative, SPC and OSP piles may be evaluated using DPT methods to evaluate capacity. The initial installation of precast concrete piles should be monitored and evaluated by DPT using a Pile Driving Analyzer® (PDA). A PDA can monitor driving stresses during installation and evaluate pile integrity during or after installation. A PDA can also monitor energy transferred to the pile by the hammer to evaluate pile installation efficiency. In order to evaluate pile capacity, "restrike" DPT should be performed a minimum of 14 days after its initial installation for friction piles, or 7 days after initial installation for end bearing piles. Shorter restrike set times may be considered, but shorter restrikes may not indicate the full ultimate capacity. In any case, we do not recommend a restrike set time less than 3 days to evaluate capacity. In addition, a larger hammer may be required for the restrike DPT to fully mobilize restrike DPT piles. Data from this restrike should be further evaluated by Case Pile Wave

Analysis Program (CAPWAP®) analyses (signal matching). Eustis Engineering is available to perform and evaluate the results of DPT and CAPWAP analyses. If dynamic testing is utilized without static load testing, the allowable pile load capacities presented in Figures 5 through 8 must be adjusted for a factor of safety of at least 2.5.

Vibrations

88. Pile driving and other construction activities may cause vibrations that can affect nearby buildings and utilities. These activities should be monitored with a seismograph at any structure of concern during the driving of piles to record their magnitude of vibrations. Peak particle velocities of 0.25 in./sec, as measured by a seismograph, are generally regarded as a vibration level uncomfortable to human perception. In addition, peak particle velocities of 0.25 in./sec may densify cohesionless deposits or structural fill and result in settlement of structures founded in or above these materials. Such materials were encountered in the borings. Peak particle velocities in excess of 0.50 in./sec may induce damage to structures or underground utilities. Therefore, for sustained peak particle velocities in excess of 0.25 in./sec, measured at a structure, utility, or pavement of concern, Eustis Engineering should be notified, driving operations terminated, and consideration given to altering driving techniques to minimize vibrations.

89. Eustis Engineering should be consulted to establish, in conjunction with the designer and the owner, vibration and monitoring limits appropriate for your project. Once means and methods of construction are established by the selected contractor, Eustis Engineering should be consulted to recommend construction procedures that reduce vibration levels and mitigate the potential for vibration damage.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

90. To provide continuity among the exploration, design, permitting, and construction phases, Eustis Engineering should be retained to provide additional services for the duration of the project. These services may include consultation during design and construction, testing and approval of proposed fill materials, witnessing of proofrolling, and any other soils and materials testing services. Eustis Engineering can also monitor vibrations, log the installation of test piles and job piles, and perform and evaluate static pile load tests. Eustis Engineering offers a complete range of materials testing services which will provide quality control during construction and conformance to design specifications.

91. In summary, Eustis Engineering should be retained to monitor all geotechnical-related work performed by the contractor. If construction problems arise, Eustis Engineering should be notified to participate in the development of solutions. This participation permits the geotechnical engineer to evaluate the effects of unanticipated conditions and propose solutions on the geotechnical design assumptions particular to the project. The design geotechnical engineer may also be able to judge how site-specific soil and groundwater conditions will affect the success of proposed construction means and methods.

LIMITATIONS

92. Eustis Engineering has striven to provide engineering services in accordance with generally accepted geotechnical engineering practices in this locality at this time. No warranty or guarantee is expressed or implied.

93. This report has been prepared for the exclusive use of W-P and SWBNO for specific application to the subject site. In the event of any changes in the nature, design, or location of the proposed construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report are modified and verified in writing by Eustis Engineering. Should these data be used by anyone other than W-P or SWBNO, the user should contact Eustis Engineering for interpretation of data and to secure any other information pertinent to this project.

94. The analyses and recommendations contained in this report are based on data obtained from the soil borings performed at the facility/project site by Eustis Engineering during the current and previous subsurface explorations. The boring logs are considered representative of subsurface conditions at the boring locations on the dates completed. No warranty is given that the boring logs are representative of subsurface or groundwater conditions at other locations or times. The nature and extent of variations in subsurface or groundwater conditions, between and away from the exploration locations, may not become evident until construction. If such variations then appear, it will be necessary to reevaluate the recommendations contained in this report.

95. Recommendations and conclusions contained in this report are to some degree subjective, having partial basis in engineering judgement and experience particular to the design engineer. For this reason, this report should not be included in the contract plans and specifications; however, the results of the borings and laboratory tests contained in Appendices I and II of this report may be included in the plans and specifications. The construction contractor will then be obliged to make an independent interpretation of

subsoil conditions at the site and their potential impact on means and methods used to achieve the plans and specifications.

96. This report is issued with the understanding that the owner or owner's representative has the responsibility to bring the information and recommendations contained herein to the attention of the architect and engineers for the project so they are incorporated into the plans and specifications for the project. The owner or owner's representative also has the responsibility to take the necessary steps to see that the general contractor and all subcontractors follow such recommendations. The owner or owner's representative is responsible for submitting this report to the appropriate governing agencies.

97. The plans and specifications for the project should be provided to Eustis Engineering for a general review. This is to ensure the intent of this report is incorporated into the plans and specifications. If Eustis Engineering is not accorded the privilege of making this recommended review, we can assume no responsibility for misinterpretation of our recommendations.

98. The scope of our service does not include an environmental assessment or an investigation for the presence or absence of wetlands and hazardous or toxic materials in the soil; surface water; groundwater; or air on, below, or adjacent to the subject property. Furthermore, the scope does not include the investigation or detection of biological pollutants at the site. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, and the byproducts of any such biological organisms.



SATELLITE IMAGERY DATED: **MARCH 2023**

NOT TO SCALE

EUSTIS ENGINEERING L.L.C. SINCE 1946

SITE VICINITY MAP

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

DRAWN BY: JPD	DATE: 6 SEP 2023	FILENAME: FIG
CHECKED BY: BMC	JOB NO. 25026	FIGURE 1



DENOTES APPROXIMATE LOCATIONS OF SOIL BORINGS DRILLED ON 2 THROUGH 11 AUGUST 2023, (EE PROJECT NO. 25026).

DENOTES APPROXIMATE LOCATION OF SOIL BORING DRILLED ON 12 JANUARY 2009, (EE PROJECT NO. 20446).

EUSTIS ENGINEERING L.L.C. SINCE 1946

BORING LOCATION PLAN

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

DRAWN BY: JPD	DATE: 9 SEP 2023	FILENAME: FIG
CHECKED BY: BMC	JOB NO. 25026	FIGURE 2

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY
TREATED ASTM D25 QUALITY TIMBER PILES

CLARIFIER AREA (BORING B-5)
PILE CUTOFF AT EL -3.5

PILE SIZE	PILE TIP ELEVATION (NAVD 88)[1][5]	PILE LENGTH IN FEET	ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS[2][3] FACTOR OF SAFETY ≈ 2.0[4]	
			COMPRESSION	TENSION
6-In. Tip 8-In. Butt	-33.5 -38.5 -43.5	30 35 40	3½ 4½ 5½	2½ 3 3½
8-In Tip 12-In. Butt	-33.5 -38.5	30 35	5 6½	3½ 4
7-In Tip 12-In. Butt	-43.5 -48.5 -53.5	40 45 50	7 8½ 10	5 6 7
7-In Tip 13-In. Butt	-58.5	55	12½	8½

[1] Selection of pile tip embedment should also consider settlement potential. Estimates include capacity reduction for an approximate embedment of 2 feet of the piles within a cap.
[2] Piles assumed to be installed by impact driving equipment without assistance from vibratory equipment.
[3] These estimated capacities do not include limitations on structural capacity as imposed by some building codes.
[4] Use of a factor of safety of 2.0 assumes pile capacity estimates are confirmed with a static load test.
[5] The results of our analyses assume an existing ground surface elevation at approximate el -1.5 (NAVD 88).

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY
TREATED ASTM D25 QUALITY TIMBER PILES

CLARIFIER AREA (BORING B-5)
PILE CUTOFF AT EL -7.8

PILE SIZE	PILE TIP ELEVATION (NAVD 88)[1][5]	PILE LENGTH IN FEET	ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS[2][3] FACTOR OF SAFETY ≈ 2.0[4]	
			COMPRESSION	TENSION
6-In. Tip 8-In. Butt	-37.8 -42.8 -47.8	30 35 40	3½ 4½ 5½	2½ 3 3½
8-In Tip 12-In. Butt	-37.8 -42.8	30 35	5 6½	3½ 4
7-In Tip 12-In. Butt	-47.8 -52.8 -57.8	40 45 50	7 8½ 10	5 6 7
7-In Tip 13-In. Butt	-62.8	55	12½	8½

[1]`Selection of pile tip embedment should also consider settlement potential. Estimates include capacity reduction for an approximate embedment of the piles within a cap.
[2]`Piles assumed to be installed by impact driving equipment without assistance from vibratory equipment.
[3]`These estimated capacities do not include limitations on structural capacity as imposed by some building codes.
[4]`Use of a factor of safety of 2.0 assumes pile capacity estimates are confirmed with a static load test. [5]The results of our analyses assume an existing ground surface elevation at approximate el -1.5 (NAVD 88).

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY
TREATED ASTM D25 QUALITY TIMBER PILES

SLUDGE AND SEPTAGE AREA (BORINGS B-1 THROUGH B-4)
PILE CUTOFF AT EL -1.0 (ESTIMATED NATURAL GROUND SURFACE)

PILE SIZE	PILE TIP ELEVATION (NAVD 88)[1][5]	PILE LENGTH IN FEET	ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS[2][3] FACTOR OF SAFETY ≈ 2[4]	
			COMPRESSION	TENSION
6-In. Tip 8-In. Butt	-31.0 -36.0 -41.0	30 35 40	4 5 6	2½ 3 4
8-In Tip 12-In. Butt	-31.0 -36.0	30 35	5½ 7	3½ 4½
7-In Tip 12-In. Butt	-41.0 -46.0 -51.0	40 45 50	8 9½ 11	5½ 6½ 7½
7-In Tip 13-In. Butt	-56.0	55	13½	9

[1] Selection of pile tip embedment should also consider settlement potential. Estimates include capacity reduction for an approximate embedment of the piles within a cap.
[2] Piles assumed to be installed by impact driving equipment without assistance from vibratory equipment.
[3] These estimated capacities do not include limitations on structural capacity as imposed by some building codes.
[4] Use of a factor of safety of 2.0 assumes pile capacity estimates are confirmed with a static load test.
[5] The results of our analyses assume an existing ground surface elevation at approximate el -1 (NAVD 88).

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
TREATED ASTM D25 QUALITY TIMBER PILES

SLUDGE AND SEPTAGE AREA (BORINGS B-1 THROUGH B-4)
PILE CUTOFF AT EL -8.6

PILE SIZE	PILE TIP ELEVATION (NAVD 88)[1][5]	PILE LENGTH IN FEET	ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS[2][3] FACTOR OF SAFETY ≈ 2[4]	
			COMPRESSION	TENSION
6-In. Tip 8-In. Butt	-38.6 -43.6 -48.6	30 35 40	4 5½ 6½	3 3½ 4½
8-In Tip 12-In. Butt	-38.6 -43.6	30 35	6 7½	4 5
7-In Tip 12-In. Butt	-48.6 -53.6 -58.6	40 45 50	8½ 10½ 12½	6 7 8½
7-In Tip 13-In. Butt	-63.6	55	15	10

[1] Selection of pile tip embedment should also consider settlement potential. Estimates include capacity reduction for an approximate embedment of the piles within a cap.
[2] Piles assumed to be installed by impact driving equipment without assistance from vibratory equipment.
[3] These estimated capacities do not include limitations on structural capacity as imposed by some building codes.
[4] Use of a factor of safety of 2.0 assumes pile capacity estimates are confirmed with a static load test.
[5] The results of our analyses assume an existing ground surface elevation at approximate el -1 (NAVD 88).

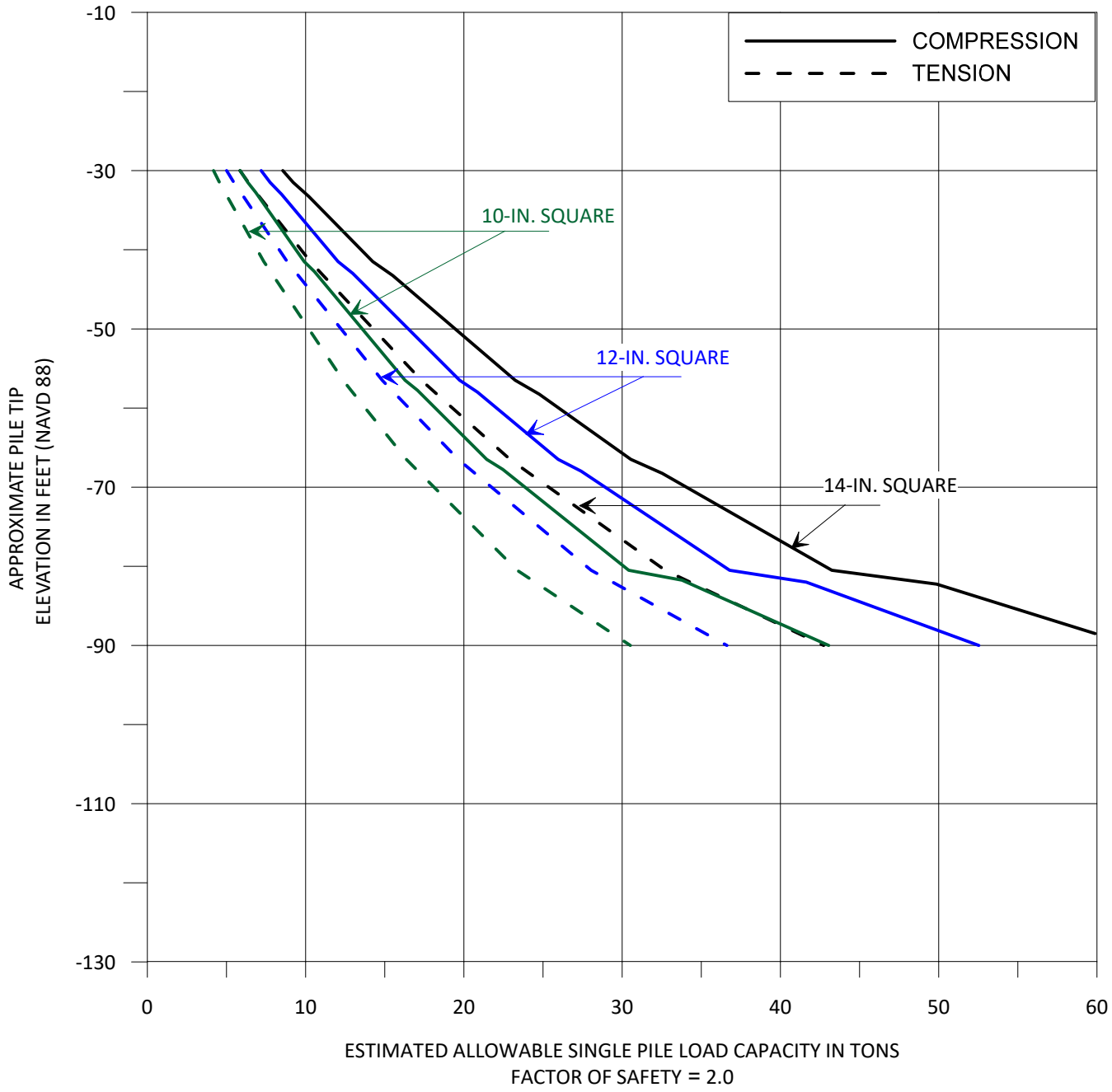
SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITIES
TREATED ASTM D25 QUALITY TIMBER PILES

SLUDGE AND SEPTAGE AREA (BORINGS B-1 THROUGH B-4)
PILE CUTOFF AT EL -14.5

PILE SIZE	PILE TIP ELEVATION (NAVD 88)[1][5]	PILE LENGTH IN FEET	ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS[2][3] FACTOR OF SAFETY ≈ 2.0[4]	
			COMPRESSION	TENSION
6-In. Tip 8-In. Butt	-44.5 -49.5 -54.5	30 35 40	5 6 7½	3 4 5
8-In Tip 12-In. Butt	-44.5 -49.5	30 35	7 8½	4½ 5½
7-In Tip 12-In. Butt	-54.5 -59.5 -64.5	40 45 50	10 11½ 14	6½ 8 11½
7-In Tip 13-In. Butt	-69.5	55	17	11½

[1] Selection of pile tip embedment should also consider settlement potential. Estimates include capacity reduction for an approximate embedment of the piles within a cap.
[2] Piles assumed to be installed by impact driving equipment without assistance from vibratory equipment.
[3] These estimated capacities do not include limitations on structural capacity as imposed by some building codes.
[4] Use of a factor of safety of 2.0 assumes pile capacity estimates are confirmed with a static load test.
[5] The results of our analyses assume an existing ground surface elevation at approximate el -1 (NAVD 88).



NOTES:

1) DESIGN OF PILE LENGTHS SHOULD CAREFULLY CONSIDER SETTLEMENT POTENTIAL AND PILE INSTALLATION REQUIREMENTS/CONSTRAINTS.

2) PILES ARE ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM VIBRATORY EQUIPMENT.

3) PILE CAPACITY ESTIMATES DO NOT INCLUDE PILE WEIGHT.

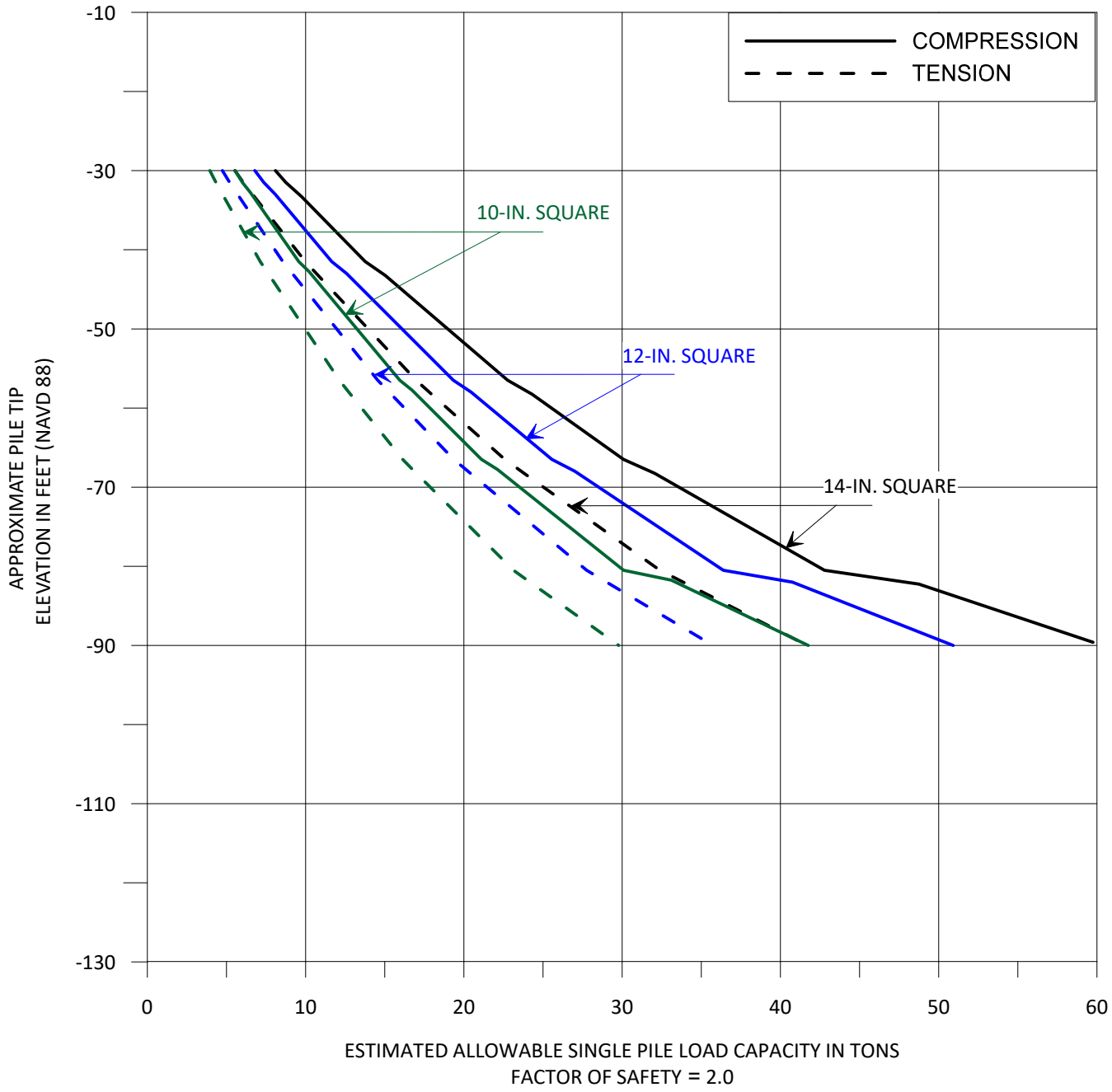
4) USE OF A FACTOR OF SAFETY OF 2.0 ASSUMES STATIC PILE LOAD TEST WILL BE PERFORMED.

5) THE RESULTS OF OUR ANALYSES ASSUME AN EXISTING GROUND SURFACE AT APPROXIMATE EL -1.5 (NAVD 88).

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE, PRECAST CONCRETE PILES
CLARIFIER AREA (B-5), PILE CUTOFF AT EL -3.5
SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: SPC.GRF	FIGURE 5, SHEET 1 OF 2



NOTES:

1) DESIGN OF PILE LENGTHS SHOULD CAREFULLY CONSIDER SETTLEMENT POTENTIAL AND PILE INSTALLATION REQUIREMENTS/CONSTRAINTS.

2) PILES ARE ASSUMED TO BE INSTALLED BY IMPACT DRIVING EQUIPMENT WITHOUT ASSISTANCE FROM VIBRATORY EQUIPMENT.

3) PILE CAPACITY ESTIMATES DO NOT INCLUDE PILE WEIGHT.

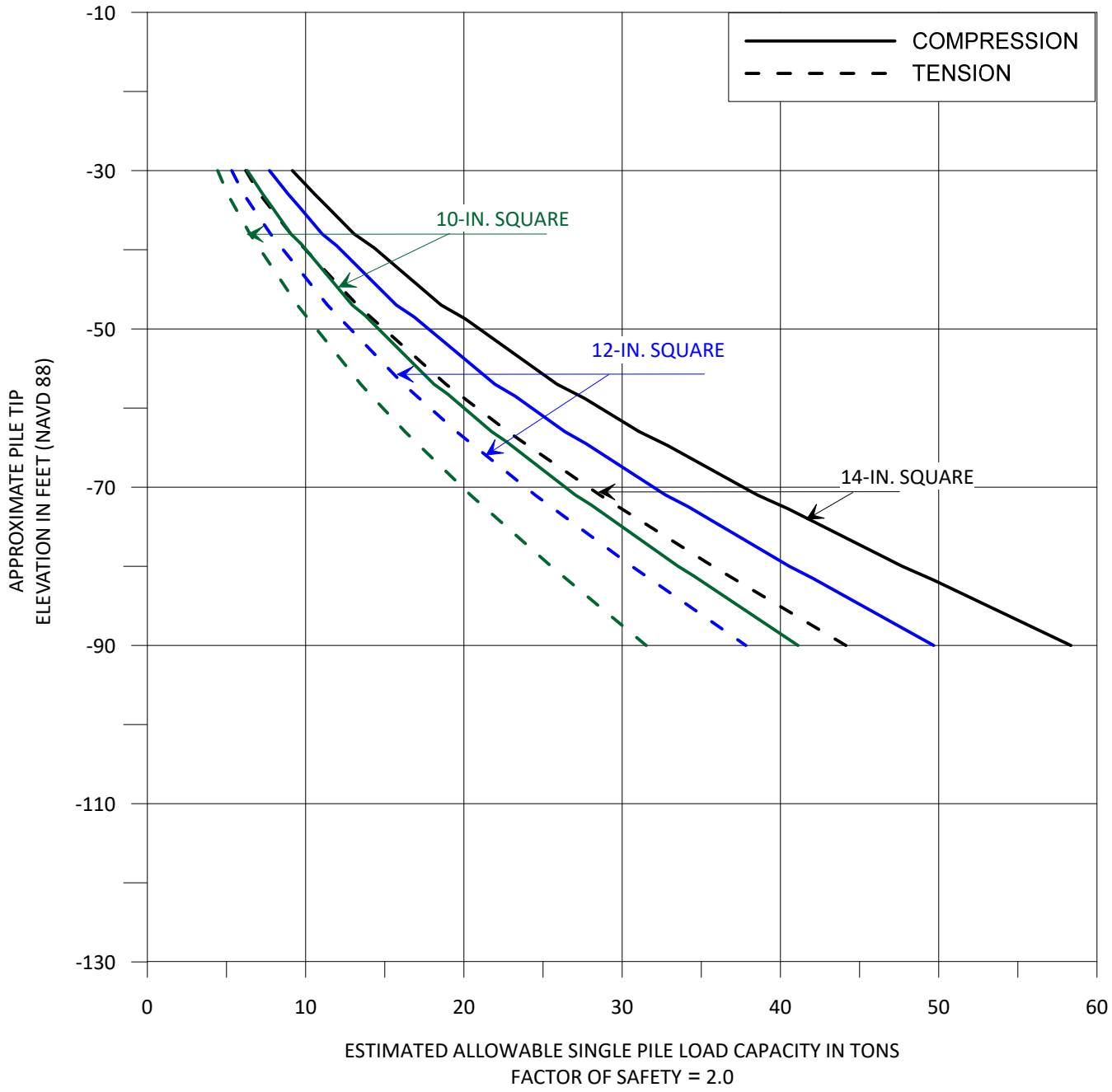
4) USE OF A FACTOR OF SAFETY OF 2.0 ASSUMES STATIC PILE LOAD TEST WILL BE PERFORMED.

5) THE RESULTS OF OUR ANALYSES ASSUME AN EXISTING GROUND SURFACE AT APPROXIMATE EL -1.5 (NAVD 88).

ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE, PRECAST CONCRETE PILES
CLARIFIER AREA (B-5), PILE CUTOFF AT EL -7.8
SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: SPC.GRF	FIGURE 5, SHEET 2 OF 2



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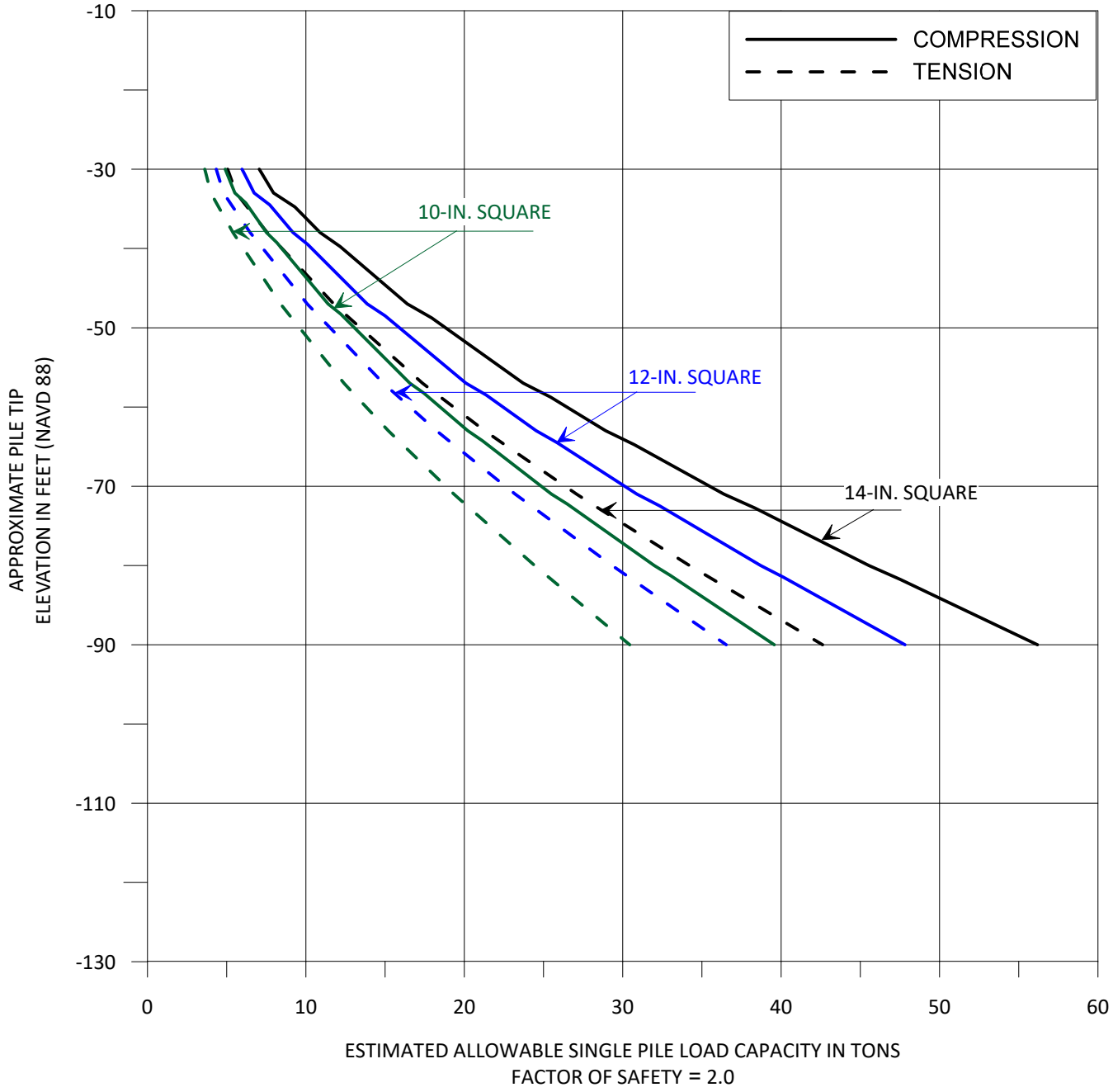
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ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE, PRECAST CONCRETE PILES
SLUDGE AND SEPTAGE AREAS (B-1 THROUGH B-4), PILE CUTOFF AT EL -1.0

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: SPC.GRF	FIGURE 6, SHEET 1 OF 3



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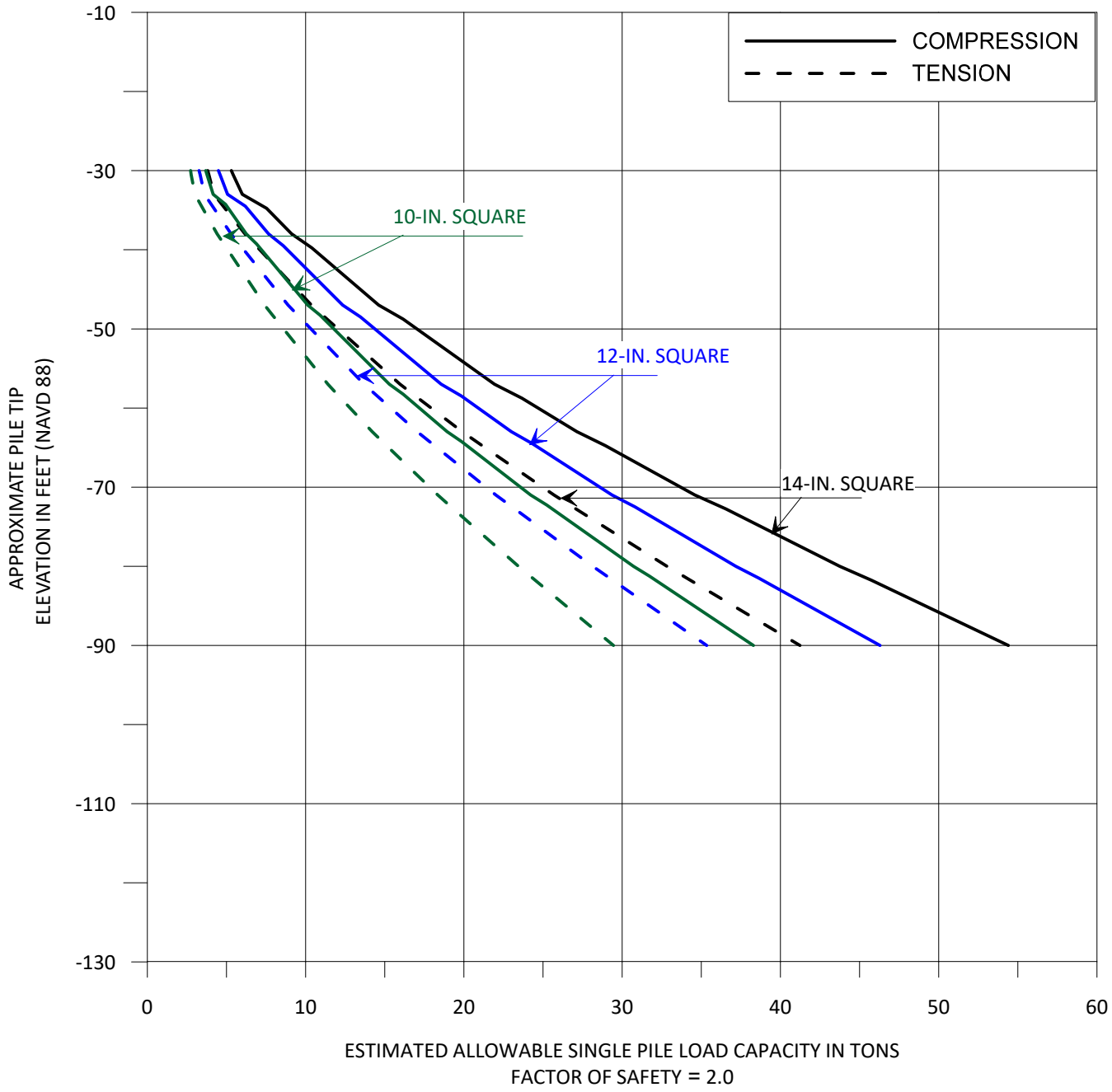
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ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE, PRECAST CONCRETE PILES
SLUDGE AND SEPTAGE AREAS (B-1 THROUGH B-4), PILE CUTOFF AT EL -8.6

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: SPC.GRF	FIGURE 6, SHEET 2 OF 3



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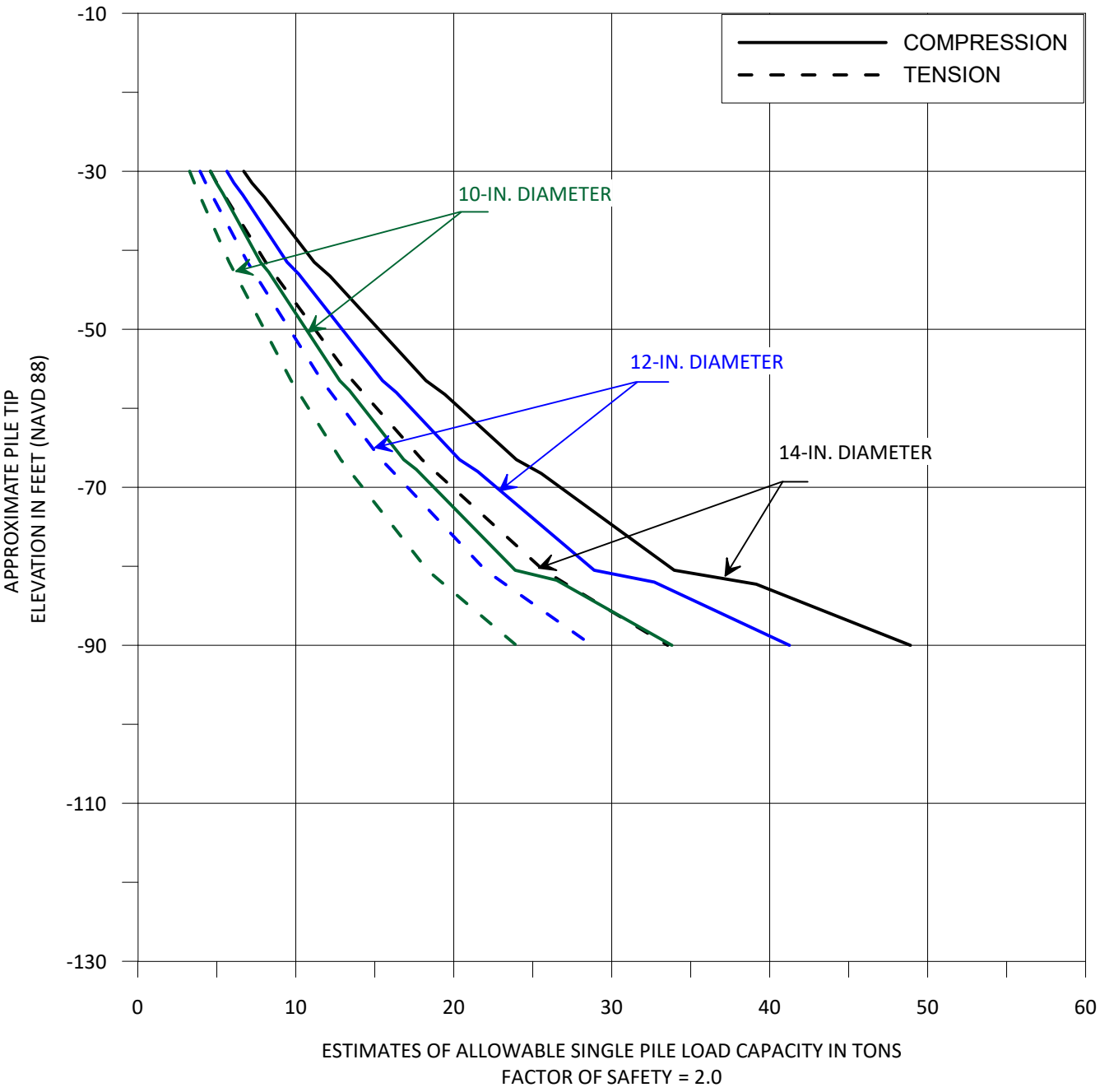
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ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
SQUARE, PRECAST CONCRETE PILES
SLUDGE AND SEPTAGE AREAS (B-1 THROUGH B-4), PILE CUTOFF AT EL -14.5

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: SPC.GRF	FIGURE 6, SHEET 3 OF 3



NOTES:

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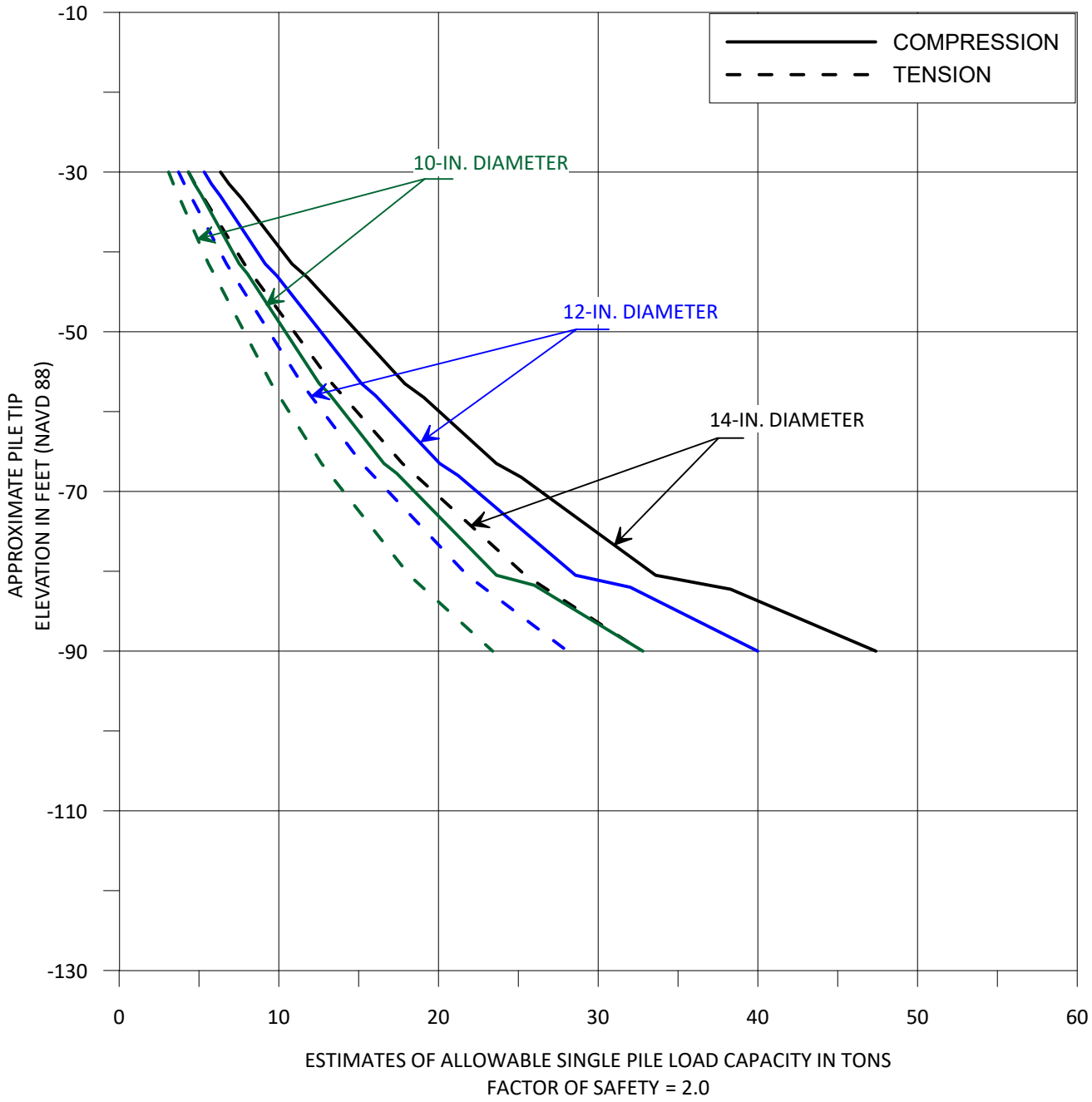
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ESTIMATES OF ALLOWABLE SINGLE PILE LOAD CAPACITIES
OPEN-END STEEL PIPE PILES
CLARIFIER AREA (B-5), PILE CUTOFF AT EL -3.5

SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: OSP APLC	FIGURE 7, SHEET 1 OF 2



NOTES:

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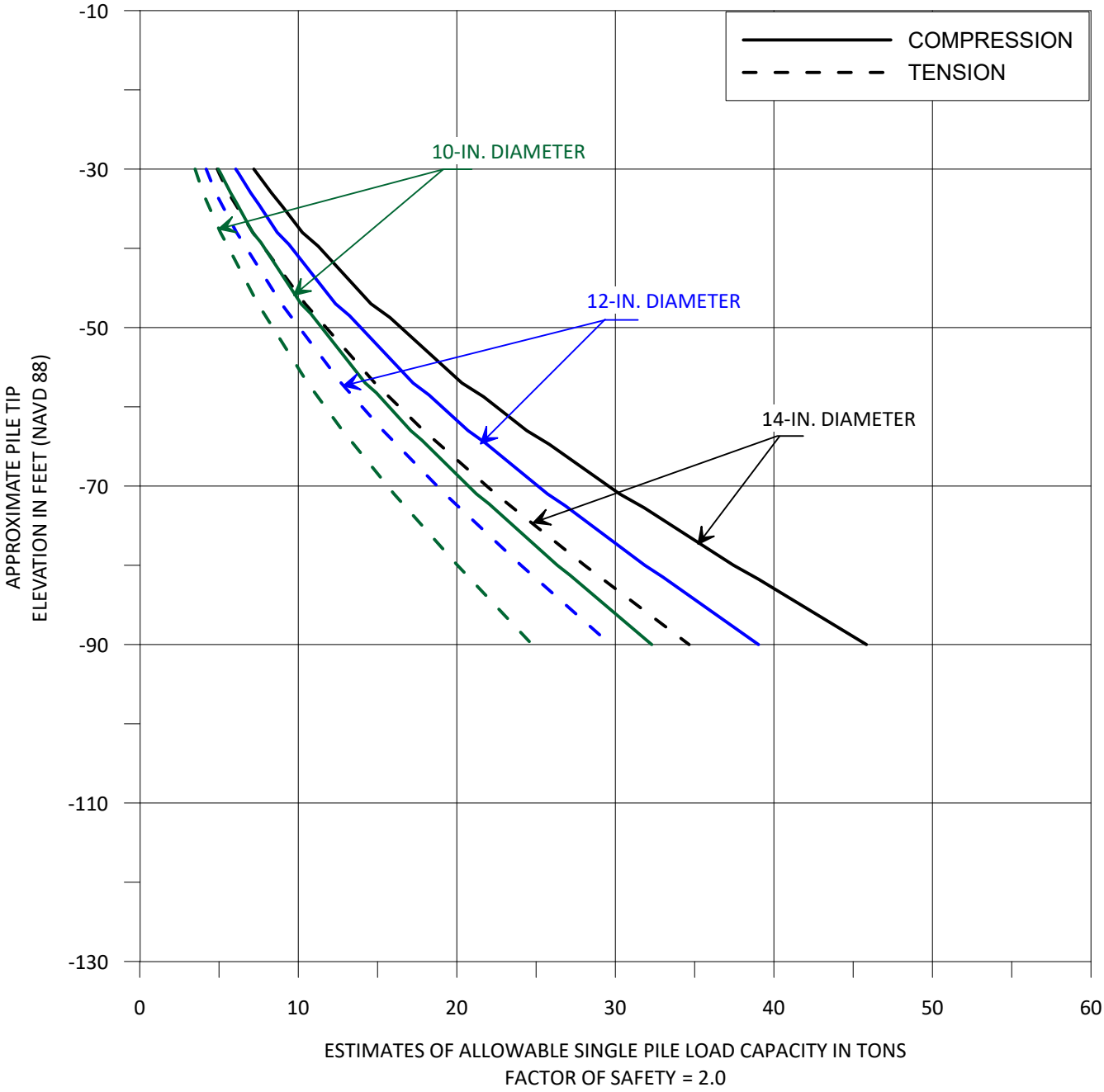
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OPEN-END STEEL PIPE PILES
CLARIFIER AREA (B-5), PILE CUTOFF AT EL -7.8
SEWERAGE &WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: OSP APLC	FIGURE 7, SHEET 2 OF 2



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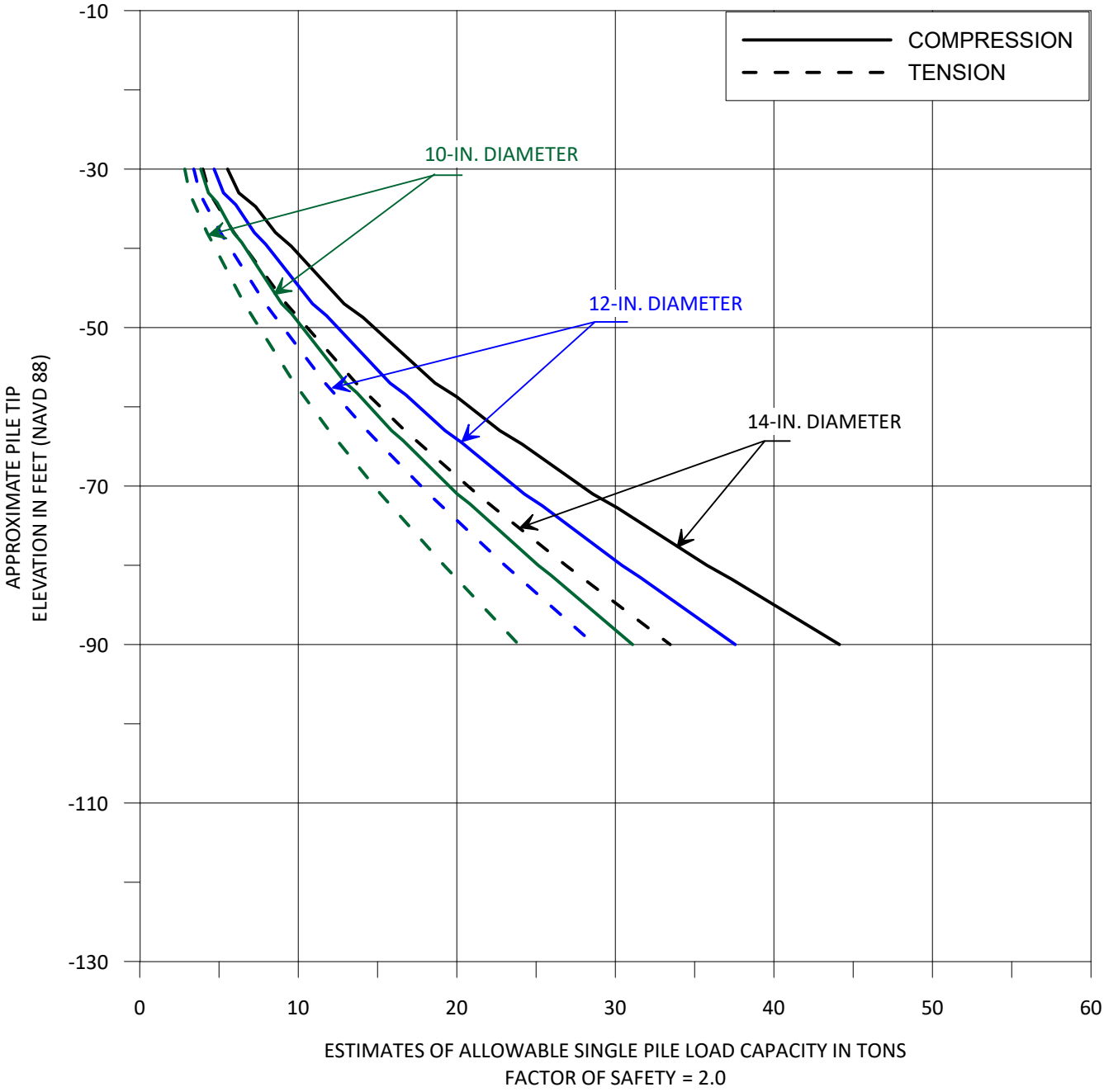
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NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: OSP APLC	FIGURE 8, SHEET 1 OF 3



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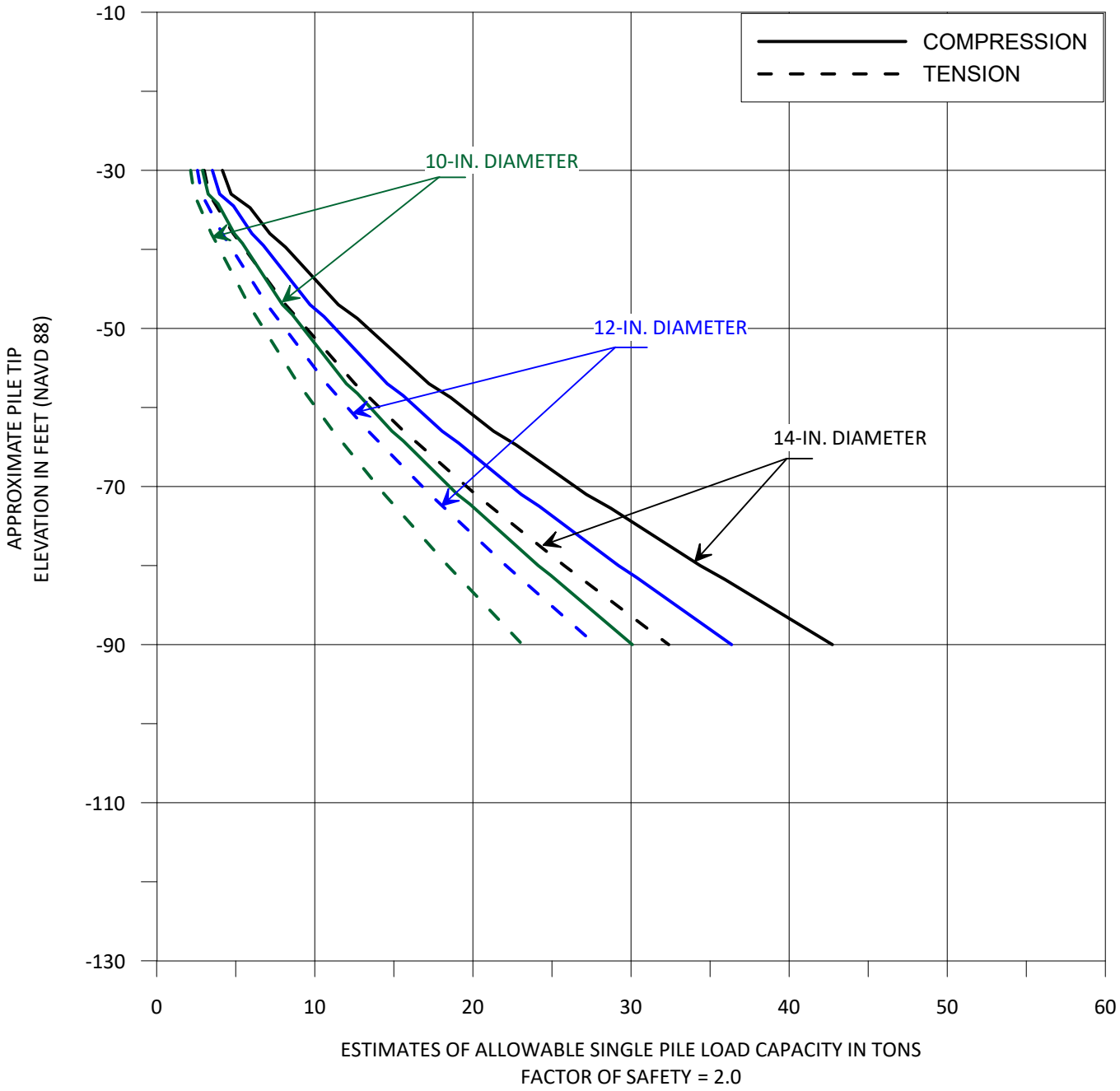
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WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: OSP APLC	FIGURE 8, SHEET 2 OF 3



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WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA

EUSTIS ENGINEERING SINCE 1946

DRAWN BY: JPD	JOB NO.: 25026
CHECKED BY: B.M.C.	DATE: 6 SEP 2023
FILE NAME: OSP APLC	FIGURE 8, SHEET 3 OF 3

SEWERAGE & WATER BOARD OF NEW ORLEANS
EAST BANK SEWAGE TREATMENT PLANT
PHASE 1
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
NEW ORLEANS, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 25026

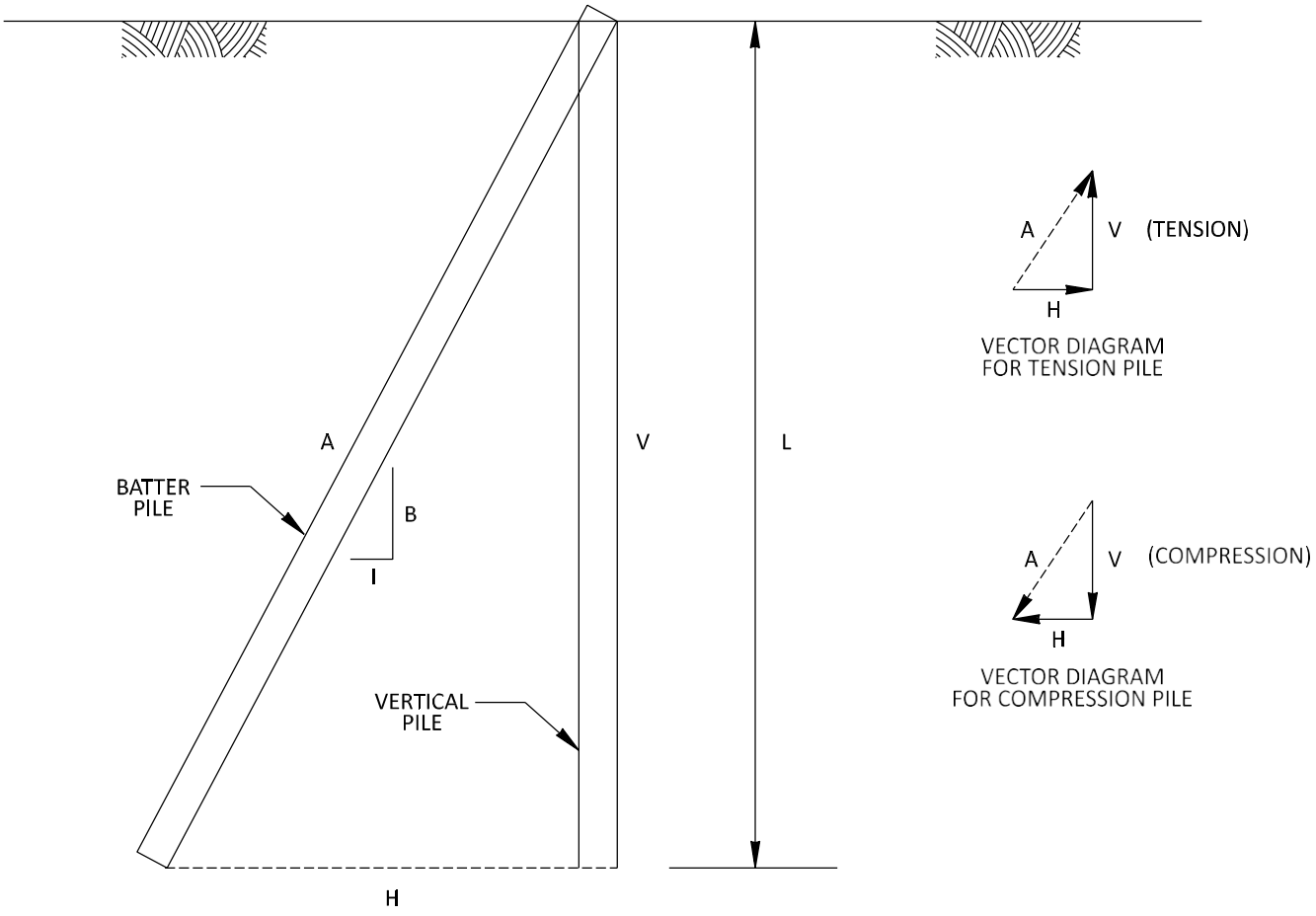
SUMMARY OF SOIL-PILE INTERACTION ANALYSES – LATERALLY LOADED SINGLE 12-IN. DIAMETER CONCRETE FILLED OPEN-END STEEL PIPE PILES[1] ; ½ INCH WALL THICKNESS (I.E. LPILE ANALYSES)

PROJECT AREA	PILE CUTOFF ELEVATION (NAVD 88)	APPROXIMATE PILE TIP ELEVATION (NAVD 88)	PILE LENGTH IN FEET	VERTICAL LOAD PILE HEAD IN KIPS[2]	PILE HEAD FIXITY CONDITION	LATERAL LOAD APPLIED AT PILE HEAD IN KIPS	LATERAL DISPLACEMENT OF PILE HEAD IN INCHES	MAXIMUM MOMENT IN PILE IN KIP-FEET (DEPTH TO MAXIMUM MOMENT BELOW PILE HEAD IN FEET)
Sludge and Septage Area (Borings B-1 to B-4)	-13.5[3]	-89.0	75.5	72.0	Free Head	2.4	0.25	13.2 (8.3)
						3.6	0.50	21.9 (9.1)
						4.4	0.75	28.4 (9.1)
						5.1	1.00	34.1 (9.8)
						8.0	2.40	61.6 (10.6)
					Fixed Head	5.7	0.25	32.8 (0.0)
						8.0	0.46	49.5 (0.0)
						8.4	0.50	52.1 (0.0)
						10.5	0.75	69.0 (0.0)
						12.4	1.00	84.4 (0.0)
Clarifier Area (Boring B-5)	-6.8[3]	-89.0	82.2	80.0	Free Head	2.7	0.25	13.0 (7.4)
						3.8	0.50	20.9 (9.0)
						4.7	0.75	27.3 (9.0)
						5.2	1.00	32.5 (9.9)
						8.0	3.00	65.0 (10.7)
					Fixed Head	5.8	0.25	32.4 (0.0)
						8.0	0.46	48.0 (0.0)
						8.3	0.50	50.5 (0.0)
						10.0	0.75	64.7 (0.0)
						11.4	1.00	77.3 (0.0)

(1) Estimated concrete filled section in upper 20 feet only due to soil plug.
(2) Estimated from allowable single pile compressive capacity curves presented in Figures 7 and 8.
(3) Assumed 1-ft stickup from furnished pile cutoff for embedment in a pile cap.

EUSTIS ENGINEERING SINCE 1946

AXIAL AND HORIZONTAL RESISTANCE OF BATTER PILES ESTIMATED FROM ALLOWABLE VERTICAL LOAD CAPACITIES



L = VERTICAL COMPONENT OF BATTER PILE EMBEDMENT LENGTH.

V = ESTIMATED ALLOWABLE SINGLE LOAD CAPACITY OF A PILE DRIVEN VERTICALLY WITH EMBEDMENT LENGTH, L.

B = BATTER OF PILE EXPRESSED AS A RATIO OF VERTICAL DISTANCE TO ONE FOOT HORIZONTAL DISTANCE.

H = HORIZONTAL RESISTANCE OF BATTER PILE ESTIMATED AS FOLLOWS: $H = \frac{V}{B}$

A = ALLOWABLE AXIAL PILE LOAD CAPACITY OF A SINGLE BATTER PILE ESTIMATED AS FOLLOWS: $A = \sqrt{V^2(1+\frac{1}{B^2})}$

NOTE: THE AXIAL LOAD RESISTANCE OF A VERTICAL PILE, V, IS DEPENDENT ON THE TYPE OF LOADING - TENSION OR COMPRESSION. CAUTION SHOULD BE EXERCISED TO ENSURE THE CORRECT VERTICAL CAPACITY IS USED.

CAPACITY OF PILE GROUPS

The ***maximum allowable load carrying capacity*** of a pile group is no greater than the sum of the single pile load capacities, but may be limited to a ***lower*** value if so indicated by the result of the following formula.

$$Q_a = \frac{P\ x\ L\ x\ c}{(FSF)} + \frac{2.6\ q_u \left(1 + 0.2\ \frac{w}{b}\right) A}{(FSB)}$$

In Which:

Q_a	=	Allowable load carrying capacity of pile group, pounds
P	=	Perimeter distance of pile group, feet
L	=	Length of pile, feet
c	=	Average (weighted) cohesion or shear strength of material between surface and depth of pile tip, psf
q_u	=	Average unconfined compressive strength of material in the zone immediately below the pile tips, psf (unconfined compressive strength = cohesion x 2)
w	=	Width of base of pile group, feet
b	=	length of base pile group, feet
A	=	base area of pile, square feet
FSF	=	Factor of safety for the friction area ≈ 2.0
FSB	=	Factor of safety for the base area ≈ 3.0

The values of c and q_u used in this formula should be based on applicable data shown on the Log of Boring and Test Results for this report. In the application of this formula, the weight of the piles, pile caps and mats, considering the effect of buoyancy, should be included.

SPACING WITHIN PILE GROUPS

SPAC = 0.05 (L_1) + 0.025 (L_2) + 0.0125 (L_3)

In Which:

SPAC	=	center-to-center of piles, feet
L_1	=	Pile penetration up to 100 feet
L_2	=	Pile penetration between 101 to 200 feet
L_3	=	Pile penetration beyond 200 feet

Note: Minimum pile spacing = 3 feet or 3 pile diameters, whichever is greater

APPENDIX I

LEGEND AND NOTES FOR
LOG OF BORING AND TEST RESULTS

PP Pocket penetrometer resistance in tons per square foot

SPT Standard Penetration Test: Number of blows of a 140-lb. hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches

SPLR Type of Sampling  Shelby  SPT  Auger  No sample

SYMBOL Clay  Silt  Sand  Peat/Humus  Shells  Stone/Gravel 

Predominant type shown heavy; Modifying type shown light

USC Unified Soil Classification

DENSITY Unit weight in pounds per cubic foot

SHEAR TESTS

TYPE

- UC Unconfined compression shear
- OB Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
- UU Unconsolidated undrained triaxial compression shear
- CU Consolidated undrained triaxial compression shear
- DS Direct shear

Ø Angle of internal friction in degrees

c Cohesion in pounds per square foot

ATTERBERG LIMITS

LL Liquid Limit

PL Plastic Limit

PI Plasticity Index

OTHER TESTS

- CON Consolidation
- PD Particle size distribution (sieve and/or hydrometer)
- k Coefficient of permeability in centimeters per second
- SP Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

(1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

SEWERAGE & WATER BOARD OF NEW ORLEANS
PROPOSED GENERATOR BUILDING AND FUEL TANK
EAST BANK SEWAGE TREATMENT PLANT
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 20446 **Date Drilled:** 1/12/09 **Boring:** 1 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0		29			Very loose brown sandy silt w/shell fragments & vegetation	ML	1	0-0.5	12										
						GP	2	0.5-1	10										
					Medium dense light gray shells w/silty sand pockets		3	1-2.5	8										
		16				GP	4	4-5.5	13										
					Medium dense gray & light gray shells w/clay pockets														
		44			Loose dark black & dark gray shells w/clay pockets	GP	5	7-8.5	33										
10		4			Soft black & dark gray clay w/shells, gravel, & glass	CH	6	10-11.5	33										
		2			Very soft brown humus w/roots	Pt	7	13-14.5	249										
					Very soft gray organic clay w/roots & decayed wood	OH													
20	0.25				Soft gray sandy clay	CL	8	19-20	125	38	85	UC	--	180					
	0.75				Soft gray clay w/silty sand lenses	CH	9	24-25	31	90	118	UC	--	385					
30	0.50						10	29-30	64	62	102	UC	--	335					
	0.50				Soft gray clay		11	34-35											
40	0.50				w/silt pockets		12	39-40	72	57	99	UC	--	260					
					Medium stiff gray clay	CH													
	0.75						13	44-45											
50	0.75				w/silty sand pockets		14	49-50	56	66	104	UC	--	530					

Comments: Latitude: 29° 58.661' N
Longitude: 89° 59.822' W

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

SEWERAGE & WATER BOARD OF NEW ORLEANS
PROPOSED GENERATOR BUILDING AND FUEL TANK
EAST BANK SEWAGE TREATMENT PLANT
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 20446 **Date Drilled:** 1/12/09 **Boring:** 1 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Medium stiff gray clay w/silty sand pockets & shell fragments	CH													
	0.50						15	54-55											
60	0.75				Stiff greenish-gray sandy clay	CL	16	59-60	51	72	107	UC	--	530					
	1.75				Stiff tan & gray clay w/silty sand pockets & roots	CH	17	64-65	21	106	128	UC	--	1065					
70	2.25				Stiff gray clay w/wood	CH	18	69-70	36	85	116	UC	--	900					
	1.25				Loose to medium dense gray silty sand	SM	19	74-75											
80	1.50						20	79-80	24	102	127	OB	0	980					
	0.50	18			Very stiff gray silty clay	CL	21	84-85	24	101	125	OB	0	705					
							22	85.5-87	29										
90	1.50				Medium stiff gray clay w/silty sand pockets	CH	23	89-90	49	83	109	UC	--	680					
	1.25				Stiff gray clay	CH	24	94-95											
100	1.50				w/silt pockets		25	99-100	43	79	112	UC	--	1235					

Comments: Latitude: 29° 58.661' N
Longitude: 89° 59.822' W

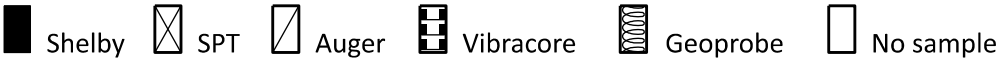
APPENDIX II

EUSTIS ENGINEERING SINCE 1946

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP Pocket penetrometer: Resistance in tons per square foot

SPT Standard Penetration Test: Number of blows of a 140-lb hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches. Values shown have not been corrected.

SPLR Type of Sampling  Shelby, SPT, Auger, Vibracore, Geoprobe, No sample

SYMBOL Clay, Silt, Sand, Peat/Humus, Shells, Stone/Gravel



Predominant type shown heavy; modifying type shown light

USC Unified Soil Classification

DENSITY Unit weight in pounds per cubic foot

SHEAR TESTS

TYPE

- UC Unconfined compression shear
- OB Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
- UU Unconsolidated undrained triaxial compression shear
- ϕ Angle of internal friction in degrees
- c Cohesion in pounds per square foot

ATTERBERG LIMITS

- LL Liquid Limit
- PL Plastic Limit
- PI Plasticity Index

OTHER TESTS

- CON Consolidation
- -#200 Percent passing a U.S. No. 200 sieve
- SV Particle size distribution (sieve only)
- PD Particle size distribution (sieve and hydrometer)
- k Coefficient of permeability in centimeters per second
- SP Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

(1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-1

Project No: 25026
Date: 08/09/2023 - 08/10/2023
Latitude: 29.97752°
Longitude: -89.99693°
Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Moist, medium dense gray fine POORLY GRADED GRAVEL w/coarse to fine sand	GP	PB1	0	3										
					Moist, medium dense brown fine CLAYEY SAND w/few shell fragments	SC	2	2	15										-#200 = 21.7%
5	0.50				Moist, medium dense gray fine POORLY GRADED GRAVEL w/coarse to fine sand	GP	3	5	7										-#200 = 4.8%
	0.50				Wet, medium compact brown & gray fine SANDY SILT w/few clay pockets	ML	4	8	47										-#200 = 55.2%
10	0.50						5	11											
	0.50				Wet, extremely soft dark brown & black ORGANIC CLAY w/trace of decayed wood	OH	6	14	154	33	83	UC	--	71					
15	0.50						7	18											
20					Wet, extremely soft gray fine SANDY LEAN CLAY	CL													
	0.50						8	23	45	76	111	UC	--	115					
25					Moist, soft gray LEAN CLAY w/fine sand	CL													
	0.50						9	28	37						43	19	24		
30					Moist, very soft gray FAT CLAY w/fine sand layers	CH													
	0.50						10	33	50	72	108	OB	0	240					
35																			
	0.50						11	38											
40																			
	0.50						12	43											
45					Moist, soft gray FAT CLAY	CH													
	0.50						13	48	68	60	100	UC	--	335					
50																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-1

Project No: 25026
Date: 08/09/2023 - 08/10/2023
Latitude: 29.97752°
Longitude: -89.99693°
Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Moist, soft gray FAT CLAY	CH													
	1.00						14	53	66	61	101	UC	--	382					
55																			
	1.00						15	58											
60					Moist, medium stiff gray FAT CLAY w/trace of shell fragments	CH													
	1.00						16	64	53	70	107	UC	--	547					
65																			
	1.00						17	68											
70					Moist, very soft gray & dark gray LEAN CLAY w/fine to coarse gravel	CL													
	1.00						18	73											
75																			
	1.00						19	78	40	82	114	UC	--	216					
80																			
	1.00						20	83											
85																			
	1.00						21	88											
90					Moist, very soft gray & greenish-gray FAT CLAY w/few organic matter & trace of decayed wood	CH													
	1.00						22	93	53	70	107	OB	0	235					
95																			
	1.00						23	98											
100																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-2

Project No: 25026
Date: 08/11/2023
Latitude: 29.97777°
Longitude: -89.99787°

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Moist, loose brown fine SILTY SAND w/few shell fragments	SM	PB1	0											
	0.50						2	2	14										
5					Moist, loose brown fine to medium POORLY GRADED SAND W/SILT	SP-SM	PB3	5	22										-#200 = 5.9%
	0.50				Moist, loose gray fine SILTY SAND w/some shell fragments	SM	4	8	18						NP	NP	NP		
10	0.50				Moist, dark brown WOOD W/SAND	Wd	5	11	99										
	0.50				Moist, soft dark brown & black ORGANIC CLAY w/few decayed wood	OH	6	14	160	31	82	UC	--	218					
15	0.50				Moist, soft gray FAT CLAY	CH	7	18											
20	0.50				w/few silt pockets		8	23	56	67	105	OB	0	293					
25					Moist, soft gray LEAN CLAY	CL													
	0.50						9	28	35	87	117	UC	--	421					
30	0.50						10	33											
35					Moist, soft gray FAT CLAY	CH													
	0.50						11	38	57	67	105	UC	--	330					
40	0.50						12	43											
45	0.50				w/trace of silt lenses		13	48	63	63	102	OB	0	352					
50																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-2

Project No: 25026
Date: 08/11/2023
Latitude: 29.97777°
Longitude: -89.99787°

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Moist, soft gray FAT CLAY	CH													
	0.50						14	53	70	59	100	UC	--	317					
55																			
	0.50				w/few silt lenses		15	58	63	63	102	UC	--	345					
60																			
	0.50						16	63											
65					Moist, medium dense greenish-gray fine CLAYEY SAND	SC													
	0.50						17	68	21										-#200 = 21.4%
70					Moist, medium stiff gray & tan FAT CLAY w/fine sand layers & organic matter	CH													
	1.00						18	73	38	84	116	UC	--	709					
75																			
	1.00						19	78											
80					Moist, medium stiff gray fine SANDY LEAN CLAY	CL													
	1.00						20	83	27	99	125	UC	--	586					
85					Moist, medium stiff gray FAT CLAY w/few silt lenses	CH													
	1.00						21	88	41						64	25	39		
90																			
	1.00						22	93											
95																			
	1.00						23	98											
100																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-3

Project No: 25026
Date: 08/02/2023 - 08/04/2023
Latitude: 29.97806°
Longitude: -89.99817°
Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Moist, loose brown fine SILTY SAND	SM	PB-1	0	6										
							2	0.5											
	1.00						PB-3	3.5											
5	1.00						4	5											-#200 = 17.6%
					Moist, medium dense gray & brown fine to medium CLAYEY SAND w/few shell fragments, fine gravel, & some brick fragments	SC													
	1.00						5	8	15										
10	1.00						PB-6	11											
					Moist, black & gray ORGANIC CLAY w/trace of roots	OH													
	1.00						7	14	124	39	87	OB	0	174					
15					Moist, extremely soft to very soft gray FAT CLAY w/few organic matter & trace of concretions	CH													
	0.25						8	18	62	64	103	UC	--	166					
20																			
	0.25				w/few organic matter		9	23	74	57	98	OB	0	110					
25																			
	0.25						10	28											
30					Moist, soft gray fine SANDY LEAN CLAY	CL													
	0.25						11	33	38	84	116	UC	--	380					
35					Moist, very soft gray FAT CLAY	CH													
	0.25						12	38	73	57	99	OB	0	131					
40																			
	0.25						13	43											
45																			
	0.25						14	48											
50																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-3

Project No: 25026
Date: 08/02/2023 - 08/04/2023
Latitude: 29.97806°
Longitude: -89.99817°
Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Moist, very soft gray FAT CLAY	CH													
	0.25						15	53											
55					Moist, medium stiff gray FAT CLAY (fissured)	CH													
	0.25						16	58	48	75	110	UC	--	986					
60					Moist, soft greenish-gray LEAN CLAY w/trace of shell fragments	CL													
	1.00						17	63	38	83	115	UC	--	349					
65																			
	1.00						18	68											
70					Moist, medium stiff gray FAT CLAY w/trace of organic matter & trace of wood	CH													
	1.00						19	73	56	67	105	UC	--	810					
75																			
	1.00						20	78											
80																			
	1.00						21	83											
85					Moist, medium stiff gray LEAN CLAY w/few fine sand	CL													
	1.00						22	88	35	87	117	OB	0	578					
90																			
	1.00						23	93											
95					Moist, medium stiff gray FAT CLAY w/fine sand layers	CH													
	1.00						24	98	47	75	110	UC	--	874					
100																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-4

Project No: 25026
Date: 08/08/2023
Latitude: 29.97865°
Longitude: -89.99790°

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Moist, loose brown fine SILTY SAND wtrace of /gravel	SM	PB-1	0	5										
	1.00				Moist, stiff gray & brown LEAN CLAY w/few shell fragments, trace of roots, & silty sand pockets	CL	2	2	24	104	128	UC	--	1409					
5	0.50				Moist, medium dense gray & brown fine CLAYEY SAND w/few roots, trace of shell fragments, & fine gravel	SC	3	5											
	0.50						4	8	29										-#200 = 25.3%
10	0.50				Wet, soft black ORGANIC CLAY w/few decayed wood	OH	5	11											
	0.50						6	14	340	17	73	UC	--	301					
15	0.50				Moist, very soft gray fine SANDY LEAN CLAY	CL	7	18											
20	0.50						8	23	37	85	116	UC	--	149					
25	0.50				Moist, loose gray fine SILTY SAND w/few clay layers	SM	9	28	25	100	125	OB	0	494					
30	0.50				Moist, soft gray FAT CLAY	CH	10	33											
35	0.50						11	38	68	60	100	UC	--	386					
40	0.50						12	43											
45	0.50						13	48											
50																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-4

Project No: 25026
Date: 08/08/2023
Latitude: 29.97865°
Longitude: -89.99790°

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Moist, soft gray FAT CLAY	CH													
	0.50						14	53	66	61	101	OB	0	487					
55																			
	0.50						15	58											
60					Moist, medium stiff gray clay w/trace of shell fragments (fissured)	CH													
	0.50						16	63	44	78	112	UC	--	876					
65																			
	1.00						17	68											
70					Moist, medium stiff greenish-gray FAT CLAY w/trace of fine sand pockets & shell fragments (fissured)	CH													
	1.00						18	73	40	82	115	UC	--	847					
75																			
	1.00						19	78											
80					Moist, medium stiff gray LEAN CLAY w/trace of organic matter & decayed wood (fissured)	CL													
	1.00						20	83	32	91	120	UC	--	808					
85																			
	1.00				w/fine sand & few silt layers		21	88	37	85	116	OB	0	541					CONS
90					Moist, medium stiff gray FAT CLAY w/few fine sand layers (fissured)	CH													
	1.00						22	93											
95																			
	1.00						23	98	43	78	112	UC	--	934					
100																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-5

Project No: 25026
Date: 08/07/2023
Latitude: 29.97981°
Longitude: -89.99612°

Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0		24			Moist, medium dense gray fine SILTY SAND w/fine gravel	SM	PB-1 PB-2	0 0.5	17										
					Moist, medium dense gray POORLY GRADED SAND W/SILT & trace of shell fragments	SP-SM	PB-3	3.5	20										
5	0.50	27			Moist, loose gray fine SILTY SAND w/trace of clay pockets & shell fragments	SM	4	5	21						NP	NP	NP		
	0.50				Moist, very loose gray fine CLAYEY SAND	SC	5	8	25	99	124	OB	0	125					
10	0.50				Moist, very soft gray & brown FAT CLAY w/fine sand & few organic matter	CH	6	11	47	75	110	UC	--	181					
	0.50						7	14											
15					Moist, very soft black ORGANIC CLAY w/few wood & roots	OH													
	0.50						8	18	256	21	76	UC	--	227					
20					Moist, very soft to soft gray FAT CLAY w/wood	CH													
	0.50						9	23											
25																			
	0.50				Moist, very soft to soft gray FAT CLAY (fissured)		10	28	64	62	102	OB	0	414					
30																			
	0.50						11	33											
35																			
	0.50				w/few wood		12	38	66	61	101	UC	--	192					
40																			
	0.50						13	43											
45																			
	0.50						14	48	63	63	102	OB	0	373					
50																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

EUSTIS ENGINEERING SINCE 1946

Sewerage & Water Board of New Orleans
East Bank Sewage Treatment Plant
Phase I
Wastewater Treatment Facility
Improvements
New Orleans, Louisiana

LOG OF BORING AND TEST RESULTS

Boring: B-5

Project No: 25026
Date: 08/07/2023
Latitude: 29.97981°
Longitude: -89.99612°

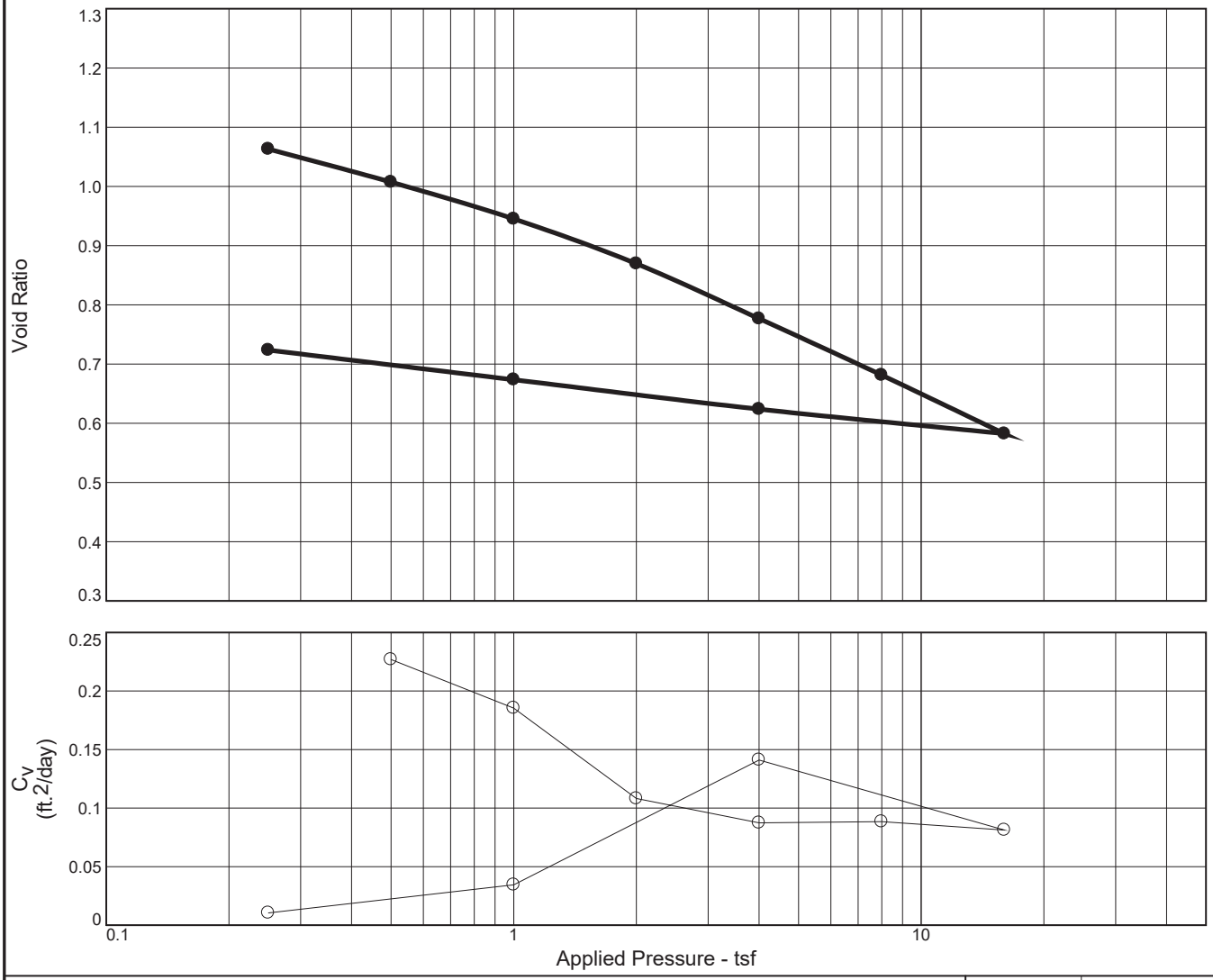
Water Depth: See Text
Total Depth: 100.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content %	Density Dry pcf	Density Wet pcf	Shear Tests Type	Shear Tests ϕ	Shear Tests C psf	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Moist, soft gray FAT CLAY	CH													
	0.50						15	53											
55					Moist, soft gray FAT CLAY W/SAND & trace of shell fragments	CH													
	0.50						16	58	48	74	109	UC	--	336					
60																			
	0.50						17	63											CONS
65					Moist, medium stiff to stiff greenish-gray FAT CLAY w/few concretions & trace of organic matter	CH													
	0.50						18	68	44										
70																			
	0.50						19	73											
75																			
	0.50				w/few concretions, trace of roots, & organic matter (fissured)		20	78	42	80	113	UC	--	673					
80					Moist, medium dense gray fine SILTY SAND	SM													
	0.50						21	83	26						NP	NP	NP		
85		27			w/trace of clay		PB-22	85.5	31										
		29					PB-23	88.5											
90		23					PB-24	91.5	27										
					Moist, medium stiff to stiff gray FAT CLAY w/fine sand	CH	25	94	38	84	116	UC	--	917					
95																			
	1.00				w/fine sand lenses		26	98	52	70	107	UC	--	1107					
100																			

EUSTIS_GINT_LIBRARY_3_22_2023.GLB EE STANDARD BORING LOG 25026.GPJ 10/19/23

NOTES:

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
M, mst g LN CL W/ SA (fi), fw si lay	CL	

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
39	23	2.70	--	97.8	97.8	41.7 %	31.9 %	99.8 %	100.0 %	1.128	0.724	1.4	0.32

Preparation Process: Trimmed in Ring

Condition of Test: Natural Moisture

D2435 Method	C_r	Swell Press. (tsf)	Swell %
B			

Project No. 25026 **Client:** WRIGHT - PIERCE, INC.

Project: SEWER & WATER BOARD OF NEW ORLEANS - EAST BANK SEWAGE TREATMENT PLANT, PHASE 1, WASTEWATER TREATMENT FACILITY

Source of Sample: B-4 **Depth:** 88 **Sample Number:** 21

EUSTIS ENGINEERING SINCE 1946

Remarks:

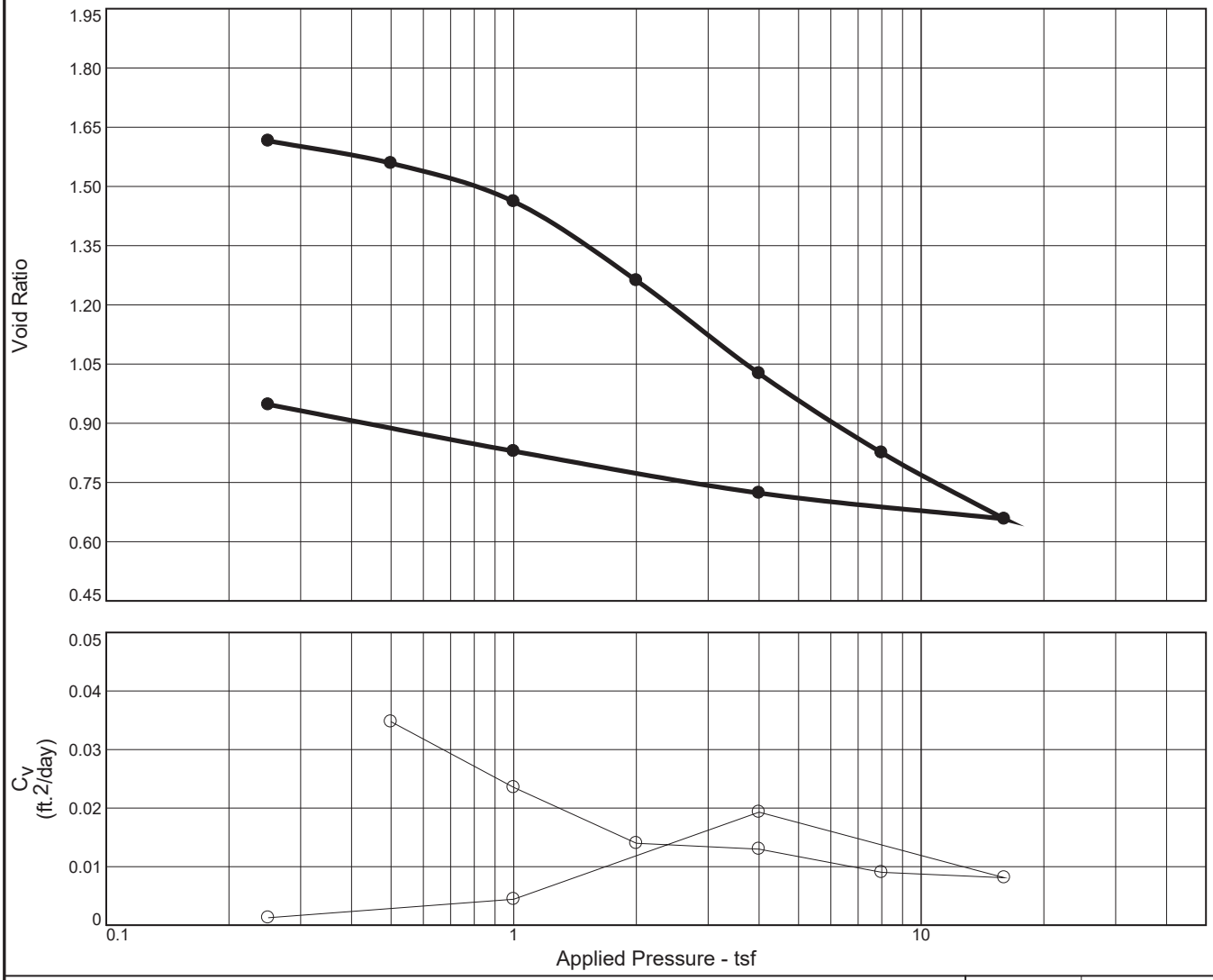
Checked By: BH

Title: Senior Lab Tech

Figure

Tested By: BH

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
M, mst g FT CL w/ fw si poc	CH	

LL	PI	Sp. Gr.	Overburden (tsf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (tsf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
89	65	2.72	--	64.3	87.2	58.8 %	39.9 %	97.4 %	100.0 %	1.642	0.947	1.1	0.77

Preparation Process: Trimmrd in Ring

Condition of Test: Natural Moisture

D2435 Method	C_r	Swell Press. (tsf)	Swell %
B			

Project No. 25026 **Client:** WRIGHT - PIERCE, INC.

Project: SEWER & WATER BOARD OF NEW ORLEANS - EAST BANK SEWAGE TREATMENT PLANT, PHASE 1, WASTEWATER TREATMENT FACILITY

Source of Sample: B-5 **Depth:** 63 **Sample Number:** 17

Remarks:

Checked By: BH

Title: Senior Lab Tech

EUSTIS ENGINEERING SINCE 1946

Figure

Tested By: BH

APPENDIX III

LAST SAVED BY: CHRISTOPHER.HINKLEY 8/17/2023 1:32 PM

J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\FIG\21163-CS-OVERALLSITEMP_BORINGS.DWG | 21163-CS-OverallSiteMP_Borings | 110.1236627 | — | 8/17/2023 1:34:37 PM | CHRISTOPHER.HINKLEY

WASTE DRYING FACILITY

PROJECT TBM #2003
CROSS CUT
EL.=-0.07

ENLARGEMENT PLAN, SEE DWG C-08-102

PROJECT TBM #19
CROSS CUT
EL.=6.11

ENLARGEMENT PLAN, SEE DWG C-08-103

TOP WALL EL=17.50

CP102

CP103

RAW SEWAGE CHANNELS

STORMWATER PUMPING SYSTEM

MATERIAL STORAGE

ASH DRYING BED

OXYGEN PLANT

ENLARGEMENT PLAN, SEE DWG C-08-105

OXYGEN REACTORS

B-3
EL.=-1.13'

B-4
EL.=-0.25'

MS9

PLANT SHOP AND EMPLOYEES BUILDING

FLOW METER VAULT NO. 3

NORTH RAS PUMP STATION

GREASE CONCENTRATOR STATION

PLANT SHOP AND EMPLOYEES BUILDING

MS10

B-2
EL.=-1.97'

HEADWORKS/GRIT BASINS

MS8

ELECTRICAL BUILDING

MS7

FLOW METER VAULT NO. 1

SLUDGE THICKENING

ENGINEERING BUILDING

MS11

SOLIDS HANDLING BUILDING

SECONDARY CLARIFIER NO.2 (SCL-2)

SECONDARY CLARIFIER NO.4 (SCL-4)

SECONDARY CLARIFIER NO.6 (SCL-6)

SECONDARY CLARIFIER NO.8 (SCL-8)

SODIUM HYPOCHLORITE DISINFECTION SYSTEM

MS13

MS15

SEDIMENTATION BASIN NO. 2

ADMIN BUILDING

THICKENED SLUDGE STORAGE TANK

MS6

PROJECT TBM #2002
CROSS CUT
EL.=2.12

MS12

MS14

B-5
EL.=-1.51

MS1

MS2

B-1
EL.=-0.55

WAS STORAGE TANK

SECONDARY CLARIFIER NO.1 SCL-1

SECONDARY CLARIFIER NO.3 (SCL-3)

SECONDARY CLARIFIER NO.5 (SCL-5)

SECONDARY CLARIFIER NO.7 (SCL-7)

MS5

INV-1.44

MS4

MS16

CP101

CP100

ENLARGEMENT PLAN, SEE DWG C-08-101

EMERGENCY GENERATOR BUILDING

DIESEL FUEL STORAGE FACILITY

FLOW METER VAULT NO.2

ELECTRICAL BUILDING AND TRANSFORMERS

EFFLUENT PUMP STATION AND ELECTRICAL CONTROL BUILDING

LIQUID SLUDGE/SEPTAGE RECEIVING FACILITIES

EXISTING FERRETER CHEMICAL FEED SYSTEM CANOPY
SLUDGE THICHENER/POLYMER CHEMICAL FEED SYSTEM

ENLARGEMENT PLAN, SEE DWG C-08-104

SOUTH RAS PUMP STATION

EFFLUENT CHANNEL

ENLARGEMENT PLAN, SEE DWG C-08-106

OVERALL SITE MODIFICATION PLAN

SCALE: 1"=60'

0 60 120

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

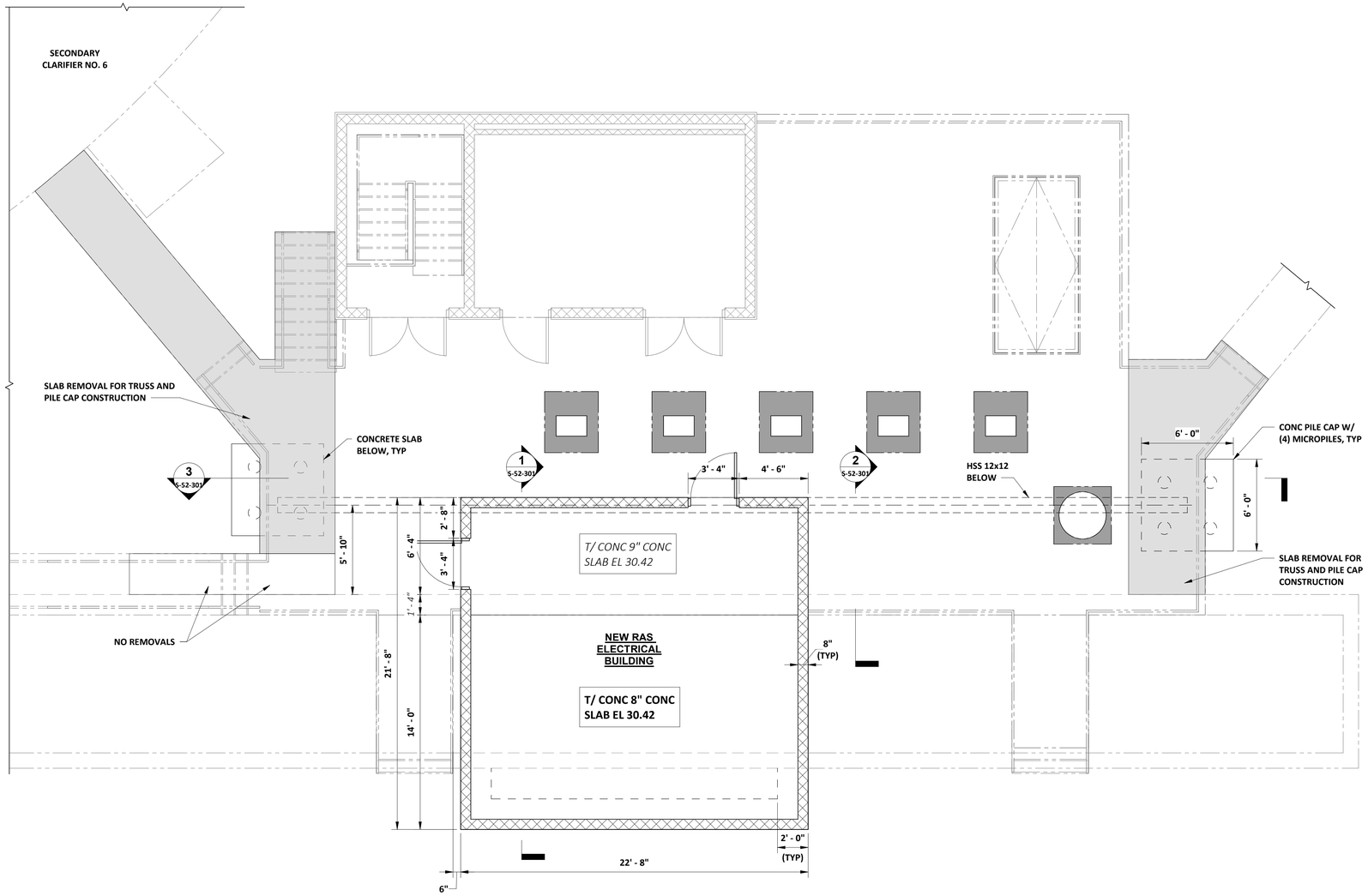
SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
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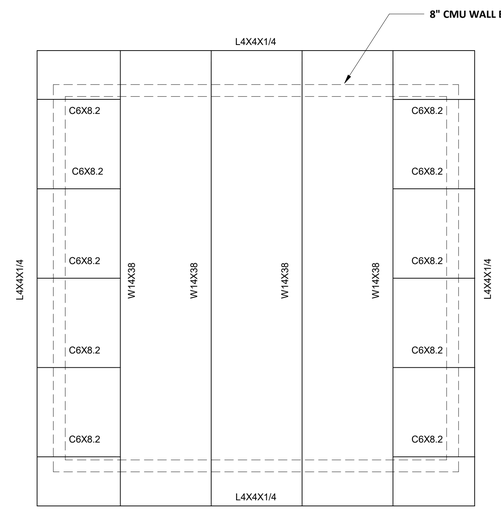
OVERALL SITE MODIFICATION PLAN

DR. C.HINKLEY	C-04-101
TRC.	
CK.	
PROJECT NO: 21163	DESIGNED BY:
AP.	DWG. No.
SUBMISSION: 30% DESIGN REVIEW	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE:
SET NO.	SHEET NO. OF



TOP PLAN

SCALE: 1/4" = 1'-0"



ROOF FRAMING PLAN

SCALE: 1/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

NORTH RAS PUMP STATION
TOP PLAN

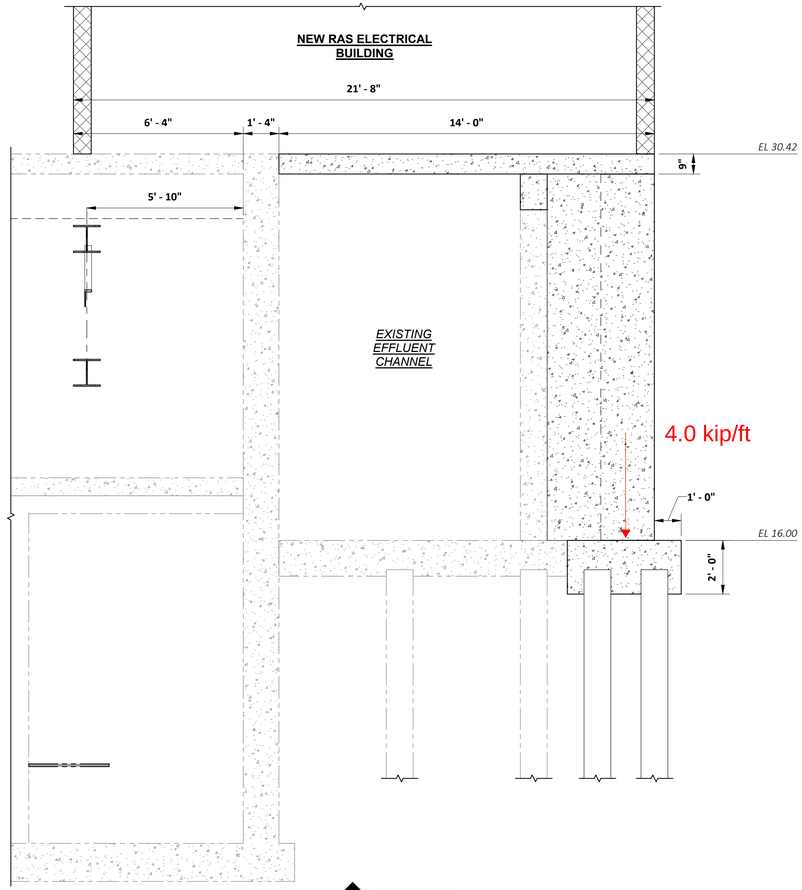
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DR. A.NESBIT	
TRC.	
CK.	
PROJECT NO: 21163	DESIGNED BY: R.CYR
AP.	
SUBMISSION: 30% DESIGN REVIEW	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE:

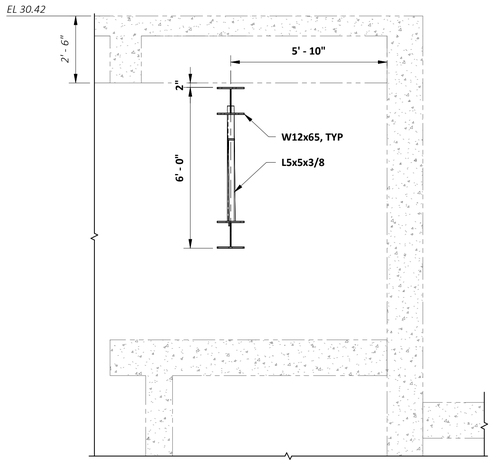
S-52-101
DWG. No.
SET NO. SHEET NO. OF

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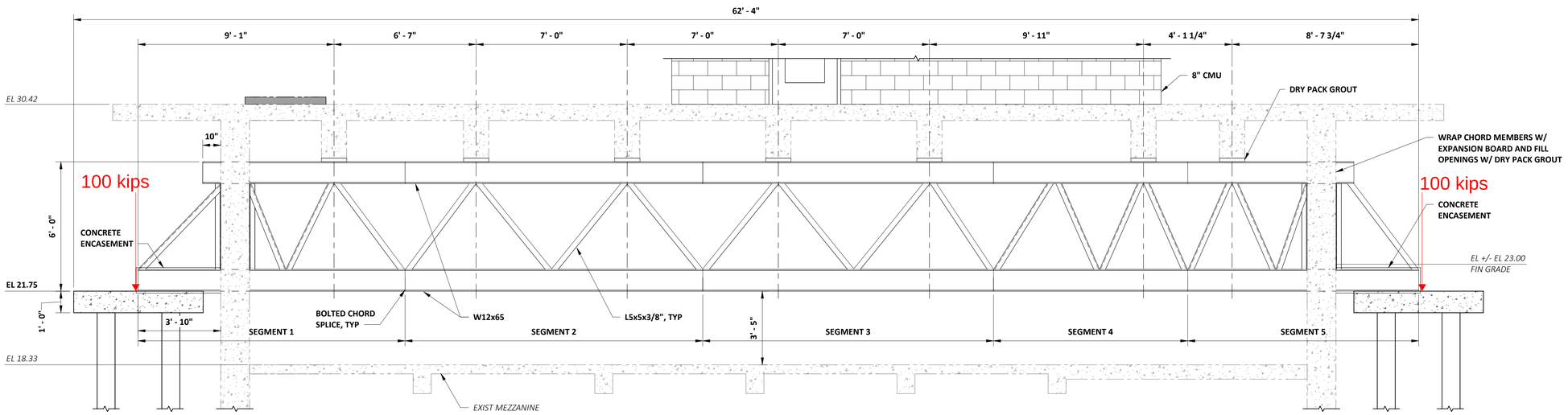
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1 SECTION
S-52-101 SCALE: 3/8" = 1'-0"



2 SECTION
S-52-101 SCALE: 3/8" = 1'-0"



3 SECTION
S-52-101 SCALE: 3/8" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: 30% DESIGN REVIEW	
CAD COORD: A.COUTURE	

NORTH RAS PUMP STATION SECTIONS

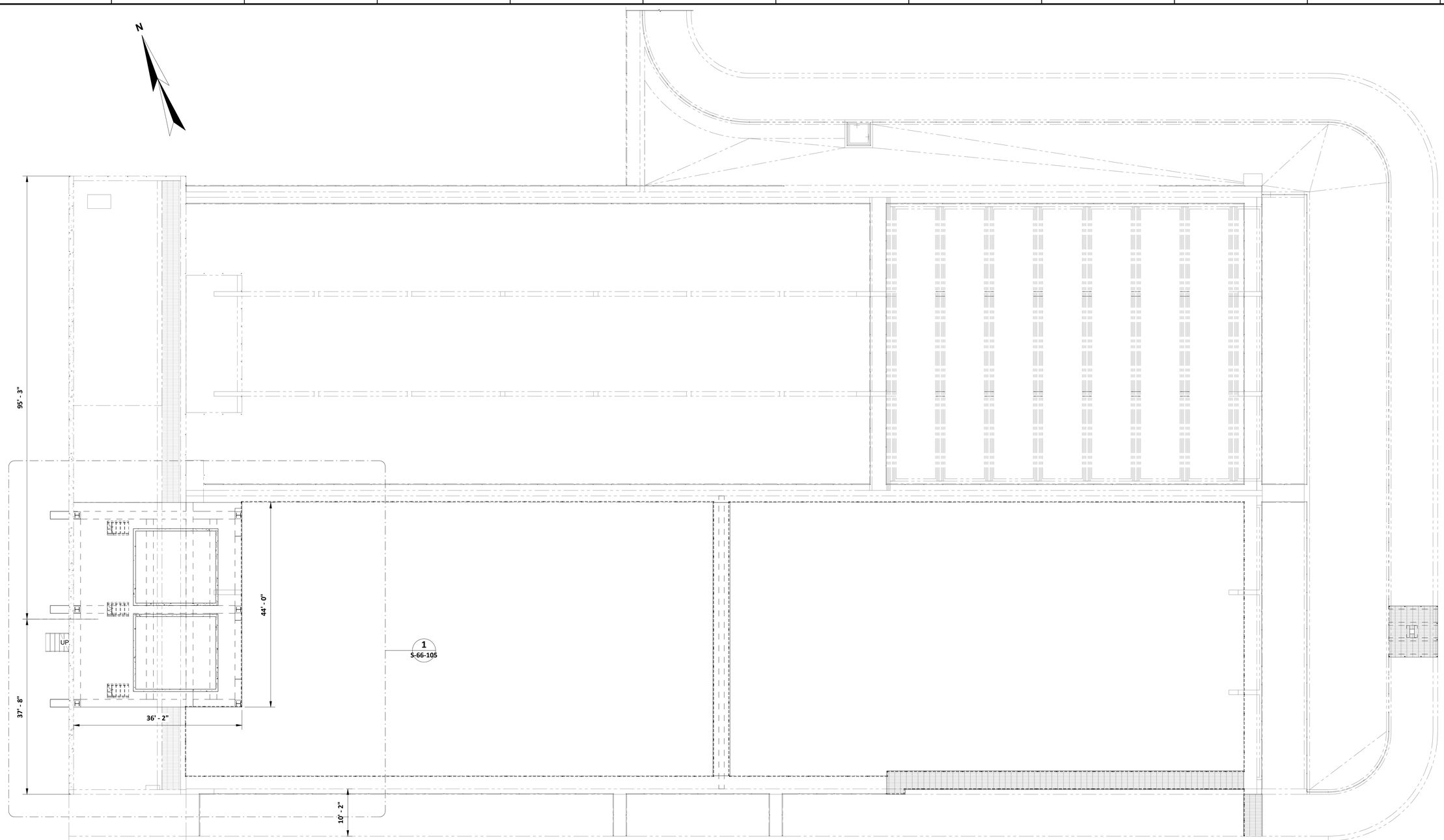
DR. A.NESBIT	
TRC.	
CK.	
AP.	
SCALE: AS NOTED	
DATE:	

S-52-301
DWG. No.

SET NO. SHEET NO. OF

Autodesk Docs://JA-NewOrleans-21163-EastBank-STP-Phase/21163-SM-RAS-PS-North.rvt

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TOP MODIFICATION PLAN 1

SCALE: 1" = 10'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

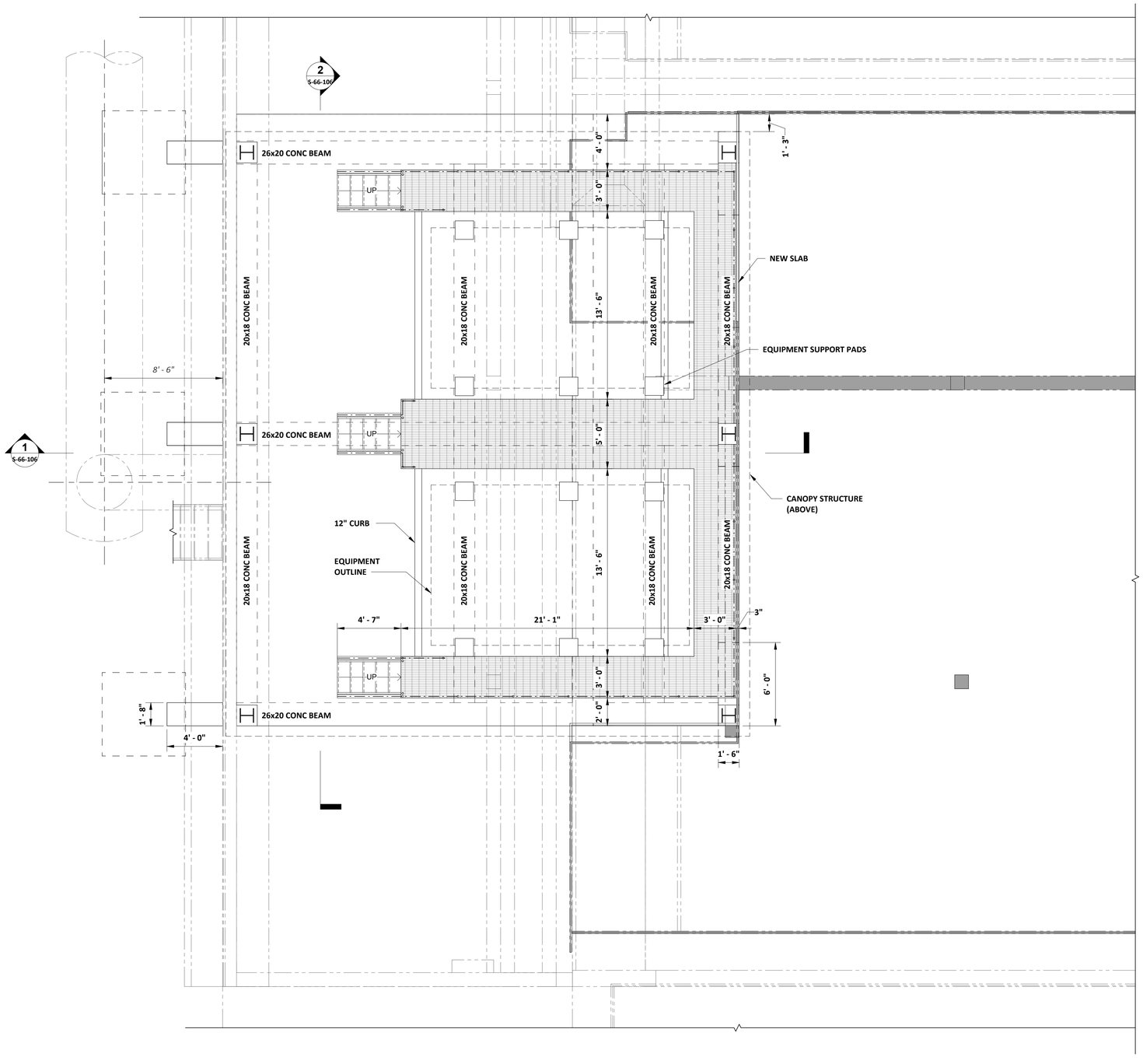
SEDIMENTATION BASINS TOP MODIFICATION PLAN

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DR. A.NESBIT	S-66-104
TRC.	
CK.	
AP.	DWG. No.
PROJECT NO: 21163 / DESIGNED BY: J.KELLOGG	
SUBMISSION: 30% DESIGN REVIEW	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: / SET NO. / SHEET NO. / OF

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase/21163-SM-SedimentationTanks.rvt

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PARTIAL TOP PLAN

SCALE: 1/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.

EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

SEDIMENTATION BASINS PARTIAL TOP PLAN

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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: 30% DESIGN REVIEW	
CAD COORD: A.COUTURE	

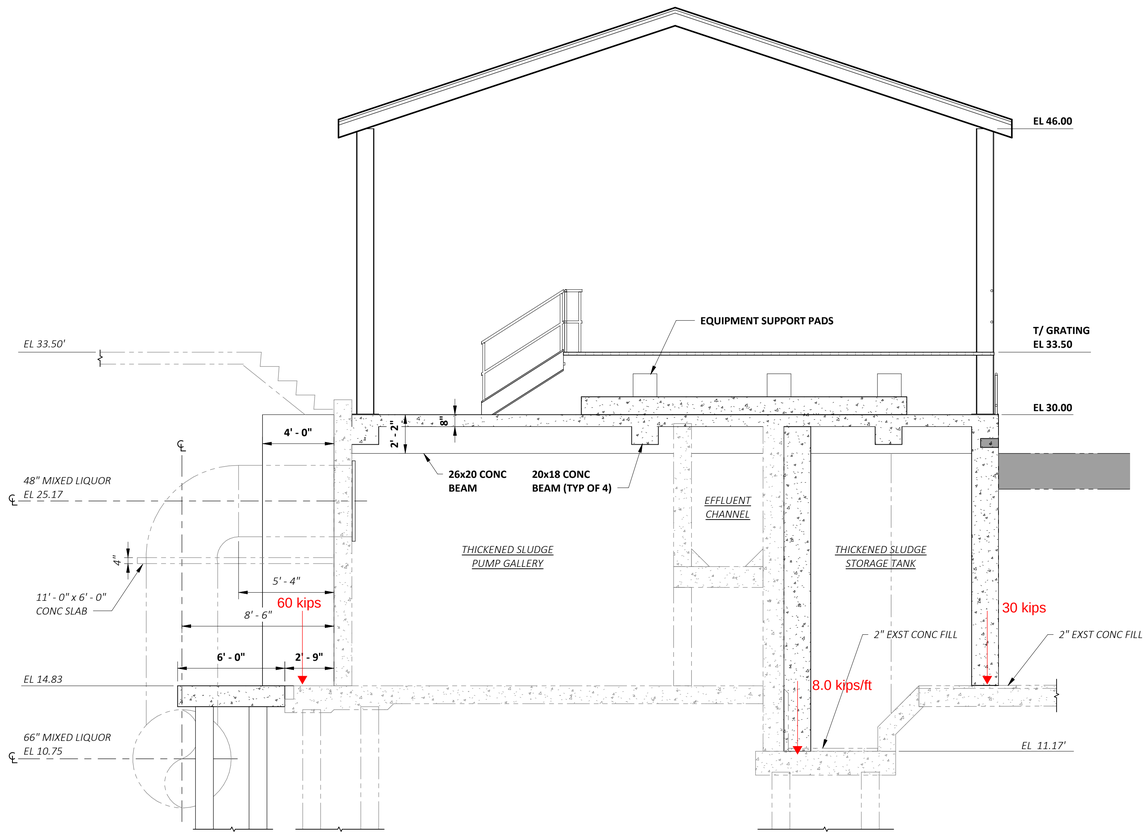
DR. A.NESBIT	
TRC.	
CK.	
AP.	
SCALE: AS NOTED	
DATE:	SET NO. / SHEET NO. OF

S-66-105

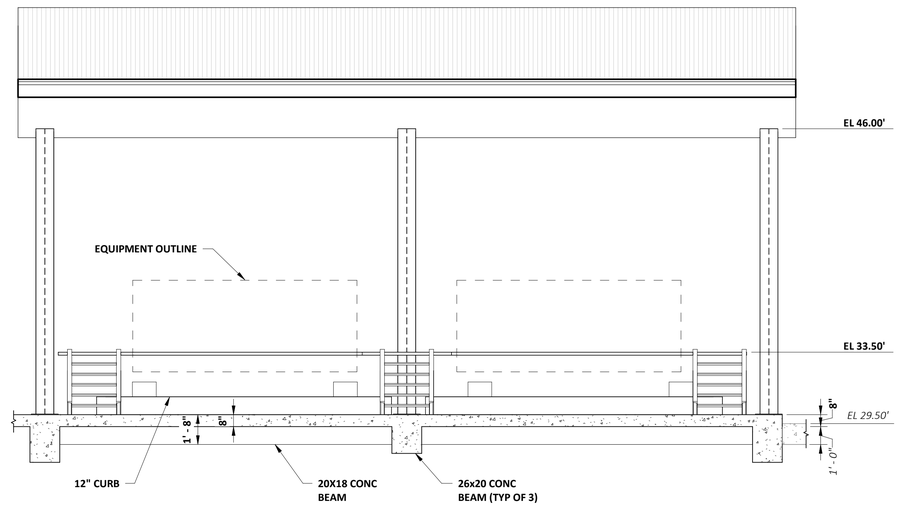
DWG. No.

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase/21163-SM-SedimentationTanks.rvt

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1 SECTION
S-66-105 SCALE: 1/4" = 1'-0"



2 SECTION
S-66-105 SCALE: 1/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

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EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

SEDIMENTATION BASINS SECTIONS

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DR. Author	
TRC.	
CK. Checker	
AP. Approver	
SCALE: AS NOTED	
DATE:	SET NO. / SHEET NO. / OF

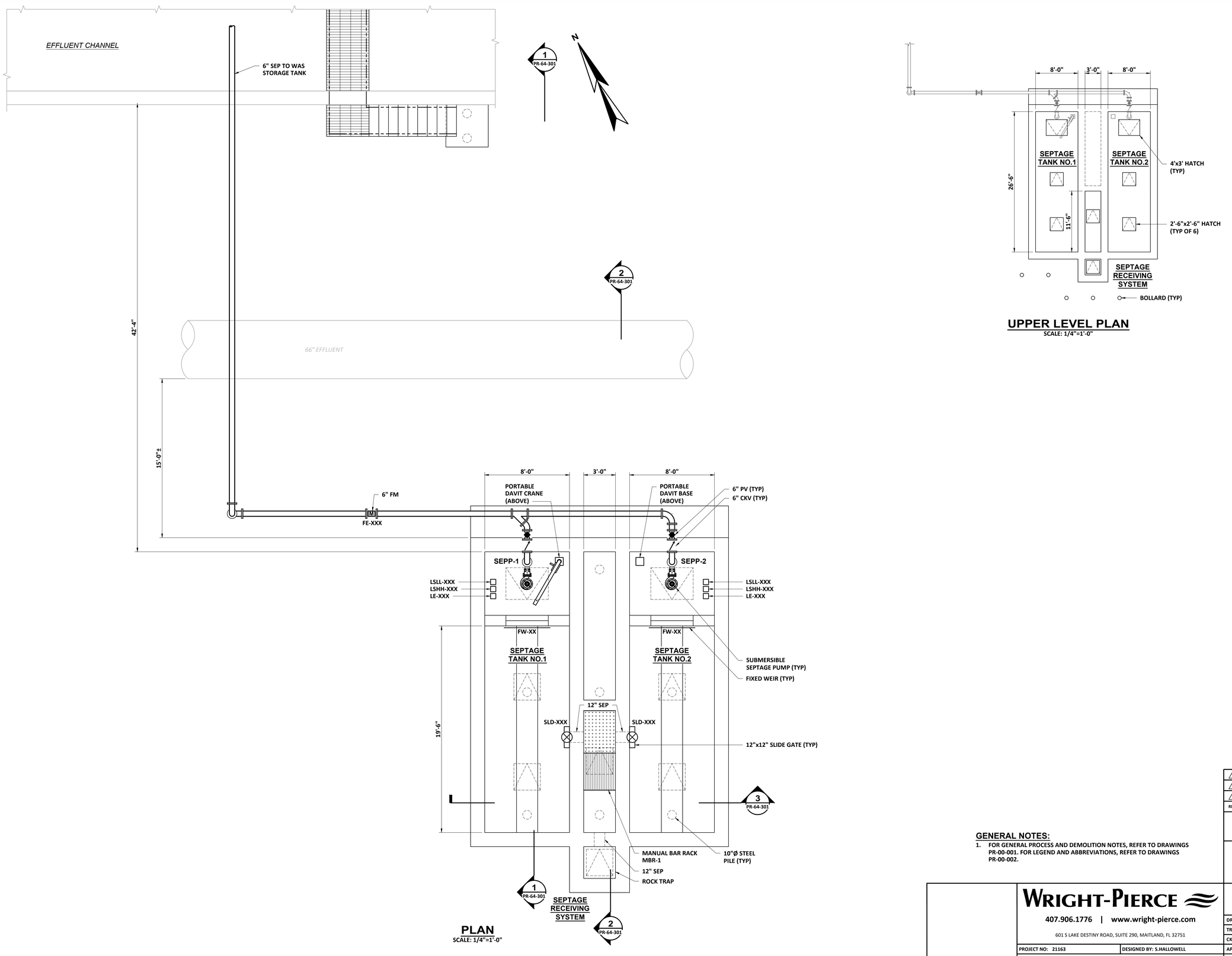
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PLAN
SCALE: 1/4"=1'-0"

UPPER LEVEL PLAN
SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

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LIQUID SLUDGE/SEPTAGE RECEIVING FACILITY PLANS

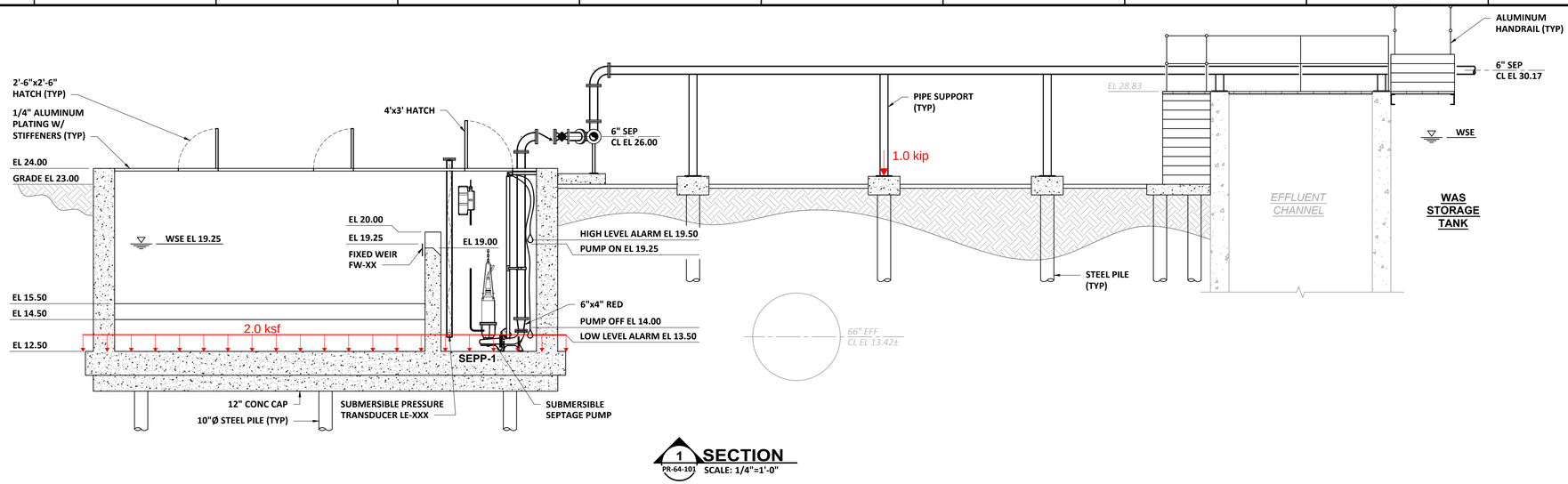
DR. A.COUTURE	
TRC.	
CK.	
AP.	
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: 30% DESIGN REVIEW	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: 6-27-2023

PR-68-101

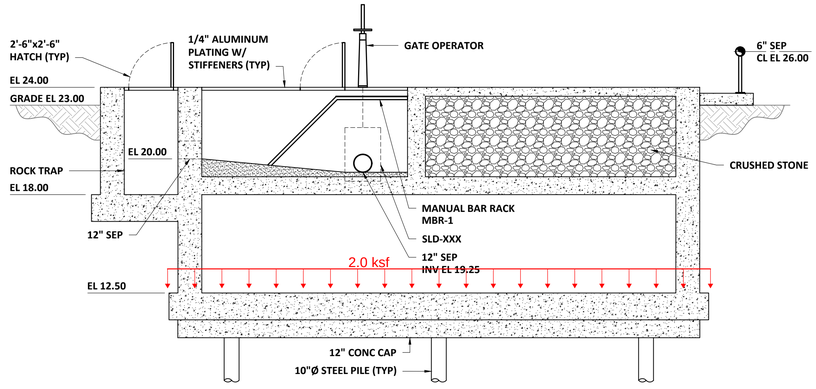
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SET NO. | SHEET NO. | OF

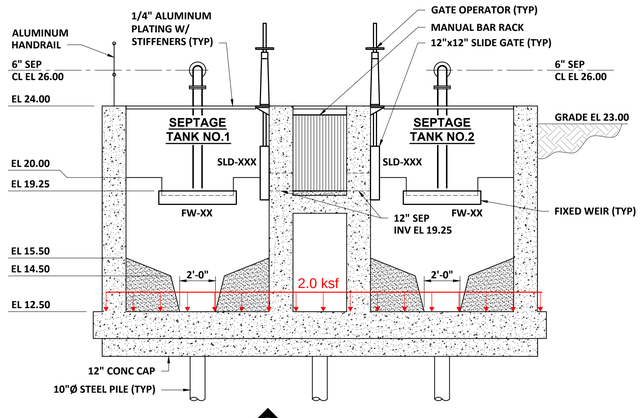
LAST SAVED BY: ADAM.COUTURE 6/26/2023 2:45 PM



1 PR-64-101 **SECTION**
SCALE: 1/4"=1'-0"



2 PR-64-101 **SECTION**
SCALE: 1/4"=1'-0"



3 PR-64-101 **SECTION**
SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.

REV.	DATE	DESCRIPTION	BY
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No.
EAST BANK STP - PHASE I
SECONDARY TREATMENT AND SOLIDS UPGRADE

LIQUID SLUDGE/SEPTAGE RECEIVING FACILITY SECTIONS

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DR. A.COUTURE	
TRC.	
CK.	
AP.	
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: 30% DESIGN REVIEW	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: 6-27-2023

PR-68-301

DWG. No.

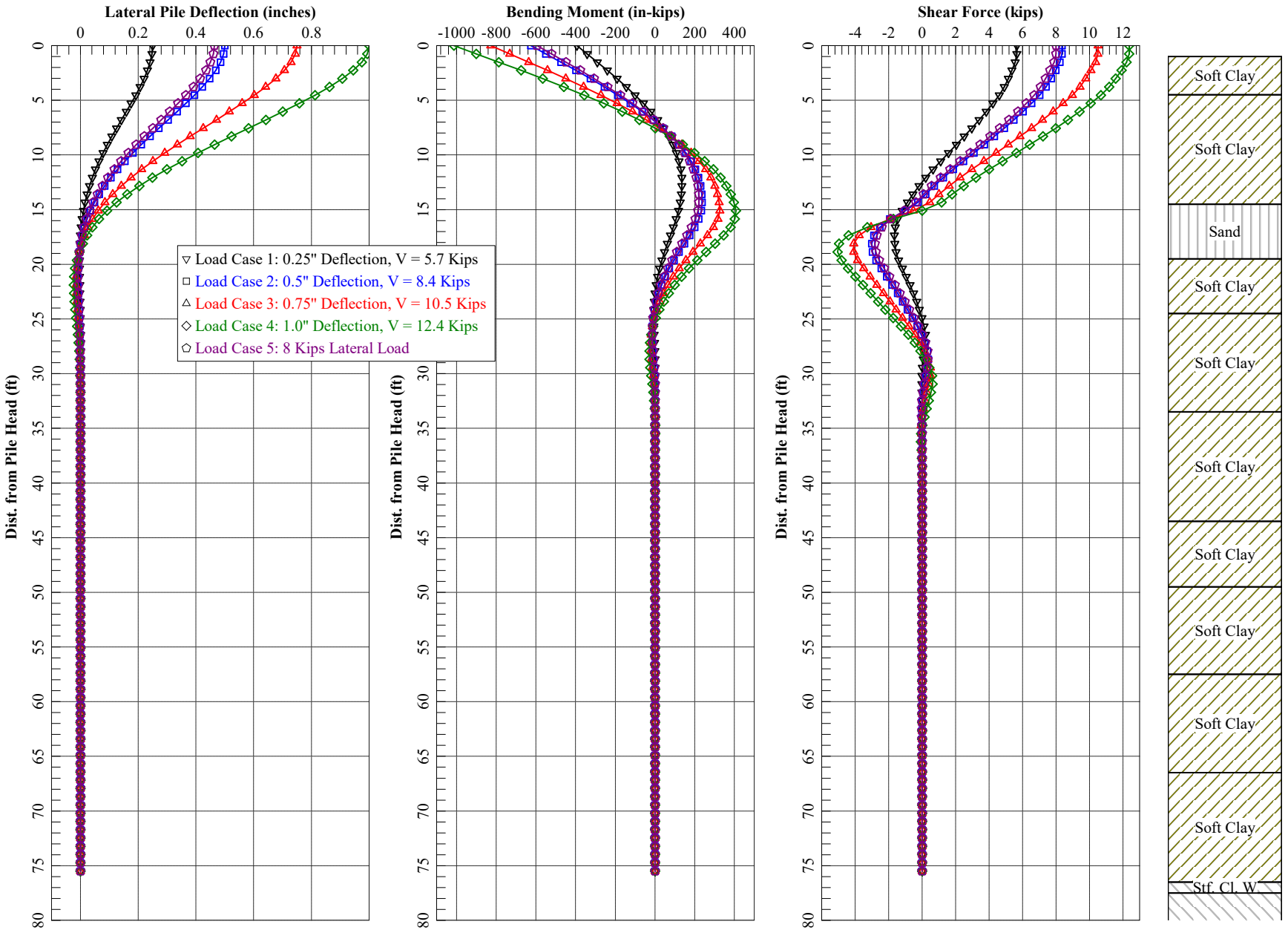
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APPENDIX IV

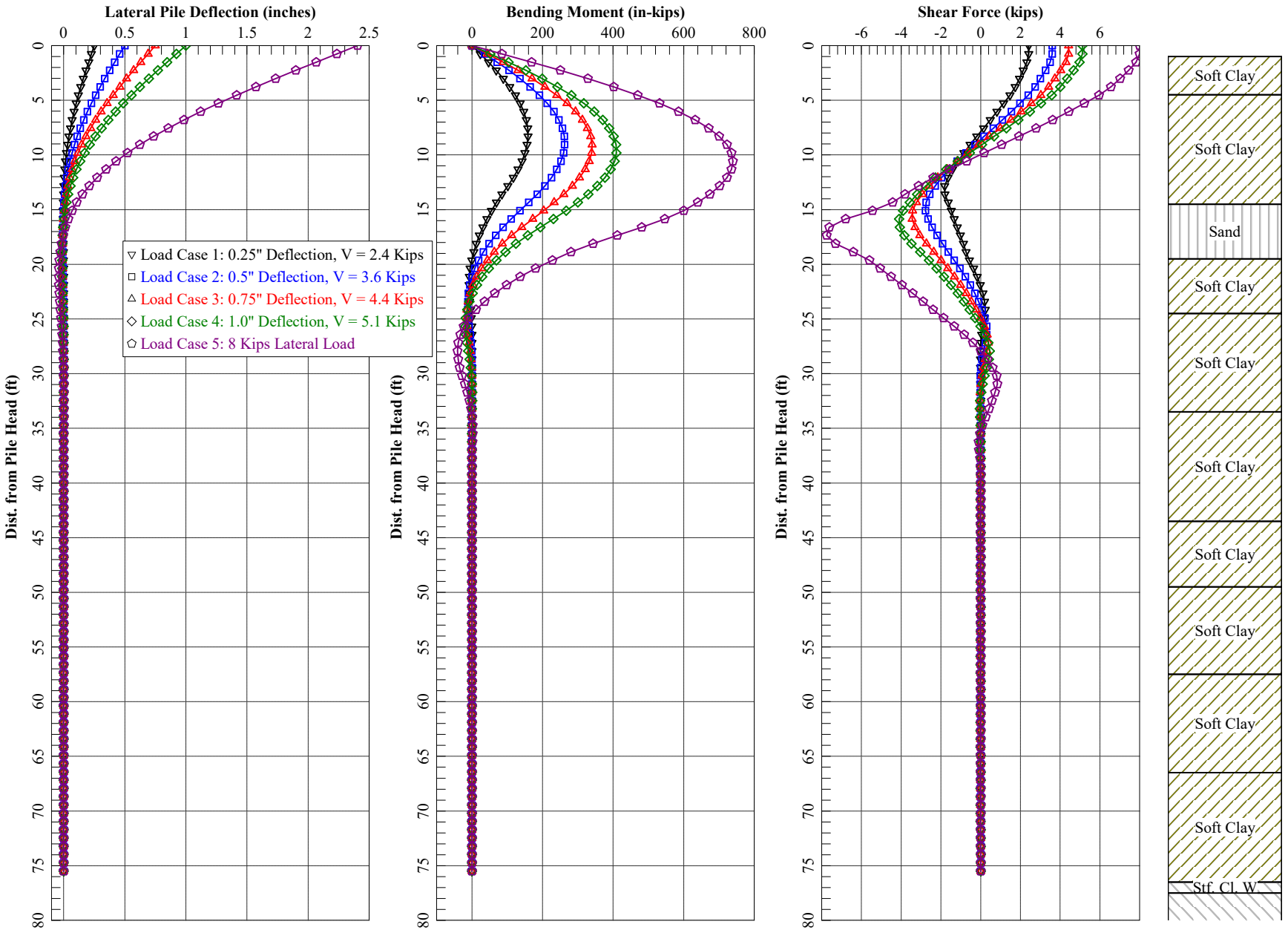
25026 Sewerage & Water Board, New Orleans
Sludge Area, LPILE Analyses
12-in. Encased OSP Piles (75.5-ft Long)

Shaft/Pile Butt at El -13.5
Fixed Head Conditions
Axial Load = 72 Kips



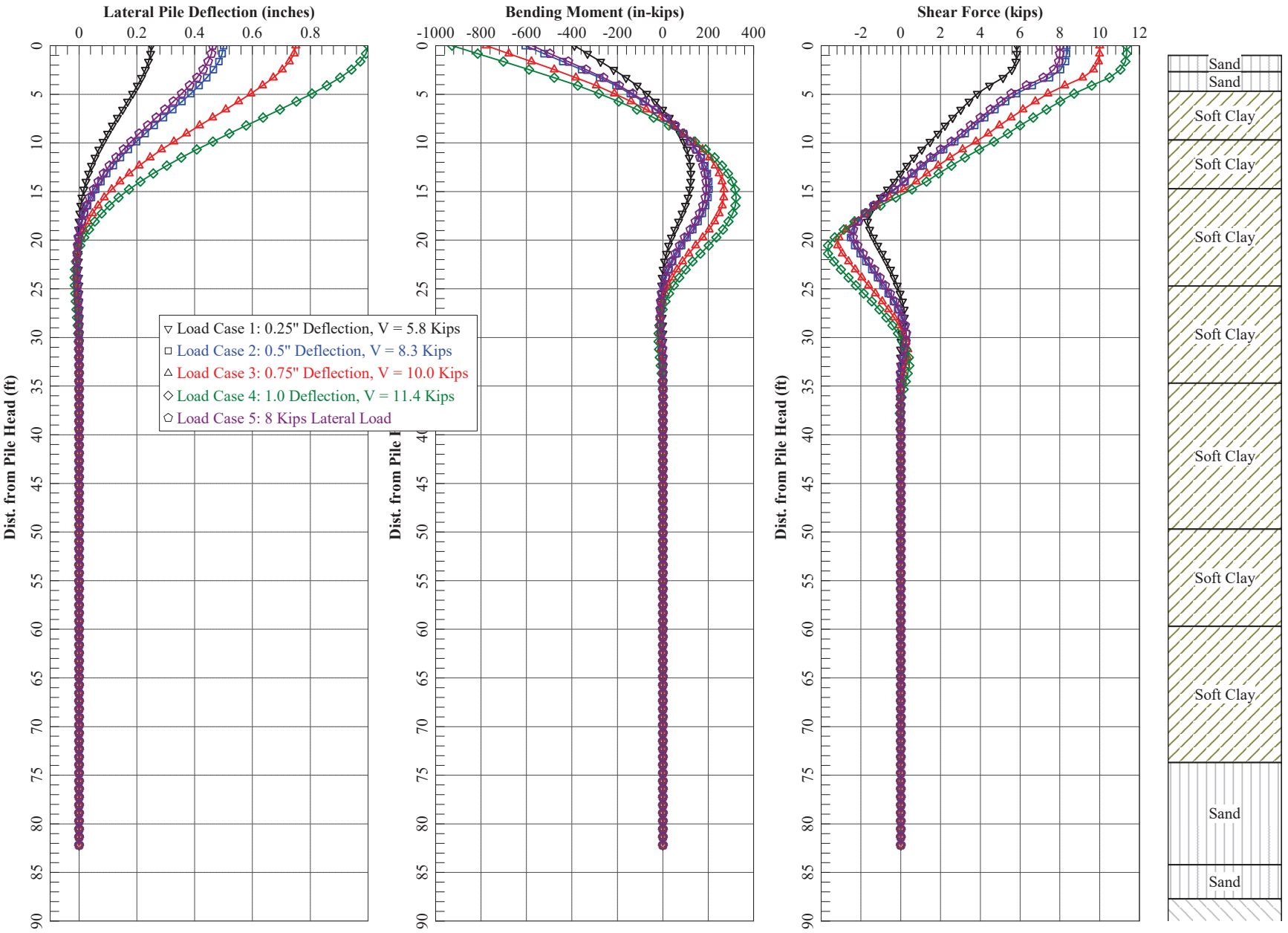
25026 Sewerage & Water Board, New Orleans
Sludge Area, LPILE Analyses
12-in. Encased OSP Piles (75.5-ft Long)

Shaft/Pile Butt at El -13.5
Free Head Conditions
Axial Load = 72 Kips



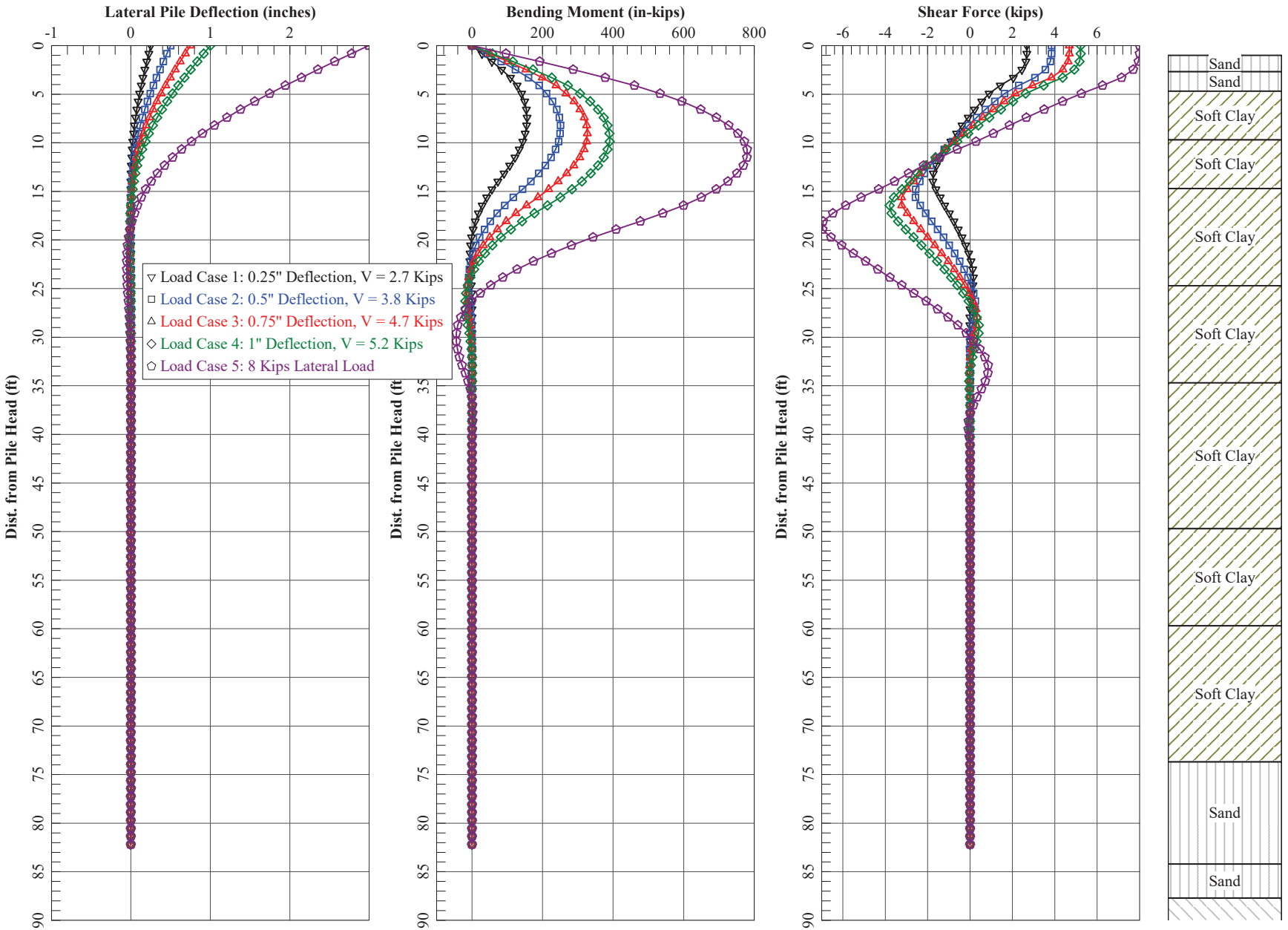
25026 Sewerage & Water Board, New Orleans
Sludge Area, LPILE Analyses
12-in. Encased OSP Piles (75.5-ft Long)

Top of Pile at El -7.8 with 1-ft Stick Up
Fixed Head Conditions
Axial Load = 80 Kips



25026 Sewerage & Water Board, New Orleans
Sludge Area, LPILE Analyses
12-in. Encased OSP Piles (75.5-ft Long)

Top of Pile at El -7.8 with 1-ft Stick Up
Free Head Conditions
Axial Load = 80 Kips



Appendix C
Control Loop Descriptions

SECTION 13441

CONTROL LOOP DESCRIPTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes control descriptions for loop diagrams shown on the Instrumentation Drawings.

B. Control Loops Descriptions shall be used by the Application Engineering Services Supplier (AESS) for developing PLC code and SCADA development under this contract.

C. The AESS shall be responsible for all of the scope within this specification unless specifically stated otherwise.

D. At a minimum, all status, alarm, and control signals shown on the drawings shall be provided as such and in accordance with the CONTROL DESCRIPTIONS - GENERAL unless specifically stated otherwise.

E. The specific requirements of the custom software will be defined during the Shop Drawing submittal process, with the input of the Owner and Engineer. A meeting(s) will be held at the project site, with a representative of the Application Engineering Services Supplier, PLC AESS/Supplier, Client, Contractor, and Engineer, to finalize the custom programming specifications.

F. The AESS shall provide 50 hours of additional programming time and 6 round trips to be used for scope not listed. Unused programming time in the first year will be given to the Owner as a credit.

G. The AESS shall create the SCADA Screens and alarms for the new functionality as described herein.

H. The AESS shall provide the necessary temporary programming to keep the plant operational during the construction period.

I. The AESS shall provide 8 hours to update reports for systems provided in this contract.

J. The AESS shall assign IP addresses and establish communication to all network Division 11 panels, VFD’s and other networked equipment outside of Division 11 manufacturers

K. The specific requirements of the custom software shall be defined during the Shop Drawing submittal process, with the input of the Owner and Engineer. A meeting shall be held at the project site, with a representative of the AESS, Client, Contractor, and Engineer, to finalize the custom programming specifications.

L. Requirements specified elsewhere:

1. Additional Requirements are specified elsewhere including, but not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1.
    a. Section 13410 Instrumentation and Process Control General (and as referenced).

1.2 SYSTEM DESCRIPTION

A. Provide instrumentation hardware, software and programming as necessary to

perform control functions specified herein and as shown on drawings. Ensure coordination with other work to ensure that necessary wiring, conduits, contacts, relays, converters, and incidentals are provided in order to transmit, receive, and control necessary signals to other control elements, to control panels, and to receiving stations.

B. The specifications direct attention to certain required features of the system, but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish the CONTROL LOOPS complete in all details and ready for operation.

1.3 SUBMITTALS

A. Shops
   1. Provide annotated versions of the PLC, operator interface terminal and SCADA programming files in .pdf format for review by the Engineer. Provide the PLC and OIT files 15 days prior to FAT.
      a. The programs will be submitted in .pdf format. Native format shall be provided at the engineers request.
      b. PLC Programming and diagnostic software shall be Windows based via Relay Ladder Logic (RLL) custom programming tools for the PLCs
      c. Ladder will be fully documented including a listing of each task/function. Annotations shall clarify the intent of each task/function with a description of the process so that the engineer or a future AESS will be able to clearly understand.
   2. AESS shall submit the PLC programming logic (ladder logic, function blocks, structured text, etc.). Include the following:
      a. PLC I/O configurations
      b. PLC communication configurations
      c. PLC cross reference list
      d. PLC tag data base and memory usage
   3. AESS shall submit the OIT Program. Submit the following:
      a. OIT communication configurations
      b. OIT Screen List
      c. OIT Screen printouts

B. Operation and Maintenance Manuals:
   1. Provide annotated final versions of the modified PLC, operator interface terminal and SCADA programming files on DVD or USB drive. The PLC and OIT programing files shall be stored on individual USB drives located in each of the respective control panels as well as a USB drive with the SCADA programming files.
   2. Refer to Section 13410 for additional O&M sections.

C. All PLC, OIT, and SCADA programs are property of the Owner. All programs shall be unlocked, the program nor functions or add-on instructions within the program shall have a password.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 CONTROL DESCRIPTIONS – GENERAL

A. The OIT and SCADA setup and programming shall include:

1. Graphic screens to monitor equipment status (on/off, enable, speed, etc.) and process instrumentation (i.e. tank levels, dissolved oxygen levels, pH, etc.); elements to allow easy review and adjustment of process parameters; trending screens for measure process values such as flows, level, DO, pH, and power usage; alarm adjustment screen with ability to adjust (if required), set delay time and activate/deactivate each alarm condition and alarm summary screen with acknowledge.
2. Provide all screens needed for process and equipment monitoring, equipment control, operating parameter adjustment, and alarms as specified. A minimum list of SCADA screens is as follows:
    a. Facility Overview Screens showing status (on/off, emergency/normal power) and approximate location of each major process system and major piece of equipment at the facility. Also indicate location and status of each system control panel. Operators shall be able to access more detailed major process system overview screens identifying equipment, valves, piping, etc. upon clicking on system displayed on overview screen.
    b. Process System Overview: Screens shall be provided for each major process system for process and equipment monitoring, equipment control, operating parameters adjustment, and Alarms as described in Sections 13440, 13441. Operators shall be able to access specific function screens from each Process System Overview Screen as applicable, showing process control variables and alarm set-ups, tank levels, etc. upon clicking the piece of equipment or tag setting displayed on process system overview screen.
        i. Process and Equipment Setting Screens: Setpoint and tuning settings that are will be available though popups located on equipment or process system screens as appropriate.
        ii. System adjustment parameters shall be done with multi-tiered popups. Primary system setpoint changes (E.g. Mode, Dose, DO, flow rate, recycle rate, timers, etc.) will be available at the first level. Secondary parameters (E.g. system minimum/maximum speeds, chemical concentrations, minimum/maximum trim values, etc.) that require little or intermittent changes will be available at subsequent levels. Tertiary parameters (E.g. PID settings, etc.) that require rare changes will be available at the next level.
        iii. An indicator will be shown next to or on each piece of equipment to indicate if it is available for automatic operation. This is noted as Equipment Availability in 13441.
        iv. Operators shall be able to access more detailed equipment screens upon clicking on equipment displayed on the process system screen.
        v. A checklist of System Availability will be shown on the Process

System screens. System Availability is defined in 13441.

c. Equipment Screens: Equipment screen are to show the status of each piece of equipment. Operators will be able to modify the HOA status of the equipment, change the speeds, see the run totalizer, amperage, speed feedback, etc.
   i. The Equipment screen will show a list of all items that prevent it from running in automatic from the PLC. Equipment Availability is defined in 13441.
d. Menu Screen and Navigation:
   i. Provide a Menu screen to easily navigate through all the process systems. Additionally provide a dropdown menu for navigation as well.
   ii. Provide a back button on each screen to navigate to the previous screen.
e. Alarm Summary and Alarm Set-up Screens
   i. Provides all alarms with alarms, descriptions, setpoints, enable/disable, alarm status, etc. Alarms shall be grouped by equipment.
   ii. Provide an alarm dialer screen that enables the testing of all alarm dialers.
   iii. Provides a shortcut to the alarm dialer.
   iv. The alarm screens will show all current and past alarm conditions along with the date/time of activation and date/time of acknowledgment. Each alarm condition will be maintained in a database which shall include the ability to track alarm frequency. The operator will be capable of printing out an alarm report for a selected period of time and removing old data from the system.
f. Equipment Run Time Screen
g. Chemical Tank Level and Consumption Screen
h. System I/O Screen: Shows the status off all discrete and analog I/O. Screen to show the discrete input status, discrete output status, analog input mA value, and analog output mA value.
i. Flow Totalizer Screen (today, yesterday, total, resettable)
j. Trending Screens (SCADA Only):
   i. Provide trends for all signals identified in 13441 and trend grouping as herein.
   ii. Trends to be grouped by system (E.g. disinfection, filter, etc.). Trends are to be used on multiple system screens as required.
   iii. Trends on pages will be able to be easily removed or added to pre-built pages by clicking on the tag
   iv. The following trending screens shall be provided at a minimum:
      (1) Influent, effluent flows and residual
      (2) Etc.
k. Network Status Monitoring and PLC status monitoring (SCADA Only):
   i. Screen to display the status of the fault contacts of the switches OT networks.

ii. Screen to display any communications and alarms with the OT network PLCs.
iii. Display communication success rates and polling cycles with radios and cellular modems.
iv. Display health status of PLC monitoring the fault bits from the CPU and IO modules.

l. Utility Power Screen:
i. The facility will monitor and display the status of power based on status contacts on a new automatic transfer switch along with power monitoring from a new power monitor including volts, amps and kW demand. Refer to 13441 for additional information.

m. User Credentials Screen: See System Security Section

3. All screens shall show an alarm acknowledge and alarm reset pushbutton.
4. All screens shall show the status of the automated alarm dialer in the banner or header.
5. The Division 13 Application Engineering Services Supplier shall employ and make use of the software manufacturers ability to utilize global objects (dynamos, genies, etc) for pumps, valves, pushbuttons, pilot lights, etc whereby changing the properties of the global object, is reflected in that object throughout the entire project.

B. The SCADA system shall automatically track and accumulate the operating hours of all major equipment provided under this contract. The totalized time and a reset for each time meter shall be displayed on equipment run time screen. Eight (8) fields for each piece of equipment shall be provided to allow the inclusion of maintenance related data. Information will include Name, ID, Model Number, Serial Number, Manufacturer, Manufacture Telephone Number and Date of Installation.

C. All Control Loop programming shall be done in the PLC where the inputs/outputs terminate unless otherwise stated. All PLC tags shall be descriptive in nature.

D. Equipment Fail Alarms:
1. Equipment Fail alarms are defined as a condition where a command is given and the status confirmation of that command is not received within an acceptable time-frame. Fail Alarms shall not be triggered in the event of Loss of Power, or any other alarms related to the equipment (ie. High Temp, O/L. Fault, Low Pressure, etc.). Examples are as follows:
a. Fail to start-stop: A piece of equipment is given the command to start and the running status is not confirmed within an appropriate time delay. Conversely a piece of equipment is commanded to stop and the run status does not drop out within an appropriate time delay.
b. Fail to open-close: A duty valve is given the command to open and the opened status is not received within and appropriate time delay. Conversely, a duty valve is given the command to close and the closed status is not received within an appropriate time delay.
c. Fail to make speed: A VFD driven piece of equipment is commanded to go to a specific speed and it does not reach that speed (within a deadband) within an appropriate time delay.

d. Fail to make position: A modulating control valve is commanded to go to a specific position and it does not reach that position (within a bandwidth) within an appropriate time delay.

2. Provide the applicable Equipment Fail alarms for all equipment based on type and I/O available.

E. PID Controllers:

1. The words "PID", "PID Control" "PID Controller" shall mean a control loop feedback mechanism that is a complete function for the described process control and which includes operator adjustable inputs for fine tuning. These terms do not purport to require a prescribed method but to describe a universal function for feedback control. Nevertheless, the Contractor shall furnish a means to control the process smoothly and accurately, complete in all details, using standard good practices, and ready for operation.
2. A manufacturer supplied positional independent PID controller function shall be used when PID is required in the specifications. Other programming shall be provided surrounding the PID function to provide the other functionality specified in this section.
3. The PID controller algorithm parameters DEADBAND, GAIN (Proportional), DELAY, RESET (Integral), REPEATS (Derivative), Loop Update Time, and MINIMUM/MAXIMUM Controller Output shall be adjustable through a password protected screen (accessible at the OIT/SCADA).
4. Each PID controller shall have a faceplate configured with numeric and graphic indication of setpoint, process variable and controller output, AUTO/MAN mode selection (as applicable), means of setpoint entry, and navigation button to access a historical display screen with the setpoint, process variable, and controller output.
5. Process Values and Setpoints shall be scaled from the true engineering range to the required PID range as necessary to provide the full resolution in the calculation of error.
6. The setpoint shall be limited to prevent hazardous process conditions. Range shall be hardcoded in the OIT/SCADA during startup and commissioning.
7. Loop update time of the feedback control shall be coordinated with the analog input module and the requirements of the process.
8. Unless otherwise noted, PID controller outputs are 0 to 100%, linearly scaled to a 4 to 20 mA DC output signal by the PLC.
9. Each PID controller shall be configured for bumpless transfer with anti-windup and anti-reset when switching between manual (or hand) and automatic modes.
10. Each PID controller shall be configured for Bumpless Restart when the controller changes from Program to Run mode or when the controller powers up.
11. Control Value (CV) Clip and Clamp: The PID controller output shall be compared with an adjustable low limit (0% unless otherwise noted) and an adjustable high limit (100% unless otherwise noted). The PID controller output signal will not be lower than the low limit (clamp) or greater than the high limit (clip). If the PID algorithm calculates an output that is out of range, then the

PID algorithm shall cease accumulating error for the integral term until the calculated output is back in range.

12. An alternative algorithm to PID may be used upon written approval by the engineer, the method that is provided shall include equivalent requirements. Where PID or equal is provided, additional provisions shall be made for the control loop to function as described.
13. The AESS shall provide a trend that refreshes appropriately to evaluate the performance of the PID.

F. In the event of an instrument, process analyzer failing, or loss of signal, the PLC shall default to the safest condition to provide a quality product and to not upset the process condition. Failing conditions may be different by instrument type and shall be finalized during construction.
   1. Examples include: A chemical tank, the fail condition from the level instrument should trigger a high level alarm. A level instrument failure in a pump station wet well should go to a low level to not run the pumps dry and the backup float system would activate. A failure of an airflow meter in an aeration tank should hold the last known valid value. A failure of a finish water analyzer at a water plant should fail high to shut down the plant.
   2. An alarm shall be generated as "loss of signal" for that particular instrument/analyzer. If associated with a PID loop, the PID loop shall be automatically place in manual mode with bumpless transfer and anti-windup/anti-reset.

G. Reports: See Section 13443 for requirements.

H. All SCADA Servers, View Nodes, and PLC's shall time sync once a day. A single SCADA Server shall time sync with the NIST server. A Firewall exception policy shall be created to allow for the specific address and protocol.

I. Control Loops
   1. Local LOR/HOA – all local hardware selector switches shall:
      a. In Local or Hand position run the associated equipment to be used in conjunction with Open-Stop-Close pushbuttons or a potentiometer for valve position or VFD speed.
      b. In Off position, Stop the associated equipment
      c. In Remote or Auto position, the control of the associated equipment shall be transferred to the PLC. At the OIT/SCADA the operator shall control the equipment with either a software HOA or both a software HOA and an OSC. The OIT/SCADA system will display the "In Remote" and "Not in Remote" status based on an auxiliary contact in the Remote position. This status shall be displayed near the software selector switch. The same shall apply for "Auto" and "E-stop".
   2. Software LOR/HOA/MOA – all OIT/SCADA software selector switches shall:
      a. In Hand position Run the associated equipment in manual mode whereby an operator can make adjustments with setpoint speed or position entry.
      b. In Off position, Stop the associated equipment from running remotely.
      c. In Remote or Auto, the control of the associated equipment shall be transferred to PLC control as described in the control loop.

d. Related alarms such as Motor High Temperature, E-Stop, etc. shall be displayed as statuses at the LOR/HOA controls or with the equipment status.

3. Local OSC – all valving local hardware selector switches shall:
   a. In Open position change the valve position towards Open
   b. In Stop position remains in position
   c. In Close position change the valve position towards Close
4. Software OSC – all valving software selector switches shall:
   a. Pressing Open will latch the Open command until a Full Open or 100% Open is received
   b. Pressing Stop will interrupt and unlatch any current Open/Close commands
   c. Pressing Close will latch the Close command until a Full Close or 0% Open is received.
5. Flow Totalizing –
   a. All flow meters shall be configured in PLC for flow totalizing with display at OIT/SCADA.
   b. Flow totals shall be configured as both running totals (today, yesterday, lifetime, and resettable).
   c. Systems with more than one flow meter will also have a combined flow totalizer in the same style.
   d. Flow meters from other divisions shall be displayed and totalized similarly.
6. Runtime Hours Totalizing –
   a. All equipment with a Run Status signal shall be configured in the PLC for run hour totalizing with display at OIT/SCADA.
   b. Runtime Hour totals shall be configured as both running totals with a password protected (or higher user privilege) reset and with a separate pushbutton resettable total.
7. Alarms: All alarms shall be displayed and identified:
   a. The specification may assign initial alarm prioritization. Owner and engineer reserve the right to change alarm priority at no cost.
   b. All alarms will be able to be enabled or disabled by SCADA users. Refer to the Security Section below.
   c. All alarms shall be latched upon activation and reset with the Alarm Acknowledge pushbutton unless otherwise specified.
   d. All alarms, unlatching and latching shall be logged in the alarm history.
   e. All alarms shall be able to be enabled or disabled with a button.
   f. Delays – Alarms shall activate if TRUE setpoint exceed for this adjustable time period (0-600 seconds, initially 5s) unless otherwise specified.
8. Analog Alarms: shall be configured at the OIT/SCADA with the following (operator adjustable):
   a. Low and High Setpoints as specified in specific loops below
   b. Low-Low and High-High Setpoints as specified in specific loops below.

9. Digital Alarms: all alarms noted as such or as other (fault, overload, fail, E-Stop, etc.) on drawings as shall be configured at the OIT/SCADA with the following (operator adjustable):
10. Alarm Dialing: Refer to Alarms above.
11. Security: Some alarms will only be able to have the setpoints changed, enabled or disabled by Supervisor account levels or higher. These will be identified in the narratives, Owner and engineer reserve the right to change alarm priority at no cost
12. Timer modes: Any control that requires a duration setpoint shall include a countdown displayed value to indicate to the operator the length of time until the mode expires or starts.
13. Totalizer modes: Any control that requires a totalized setpoint shall include a current total displayed value to indicate to the operator the current progress towards the setpoint.
14. PLC Failure Mode: Upon PLC failure, all discrete outputs shall de-energize to an off condition.
15. Mode or equipment selections shall be selected by a description. Selecting a number associated with a selection shall not be acceptable.

J. Logging & Auditing:
1. Develop a user friendly interface with logging.
2. Logging shall include at a minimum, user access, process setpoint changes, and process control changes (E.g. turning equipment from Auto to Hand, or speed changes). Log shall include the user, the action, and the timestamp at a minimum.
3. Logs shall be continuous, and not require the operator to go to more than 1 file per month.

K. Integration of Division 11 Control Panels
1. Standard Functionality - Control Panels provided by others shall be integrated to provide controls equivalent to the OIT control provided by the Division 11 manufacturer.
2. Enhanced Functionality – Communications, calculations, and any other additional provisions shall be made as necessary to meet the requirements listed in the CONTROL DESCRIPTIONS.

L. Emergency Standby Power:
1. The Application Engineering Services Supplier shall provide programming of time delays to stagger restarting of equipment and loads as sequenced in Section 16620 – Diesel Generators.
2. The adjustment, sequencing, and staging of the loads will be adjustable by Supervisor account levels or higher.

M. Reading/Writing across the Network– Provisions shall be made such that multiple points of access have the ability to change setpoints and modes. This functionality shall be furnished such the setpoint or command will automatically reset and the operator does not have to intervene. The setpoint or command shall change to a value that does not have control in the system once the required change is made.

3.2 CONTROL PANEL DESCRIPTIONS – COMMUNICATIONS

A. The following is a general description of communication and network monitoring.

B. SCADA shall activate a Loss of Communication Alarm in the event of communication loss across the network(s) to any of the networked PLCs.
C. SCADA shall activate a SCADA Server Failover Alarm if the SCADA servers Primary and Secondary status are altered.
D. Alarms at SCADA:

3.3 CONTROL PANEL DESCRIPTIONS – GENERAL VFD AND MOTOR STARTER DRIVEN EQUIPMENT AND VALVE ACTUATORS

A. The following is a general description of VFD and motor driven equipment as well as modulating actuators. Refer to individual loop numbers for specifics.
B. General VFD driven equipment.
    1. PLC Control:
        a. Monitoring:
            i. The status of the drive shall be displayed at SCADA as RUN/STOP based on the run status contact. The PLC shall totalize the run time hours.
            ii. The PLC shall activate a Motor High Temp Alarm when the contact activates (fixed delay of 5s).
            iii. The PLC shall activate a Pump Seal Leak Warning when the contact activates (fixed delay of 5s).
            iv. The PLC shall activate a VFD Fault Alarm when the Fault contact activates (fixed delay of 5s).
            v. The PLC shall activate an E-Stop Alarm when the contact activates (fixed delay of 1s).
            vi. The PLC shall monitor, display, and trend the speed feedback of the VFD (0.0-100.0%).
            vii. The PLC shall monitor, display, and trend the load feedback of the VFD (0.0-100.0%).
            viii. The PLC shall activate a Pump High Load Alarm when the load exceeds an operator adjustable setpoint (0.0–100.0%, initially 80.0) (delay 0-600s, initially 60s).
            ix. The PLC will monitor and display the status of the Remote position of the LCS LOR.
        b. Activation:
            i. The Operator shall be able to set a VFD Minimum and Maximum Speed (0.0-100.0%, initially 60.0% & 100.0%).
            ii. A Fail Alarm shall be activated if the equipment is available and PLC attempts to start the equipment and the return run contact does not indicate that the motor is running (fixed delay of 60s).
            iii. The equipment shall have a virtual Manual/Off/Auto switch. In Off, the pump shall not run. In Manual, the pump shall run at an operator adjustable VFD speed setpoint (0.0-100.0%).
            iv. Refer to specific control narratives for additional functions.
    2. Alarms at OIT/SCADA:
        a. Refer to specific control narratives
    3. Monitoring at OIT/SCADA:
        a. Refer to specific control narratives

C. General Motor Starter driven equipment.
   1. PLC Control:
      a. Monitoring:
         i. The status of the drive shall be displayed at SCADA as RUN/STOP based on the run status contact. The PLC shall totalize the run time hours.
         ii. The PLC shall activate a Motor High Temp Alarm when the contact activates (fixed delay of 5s).
         iii. The PLC shall activate a Pump Seal Leak Warning when the contact activates (fixed delay of 5s).
         iv. The PLC shall activate an O/L Alarm when the O/L contact activates (fixed delay of 5s).
         v. The PLC shall activate an E-Stop Alarm when the contact activates (fixed delay of 1s).
         vi. The PLC will monitor and display the status of the Remote position of the LCS LOR.
      b. Activation:
         i. A Fail Alarm shall be activated if the equipment is available and PLC attempts to start the equipment and the return run contact does not indicate that the motor is running (fixed delay of 60s).
         ii. The equipment shall have a virtual Manual/Off/Auto switch. In Off, the pump shall not run.
         iii. Refer to specific control narratives for additional functions.
   2. Alarms at OIT/SCADA:
      a. Refer to specific control narratives
   3. Monitoring at OIT/SCADA:
      a. Refer to specific

3.4 CONTROL NARRATIVES CONTROL DESCRIPTION – DEWATERING CONTROL PANEL

A. Loop 6603 – Dewatering Control Panel (DWCP)
   1. General: One status light will be on the face of the Control Panel to provide an indication of the panel power status. The PLC generates one latching alarm that shall illuminate lights on the face of the panel. A Reset pushbutton on the panel or at the HMI/SCADA shall unlatch the alarms. A maintenance bypass switch shall be mounted on the face of the control panel. An UPS Fail and Surge device shall be mounted to the back of the control panel.
   2. Panel Control definitions are defined on the Instrument Drawing I-1.
      a. Normal Power Indicator Light (YL-6603A)
      b. Common Alarm Indicator Light (AL-6603A)
      c. PLC Fail Alarm (AL-6603B)
      d. Reset Pushbutton (HS-6603A)
      e. Maintenance Bypass Switch (HS-6603B)
      f. UPS Fail Relay (EY-6603)
      g. UPS Power Indicator Light (YL-6603B)
      h. Surge Detection (ESH-6603)
      i. Managed Ethernet Switch Fault (AL-6603C)

3. Local Control:
    a. The Normal Power indicating light (YL-6603A) shall be illuminated and a power fail relay shall be energized when the control panel is powered from an external 120 VAC power circuit.
    b. When power from the external 120 VAC circuit is lost and the control panel is powered by the UPS, the power fail relay will de-energize and the Normal Power indicating light shall not be illuminated.
4. PLC:
    a. The PLC shall monitor the power failure contact, and shall activate the Control Panel Power Fail alarm if an adjustable on-delay timer expires (0 to 600 seconds, initially 60 seconds).
    b. The PLC shall output a common alarm if any of the alarms configured in the PLC program are active. This common alarm output shall activate the Common Alarm indicating light on the panel (AL-6603A).
    c. The contact state of the reset pushbutton (HS-6603A) shall be monitored by the PLC. When pushed, hardwired control shall reset the PLC Fail and the PLC shall unlatch the Common Alarm if the alarm condition has returned to normal.
    d. The PLC shall monitor the UPS battery failure/fault condition contact (EY-6603), and shall activate an alarm if an adjustable on-delay timer expires (0 to 60 seconds, initially 10 seconds).
    e. The PLC shall monitor the Surge condition contact (ESH-6603), and shall activate an alarm if a normally closed contact is opens.
5. Alarms at HMI/SCADA:
    a. Power Fail Alarm
    b. Common Alarm
6. Monitoring and Control at SCADA:
    a. Reset Pushbutton
    b. UPS Battery Failure
    c. Surge Detection
    d. Maintenance Bypass Switch

B. Loops 6610 to 6612 – Waste Activated Sludge Transfer Pumps
1. General: Three (3) new pumps (WSTP-1, WSTP-2, WSTP-3) will be driven by new VFDs. The pumps will operate in an alternating Lead-Standby-Lead sequence.
2. Local:
    a. Each pump has a new local control station provided. The following local controls and indications will be located at LCS-6610, -6611, -6612 respectively:
        i. Speed Potentiometer (HSC-6610, -6611, -6612)
        ii. Local-Off-Remote (LOR) Switch (HS-6610B, -6611B, -6612B)
            (1) In the Local position the equipment will run continuously. Speed will be controlled by the speed potentiometer when the switch is in the Local position.
            (2) In the Off position the equipment will not run.
            (3) In the Remote position the equipment will be controlled by

the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.

iii. Estop (HS-6610A, -6611A, -6612A)
   (1) The Estop will directly shut down the equipment.
   (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.

iv. Run Light (YL-6610A, -6611A, -6612A)

3. VFD:
   a. The following controls and indications shall be located at the VFD for each Pump:
      i. Elapsed Time Meter (KQI-6610, -6611, -6612)
      ii. Run Light (YL-6610B, -6611B, -6612B)
      iii. Seal Fail Warning Light (LAH-6610, -6611, -6612)
      iv. Motor High Temperature Alarm Light (TAH-6610, -6611, -6612)
      v. Motor High Temperature Interlock Reset (HS-6610C, -6611C, -6612C)
      vi. Motor Fault Alarm Light (AL-6610A, -6611A, -6612A)
   b. Each VFD shall report the following to the PLC:
      i. Run Status
      ii. VFD Fault
      iii. Speed Feedback
      iv. Amps
      v. Seal Fail
      vi. Motor High Temperature
   c. The PLC shall report the following to the VFD:
      i. Start Command
      ii. Speed Command
4. Hardware Interlocks:
   a. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
   b. Motor Seal Leak shall provide a hardwired shutdown of the starter.
   c. Estop shall provide a hardwired shutdown of the starter.
5. PLC Control Functions:
   a. The PLC shall monitor the return run status, VFD Fault, Seal Fail Warning, and Motor High Temperature Alarm from each VFD.
   b. The PLC shall monitor the Estop status and LOR in Local from each local control station.

c. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor speed. Motor speed shall be displayed at the OIT and SCADA and historically trended at SCADA only.
d. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor amps. Motor amps shall be displayed at the OIT and SCADA and historically trended at SCADA only.
e. The PLC shall monitor the Requested Flow Setpoint from Division 11 Gravity Belt Thickener. Refer to Section 3.5.
f. Pump Control:
    i. The PLC shall provide a virtual Local/Off/Remote selector switch for each pump at the OIT. In Local, the pump shall start, and the operator shall enter in a speed setpoint. In Off, the pump shall not run. In Remote, the pump shall pace itself based on the Gravity Belt Thickener Flow Loops 6620 and 6621.
    ii. The Pumps shall operate in a Lead/Standby/Lead sequence. WSTP-1, 3 shall feed GBT-1, 2 respectfully. WSTP-2 shall act as a swing pump to support either gravity belt thickener. The operator will designate which main pump will be supported by the Standby Pumps through the OIT. The Lead/Standby/Lead status of each Pump shall be displayed at the OIT and SCADA.
    iii. Pump speed will be based on the Gravity Belt Thickener Requested Flow received through ethernet connection by the Gravity Belt Thickener Panel. WSTP-1 shall feed FE/FIT-6620 and WSTP-3 shall feed FE/FIT-6621. WSTP-2 shall have pipe isolation as to act like a swing pump to support standby operation for either gravity belt thickener once flow has exceeded an operator adjustable setpoint. The operator will be able to select minimum and maximum speed, for each pump, at the OIT. When in Auto the PLC will control the speed of the pumps to meet the requested flow demand.
    iv. The Lead pumps shall be called to shut down by the Division 11 Gravity Belt Thickener or if the sludge tank exceeds it Low-Low setpoint from either the float or pressure transducer.
    v. Pump speed shall be scaled 0-100% as the VFD frequency output goes from 0-60 Hz.

6. Alarms at OIT:
    a. WSTP-1, 2, 3 Emergency Stop
    b. WSTP-1, 2, 3 Motor High Temperature
    c. WSTP-1, 2, 3 VFD Fault
    d. WSTP-1, 2, 3 Fail to Start
    e. WSTP-1, 2, 3 Seal Fail
    f. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
7. Monitoring and Control at OIT/SCADA:
    a. WSTP-1, 2, 3 Run Status
    b. WSTP-1, 2, 3 Speed (0-100%)
    c. WSTP-1, 2, 3 Speed Historical Trend (SCADA only)
    d. WSTP-1, 2, 3 LOR Enable/Not In Remote Status

e. WSTP-1, 2, 3 Virtual LOR Selector Switch
f. WSTP-1, 2, 3 Elapsed Time Meter (###### hours)
g. WSTP-1, 2, 3 Start Command
h. WSTP-1, 2, 3 Manual Speed Setpoint (0-100%)
i. WSTP-1, 2, 3 Lead/Standby/Lead Status
j. Gravity Belt Thickener Requested Flow
k. Virtual Lead/Standby/Lead Selection
l. Enable/Disable Automatic Standby Support
m. WSTP-1, 2, 3 Amps
n. WSTP-1, 2, 3 Amps Historical Trend (SCADA only)

C. Loops 6620 and 6621 – Gravity Belt Thickener Flow
1. General: WAS transfer pump station effluent flow will be monitored by two new 8 inch magnetic flow meter. WSTP-1 will be monitored by FE/FIT-6620. WSTP-3 will be monitored by FE/FIT-6621. WSTP-2 will have piping isolation as to support standby for either flow meter.
2. Field Instruments:
a. Magnetic Flow Meter No.1 (FE/FIT-6620)
b. Magnetic Flow Meter No.2 (FE/FIT-6621)
3. PLC:
a. Each flow meter shall measure the flow through its designated discharge pipe. A 4-20mA signal will be sent to the PLC from each flow meter corresponding to flow rate. The flow rate will be displayed at OIT-DWCP and SCADA and historically trended at SCADA only.
b. The PLC shall totalize the flow from FE/FIT-6620, 6621 based on a pulse output from the flow transmitters. The transmitter pulse outputs shall initially be set to 1 pulse per 100 gallons. The following totalized flows shall be displayed at the OIT:
i. Current 24 hour period (start at 12:00 midnight)
ii. Previous 24 hour period (midnight to midnight)
iii. Totalized Flow (millions of gallons)
4. Alarms at OIT:
a. While any pump is running, the PLC will activate an operator adjustable low flow alarm at the OIT after an operator adjustable time delay.
b. Low Flow Alarm Setpoint (0-500 gpm initially set at 200 gpm) and Time Delay (0-300 seconds, set at 60 seconds)
c. Low Flow Alarm
5. Monitoring and Control at OIT/SCADA:
a. Effluent Flow Rate (0-6000 gpm)
b. Effluent Flow Historical Trend (SCADA only)
c. Current 24 hr Period Totalized Flow (##### gallons)
d. Previous 24 hr Period Totalized Flow (##### gallons)

D. Loop 6660 – Thickened Sludge Level
1. General: The thickened sludge level in the Sludge Holding Tank shall be monitored by one submersible pressure transducer. The level shall be displayed at level indicators at the Sludge Holding Tank and at the OIT. A High-High and a Low-Low level float switch and a submersible pressure transducer in the tank

will control the thickened sludge mixer, MOV-6667, 6668 and alarms. If the primary submersible pressure transducer fails (equal to or less than 4 mA signal or loss of signal) the PLC will automatically switch to the other level measurement system and will use these levels signal for mixer and pump control.

2. Field Instruments:
   a. Submersible Pressure Transducers (LE/LIT-6660)
   b. High-High Level Float Switch (LSHH-6660)
   c. Low-Low Level Float Switch (LSLL-6660)
3. Interlocks:
   a. None
4. PLC Control Functions:
   a. The PLC shall monitor the submersible pressure transducer (LE/LIT-6660) and measure the thickened sludge level in the holding tank from 0.00 to 15.00 feet and send a 4-20 mA signal to the PLC.
   b. The PLC shall display tank level on the OIT graphically as a percentage (0-100%) and as a level measurement in feet (##.## feet) from the bottom of the tank. The operator shall be able to enter an adjustable Tank Level Offset (0.00 to 5.00 feet) for each tank which shall be added by the PLC to the level signal from the submersible pressure transducers.
   c. If the tank level(s) rise above the High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue a warning. The PLC shall latch the alarm and shall require reset on OIT.
   d. If the tank level(s) rise above the High-High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The High-High Tank Level Setpoint shall be received either from the tank's pressure transducer or High-High float switch. The PLC shall latch the alarm and shall require reset on OIT.
   e. If the tank level(s) drop below the Low Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue a warning. The PLC shall latch the alarm and shall require reset on OIT. The PLC shall send a command to turn off all Thickened Sludge Mixers.
   f. If the tank level(s) drops below the Low-Low Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The Low-Low Tank Level Setpoint shall be received either from the tank's pressure transducer or Low-Low float switch. The PLC shall latch the alarm and shall require reset on OIT. The PLC shall send a command to turn off all Thickened Sludge Mixers and all Thickened Waste Sludge Grinders.
   g. The PLC shall monitor the status of Tank High-High level float switch.
   h. The PLC shall monitor the status of Tank Low-Low level float switch.
5. Alarms at OIT/SCADA:
   a. High-High Level Alarm, Setpoints, and Time Delays
   b. High Level Alarm Setpoints, and Time Delays

c. Low Level Alarm Setpoints, and Time Delays
d. Low-Low Level Alarm Setpoints, and Time Delays
e. High-High Level Float Alarm
f. Low-Low Level Float Alarms
g. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)

6. Monitoring and Control at OIT/SCADA:
   a. Tank Level (0.00-15.00 ft)
   b. Tank Level (0-100%)
   c. Level Control Setpoint (2.00-15.00 ft)
   d. Level PID Parameters with Virtual Manual/Auto Operation
   e. Tank Level Historical Trend (SCADA only)
   f. Graphical Level from Tank Level Sensor (% full)

E. Loops 6661 to 6664 – Thickened Sludge Mixer
   1. General: Four (4) thickened sludge mixer will start/stop either locally or remotely from the SCADA system. The mixers will be driven by a motor starter with a Reset Hand Switch (HS-6661C, 6662C, 6663C, 6664C) located at the MCC.
   2. Interlocks:
      a. Motor Starter Overload shall provide a hardwired shutdown of the starter.
      b. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
      c. Motor Seal Leak shall provide a hardwired shutdown of the starter.
      d. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
   3. Local:
      a. The mixer has a new local control station provided by Division 16. The following local controls and indications will be located at LCS-6661, 6662, 6663, 6664 respectively:
         i. Local-Off-Remote (LOR) Switch (HS-6661B, 6662B, 6663B, 6664B)
            (1) In the Local position the equipment will run at full speed.
            (2) In the Off position the equipment will not run.
            (3) In the Remote position the equipment will be controlled by the PLC. In Remote Off, the mixer will not run except at the LCS. The equipment shall be displayed as REMOTE OFF at the OIT and SCADA. In Remote Auto, the mixer will operate as specified below.
         ii. Estop (HS-6661A, 6662A, 6663A, 6664A)
            (1) The Estop will directly shut down the equipment.
            (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
         iii. Run Light (YL-6661A, 6662A, 6663A, 6664A)
   4. Field Instruments:
      a. None
   5. PLC:
      a. Thickened Sludge Mixer Monitoring:

i. The PLC shall monitor the Running status of the mixer. The status shall be displayed at SCADA as RUN/STOP based on the run status. The PLC will totalize the run time hours.
ii. A mixer Fail-to-Start Alarm shall be activated if the mixer is in On and the PLC attempts to start the mixer and the return Run contact does not indicate that the mixers is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.
iii. The PLC shall activate a mixer High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.
iv. The PLC shall activate a mixer O/L Alarm when the O/L contact activates (fixed delay of 2s). The Run command shall be removed.
v. The PLC shall activate a mixer Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s). The Run command shall be removed.
vi. The PLC shall activate a mixer Emergency Stop Alarm when the Emergency Stop contact de-activates. The PLC shall remove the run command upon alarm (fixed delay of 1s).

b. Thickened Sludge Mixer Activation:
i. The PLC shall control the mixer when the Local/Off/Remote Selector Switch is in the Remote Position.
ii. In Remote-Auto, the mixer will run unless a fault occurs or the thickened sludge tank level goes below the Low-Low Tank Level setpoint from either the submersible transducer or Low-Low Float Switch. The equipment shall be displayed as ENABLE at the OIT and SCADA.
iii. The PLC shall provide virtual On/Off Selector Switch control for the mixer at SCADA. In Off, the Mixer will not run. In Hand the mixers will run.

6. SCADA Alarm Functions:
a. Start Fail
b. High Motor Temperature
c. Motor Overload
d. Motor Seal Leak
e. Emergency Stop
f. Adjustable Enable / Delay / Setpoints for each warning and alarm

7. SCADA Monitoring and control Functions:
a. Mixer Run Status and Totalizer
b. Mixer Virtual Off/On
c. Mixer LOR Selector Switch
d. Mixer Virtual LOR Selector Switch
e. Mixer Start Command

F. Loops 6665 and 6666 – Influent Waste Sludge Motor Operated Valve
1. General: Two new flow control plug valves will be used to control the flow from North and South RAS. The valves will be controlled by a position selector on the OIT and SCADA.

2. Instruments:
    a. None
3. Control Elements:
    a. MOV No.1 – 6665 Influent North WAS Valve
    b. MOV No.2 – 6666 Influent South WAS Valve
4. Hardware Interlocks:
    a. None
5. Local:
    a. Each flow control valve has an integrated local control station provided by the valve manufacture that contains the following controls.
        i. Local-Off-Remote (LOR) Valve Controls (HS-6665A, 6666A)
            (1) In the Local position the equipment will be controlled by the associated Open-Stop-Close (OSC) selector switch (HS-6665B, 6666B)
            (2) In the Off position the valve will maintain its last position.
            (3) In the Remote position the equipment will be controlled remotely by the PLC. When in Remote Off the valve will maintain its last position and will not operate except at the LCS, In Remote Auto, the valve position will be controlled by a position selector on the OIT/SCADA.
        ii. Position Indication and Control (ZIC-6665, 6666)
6. PLC Control Functions:
    a. Valve Controls:
        i. The PLC shall provide a virtual Local/Off/Remote selector switch. In SCADA Manual, the valve shall be set to an operator adjustable position with virtual Open-Stop-Close push buttons on HMI/SCADA.
        ii. In Off, the valve shall maintain its last position.
        iii. In Remote, the valve position will be controlled by a position selector on the OIT/SCADA.
    b. In Auto, the valve position will be controlled by a position selector on the OIT/SCADA. The PLC shall send a FULL CLOSE command to MOV-6665, 6666 and shall display FULL CLOSE when the waste sludge tank level exceeds the High-High Tank Level Setpoint from either submersible transducer or High-High Float Switch. The PLC shall send a FULL OPEN command to MOV-6665, 6666 and shall display FULL OPEN at a user adjustable setpoint. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
7. Alarms at SCADA:
    a. MOV-6665, 6666 Faulted Alarm
8. Monitoring and Control at SCADA:
    a. MOV-6665, 6666 Full Open
    b. MOV-6665, 6666 Full Closed
    c. MOV-6665, 6666 Open Command

d. MOV-6665, 6666 Close Command
e. MOV-6665, 6666 In Remote/Not in Remote
f. MOV-6665, 6666 LOR Selector Switch
g. MOV-6665, 6666 LOR Virtual Selector
h. MOV-6665, 6666 Open/Stop/Close Virtual Pushbuttons

G. Loops 6667 and 6668 – Influent Thickened Sludge Motor Operated Valve

1. General: Two new flow control plug valves will be used to control the flow of waste activated sludge from the North and South RAS. The valves will be controlled by a position selector on the OIT and SCADA.
2. Instruments:
   a. None
3. Control Elements:
   a. MOV No.1 – 6667 Influent North WAS Valve
   b. MOV No.2 – 6666 Influent South WAS Valve
4. Hardware Interlocks:
   a. None
5. Local:
   a. Each flow control valve has an integrated local control station provided by the valve manufacture that contains the following controls.
      i. Local-Off-Remote (LOR) Valve Controls (HS-6667A, -6668A)
         (1) In the Local position the equipment will be controlled by the associated Open-Stop-Close (OSC) selector switch (HS-6667B, -6668B)
         (2) In the Off position the valve will maintain its last position.
         (3) In the Remote position the equipment will be controlled remotely by the PLC. When in Remote Off the valve will maintain its last position and will not operate except at the LCS, in Remote Auto the valve position will be controlled by a position selector on the OIT/SCADA.
      ii. Position Indication and Control (ZIC-6667, 6668)
6. PLC Control Functions:
   a. Valve Controls:
      i. The PLC shall provide a virtual Local/Off/Remote selector switch. In SCADA Manual, the valve shall be set to an operator adjustable position with virtual Open-Stop-Close push buttons on HMI/SCADA.
      ii. In Off, the valve shall maintain its last position.
      iii. In Auto, the valve position will be controlled by a position selector on the OIT/SCADA. The PLC shall send a FULL CLOSE command to MOV-6667, 6668 and shall display FULL CLOSE when the thickened sludge tank level exceeds the High-High Tank Level Setpoint from either the tanks pressure transducer or High-High Float Switch. The PLC shall never open MOV-6667, 6668 automatically. Operator shall open said valves manually. The PLC shall display FULL OPEN when the FULL OPEN position signal is received by the instrument. When the switch is in the Remote

position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.

7. Alarms at SCADA:
   a. MOV-6667, 6668 Faulted Alarm
8. Monitoring and Control at SCADA:
   a. MOV-6667, 6668 Full Open
   b. MOV-6667, 6668 Full Closed
   c. MOV-6667, 6668 Open Command
   d. MOV-6667, 6668 Close Command
   e. MOV-6667, 6668 In Remote/Auto - Not in Remote/Auto
   f. MOV-6667, 6668 LOR Selector Switch
   g. MOV-6667, 6668 LOR Virtual Selector
   h. MOV-6667, 6668 Open/Stop/Close Virtual Pushbuttons

H. Loop 6670 – Waste Sludge Level

1. General: The waste sludge level in the sludge holding tank shall be monitored by one submersible pressure transducer. The levels shall be displayed at level indicators at the Waste Sludge Holding Tank and at the OIT. A High-High and a Low-Low level float switch in the tank will activate the waste sludge mixer, MOV-6665, 6666 and alarms. If the primary submersible pressure transducer fails (equal to or less than 4 mA signal or loss of signal) the PLC will automatically switch to the other level measurement system and will use this level signal for pump control.
2. Field Instruments:
   a. Submersible Pressure Transducers (LE/LIT-6670)
   b. High-High Level Float Switch (LSHH-6670)
   c. Low-Low Level Float Switch (LSLL-6670)
3. Interlocks:
   a. None
4. PLC Control Functions:
   a. The PLC shall monitor the submersible pressure transducer (LE/LIT-6670) and measure the waste sludge level in the holding tank from 0.00 to 15.00 feet and send a 4-20 mA signal to the PLC.
   b. The PLC shall display tank level on the OIT graphically as a percentage (0-100%) and as a level measurement in feet (##.## feet) from the bottom of the tank. The operator shall be able to enter an adjustable Tank Level Offset (0.00 to 5.00 feet) for each tank which shall be added by the PLC to the level signal from the submersible pressure transducers.
   c. If the tank level(s) rise above the High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.
   d. If the tank level(s) rise above the High-High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall

issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.

e. If the tank level(s) drop below the Low Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT. The PLC shall send a command to turn off all Waste Sludge Mixers.
f. If the tank level(s) drop below the Low-Low tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT. The PLC shall send a command to turn off all Waste Sludge Mixers and Waste Activated Sludge Pumps.
g. The PLC shall monitor the status of Tank High-High level float switch.
h. The PLC shall monitor the status of Tank Low-Low level float switch.

5. Alarms at OIT/SCADA:
   a. High-High Level Alarm, Setpoints, and Time Delays
   b. High-Level Alarm Setpoints, and Time Delays
   c. Low Level Alarm Setpoints, and Time Delays
   d. Low-Low Level Alarm Setpoints, and Time Delays
   e. Tank High-High Level Float Alarm
   f. Tank Low-Low Level Float Alarms
   g. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
6. Monitoring and Control at OIT/SCADA:
   a. Tank Level (0.00-15.00 ft)
   b. Tank Level (0-100%)
   c. Level Control Setpoint (2.00-15.00 ft)
   d. Level PID Parameters with Virtual Manual/Auto Operation
   e. Tank Level Historical Trend (SCADA only)
   f. Graphical Level from Tank Level Sensor (% full)

I. Loops 6671 and 6672 - Waste Sludge Mixers
1. General: Two (2) waste sludge mixer will start/stop either locally or remotely from the SCADA system. The mixers will be driven by a motor starter with a Reset Hand Switch (HS-6671C, 6672C) located at the MCC.
2. Interlocks:
   a. Motor Starter Overload shall provide a hardwired shutdown of the starter.
   b. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
   c. Moter Seal Leak shall provide a hardwired shutdown of the starter.
   d. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
3. Local:
   a. The mixer has a new local control station provided by Division 16. The following local controls and indications will be located at LCS-6671, 6672 respectively:
      i. Local-Off-Remote (LOR) Switch (HS-6671B, 6672B)
         (1) In the Local position the equipment will run at full speed.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC. In Remote Off, the mixer will not run except at the

LCS. The equipment shall be displayed as REMOTE OFF at the OIT and SCADA. In Remote Auto, the mixer will operate as specified in this section below.

ii. Estop (HS-6671A, 6672A)
   (1) The Estop will directly shut down the equipment.
   (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.

iii. Run Light (YL-6671A, 6672A)

4. Field Instruments:
   a. None
5. PLC:
   a. Waste Sludge Mixer Monitoring:
      i. The PLC shall monitor the Running status of the mixer. The status shall be displayed at SCADA as RUN/STOP based on the run status. The PLC will totalize the run time hours.
      ii. A mixer Fail-to-Start Alarm shall be activated if the mixer is in Remote and the PLC attempts to start the mixer and the return Run contact does not indicate that the mixer is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.
      iii. The PLC shall activate a mixer High Motor Temperature Alarm when the high motor temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.
      iv. The PLC shall activate a mixer O/L Alarm when the O/L contact activates (fixed delay of 2s). The Run command shall be removed.
      v. The PLC shall activate a mixer Seal Leak Alarm when the Seal Leak contact activates (fixed delay of 2s). The Run command shall be removed.
      vi. The PLC shall activate an Emergency Stop Alarm when the Emergency Stop contact de-activates (fixed delay of 1s). The PLC shall remove the run command upon alarm (fixed delay of 1s).
   b. Waste Sludge Mixer Activation:
      i. The PLC shall control the mixer when the Local/Off/Auto Selector Switch is in the Remote Position.
      ii. In Auto, the mixer will run unless a fault occurs or the waste sludge level goes below the Low-Low Tank Level setpoint from either the submersible transducer or Low-Low Float Switch. The equipment shall be displayed as ENABLE at the OIT and SCADA.
      iii. The PLC shall provide virtual On/Off Selector Switch control for the mixer at SCADA. In Off, the Mixer will not run. In Hand the mixers will run.
6. SCADA Alarm Functions:
   a. Start Fail
   b. High Motor Temperature
   c. Motor Overload

d. Emergency Stop
e. Adjustable Enable / Delay / Setpoints for each warning and alarm

7. SCADA Monitoring and control Functions:
   a. Mixer Run Status and Totalizer
   b. Mixer Virtual Off/On
   c. Mixer Start Command
   d. Mixer LOR Selector Switch
   e. Mixer LOR Virtual Switch

J. Loops 6680 to 6682 – Thickened Waste Sludge Grinder

1. General: There are three (3) existing thickened waste sludge grinders (TWSG). Each grinder shall get new controls at an existing local control panel.
2. Interlocks:
   a. Grinder Start comment shall provide a hardwired startup of the thickened waste sludge pump starter.
3. Field Instruments:
   a. None
4. Control Panel:
   a. The grinder has an existing control panel. The following new controls and indications will be located at the Grinder Control Panel. This panel will monitor the three (3) new grinders (TWSG-6680, 6681, 6682):
      i. Local-Off-Remote (LOR) Switch (HS-6680A, -6681A, -6682A)
         (1) In the Local position the equipment will run continuously speed.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC. In Remote Off, the grinder will not run except at the CP. The equipment shall be displayed as REMOTE OFF at the OIT and SCADA. In Remote Auto, the grinder will run after a user adjustable timer (0-60s) once the Thickened Waste Sludge Pumps start, unless a fault occurs. The grinder will have a post run adjustable timer (0-60s) once the Thickened Waste Sludge Pumps are called to stop. The equipment shall be displayed as ENABLE at the OIT and SCADA.
      ii. Estop (HS-6680B, -6681B, -6682B)
         (1) The Estop will directly shut down the equipment.
         (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
      iii. Reset (HS-6680C, -6681C, -6682C)
         (1) When depressed, the resent button will reset all faults and alarms to their default status.
      iv. Power Light (YL-6680A, -6681A, -6682A)
      v. Run Light (YL-6680B, -6681B, -6682B)
      vi. Jam Alarm Light (AL-6680A, -6681A, -6682A)

vii. Fault Alarm Light (AL-6680B, -6681B, -6682B)
viii. High Temperature Alarm Light (AL-6680C, -6681C, -6682C)

5. PLC:
   a. Sludge Grinder Monitoring:
      i. The PLC shall monitor the Running status of the grinder. The status shall be displayed at SCADA as RUN/STOP based on the run status.
      ii. A grinder Fault Alarm shall be activated if the grinder is in Remote and the PLC attempts to start the grinder and the return Run contact does not indicate that the mixer is running (delay 0-60s, initially 15s).
      iii. The PLC shall activate a grinder High Motor Temperature Alarm when the high motor temperature contact switch opens (fixed delay of 2s).
      iv. The PLC shall activate a Jam Alarm when the return Run contact is received but no motion is detected (fixed delay of 2s).
      v. The PLC shall activate an Emergency Stop Alarm when the Emergency Stop contact de-activates (fixed delay of 1s).
      vi. The PLC shall monitor the power failure contact and shall activate the Control Panel Power Fail alarm if an adjustable on-delay timer expires (0 to 600 seconds, initially 60 seconds).
   b. Sludge Grinder Activation:
      i. The PLC shall control the grinder when the Local/Off/Remote Selector Switch is in the Remote Position.
      ii. The PLC shall provide virtual Local/Off/Remote Selector Switch control for the grinder at SCADA. In Off, the grinder will not run. In Local the grinder will run continuously. In Remote, the grinder will run at the same time as the Thickened Waste Sludge Pumps unless a fault occurs. The equipment shall be displayed as ENABLE at the OIT and SCADA
      iii. A grinder Fault Alarm shall be activated if the grinder is in Remote and the PLC attempts to start the grinder and the return Run contact does not indicate that the grinder is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.
      iv. A grinder Jam Alarm shall be activated if the grinder receives the Run contact, but no motion is detected in the grinder (fixed delay of 2s). The PLC shall remove the run command upon alarm.
      v. The PLC shall activate a grinder High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.
      vi. The PLC shall activate a grinder Emergency Stop Alarm when the Emergency Stop contact de-activates. The PLC shall remove the run command upon alarm (fixed delay of 1s).

6. SCADA Alarm Functions:
   a. Grinder Jam Alarm
   b. Grinder Fault
   c. Fail-to-Start

d. Emergency Stop
e. High Motor Temperature

7. SCADA Monitoring and Control Functions:
   a. Grinder Start Command
   b. Grinder Run Status
   c. Grinder Power Status
   d. Grinder in Remote
   e. Grinder LOR Selector Switch
   f. Grinder LOR Switch

K. Loops 6683 to 6685 – Thickened Waste Sludge Pump

1. General: Three (3) new pumps (TWSP-1, TWSP-2, TWSP-3) will be driven by new VFDs. The pumps will operate in an alternating Lead-Lag-Standby sequence.
2. Local:
   a. Each pump has a new local control station provided. The following local controls and indications will be located at LCS-6683, -6684, -6685 respectively:
      i. Speed Potentiometer (HSC-6683, -6684, -6685)
      ii. Local-Off-Remote (LOR) Switch (HS-6683B, -6684B, -6685B)
         (1) In the Local position the equipment will run continuously speed. Speed will be controlled by the speed potentiometer when the switch is in the Local position.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is in not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
      iii. Estop (HS-6683A, -6684A, -6685A)
         (1) The Estop will directly shut down the equipment.
         (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
      iv. Run Light (YL-6683A, -6684A, -6685A)
3. VFD:
   a. The following controls and indications shall be located at the VFD for each Pump:
      i. Elapsed Time Meter (KQI-6683, -6684, -6685)
      ii. Run Light (YL-6683B, -6684B, -6685B)
      iii. Motor Fault Alame (AL-6683, -6684, -6685)
   b. Each VFD shall report the following to the PLC:

i. Run Status
ii. VFD Fault
iii. Speed
iv. Remote Status
v. E-Stop

c. The PLC shall report the following to the VFD:
i. Start Command
ii. Speed Command

4. Hardware Interlocks:
a. Motor Low Seal Pressure shall provide a hardwired shutdown of the starter.
b. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
c. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
d. Low Suction Pressure shall provide a hardwired shutdown of the starter.
e. High Discharge Pressure shall provide a hardwired shutdown of the starter.

5. PLC Control Functions:
a. The PLC shall monitor the return run status, VFD Fault, and Motor High Temperature Alarm from each VFD.
b. The PLC shall monitor the Estop status and LOR in Local from each local control station.
c. The PLC shall monitor the Low Seal Pressure, Low Suction Pressure and High Discharge Pressure switch associated to each pump.
d. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor speed. Motor speed shall be displayed at the OIT and SCADA and historically trended at SCADA only.
e. Pump Control:
i. The PLC shall provide a virtual Manual/Off/Auto selector switch. In Manual, the pump shall start, and the operator shall enter in a speed setpoint. In Off, the pump shall not run. In Auto, the pump shall operate based on the Belt Filter Press Requested Flow Setpoint.
ii. A virtual Manual-Off-Auto switch will be provided for each pump at the OIT. When the virtual switch is in the Manual position the selected pump shall run and the operator will manually enter a speed setpoint through the OIT. When the virtual switch is in the Off position the selected pump will not run. When the virtual switch is in the Auto position the PLC will automatically control the pump speed based on the Belt Filter Press Influent Flow Setpoint.
iii. The Pumps shall operate in a Lead/Lag/Standby sequence. The operator will designate which two pumps to run that shall meet a maximum total flow demand of 600 GPM. If the lead pump faults the PLC will promote the standby pump to lead position and place the faulted pump out of service and notify the operator. The Lead/Lag/Standby status of each Pump shall be displayed at the OIT and SCADA.
iv. Pump speed will be based on the Belt Filter Press Requested Flow

Setpoint. The operator will be able to input a requested flow setpoint (max 600 GPM) at the OIT or through SCADA. The requested flow setpoint shall consist of the combined flow from the lead and lag pumps. When in Auto the PLC will control the speed of the lead and lag pumps to match the set influent flow.

v. The Lead and Lag pumps shall be called to run and shut down by the gravity belt thickener to meet the requested flow setpoint. Requested Flow setpoint shall be divided by two and sent to each lead pump. The setpoints shall be entered at the OIT or through SCADA.

vi. Pump speed shall be scaled 0-100% as the VFD frequency output goes from 0-60 Hz.

6. Alarms at OIT:
   a. TWSP-1, 2, 3 Emergency Stop
   b. TWSP-1, 2, 3 Motor High Temperature
   c. TWSP-1, 2, 3 VFD Fault
   d. TWSP-1, 2, 3 Fail to Start
   e. TWSP-1, 2, 3 Seal Fail
   f. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
7. Monitoring and Control at OIT/SCADA:
   a. TWSP-1, 2, 3 Run Status
   b. TWSP-1, 2, 3 Start Command
   c. TWSP-1, 2, 3 Elapsed Time Meter (###### hours)
   d. Virtual Lead/Lag/Standby Selection
   e. TWSP-1, 2, 3 Lead/Lag/Standby Status
   f. Enable/Disable Automatic Alternation
   g. TWSP-1, 2, 3 HOR Enable/Not In Remote Status
   h. TWSP-1, 2, 3 Virtual Manual-Off-Auto selector switch
   i. TWSP-1, 2, 3 Speed (0-100%)
   j. TWSP-1, 2, 3 Speed Historical Trend (SCADA only)
   k. TWSP-1, 2, 3 Low Suction Pressure
   l. TWSP-1, 2, 3 High Discharge Pressure
   m. Belt Filter Press Requested Flow

L. Loops 6686 and 6687 – Thickened Waste Sludge Flow
1. General: Thickened waste sludge pump station effluent flow will be monitored by two new 8 inch magnetic flow meter. TWSP No.1 will be monitored by FE/FIT-6686. TWSP No. 3 will be monitored by FE/FIT-6687. TWSP No. 2 will have piping isolation to support standby for either lead thickened waste sludge transfer pump.
2. Field Instruments:
   a. Magnetic Flow Meter No.1 (FE/FIT-6686)
   b. Magnetic Flow Meter No.2 (FE/FIT-6687)
3. PLC:
   a. Each flow meter shall measure the flow through its designated discharge pipe. A 4-20mA signal will be sent to the PLC from each flow meter

corresponding to flow rate. The flow rate will be displayed at OIT-DWCP and SCADA and historically trended at SCADA only.

b. The PLC shall totalize the flow from FE/FIT-6686 and FE/FIT-6687 based on a pulse output from the flow transmitters. The transmitter pulse outputs shall initially be set to 1 pulse per 100 gallons. The following totalized flows shall be displayed at the OIT:
   i. Current 24 hour period (start at 12:00 midnight)
   ii. Previous 24 hour period (midnight to midnight)
   iii. Totalized Flow (millions of gallons)

4. Alarms at OIT:
   a. While any Thickened Waste Sludge Pump is running, the PLC will activate an operator adjustable low flow alarm at the OIT after an operator adjustable time delay.
   b. Low Flow Alarm Setpoint (0-500 gpm initially set at 200 gpm) and Time Delay (0-300 seconds, set at 60 seconds)
   c. Low Flow Alarm
5. Monitoring and Control at OIT/SCADA:
   a. Effluent Flow Rate (0-6000 gpm)
   b. Effluent Flow Historical Trend (SCADA only)
   c. Current 24 hr Period Totalized Flow (##### gallons)
   d. Previous 24 hr Period Totalized Flow (##### gallons)

M. Loops 6692 – Effluent Channel Chlorine Analysis
1. General: Chlorine is measured in the effluent channel of the facility. The signal is routed to the Dewatering Control Panel and all alarming and trending shall be controlled by DWCP. Analog alarms and discrete alarms are configured as noted below.
2. Field Instruments:
   a. Chlorine Analyzer (AE/AIT-6692)
3. PLC Functions:
   a. From the chlorine signal, analog alarms shall be configured given the information in the following table.

ALARM	SETPOINT
High-High Cl	≥ 3 mg/l
High Cl	≥ 2 mg/l
Low Cl	≤ 0.6 mg/l
Low-Low Cl	≤ 0.3 mg/l

4. Alarms at OIT/SCADA HMI:
   a. High-High, High, Low, Low-Low Cl
   b. Chlorine Signal Out of Range
   c. Analyzer Fault
5. Monitoring/Control at OIT/SCADA HMI:
   a. Chlorine indication (0.00 to 5.00) and trend

3.5 CONTROL DESCRIPTION – GRAVITY BELT THICKENER CONTROL PANELS

A. Regarding all loops connected to the Gravity Belt Thickener Control Panels (GBTCP-1, 2), all alarming and monitoring shall comply with manufacturer. GBTCP-1, 2 are connected to the rest of the control panels in a loop configured path.

B. GBT Hydraulic Pump (Loops 6630, 6631), GBT Wash Water Booster Pump (Loops 6690, 6691) and Polymer Feed System (Loops 6650, 6651, 6652) shall be called to start and shut by the gravity belt thickeners down based on its operation.

C. The Waste Activated Sludge Transfer Pumps (Loops 6610 to 6612) shall be called to start and shut down by the gravity belt thickener based on its operation.

3.6 CONTROL DESCRIPTION – NORTH RAS PUMP STATION CONTROL PANEL

A. Loops 5010 to 5023 – Secondary Clarifier and Monitoring

1. General: Four (4) Activated Sludge Settling Tanks (SCL-5, 6, 7, 8) will be used to settle sludge that is conveyed by gravity from the mixed liquor channel. The tank arms will be driven by a motor starter. Each settling tank will have a mechanical torque switch and motor thermal overload. Each settling tank will have an ultrasonic level element to monitor the sludge blanket.
2. Field Instruments:
    a. Sludge Blanket Level (LE/LIT-5010, -5011, -5012, -5013)
3. Interlocks:
    a. Motor Starter Overload shall provide a hardwired shutdown of the starter.
    b. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
    c. Motor High Torque Switch shall provide a hardwired shutdown of the starter.
    d. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
4. Local:
    a. Each clarifier has a new local control station provided by Division 16. The following local controls and indications will be located at LCS-5010, 5011, 5012, 5013 respectively:
        i. Local-Off-Remote (LOR) Switch (HS-5010B, -5011B, -5012B, -5013B)
            (1) In the Local position the equipment will run continuously speed.
            (2) In the Off position the equipment will not run.
            (3) In the Remote position the equipment will be controlled by the PLC. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
        ii. Estop (HS-5010A, 5011A, 5012A, 5013A)
            (1) The Estop will directly shut down the equipment.
            (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
        iii. Run Light (YL-5010B, 5011B, 5012B, 5013B)

5. PLC:
   a. Activated Sludge Clarifier Drive
      i. The PLC will provide virtual LOR control for each drive at the OIT and SCADA. In the Local position, the drive will run. In Off, the drive will not run except at the LCS. In Remote, the drive will run at full speed unless a fault occurs.
      ~~i.~~ii. Each Secondary Clarifier will be displayed as In Remote/Not In Remote based on the remote contact from the LCS.
      ~~i.~~iii. A Secondary Clarifier Fail to Start Alarm will be activated if the motor is in Remote and the PLC attempts to start the remote and the return run contact does not indicate that the motor is running (delay 0-60s, initially 15s). The Fail Alarm shall not trigger in the event of a motor high temp, or high torque condition.
      ~~i.~~iv. The PLC will activate a Secondary Clarifier O/L Alarm when the O/L contact activates (fixed delay of 1s). The alarm shall be latched and require reset. PLC shall remove the run command to the associated clarifier.
      ~~i.~~v. The PLC will activate a Secondary Clarifier High Torque Warning when the Torque Alarm contact activates (delay 0-60s, initially 5s). The alarm shall be latched and require reset. PLC shall remove the run command to the associated clarifier.
      ~~ii.~~vi. The PLC will activate a Secondary Clarifier High Torque Alarm when the Torque Alarm contact activates (delay 0-60s, initially 5s). The alarm shall be latched and require reset. PLC shall remove the run command to the associated clarifier.
      ~~iii.~~vii. The PLC will activate a High Temperature Alarm when the Temperature Alarm contact activates (delay 0-60s, initially 5s). The alarm shall be latched and require reset. PLC shall remove the run command to the associated clarifier.
      ~~iii.~~viii. The PLC will activate a Secondary Clarifier E-Stop Alarm when the E-Stop contact activates (fixed delay of 1s). The alarm shall be latched and require reset. PLC shall remove the run command to the associated clarifier.
   b. Sludge Blanket Monitoring
      i. The PLC shall monitor the ultrasonic level transducer (LE/LIT-5010, 5011, 5012, 5013) and measure the waste sludge blanket level in the holding tank from 0.00 to 15.00 feet and send a 4-20 mA signal to the PLC.
      ii. The PLC shall display sludge blanket level on the OIT graphically as a percentage (0-100%) and as a level measurement in feet (##.## feet) from the bottom of the tank. The operator shall be able to enter an adjustable Tank Level Offset (0.00 to 5.00 feet) for each tank which shall be added by the PLC to the level signal from the ultrasonic level transducers.
      iii. If the sludge level(s) rise above the High Sludge Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC

shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.

iv. If the sludge level(s) rise above the High-High Sludge Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall deactivate the motor drive, latch the alarm and shall require reset on OIT.

6. Alarms at OIT and SCADA:
   a. SCL-5010, 5011, 5012, 5013 O/L Alarm
   b. SCL-5010, 5011, 5012, 5013 High Torque Alarm
   c. SCL-5010, 5011, 5012, 5013 High-High Torque Alarm
   d. SCL-5010, 5011, 5012, 5013 E-Stop Alarm
   e. SCL-5010, 5011, 5012, 5013 Fail to Start Alarm
   f. LE/LIT-5010, 5011, 5012, 5013 Level Element Fault
   g. High-High Level Alarm, Setpoints, and Time Delays
   h. High-Level Alarm Setpoints, and Time Delays
   i. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
7. Monitoring and Control at OIT and SCADA:
   a. SCL-5010, 5011, 5012, 5013 Run Status and Totalizer
   b. SCL-5010, 5011, 5012, 5013 In Remote / Not in Remote
   c. SCL-5010, 5011, 5012, 5013 LOR Selector Switch
   d. SCL-5010, 5011, 5012, 5013 Virtual LOR Switch
   e. Adjustable Enable / Delay / Setpoints for each warning and alarm
   f. Sludge Level (0.00-15.00 ft)
   g. Sludge Level (0-100%)
   h. Level Control Setpoint (2.00-15.00 ft)
   i. Level PID Parameters with Virtual HOA Operation
   j. Sludge Level Historical Trend (SCADA only)
   k. Graphical Level from Sludge Blanket Level Sensor (% full)

B. Loop 5200 – North RAS Control Panel (CP-NR)
1. General: One status lights will be on the face of the Control Panel to provide an indication of panel status. The PLC generates one latching alarms that illuminate lights on the face of the panel. A Reset pushbutton on the panel or at the HMI/SCADA shall unlatch the alarms. A maintenance bypass switch shall be mounted on the face of the control panel. An UPS Fail, Managed Ethernet Switch and Surge device shall be mounted to the back of the control panel.
2. Panel Control definitions are defined on the Instrument Drawing I-1.
   a. Normal Power Indicator Light (YL-5200A)
   b. Common Alarm Indicator Light (AL-5200A)
   c. PLC Fail Alarm (AL-5200B)
   d. Reset Pushbutton (HS-5200A)
   e. Maintenance Bypass Switch (HS-5200B)
   f. UPS Fail Relay (EY-5200)
   g. UPS Power Indicator Light (YL-5200B)
   h. Surge Detection (ESH-5200)
   i. Managed Ethernet Switch Fault (AL-5200C)

3. Local Control:
    a. The Normal Power indicating light (YL-5200A) shall be illuminated and a power fail relay shall be energized when the control panel is powered from an external 120 VAC power circuit.
    b. When power from the external 120 VAC circuit is lost and the control panel is powered by the UPS, the power fail relay will de-energize, the Normal Power indicating light shall not be illuminated and the UPS Power indicating light shall be illuminated (YL-5200B).
4. PLC:
    a. The PLC shall monitor the power failure contact, and shall activate the Control Panel Power Fail alarm if an adjustable on-delay timer expires (0 to 600 seconds, initially 60 seconds).
    b. The PLC shall output a common alarm if any of the alarms configured in the PLC program are active. This common alarm output shall activate the Common Alarm indicating light on the panel (AL-5200A).
    c. The contact state of the reset pushbutton (HS-5200A) shall be monitored by the PLC. When pushed, hardwired control shall reset the PLC Fail and the PLC shall unlatch the Common Alarm if the alarm condition has returned to normal.
    d. The PLC shall monitor the UPS battery failure/fault condition contact, and shall activate an alarm if an adjustable on-delay timer expires (0 to 60 seconds, initially 10 seconds).
    e. The PLC shall monitor the Surge condition contact (ESH-6603), and shall activate an alarm if a normally closed contact is opens.
5. Alarms at HMI/SCADA:
    a. Power Fail Alarm
    b. PLC Fail Alarm
    c. Common Alarm
6. Monitoring and Control at SCADA:
    a. Reset Pushbutton
    b. UPS Battery Failure
    c. Surge Detection
    d. Maintenance Bypass Switch
    e. Managed Ethernet Switch Fault

C. Loop 5201 – Electrical Room Temperature
1. General: The PLC will monitor the electrical room's temperature.
2. Field Instruments:
    a. Electrical Room Temperature Element and Indicating Transmitter (TE/TIT-5201)
3. PLC:
    a. The PLC shall monitor a 4-20 mA signal from the Electrical Room Temperature Transmitter. If the Electrical Room Temperature drops below a Low Electrical Room Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT. If the Electrical Room Temperature rises above a High Electrical

Room Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.

b. Electrical Room temperature shall be displayed in degrees F at the OIT and SCADA and historically trended at SCADA only.

4. Alarms at OIT/SCADA
   a. Electrical Room Low Temperature Alarm
   b. Electrical Room High Temperature Alarm
   c. Electrical Room Low Temperature Alarm Setpoint (32-120 degrees initially set at 40 degrees)
   d. Electrical Room High Temperature Alarm Setpoint (32-120 degrees initially set at 100 degrees)
5. Monitoring and Control at OIT/SCADA
   a. Electrical Room Temperature
   b. Electrical Room Temperature Historical Trend (SCADA Only)

D. Loop 5202 – Pump Room Flood/Temperature
1. General: The PLC will monitor the pump room's temperature and flood switch.
2. Field Instruments:
   a. Pump Room Temperature Element and Indicating Transmitter (TE/TIT-5202)
   b. Pump Room Flood High Float Switch (LSH-5202)
3. PLC:
   a. The PLC shall monitor a 4-20 mA signal from the Pump Room Temperature Transmitter. If the Pump Room Temperature drops below a Low Pump Room Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT. If the Pump Room Temperature rises above a High Pump Room Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.
   b. Pump Room temperature shall be displayed in degrees F at the OIT and SCADA and historically trended at SCADA only.
   c. The PLC shall monitor the Pump Room Flood Float Switch. The PLC shall issue an alarm after a fixed time delay of 5sec. The alarm shall remain latched and require reset on the OIT.
4. Alarms at OIT/SCADA
   a. Pump Room Low Temperature Alarm
   b. Pump Room High Temperature Alarm
   c. Pump Room Low Temperature Alarm Setpoint (32-120 degrees initially set at 40 degrees)
   d. Pump Room High Temperature Alarm Setpoint (32-120 degrees initially set at 100 degrees)
   e. Pump Room Flood Alarm
5. Monitoring and Control at OIT/SCADA
   a. Pump Room Temperature

b. Pump Room Temperature Historical Trend (SCADA Only)

E. Loop 5203 and 5204 – Pump Room Sump Pump

1. General: There will be two (2) sump pumps located in the Pump Room. The motor starters will be located in the MCC with a local Local-Off-Remote switch. Both pumps shall be controlled by a high and low float switch (LSH/LSL-5203, 5204).
2. Hardwire Interlocks:
   a. Low Level Switch shall be hardwired interlock with the motor starter.
   b. High Level Switch shall be hardwired interlock with the motor starter.
3. Local:
   a. The pumps have a new local control station. The following local controls and indications will be located at LCS-5203, -5204 respectively:
      i. Local-Off-Remote (LOR) Switch (HS-5203B, -5204B)
         (1) In the Local position the equipment will run at full speed.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC and floats switches. In Off, the pump will not run except at the LCS. The equipment shall be displayed as OFF at the OIT and SCADA. In Remote, the pump will operate as specified in this section below. The equipment shall be displayed as ENABLE at the OIT and SCADA.
      ii. Run Indicator Light (YL-5203B, 5204B)
4. Field Instruments:
   a. High Level Switch (LSH-5203, 5204)
   b. Low Level Switch (LSL-5203, 5204)
5. PLC:
   a. There shall be a virtual SP3/SP4 selector switch at the OIT and SCADA. The switch shall designate which pump is designated Lead at the OIT and SCADA. The pump that is not selected will be designated as Standby at the OIT and SCADA.
   b. In Remote, the pumps shall run in a Lead/Standby sequence controlled by the high and low float switch. The lead pump will run once the Low Level Float Switch is activated after a fixed time delay of 5sec. The selected Lead pump will shut off when the Low Level Float Switch is deactivated after a fixed time delay of 5sec. The selected Standby pump shall run when the High Level Float Switch is activated after a fixed time delay of 5sec. The selected Standby pump will shut off when the High Level Float Switch deactivated after a fixed time delay of 5sec.
   c. The PLC shall monitor the Low Level Float Switch. The PLC will turn on the Lead pump after a fixed time delay of 5sec after activated. The pump will run until the float switch is deactivated after a fixed time delay of 5sec.
   d. The PLC shall monitor the High Level Float Switch. The PLC will turn on the Standby pump after a fixed time delay of 5sec after activated. The pump will run until the float switch is deactivated after a fixed time delay of 5sec.

e. The PLC shall activate a pump High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.
f. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.
g. The PLC shall activate a pump Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

6. SCADA Alarm Functions:
   a. Seal Leak Alarm
   b. High Temperature Alarm
   c. Over Load Alarm
   d. Pump Room High Level Alarm
   e. Pump Room Low Level Alarm
7. SCADA Monitoring and control Functions:
   a. Pump Run Status
   b. Pump Reset Push Button
   c. Manual and Virtual Local-Off-Remote
   d. Virtual SP3/SP4 Selector Switch (Lead/Lag)

F. Loop 5205 – Weather Station
1. General: The Weather Station shall be wall mounted on the North side of the new electrical building. Specific location to be coordinated with the owner and engineer during construction. It shall be monitoring the temperature, wind speed, rain fall and humidity.
2. PLC:
   a. The PLC shall monitor a 4-20 mA signal from the Weather Station Temperature Transmitter. If the Temperature drops below a Low Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT. If the Temperature rises above a High Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.
   b. The PLC shall monitor a 4-20 mA signal from the Weather Station Wind Speed Transmitter. If the Wind Speed rises above a High Wind Speed Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.
   c. The PLC shall monitor a 4-20 mA signal from the Weather Station Rain Fall Transmitter. If the Rain Fall rises above a High Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT. If the Rain Fall rises above a High-High Temperature Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.

d. The PLC shall monitor a 4-20 mA signal from the Weather Station Humidity Transmitter. If the Humidity drops below a Low Humidity Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT. If the Humidity rises above a High Humidity Alarm Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall initiate an alarm. The alarm shall remain latched and require reset on the OIT.

3. The Weather Station shall report the following analog signals to the PLC:
   a. Temperature in degrees F
   b. Wind Speed in miles per hour
   c. Rain Fall
   d. Humidity
4. Alarms at OIT/SCADA:
   a. High/Low Temperature Alarm
   b. High Wind Speed
   c. High/High-High Rain Fall
   d. High/Low Humidity
   e. Weather Low Temperature Alarm Setpoint (32-120 degrees initially set at 40 degrees)
   f. Weather High Temperature Alarm Setpoint (32-120 degrees initially set at 100 degrees)
   g. Wind Speed High Alarm Setpoint
   h. High Rain Fall Alarm Setpoint
   i. High-High Rain Fall Alarm Setpoint
   j. High Humidity Alarm Setpoint
   k. Low Humidity Alarm Setpoint
5. Monitoring and Controls at OIT/SCADA:
   a. Weather Temperature
   b. Weather Temperature Historical Trend (SCADA Only)
   c. Wind Speed
   d. Wind Speed Historical Trend (SCADA Only)
   e. Rain Fall
   f. Rain Fall Historical Trend (SCADA Only)
   g. Humidity Level
   h. Humidity Level Historical Trend (SCADA Only)

G. Loops 5210 to 5214 – Return Sludge Pumps and Flow
1. General: Five (5) new pumps (RSLP-6, 7, 8, 9 10) will be driven by new VFDs. The pumps SCL-6, 5, 7, and 8 shall run individually for clarifiers RSLP-6, 7, 9, and 10 respectfully. SCL-8 shall act as a swing pump for any clarifier. Return sludge pumps station effluent flow will be monitored by five (5) new 16 inch magnetic flow meter.
2. Field Instruments:
   a. Magnetic Flow Meter No.1 (FE/FIT-5210)
   b. Magnetic Flow Meter No.2 (FE/FIT-5211)
   c. Magnetic Flow Meter No.3 (FE/FIT-5212)

d. Magnetic Flow Meter No.4 (FE/FIT-5213)
e. Magnetic Flow Meter No.5 (FE/FIT-5214)

3. Local:
   a. Each pump has a new local control station provided. The following local controls and indications will be located at LCS-5210, 5211, 5212, 5213, 5214 respectively:
      i. Speed Potentiometer (HSC-5210, 5211, 5212, 5213, 5214)
      ii. Local-Off-Remote (LOR) Switch (HS-5210B, 5211B, 5212B, 5213B, 5214B)
         (1) In the Local position the equipment will run continuously speed. Speed will be controlled by the speed potentiometer when the switch is in the Local position.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is in not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
      iii. Estop (HS-5210A, 5211A, 5212A, 5213A, 5214A)
         (1) The Estop will directly shut down the equipment.
         (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
      iv. Run Light (YL-5210A, 5211A, 5212A, 5213A, 5214A)

4. VFD:
   a. The following controls and indications shall be located at the VFD for each Pump:
      i. Elapsed Time Meter (KQI-5210, 5211, 5212, 5213, 5214)
      ii. Run Light (YL-5210B, 5211B, 5212B, 5213B, 5214B)
      iii. Seal Fail Warning Light (LAH-5210, 5211, 5212, 5213, 5214)
      iv. Motor High Temperature Alarm Light (TAH-5210, 5211, 5212, 5213, -5214)
      v. Reset (HS-5210C, 5211C, 5212C, 5213C, 5214C)
      vi. Motor Fault Alarm Light (AL-5210A, 5211A, 5212A, 5213A, 5214A)
   b. Each VFD shall report the following to the PLC:
      i. Run Status
      ii. VFD Fault
      iii. Speed Feedback
      iv. Amps
      v. Seal Fail

vi. Motor High Temperature

c. The PLC shall report the following to the VFD:
   i. Start Command
   ii. Speed Command

5. Hardware Interlocks:
   a. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
   b. Motor Seal Leak shall provide a hardwired shutdown of the starter.
   c. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
6. PLC Control Functions:
   a. The PLC shall monitor the return run status, VFD Fault, Seal Fail Warning, and Motor High Temperature Alarm from each VFD.
   b. The PLC shall monitor the Estop status and LOR in Local from each local control station.
   c. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor speed. Motor speed shall be displayed at the OIT and SCADA and historically trended at SCADA only.
   d. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor amps. Motor amps shall be displayed at the OIT and SCADA and historically trended at SCADA only.
   e. Each flow meter shall measure the flow through its designated discharge pipe. A 4-20mA signal will be sent to the PLC from each flow meter corresponding to flow rate. The flow rate will be displayed at OIT-NR and SCADA and historically trended at SCADA only.
   f. The PLC shall totalize the flow from FE/FIT-5210, 5211, 5212, 5213 and 5214 based on a pulse output from the flow transmitters. The transmitter pulse outputs shall initially be set to 1 pulse per 100 gallons. The following totalized flows shall be displayed at the OIT:
      i. Current 24 hour period (start at 12:00 midnight)
      ii. Previous 24 hour period (midnight to midnight)
      iii. Totalized Flow (millions of gallons)
   g. Pump Control:
      i. The PLC shall provide a virtual Local/Off/Remote switch will be provided for each pump at the OIT. When the virtual switch is in the Manual position the selected pump shall run and the operator will manually enter a speed setpoint through the OIT. When the virtual switch is in the Off position the selected pump will not run. When the virtual switch is in the Auto position the PLC will automatically control the pump flow based on user adjustable Return Sludge Flow percentage setpoint.
      ii. The Pumps shall operate in a Lead/Standby sequence. The pumps SCL-6, 5, 7, and 8 shall run individually for clarifiers RSLP-6, 7, 9, and 10 respectfully. SCL-8 shall act as a swing pump for any clarifier. The status of each Pump shall be displayed at the OIT and SCADA.
      iii. Pump speed will be based on a user adjustable Return Sludge Flow percentage setpoint. Based on the percentage setpoint, the PLC shall

calculate the corresponding flow rate per online pump and adjust the pump speed accordingly. Due to hydraulic constraints, the percentage shall be scaled from 0% to 75%.

iv. The Lead and Standby pumps shall be called to run and shut down at operator adjustable sludge level setpoints. The setpoints shall be entered at the OIT.

v. Pump speed shall be scaled 0-100% as the VFD frequency output goes from 0-60 Hz.

7. Alarms at OIT:
   a. RSLP-6, 7, 8, 9, 10 Emergency Stop
   b. RSLP-6, 7, 8, 9, 10 Motor High Temperature
   c. RSLP-6, 7, 8, 9, 10 VFD Fault
   d. RSLP-6, 7, 8, 9, 10 Fail to Start
   e. RSLP-6, 7, 8, 9, 10 Seal Fail
   f. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
   g. Low Flow Alarm
8. Monitoring and Control at OIT/SCADA:
   a. RSLP-6, 7, 8, 9, 10 Run Status
   b. RSLP-6, 7, 8, 9, 10 Elapsed Time Meter (###### hours)
   c. RSLP-6, 7, 8, 9, 10 Start Command
   d. RSLP-6, 7, 8, 9, 10 LOR Enable/Not In Remote Status
   e. RSLP-6, 7, 8, 9, 10 Virtual LOR Selector Switch
   f. Virtual Lead/Standby Selection
   g. RSLP-6, 7, 8, 9, 10 Lead/Standby Status
   h. RSLP-6, 7, 8, 9, 10 Virtual Lead/Standby Status
   i. Enable/Disable Automatic Alternation
   j. RSLP-6, 7, 8, 9, 10 Manual Speed Setpoint (0-100%)
   k. RSLP-6, 7, 8, 9, 10 Speed (0-100%)
   l. RSLP-6, 7, 8, 9, 10 Speed Historical Trend (SCADA only)
   m. RSLP-6, 7, 8, 9, 10 Amps
   n. RSLP-6, 7, 8, 9, 10 Amps Historical Trend (SCADA only)
   o. RSLP-6, 7, 8, 9, 10 High Motor Temperature Switch
   p. Raw Influent Flow Percentage (0-75%)
   q. Effluent Flow Rate (0-6000 gpm)
   r. Effluent Flow Historical Trend (SCADA only)
   s. Current 24 hr Period Totalized Flow (##### gallons)
   t. Previous 24 hr Period Totalized Flow (##### gallons)

H. Loops 5220 – Motor Operated Valve and Waste Activated Sludge Flow
1. General: A new flow control plug valve and an 8 inch magnetic flow meter will be used to control and monitor the flow from the RAS pressure line to the Waste and Thickened Sludge Storage Tanks. The valves will be controlled by operator adjustable setpoints set at the OIT and SCADA.
2. Instruments:
   a. Magnetic Flow Meter (FE/FIT-5220)
3. Control Elements:
   a. MOV – 5220 RAS Pressure Line Valve

4. Hardware Interlocks:
    a. None
5. Local:
    a. Each flow control valve has an integrated local control station provided by the valve manufacturer that contains the following controls.
        i. Local-Off-Remote (LOR) Valve Controls (HS-5220)
            (1) In the Local position the equipment will be controlled by the associated Open-Stop-Close (OSC) selector switch (HS-5220)
            (2) In the Off position the valve will maintain its last position.
            (3) In the Remote position the equipment will be controlled remotely by the PLC. When in Remote Off the valve will maintain its last position and will not operate except at the LCS, in Remote Auto the valve position will be controlled as specified within this loop. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
6. PLC Control Functions:
    a. Valve Controls:
        i. The PLC shall provide a virtual Local/Off/Remote selector switch. In SCADA Manual, the valve shall be set to an operator adjustable position with virtual Open-Stop-Close push buttons on HMI/SCADA.
        ii. In Off, the valve shall maintain its last position.
        iii. In Auto, the valve position will be controlled as specified within this loop. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
    b. In Auto, the valve position shall depend on the daily waste sludge volume setpoint that shall be measured through FE/FIT-5220 and how many times per day the operator wants to waste, refer to Loops 5210 to 5214 Return Sludge Pumps for more detail. An operator shall be allowed to input a daily waste sludge volume setpoint and the times per day setpoint at the OIT and SCADA. Each cycle shall be 24hr long. The PLC shall then calculate when and for how long MOV-5220 will open and close to best achieve the daily waste sludge setpoint. At the start of each cycle, the PLC shall open MOV-5220 completely. When the valve is fully open, it shall be displayed as FULL OPEN at the OIT and SCADA. Once the daily waste sludge volume setpoint has been met, the PLC shall fully close the valve for the remainer of the cycle. When the valve is fully closed, the valve shall be displayed as FULL CLOSED at the OIT and SCADA. The valve position between fully closed and open shall be scaled from 0-100% Open and displayed at the OIT and SCADA.

c. The flow meter shall measure the flow through its designated discharge pipe. A 4-20mA signal will be sent to the PLC from the flow meter corresponding to flow rate. The flow rate will be displayed at OIT-NR and SCADA and historically trended at SCADA only.
d. The PLC shall totalize the flow from FE/FIT-5220 based on a pulse output from the flow transmitter. The transmitter pulse outputs shall initially be set to 1 pulse per 100 gallons. The following totalized flows shall be displayed at the OIT:
   i. Current 24 hour period (start at 12:00 midnight)
   ii. Previous 24 hour period (midnight to midnight)
   iii. Totalized Flow (millions of gallons)

7. Alarms at SCADA:
   a. MOV-5220 Faulted Alarm
   b. While any pump is running, the PLC will activate an operator adjustable low flow alarm at the OIT after an operator adjustable time delay.
   c. Low Flow Alarm Setpoint (0-500 gpm initially set at 200 gpm) and Time Delay (0-300 seconds, set at 60 seconds)
   d. Low Flow Alarm
8. Monitoring and Control at SCADA:
   a. MOV-5220 Full Open
   b. MOV-5220 Full Closed
   c. MOV-5220 Open Command
   d. MOV-5220 Close Command
   e. MOV-5220 In Remote/Auto - Not in Remote/Auto
   f. MOV-5220 LOR Selector Switch
   g. MOV-5220 LOR Virtual Switch
   h. MOV-5220 Open/Stop/Close Virtual Pushbuttons
   i. Daily Waste Sludge Volume
   j. Times per Day to Waste
   k. PID parameters and Loop Update for each Valve Flow PID loop.
   l. Effluent Flow Rate (0-6000 gpm)
   m. Effluent Flow Historical Trend (SCADA only)
   n. Current 24 hr Period Totalized Flow (##### gallons)
   o. Previous 24 hr Period Totalized Flow (##### gallons)

I. Loops 5230 to 5233 – Secondary Clarifier Grease/Scum Pump
1. General: Four (4) existing scum pumps (PSP-5,6,7,8) will have new motor starters. The scum pumps shall recycle the grease and scum from the secondary clarifiers back into the secondary clarifiers after it has been through a grinder.
2. Field Instruments:
   a. None
3. Interlocks:
   a. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
   b. Seal Leak Switch shall provide a hardwired shutdown of the starter.
   c. Estop shall provide a hardwired shutdown of the starter.
4. Local:

a. Each pump has a new local control station provided by Div 16. The following local controls and indications will be located at LCS-5230, 5231, 5232, 5233 respectively:
   i. Local-Off-Remote (LOR) Switch (HS-5230B, 5231B, 5232B, 5233B)
      (1) In the Local position the equipment will run continuously speed.
      (2) In the Off position the equipment will not run.
      (3) In the Remote position the equipment will be controlled by the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
   ii. Estop (HS-5230A, 5231A, 5232A, 5233A)
      (1) The Estop will directly shut down the equipment.
      (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
   iii. Run Light (YL-5230B, 5231B, 5232B, 5233B)

5. PLC Control Functions:
   a. Secondary Clarifier Grease/Scum Pump Monitoring:
      i. The PLC shall monitor the Running status of the pump. The status shall be displayed at SCADA as RUN/STOP based on the run status. The PLC will totalize the run time hours.
      ii. A pump Fail-to-Start Alarm shall be activated if the pump is in Remote and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s).
      iii. The PLC shall activate a pump High Motor Temperature Alarm when the high motor temperature contact switch opens (fixed delay of 2s).
      iv. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s).
      v. The PLC shall activate a pump Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s).
      vi. The PLC shall activate an Emergency Stop Alarm when the Emergency Stop contact de-activates (fixed delay of 1s).
   b. Secondary Clarifier Grease/Scum Pump Activation:
      i. The PLC shall control the pump when the Local/Off/Remote Selector Switch is in the Remote Position.
      ii. In Remote, the pump will run when the High-High Float is activated.

The pumps shall shut off after a set time delay once the High-High Float deactivated.

iii. The PLC shall provide virtual LOR Selector Switch control for the pump at SCADA. In Off, the pump will not run. In Local the pump will run continuously.

iv. A pump Fail-to-Start Alarm shall be activated if the pump is in On and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.

v. The PLC shall activate a pump High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vi. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vii. The PLC shall activate a pump Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

viii. The PLC shall activate a pump Emergency Stop Alarm when the Emergency Stop contact de-activates. The PLC shall remove the run command upon alarm (fixed delay of 1s).

6. Alarms at OIT/SCADA:
   a. Start Fail
   b. High Motor Temperature
   c. Motor Overload
   d. Emergency Stop
   e. Seal Leak
   f. Adjustable Enable / Delay / Setpoints for each warning and alarm
7. Monitoring and Control at OIT/SCADA:
   a. PSP-5, 6, 7, 8 Run Status and Totalizer
   b. PSP-5, 6, 7, 8 LOR Selector Switch
   c. PSP-5, 6, 7, 8 Virtual LOR Switch
   d. PSP-5, 6, 7, 8 Start Command

J. Loops 5234 to 5237 – Grease/Scum Grinder and Pump
1. General: Four (4) existing progressive cavity pumps (PCP-5,6,7,8) will have new motor starters. The pumps shall recycle the grease and scum from the secondary clarifiers after it has been through a grinder. It then disposes of it into the secondary clarifier grease/scum storage tank.
2. Field Instruments:
   a. None
3. Interlocks:
   a. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
   b. Estop shall provide a hardwired shutdown of the starter.
4. Local:

a. Each pump has a new local control station provided by Div 16. The following local controls and indications will be located at LCS-5234, 5235, 5236, 5237 respectively:
   i. Local-Off-Remote (LOR) Switch (HS-5234B, 5235B, 5236B, 5237B)
      (1) In the Local position the equipment will run continuously speed.
      (2) In the Off position the equipment will not run.
      (3) In the Remote position the equipment will be controlled by the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
   ii. Estop (HS-5234A, 5235A, 5236A, 5237A)
      (1) The Estop will directly shut down the equipment.
      (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
   iii. Forward-Off-Reverse (FOR) Switch (HS-5234C, 5235C, 5236C, 5237C)
      (1) In the Forward position the progressive cavity pump shall rotate in a clockwise direction, disposing the scum into the grit basin and into the secondary clarifier.
      (2) In the Off position the equipment will not run.
      (3) In the Reverse position the progressive cavity pump shall rotate in a counter-clockwise direction, pushing scum back towards the grinder.
   iv. Run Light (YL-5234B, 5235B, 5236B, 5237B)

5. PLC Control Functions:
   a. Grease/Scum Grinder and Pump Monitoring:
      i. The PLC shall monitor the Running status of the pump. The status shall be displayed at SCADA as RUN/STOP based on the run status. The PLC will totalize the run time hours.
      ii. A pump Fail-to-Start Alarm shall be activated if the pump is in Remote and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s).
      iii. The PLC shall activate a pump High Motor Temperature Alarm when the high motor temperature contact switch opens (fixed delay of 2s).
      iv. The PLC shall activate a pump O/L Alarm when the O/L contact

activates (fixed delay of 2s).

v. The PLC shall activate an Emergency Stop Alarm when the Emergency Stop contact de-activates (fixed delay of 1s).

b. Grease/Scum Grinder and Pump Activation:

i. The PLC shall control the pump when the Local/Off/Remote Selector Switch is in the Remote Position.

ii. In Remote, the pump will run when the High-High Float is activated. The pumps shall shut off after a set time delay once the High-High Float deactivated.

iii. The PLC shall provide virtual LOR Selector Switch control for the pump at SCADA. In Off, the pump will not run. In Local the pump will run.

iv. A pump Fail-to-Start Alarm shall be activated if the pump is in On and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.

v. The PLC shall activate a pump High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vi. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vii. The PLC shall activate a pump Emergency Stop Alarm when the Emergency Stop contact de-activates. The PLC shall remove the run command upon alarm (fixed delay of 1s).

6. Alarms at OIT/SCADA:
   a. Start Fail
   b. High Motor Temperature
   c. Motor Overload
   d. Emergency Stop
   e. Adjustable Enable / Delay / Setpoints for each warning and alarm
7. Monitoring and Control at OIT/SCADA:
   a. PCP-5, 6, 7, 8 Run Status and Totalizer
   b. PCP-5, 6, 7, 8 LOR Selector Switch
   c. PCP-5, 6, 7, 8 Virtual LOR Switch
   d. PCP-5, 6, 7, 8 Start Command

K. Loops 5238 to 5241 – Secondary Clarifier Grease/Scum Storage Level
1. General: There is an existing float element in each Secondary Clarifier Grease/Scum Storage tank. Each float shall be used to monitor the scum level in the associated storage tank as well as control the associated grease/scum pump.
2. Field Instruments:
   a. Low-Low Level Float Switch (LSLL-5238, 5239, 5240, 5241)
3. Interlocks:
   a. None

4. PLC Control Functions:
    a. The PLC shall monitor the status of the grease/scum High-High Float Switch. Once activated, the PLC shall send a START command to SCSP No. 5-8 and SCSG No. 5-8. The PLC shall send a STOP command to SCSP No. 5-8 and SCSG No. 5-8 after the High-High Float has been deactivated and after the set time delay has expired (## minutes). If the High-High Float remains activated after an uninterrupted time of 5 minutes, the PLC shall activate a High-High Float Alarm.
5. Alarms at OIT/SCADA:
    a. High-High Level Float Alarm
    b. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
6. Monitoring and Control at OIT/SCADA:
    a. None

3.7 CONTROL DESCRIPTION – DEWATERED SLUDGE TRANSFER PUMP CONTROL PANELS

A. Regarding all loops connected to the Dewatered Sludge Transfer Pump Control Panels (DSFPCP-1, 2), all alarming and monitoring shall comply with manufacturer. DSFPCP-1, 2 are connected to the rest of the control panels in a loop configured path.

3.8 CONTROL DESCRIPTION – POLYMER BLEND CONTROL PANELS

A. Loops 6650, 6651 and 6652 – Polymer Feed System
    1. Regarding all loops connected to the Polymer Blend Unit Control Panels (PBUCP-1, 2, 3), all alarming and monitoring shall comply with manufacturer. PBUCP-1, 2, 3 are connected to the rest of the control panels in a loop configured path.
    2. The three Polymer Blending Pumps (PBU-1, 2, 3) and Water Booster Pumps (DWBP-1, 2, 3) shall be configured in a Lead/Lead/Standby configuration. The polymer and booster pumps shall be called to start by the gravity belt thickeners. Refer to Section 3.5 for details.
        a. A Polymer Blend Pump No. 1 (PBU-1) will be piped to feed Gravity Belt Thickener No. 1 (GBT-1). A Polymer Blend Pump No. 3 (PBU-3) will be piped to feed Gravity Belt Thickener No. 2 (GBT-2). A Polymer Blend Pump No. 2 (PBU-2) shall have piping isolation to support standby operation from either Gravity Belt Thickener.

3.9 CONTROL DESCRIPTION – SEPTAGE CONTROL PANELS

A. Loops 6810 and 6811 – Septage Pump Tank Level
    1. General: The septage level in the septage tank shall be monitored by one submersible pressure transducer. The levels shall be displayed at level indicators in the Liquid Sludge/Septage Receiving Facility and at the OIT. A High-High and a Low-Low level float switch in the tank will activate pumps SEPP-1 and SEPP-2 in backup float mode as well as issue alarms. If the primary submersible pressure transducer fails (equal to or less than 4 mA signal or loss of signal) the PLC will automatically switch to the other level measurement system and will use this level signal for pump control.
    2. Field Instruments:

a. Submersible Pressure Transducers (LE/LIT-6810, 6811)
b. High-High Level Float Switch (LSHH-6810, 6811)
c. Section A Low-Low Level Float Switch (LSLL-6810A, 6811A)
d. Section B Low-Low Level Float Switch (LSLL-6810B, 6811B)

3. Interlocks:
   a. None
4. PLC Control Functions:
   a. The PLC shall monitor the submersible pressure transducers (LE/LIT-6810, 6811) and measure the septage level in the holding tank from 0.00 to 15.00 feet and send the corresponding 4-20 mA signal to the PLC.
   b. The PLC shall display tank level on the OIT graphically as a percentage (0-100%) and as a level measurement in feet (##.## feet) from the bottom of the tank. The operator shall be able to enter an adjustable Tank Level Offset (0.00 to 5.00 feet) for each tank which shall be added by the PLC to the level signal from the submersible pressure transducers.
   c. If the tank level(s) rise above the High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.
   d. If the tank level(s) rise above the High-High Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.
   e. If the tank level(s) drop below the Low Tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.
   f. If the tank level(s) drop below the Low-Low tank Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT.
   g. The PLC shall monitor the status of Tank High-High level float switch.
   h. The PLC shall monitor the status of Section A Tank Low-Low level float switch.
   i. The PLC shall monitor the status of Section B Tank Low-Low level float switch.
5. Alarms at OIT/SCADA:
   a. High-High Level Alarm, Setpoints, and Time Delays
   b. High-Level Alarm Setpoints, and Time Delays
   c. Low Level Alarm Setpoints, and Time Delays
   d. Low-Low Level Alarm Setpoints, and Time Delays
   e. Tank High-High Level Float Alarm
   f. Section A Tank Low-Low Level Float Alarms
   g. Section B Tank Low-Low Level Float Alarms
   h. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
6. Monitoring and Control at OIT/SCADA:

a. Tank Level (0.00-15.00 ft)
b. Tank Level (0-100%)
c. Level Control Setpoint (2.00-15.00 ft)
d. Tank Level Historical Trend (SCADA only)
e. Graphical Level from Tank Level Sensor (% full)

B. Loops 6812 and 6813 – Septage Pumps
1. General: Two (2) new submersible pumps (SEPP-6812, 6813) will start/stop either locally or remotely from the SCADA system. The pumps will be driven by a motor starter with a Reset Hand Switch (HS-6812C, 6813C) located at the MCC.
2. Interlocks:
a. Motor Starter Overload shall provide a hardwired shutdown of the starter.
b. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
c. Motor Seal Leak shall provide a hardwired shutdown of the starter.
d. Emergency Pushbutton shall provide a hardwired shutdown of the starter.
e. ON/OFF Hand Switch shall provide a hardwired shutdown of the starter
3. Local:
a. The pumps has a new local control station. The following local controls and indications will be located at LCS-6812, 6813 respectively:
i. Local-Off-Remote (LOR) Switch (HS-6812B, 6813B)
(1) In the Local position the equipment will run at full speed.
(2) In the Off position the equipment will not run.
(3) In the Remote position the equipment will be controlled by the PLC. In Remote Off, the pump will not run except at the LCS. The equipment shall be displayed as REMOTE OFF at the OIT and SCADA. In Remote Auto, the pump will operate as specified in this section below. The equipment shall be displayed as ENABLE at the OIT and SCADA.
ii. Estop (HS-6812A, 6812A)
(1) The Estop will directly shut down the equipment.
(2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
iii. On-Off Hand Switch (HS-6812D, 6813D)
(1) In the On position, the pump will run at a continuous speed.
(2) In the Off position, the pump will not run.
iv. Run Light (YL-6812A, 6813A)
4. Field Instruments:
a. None
5. PLC:
a. Septage Pump Monitoring:
i. The PLC shall monitor the Running status of the pump. The status shall be displayed at SCADA as RUN/STOP based on the run status. The PLC will totalize the run time hours.
ii. A pump Fail-to-Start Alarm shall be activated if the pump is in

Remote and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s).

iii. The PLC shall activate a pump High Motor Temperature Alarm when the high motor temperature contact switch opens (fixed delay of 2s).

iv. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s).

v. The PLC shall activate a pump Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s).

vi. The PLC shall activate an Emergency Stop Alarm when the Emergency Stop contact de-activates (fixed delay of 1s).

b. Septage Pump Activation:

i. The PLC shall control the pump when the Local/Off/Auto Selector Switch is in the Remote Position.

ii. In Auto, the pump shall run at full speed unless a fault occurs or the Septage Tank Level exceeds the Low-Low setpoint from either pressure transducer or Low-Low Float Switch. The pump shall be called to start when the septage level no longer exceeds the Low-Low setpoint or Low-Low Float Switch deactivated (fixed delay of 2s). Refer to Loops 6810 and 6811 Septage Pumps Level for specific septage level setpoints.

iii. The PLC shall provide virtual On/Off Selector Switch control for the pump at SCADA. In Off, the pump will not run. In Hand the pump will run.

iv. A pump Fail-to-Start Alarm shall be activated if the pump is in On and the PLC attempts to start the pump and the return Run contact does not indicate that the pump is running (delay 0-60s, initially 15s). The PLC shall remove the run command upon alarm.

v. The PLC shall activate a pump High Motor Temperature Alarm when the High Motor Temperature contact switch opens (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vi. The PLC shall activate a pump O/L Alarm when the O/L contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

vii. The PLC shall activate a pump Seal Leak Alarm when the seal leak contact activates (fixed delay of 2s). The PLC shall remove the run command upon alarm.

viii. The PLC shall activate a pump Emergency Stop Alarm when the Emergency Stop contact de-activates. The PLC shall remove the run command upon alarm (fixed delay of 1s).

6. SCADA Alarm Functions:
   a. Start Fail
   b. High Motor Temperature
   c. Motor Overload
   d. Emergency Stop

e. Seal Leak
f. Adjustable Enable / Delay / Setpoints for each warning and alarm

7. SCADA Monitoring and control Functions:
   a. Pump Run Status and Totalizer
   b. Pump Virtual Off/On
   c. Pump Start Command
   d. Pump LOR Selector Switch
   e. Pump LOR Virtual Switch

C. Loops 6814 and 6815 – Septage Tank Blowers

1. General: Two (2) new septage blowers (SEPB-6814, 6815) will be driven by new VFDs. SEPB No.1 will supply atmospheric air to Septage Tank No.1. SEPB No.2 will supply atmospheric air to Septage Tank No.2.
2. Field Instruments:
   a. High Discharge Air Temperature Switch (TSH-6814, 6815)
   b. Discharge Air Pressure Element (PE/PIT-6814, 6815)
3. Local:
   a. Each pump has a new local control station provided. The following local controls and indications will be located at LCS-6814, 6815 respectively:
      i. Speed Potentiometer (HSC-6814, 6815)
      ii. Local-Off-Remote (LOR) Switch (HS-6814B, 6815B)
         (1) In the Local position the equipment will run continuously speed. Speed will be controlled by the speed potentiometer when the switch is in the Local position.
         (2) In the Off position the equipment will not run.
         (3) In the Remote position the equipment will be controlled by the PLC as described in this set of loops. The PLC shall monitor a second set of contacts from the Remote position which will indicate that the equipment is available for PLC control. When the switch is in the Remote position the equipment shall be displayed as ENABLE at the OIT and SCADA. When the switch is not in the Remote position the equipment shall be displayed as NOT IN REMOTE at the OIT and SCADA.
      iii. Estop (HS-6814A, 6815A)
         (1) The Estop will directly shut down the equipment.
         (2) The PLC shall monitor a second set of contacts from the Estop switch which will be used to activate an alarm at the OIT and SCADA and indicate that the equipment is unavailable for PLC control.
      iv. Run Light (YL-6814A, 6815A)
4. VFD:
   a. The following controls and indications shall be located at the VFD for each Pump:
      i. Elapsed Time Meter (KQI-6814, 6815)
      ii. Run Light (YL-6814B, 6815B)
      iii. Motor High Temperature Alarm Light (TAH-6814, 6815)

iv. Motor High Temperature Interlock Reset (HS-6814C, 6815C)
v. Motor Fault Alarm Light (AL-6814, 6815)

b. Each VFD shall report the following to the PLC:
i. Run Status
ii. VFD Fault
iii. Speed Feedback
iv. Amps
v. Motor High Temperature

c. The PLC shall report the following to the VFD:
i. Start Command
ii. Speed Command

5. Hardware Interlocks:
a. Motor Thermal Switch shall provide a hardwired shutdown of the starter.
b. Estop shall provide a hardwired shutdown of the starter.

6. PLC Control Functions:
a. The PLC shall monitor the return Run status, VFD Fault, and Motor High Temperature Alarm from each VFD.
b. The PLC shall monitor the Estop status and LOR in Local from each local control station.
c. The PLC shall monitor a 4-20 mA signal from each VFD corresponding to motor speed. Motor speed shall be displayed at the OIT and SCADA and historically trended at SCADA only.
d. The PLC shall monitor a 4-20 mA signal from each VFD corresponding motor amps. Motor amps shall be displayed at the OIT and SCADA and historically trended at SCADA only.
e. The PLC shall monitor the High Temperature Switch. The PLC shall issue an alarm after a fixed time delay of 5sec. The alarm shall remain latched and require reset on the OIT. The PLC shall shut down the associated Septage Tank Blower.
f. The PLC shall monitor a 4-20 mA signal from each pressure element corresponding to the pressure in the pipe. The pressure shall be displayed in psi at the OIT and SCADA and historically trended at SCADA only.
g. If the blower pressure rises above the High Air Pressure Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue a warning. The PLC shall latch the warning and shall require reset on OIT.
h. If the blower pressure rises above the High-High Air Pressure Level Setpoint (user adjustable) for a time delay (0-60sec, initially @ 30sec.), the PLC shall issue an alarm. The PLC shall latch the alarm and shall require reset on OIT. The PLC shall shut down the associated Septage Tank Blower.
i. Blowers Control:
i. The PLC shall provide a virtual Local/Off/Remote selector switch for each blower at the OIT. In Local, the blower shall start, and the operator shall enter in a speed setpoint. In Off, the blower shall not run. In Auto, the blower shall pace itself based on the pressure in the

pipe (PE/PIT-6814, 6815) and the Septage Tank Level Loops 6810 and 6811. The blowers shall run unless a fault occurs or if the level in the septage tanks exceeds the Low-Low Level setpoint.

(1) Normal operation of the equipment shall be run in Hand. Automatic control shall be used when SLD-3 is open. Operator shall manually switch between Hand and Automatic operation.

ii. SEPB No.1 will supply atmospheric air to Septage Tank No.1. SEPB No.2 will supply atmospheric air to Septage Tank No.2. When activated, the status of the associated blower shall be displayed as ENABLE at the OIT and SCADA. When deactivated, the status of the associated pump shall be displayed as DISABLED at the OIT and SCADA.

iii. The operator will be able to select minimum and maximum speed, for each pump, at the OIT. The pumps shall be called to start up and shut down based on the pressure element, the Septage Low-Low Float Switch is activated (LSLL-6810A, 6811A) and Low-Low level setpoint in the septage tanks. The setpoints shall be entered at the OIT. The proposed pump control elevations are shown on the Process Drawings.

iv. Pump speed shall be scaled 0-100% as the VFD frequency output goes from 0-60 Hz.

7. Alarms at OIT:
   a. High Air Temperature Alarm
   b. High Air Pressure Warning
   c. High-High Air Pressure Alarm
   d. SEPB-1, 2 Motor High Temperature
   e. SEPG-1, 2 VFD Fault
   f. SEPG-1, 2 Fail to Start
   g. SEPG-1, 2 Emergency Stop
   h. Enable/Disable and Time Delay Setpoints for all alarms (OIT Only)
8. Monitoring and Control at OIT/SCADA:
   a. SEPG-1, 2 Run Status
   b. SEPG-1, 2 Start Command
   c. SEPG-1, 2 Amps
   d. SEPG-1, 2 Amps Historical Trend (SCADA only)
   e. SEPG-1, 2 Speed (0-100%)
   f. SEPG-1, 2 Speed Historical Trend (SCADA only)
   g. SEPG-1, 2 Pressure Level (psi)
   h. SEPG-1, 2 Pressure Level Historical Trend (SCADA only)
   i. SEPG-1, 2 Manual Speed Setpoint (0-100%)
   j. SEPG-1, 2 LOR Remote/Not In Remote Status
   k. SEPG-1, 2 Virtual LOR Selector Switch
   l. SEPG-1, 2 Elapsed Time Meter (###### hours)

D. Loop 6816 - Septage Control Panel (SEPCP)

1. General: One status light will be on the face of the Control Panel to provide an indication of the panel power status. The PLC generates one latching alarm that shall illuminate lights on the face of the panel. A Reset pushbutton on the panel or at the HMI/SCADA shall unlatch the alarms. A maintenance bypass switch shall be mounted on the face of the control panel. An UPS Fail and Surge device shall be mounted to the back of the control panel.
2. Panel Control definitions are defined on the Instrument Drawing I-1.
    a. Normal Power Indicator Light (YL-6816A)
    b. Common Alarm Indicator Light (AL-6816A)
    c. PLC Fail Alarm (AL-6816B)
    d. Reset Pushbutton (HS-6816A)
    e. Maintenance Bypass Switch (HS-6816B)
    f. UPS Fail Relay (EY-6816)
    g. UPS Power Indicator Light (YL-6816B)
    h. Surge Detection (ESH-6816)
    i. Managed Ethernet Switch Fault (AL-6816C)
3. Local Control:
    a. The Normal Power indicating light (YL-6816A) shall be illuminated and a power fail relay shall be energized when the control panel is powered from an external 120 VAC power circuit.
    b. When power from the external 120 VAC circuit is lost and the control panel is powered by the UPS, the power fail relay will de-energize and the Normal Power indicating light shall not be illuminated.
4. PLC:
    a. The PLC shall monitor the power failure contact, and shall activate the Control Panel Power Fail alarm if an adjustable on-delay timer expires (0 to 600 seconds, initially 60 seconds).
    b. The PLC shall output a common alarm if any of the alarms configured in the PLC program are active. This common alarm output shall activate the Common Alarm indicating light on the panel (AL-6816A).
    c. The contact state of the reset pushbutton (HS-6816A) shall be monitored by the PLC. When pushed, hardwired control shall reset the PLC Fail and the PLC shall unlatch the Common Alarm if the alarm condition has returned to normal.
    d. The PLC shall monitor the UPS battery failure/fault condition contact (EY-6816), and shall activate an alarm if an adjustable on-delay timer expires (0 to 60 seconds, initially 10 seconds).
    e. The PLC shall monitor the Surge condition contact (ESH-6816), and shall activate an alarm if a normally closed contact is opens.
5. Alarms at HMI/SCADA:
    a. Power Fail Alarm
    b. Common Alarm
6. Monitoring and Control at SCADA:
    a. Reset Pushbutton
    b. UPS Battery Failure
    c. Surge Detection

d. Maintenance Bypass Switch

E. Loop 6820 – Septage Flow
   1. General: The Septage Tanks effluent flow will be monitored by a new 4 inch magnetic flow meter. Pumps SEPP-1, -2 will flow through a single discharge header that will be monitored by FE/FIT-6820.
   2. Field Instruments:
      a. Magnetic Flow Meter (FE/FIT-6820)
   3. PLC:
      a. The flow meter shall measure the flow through its designated discharge pipe. A 4-20mA signal will be sent to the PLC from the flow meter corresponding to flow rate. The flow rate will be displayed at OIT-DWCP and SCADA and historically trended at SCADA only.
      b. The PLC shall totalize the flow from FE/FIT-6820 based on a pulse output from the flow transmitter. The transmitter pulse outputs shall initially be set to 1 pulse per 100 gallons. The following totalized flows shall be displayed at the OIT:
         i. Current 24 hour period (start at 12:00 midnight)
         ii. Previous 24 hour period (midnight to midnight)
         iii. Totalized Flow (millions of gallons)
   4. Alarms at OIT:
      a. While any pump is running, the PLC will activate an operator adjustable low flow alarm at the OIT after an operator adjustable time delay.
      b. Low Flow Alarm Setpoint (0-500 gpm initially set at 200 gpm) and Time Delay (0-300 seconds, set at 60 seconds)
      c. Low Flow Alarm
   5. Monitoring and Control at OIT/SCADA:
      a. Effluent Flow Rate (0-6000 gpm)
      b. Effluent Flow Historical Trend (SCADA only)
      c. Current 24 hr Period Totalized Flow (##### gallons)
      d. Previous 24 hr Period Totalized Flow (##### gallons)

Appendix D
Permitting Approvals

Frances Martinez-Marrero

From:	eml-sfmims-prd@la.gov
Sent:	Monday, December 2, 2024 2:03 PM
To:	CWASHINGTON3@SWBNO.ORG; Frances Martinez-Marrero; Steven Hallowell
Cc:	AAITIDDIR@NOLA.GOV
Subject:	OSFM Application Status Change
Attachments:	AR-24-019243-120220240103.pdf

EAST BANK SEWAGE TREATMENT PLANT PHASE I SECONDARY TREATMENT AND SOLIDS UPGRADE
8800 S CLAIBORNE AVE, NEW ORLEANS, LA 70118

Date: 12/2/2024
Project Name: EAST BANK SEWAGE TREATMENT PLANT PHASE I SECONDARY TREATMENT AND SOLIDS UPGRADE
Dear Applicant:

Your OSFM Plan Review Application bearing Project #AR-24-019243 is **RELEASED**

Click here to go to OSFM-Information Management System

IT Group
8181 Independence Blvd. Baton Rouge, LA 70806
Customer Service: (225) 925-4911 / Fax: (225) 925-4241
Autogenerated by LDPS VP Server. This e-mail transmission may contain information that is proprietary, privileged and/or confidential and is intended exclusively for the person(s) to whom it is addressed. Any use, copying, retention or disclosure by any person other than the intended recipient or the intended recipients designees is strictly prohibited. If you have received this message in error, please notify the sender immediately by return e-mail and delete all copies.

Office of State Fire Marshal

8181 Independence Blvd. Baton Rouge, LA 70806
(225) 925-4911 (800) 256-5452 Fax (225) 925-4241

PLAN REVIEW REPORT

Jeff Landry
GOVERNOR

Chief Bryan J. Adams
FIRE MARSHAL

STEVEN HALLOWELL WRIGHT-PIERCE, INC.
601 S. LAKE DESTINY DRIVE, SUITE 290
ORLANDO FL 32828

Project Number: **AR-24-019243**
Review Type: **Architectural Review**
Status: **RELEASED**
Date Completed: **12/2/2024**
Code Edition: **2021**

In accordance with L.R.S. 40:1574 et seq., satisfactory compliance with the requirements of the laws, rules, regulations and codes of the state that are entrusted to the State Fire Marshal to uphold must be achieved before any work is performed. As such, a permit shall not be issued or construction or installation of the scope of work identified herein shall not commence until the Status of this review is "Released" and the requirements of other state and local entities have been satisfied.

Project Description:	**THIS PERMIT INCLUDES VARIOUS UPGRADES TO THE EAST BANK SEWAGE TREATMENT PLANT LOCATED AT 6501 FLORIDA AVENUE INCLUDING A NEW ELECTRICAL BUILDING FOR THE NORTH RAS PUMP STATION (LEVEL II ALTERATION) AND IMPROVEMENTS TO THE ELECTRICAL ROOM IN THE SOLIDS HANDLING BUILDING (LEVEL I ALTERATION).**		
Project Name: **EAST BANK SEWAGE TREATMENT PLANT PHASE I SECONDARY TREATMENT AND SOLIDS UPGRADE**		Address: **8800 S CLAIBORNE AVE, NEW ORLEANS, LA 70118**	
Funding Type: **Municipal Owned**	Within City Limits? **YES**	Number of Stories: **2**	High Rise Building: **No**
Occupancy Separation Type:	Total Occupancy Square Feet: **2988**	Project on which Floor(s): **1, 2**	Construction Type: **II-B / II (000)**
Additional Features (if applicable):			

Occupancy Type(s) and Square Feet

Occupancy Type:	Square Feet:	Details:
Factory/Industrial	**2988**	**TYPE OF FACTORY/INDUSTRIAL BUILDING: GROUP F-1 (MODERATE HAZARD)**

Renovation

Renovation or Addition:	**Alteration Level 2 (less than or equal to 50% of the building's physical value), Addition(s)**	
Date of Original Building Construction:	**7/27/1981**	
Date of Latest Major Renovation to this Building:	**7/27/1981**	
Existing Square Feet: **2490**	Additional Square Feet: **498**	Renovated Square Feet: **2988**
Previous Occupancies:		
Generator Installation:		

Facility Licensed By DHH Health Standards Section: **No**

Louisiana State Uniform Construction Code Review

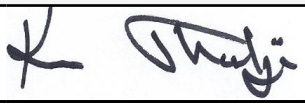
Review for the LSUCCC performed by:	3rd Party Provider's Registration Number:
Parish or Municipal Permitting Office	

Individuals Involved in this Project		
Name:	Role:	Address:
STEVEN C. HALLOWELL	**Professional of Record - CIVIL ENGINEER (E-46278)**	**601 S. LAKE DESTINY DRIVE, SUITE 290, ORLANDO, FL 32828**
CORWIN WASHINGTON	**Owner**	**8800 S CLAIBORNE AVE, NEW ORLEANS, LA 70118**

Changes that are inconsistent with the reviewed documents are not authorized unless reviewed by this office for compliance with adopted codes, rules and laws. The changes must be submitted to this office by the Professional of Record where required by law, otherwise by the Owner, for review prior to construction and inspection. Minor changes may be submitted as supplemental information amended to this assigned project number. Changes that alter the scope of work, or that otherwise will require another full review of the project, will require a complete resubmittal of the entire scope of work with application, revised plans, and applicable review fee.

This review shall in no way permit or authorize any omissions or deviations from the specific requirements of the adopted codes, rules and regulations of the state. Construction permits must be issued or installation must commence within 180 days from the date of the “Released” Status for this submittal.

Occupancy of the project will not be permitted until a satisfactory inspection of the completed construction has been made by this office. Please allow at least two (2) weeks advanced notice to schedule inspections.

Review Completed By			
Signature:			
Name:	Khalid Thalji	Badge No.:	488

Distribution List		
Name	**Firm Name**	**Role**
NEW ORLEANS CITY PERMITS		Permit Office

Cautionary Codes

The items listed below are comments for informational purposes or identified requirements that will be verified upon final inspection by this office. These requirements need not be addressed back to the reviewer, however should be addressed prior to construction and inspection scheduling. Failure to comply with or otherwise address these items may affect final occupancy and use of the structure.

1 Scope of work: 498 sf (22'X22.67') addition of Electrical Room for NORTH RAS PUMP STATION, and 2,490 sf renovations including Electrical Room renovations of SOLIDS HANDLING BUILDING and renovations at both NORTH RAS PUMP STATION and SOLIDS HANDLING BUILDING. The buildings are classified as **Special-Purpose INDUSTRIAL occupancy**.

2 LRS 40:1730.49.B and 40:1563 REVIEW FOR COMPLIANCE WITH THE LIFE SAFETY AND FIRE PROTECTION REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE ARE INCLUDED IN THIS REVIEW. Contact the building official of the applicable political subdivision to coordinate compliance with the complete requirements of the Louisiana State Uniform Construction Code (LSUCC). LRS 40:1730.23 mandates the enforcement of the LSUCC codes by municipalities and parishes in Louisiana, as described by LRS 40:1730.28. LRS 40:1730.23.H permits a parish or municipality to accept determinations made by the state fire marshal as they pertain to life safety and fire protection as required by the LSUCC.

3 After consultation with the Louisiana Rehabilitation Services, it has been determined that this office will NOT require this facility to comply with any of the ADA-ABA Accessibility Guidelines or LSC requirements for individuals with disabilities, with the following stipulations:
- No attached office spaces are allowed with this exception.
- No floor plan modifications are permitted. Office additions, and spaces created which constitute a change in use, shall provide access to persons with disabilities and shall conform to the provisions for new construction.
- Visual alarm notification shall be provided if a fire alarm system is required by Code.
- If a complaint is received about discrimination in hiring of individuals with disabilities or concerning access to any part of the facility, this office reserves the right to investigate the complaint and reserves the right to require the facility or a portion thereof to be upgraded to comply with the accessibility requirements enforced by this office.
- Please note that this document references specific compliance with state regulations and does not guarantee, or attempt to circumvent, compliance with federal law.
- As per ADA-ABA 2004, Section F103, Office of State Fire Marshal appeal determinations are not valid for facilities that are designed, constructed, altered, or operated with federal funds, or leased by a federal agency. The authority having jurisdiction over such appeals is the administrator of the General Services Administration (GSA).

4 101:7.2.1.3 and IBC 1010.1.4 through 1010.1.6 Provide level landings outside exterior doors that are within 1/2" of the interior finish floor elevation.

5 LAC 55:V:303.E Provide listed portable fire extinguishers in accordance with NFPA 10. (Refer to Appendix E for distribution information.)
Classification:
- Class A fires: fires in ordinary combustible materials, such as wood, cloth, paper, rubber and many plastics. Travel distance to a fire extinguisher shall not exceed 75 feet.
- Class B fires: fires in flammable liquids, combustible liquids. petroleum greases, tars. oils, oil-based paints, solvents, lacquers, alcohols and flammable gases. Travel distance to a fire extinguisher shall not exceed 30 feet for Class B fires (liquids). (May be increased to 50 feet for Light (low) Hazard fires with 10-B extinguisher, for Ordinary (moderate) Hazard fires with 20-B extinguisher, and for Extra (high) Hazard fires with 80-B extinguisher). See Table 10:6.3.1.1.
- Class C fires: fires that involve energized electrical equipment. Travel distance to a fire extinguisher shall not exceed 75 feet.
- Class D fires: fires in combustible metals. Travel distance to a fire extinguisher shall not exceed 75 feet.
- Class K fires: fires in cooking appliances that involve combustible cooking media (vegetable or animal oils and fats.) Travel distance to a fire extinguisher shall not exceed 30 feet for Class K fires (cooking appliances). See NFPA 10:6.6.

Orleans Levee District
6920 Franklin Avenue
New Orleans, LA 70122
Attention: Mr. Chris Humphreys

WAIVER REQUEST

This Waiver is not a regulatory permit and does not authorize the implementation of any project without documented approval from the Levee District.

Permit Applicant: Sewage and Water Board of New Orleans

Date of Request: 01-31-2025
Agent: Wright-Pierce

Applicant's Request: Approval to perform various upgrades to the East Bank Sewage Treatment Plant. Excavations for site piping will be 20-feet wide, 600-feet long, and 20-feet deep. Open end steel pipe piles will also be driven with allowable capacities ranging from 30 to 60-kip. The closest work will be ±590-feet from the levee toe.

Received via email 2/3/2025
SLFPAE #OL2025-00028

Project Location: All work to occur on the flood side of the Non-Federal - Forty Arpent Canal Levee at 6501 Florida Avenue, New Orleans, Orleans Parish, Louisiana.

Project Coordinates:..... 29° 58' 36.060" , -89° 59' 50.010"

1. This Letter of No Objection is only for stated work within or in the vicinity of the Levee District right-of-way, and must be accomplished in accordance with the details set forth in the applicant's request and the conditions contained herein. Any changes to the limits or scope of the proposed work must be submitted for additional review. The Levee District must be contacted in writing prior to commencement and at the end of activities. The applicant is responsible for obtaining and providing copies of any permits or lease agreements necessary from the U.S. Army Corps of Engineers, the U.S. Coast Guard, the Louisiana State Land Office, the Louisiana Department of Transportation and Development, the Louisiana Department of Natural Resources - Office of Coastal Management, the Louisiana Department of Wildlife and Fisheries, the Parish Government and/or any other applicable agencies, as well as documented approval from the area landowner(s) prior to the initiation of the work. The applicant is responsible for adhering to the provisions of any existing permits. The proposed work must not restrict the Levee District's maintenance operations, or any potential flood fight activities at the levee, nor shall it obstruct or impede drainage, or create areas of standing water on the levee batture. The applicant must employ and maintain suitable erosion protection measures at the project site to the satisfaction of the Levee District. The applicant or owner must immediately notify the Levee District of any seepage or sand boils that occur during high water conditions. All materials associated with the proposed work must be removed from the area upon completion of the project and the area must be returned to its original state of existence or better. Any damage done to the levee, floodwall or other flood control structure, revetment, or surrounding project area, resulting from the proposed work must be repaired

or replaced by the applicant. Should any change in the location of the existing levee, river, floodwall, drainage canal, waterway, or generally prevailing conditions in the vicinity, or should any changes in the area be required in the future, in the public interest, the applicant shall make such changes in the project as necessary. Any required changes or repairs shall be at the applicant expense. This letter of no objection is offered with no opinion or approval of the design or engineering feasibility of the work.

Failure to abide by the conditions and requirements set forth in this Letter of No Objection may constitute non-compliance with the State of Louisiana comprehensive master coastal protection plan and may subject the levee district and/or the applicant/agent to any and all procedures and actions by CPRA or the CPRA Board pursuant to La. R.S. 49:214.5.2(A)(6) and as may be necessary to ensure compliance with such comprehensive master coastal protection plan.

2. That the applicant is responsible for maintaining the existing level of flood protection at all times to the satisfaction of the levee district.

Yours very truly,

for Glenn Ledet, Jr., Executive Director
Coastal Protection and Restoration Authority of Louisiana

24570/mc/tj/jr

cc:

U.S. Army Corps Of Engineers-Levees

WRIGHT-PIERCE™
Engineering a Better Environment

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SEWERAGE AND WATER BOARD OF NEW ORLEANS

ENGINEERING DEPARTMENT

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

THIS ACKNOWLEDGES THAT THE ATTACHED DRAWINGS HAVE BEEN RECEIVED BY THE SEWERAGE & WATER BOARD OF NEW ORLEANS AND HEREBY FORWARDED FOR PROCUREMENT. THE SEWERAGE & WATER BOARD OF NEW ORLEANS DOES NOT RELEASE CONSULTANT/DESIGNER FROM ANY LEGAL LIABILITY THAT MAY ARISE FROM THE BOARD'S ACCEPTANCE OR USE OF THE ATTACHED DRAWINGS FOR THEIR INTENDED PURPOSE.

GENERAL SUPERINTENDENT



LOCATION PLAN
SCALE: 1"=2,000'

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

Infinity Engineering Consultants, LLC
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe046278
PROFESSIONAL ENGINEER
3/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163 | DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

SEWERAGE AND WATER BOARD OF NEW ORLEANS
CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

COVER SHEET

DR. A.COUTURE
TRC. -
CK. D.STILES
AP. S.HALLOWELL
SCALE: AS NOTED
DATE: FEBRUARY 2026

G-00-001
DWG. No. 12221-W-33
SET NO. SHEET NO. OF

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CIVIL

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REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
STATE OF LOUISIANA
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

DRAWING INDEX

DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

G-00-002

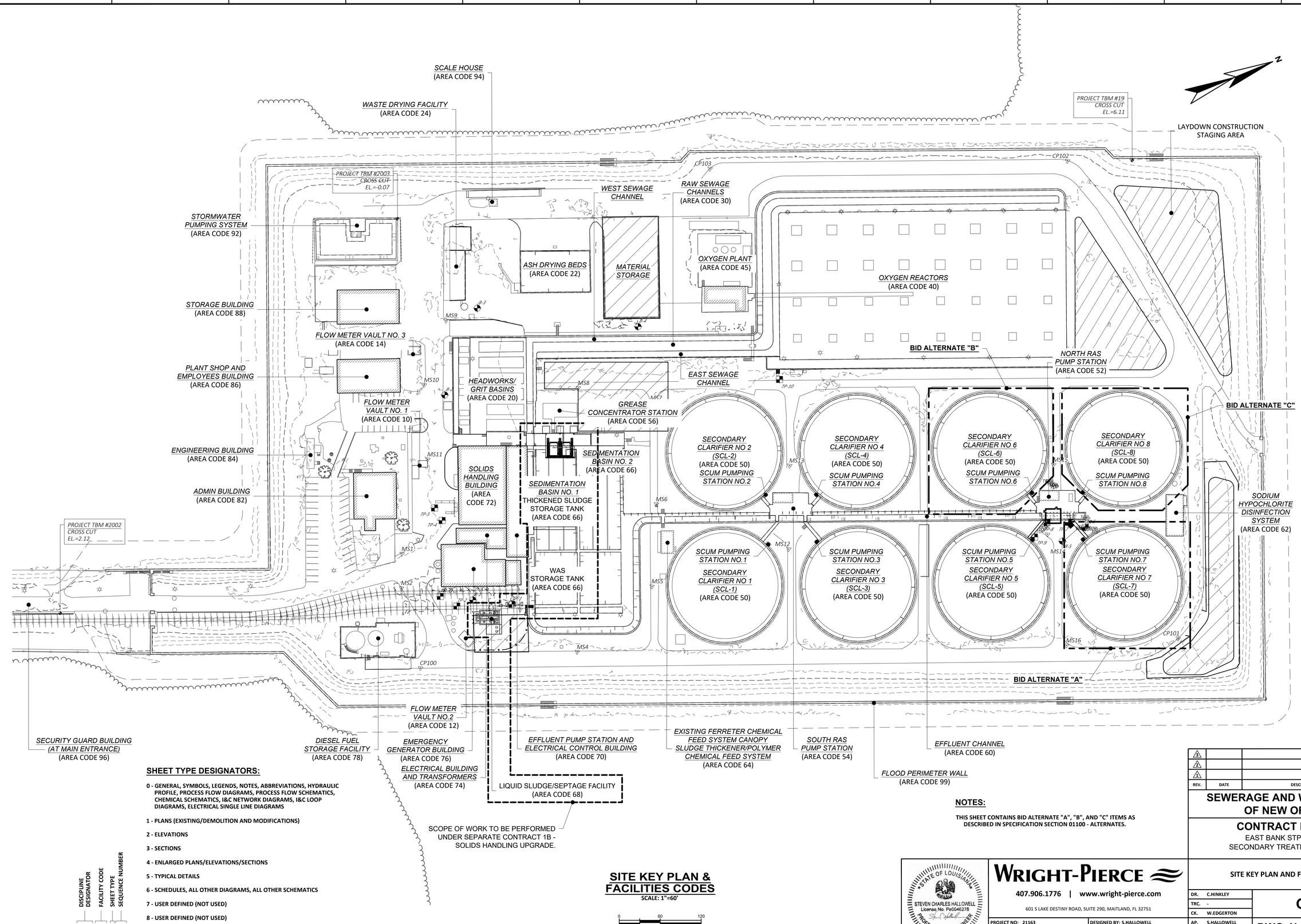
DWG. No. 12221-W-33

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LAST SAVED BY: CHRISTOPHER.HINKLEY 2/11/2026 2:36 PM

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SHEET CONTAINS BID ALTERNATES

SHEET TYPE DESIGNATORS:

0 - GENERAL, SYMBOLS, LEGENDS, NOTES, ABBREVIATIONS, HYDRAULIC PROFILE, PROCESS FLOW DIAGRAMS, PROCESS FLOW SCHEMATICS, CHEMICAL SCHEMATICS, I&C NETWORK DIAGRAMS, I&C LOOP DIAGRAMS, ELECTRICAL SINGLE LINE DIAGRAMS

1 - PLANS (EXISTING/DEMOLITION AND MODIFICATIONS)

2 - ELEVATIONS

3 - SECTIONS

4 - ENLARGED PLANS/ELEVATIONS/SECTIONS

5 - TYPICAL DETAILS

6 - SCHEDULES, ALL OTHER DIAGRAMS, ALL OTHER SCHEMATICS

7 - USER DEFINED (NOT USED)

8 - USER DEFINED (NOT USED)

9 - ISOMETRICS, PERSPECTIVES, PHOTOGRAPHS

DISCIPLINE DESIGNATOR | FACILITY CODE | SHEET TYPE | SEQUENCE NUMBER

PR-15-101

SITE KEY PLAN & FACILITIES CODES

SCALE: 1"=60'

0 60 120

NOTES:

THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100 - ALTERNATES.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe046278
PROFESSIONAL ENGINEER
2/12/2026

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PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL	DR. C.HINKLEY	
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. W.EDGERTON	
		AP. S.HALLOWELL	
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	

SITE KEY PLAN AND FACILITIES CODES

G-00-101

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

LAST SAVED BY: ADAM.COUTURE 2/19/2026 3:17 PM

LEGEND

EXISTING		PROPOSED
	PROPERTY/ROW LINE	
	SETBACK LINE	
	EASEMENT LINE	
	CENTERLINE	
	EDGE OF PAVEMENT	
	CURBING	
	EDGE OF GRAVEL	
	EDGE OF CONCRETE	
—122—	CONTOUR	123
	BUILDING	
	STONEWALL	
	TREELINE	
	CHAIN LINK FENCE	
	STOCKADE FENCE	
X X	BARB WIRE FENCE	
	RETAINING WALL	
	GUARDRAIL	
8" S	SEWER	8"S
4" FM	SEWER FORCE MAIN	4"FM
4" G	GAS	
8" W	WATER	8"W
15" SD	STORM DRAIN	
6" UD	UNDERDRAIN	
12" CMP	CULVERT	
UGE UGE	UNDERGROUND ELECTRIC	UGE UGE
OHE OHE	OVERHEAD ELECTRIC	
UGT UGT	UNDERGROUND TELEPHONE	
CATV CATV	UNDERGROUND CABLE TV	
	IRON PIPE/REBAR	
	DRILLHOLE	
	MONUMENT	
	SURVEY CONTROL POINT	
124.6	SPOT ELEVATION	X 134.5
SMH	SEWER MANHOLE	
DMH	DRAINAGE MANHOLE	
CB CB CB	CATCH BASIN	
EMH	ELECTRIC MANHOLE	
TMH	TELEPHONE MANHOLE	
	SHUTOFF VALVE	
	WATER SERVICE SHUTOFF	
	YARD HYDRANT	
	HYDRANT	
	GAS SERVICE SHUTOFF	
	GAS GATE VALVE	
	UTILITY POLE	
	UTILITY POLE W/ GUY	
	UTILITY POLE W/ LIGHT	
	LIGHT POLE	
	BOLLARD	
	FLAGPOLE	
	CONIFEROUS TREE	
	DECIDUOUS TREE	
	SHRUB	
	WETLAND FLAG	
	EDGE OF WATER	
	STREAM	
	EDGE OF WETLANDS	
	FLOODPLAIN	
	WETLANDS	
	DRAINAGE FLOW	
	DRAINAGE SWALE	
	PAVEMENT MARKINGS	
	SIGN	
MB	MAILBOX	
	TEMPORARY BENCH MARK	
TP	TEST PIT	
B	TEST BORING	
P	TEST PROBE	
MW	MONITORING WELL	
	LIMIT OF WORK	
	SILT FENCE	
	RIPRAP	
	RAILROAD	
	MATCHLINE	
	ROCK OUTCROP	
	HEAVY DUTY PAVEMENT	
	ASPHALT CONCRETE PAVEMENT	
	WALKWAY PAVEMENT	
128.11	PIPE SPOT ELEVATION	X
6"XX	CULVERT/UNDERDRAIN	
6"XX	PIPING	6"XX
30"XX	LARGE DIA PIPING (18"+)	30"XX
6"XX (AB)	PIPE PREVIOUSLY ABANDONED	
6"XX	PIPING TO BE DEMOLISHED	
6"XX	PIPING TO ABANDON	

"XX" DENOTES PIPE DESCRIPTION
SEE LIST OF CIVIL ABBREVIATIONS FOR PIPE DESCRIPTIONS

GENERAL NOTES

1. AS REQUIRED BY THE SOUTHEAST LOUISIANA FLOOD PROTECTION AUTHORITY - EAST, THE TOTAL WEIGHT OF TRUCKS CARRYING CONCRETE, EQUIPMENT, PIPING, ETC. INSIDE THE TREATMENT PLANT FLOOD PROTECTION WALLS SHALL NOT EXCEED 72,000 LBS.

2. THE OWNER WILL BE RESPONSIBLE FOR OBTAINING THE PERMITS LISTED IN THE SUPPLEMENTARY OR SPECIAL CONDITIONS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BE FAMILIAR WITH THE APPLICABLE PROVISIONS OF EACH PERMIT AS THEY APPLY TO THE WORK PRIOR TO BIDDING AND ABIDE BY THOSE PROVISIONS DURING CONSTRUCTION. COPIES OF ALL OBTAINED PERMITS ARE AVAILABLE FOR REVIEW FROM THE OWNER. ALL OTHER PERMITS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

3. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

4. CONTRACTOR SHALL COMPLY WITH THE COORDINATION REQUIREMENTS AND RELATED COSTS, IF ANY, AS SPECIFIED IN SPECIFICATION SECTION 01050.

5. CONTRACTOR SHALL NOTE THAT, IN GENERAL, ALL EXISTING CONDITION INFORMATION ON THE DRAWINGS ARE SHOWN WITH A LIGHTER LINE WEIGHT AND WITH A SLANTED TYPE TEXT.

EXISTING SITE CONDITIONS

1. THE LOCATIONS OF UNDERGROUND UTILITIES AND STRUCTURES, AS SHOWN ON THE DRAWINGS, ARE APPROXIMATE AND MAY NOT BE COMPLETE. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE BASED ON PREVIOUS CONSTRUCTION DESIGN PLANS, WHICH ARE AVAILABLE FOR INSPECTION AT THE OWNERS OFFICE. NO GUARANTEE IS MADE THAT UTILITIES OR STRUCTURES WILL BE ENCOUNTERED WHERE SHOWN, OR THAT ALL UNDERGROUND UTILITIES AND STRUCTURES ARE SHOWN. ALL LOCATIONS AND SIZES OF EXISTING UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD WITH TEST PITS AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES OR PIPING THAT MAY BE AFFECTED. THE CONTRACTOR WILL REALIGN NEW PIPE LOCATIONS AS REQUIRED TO CONFORM TO EXISTING LINES AND AS APPROVED BY THE ENGINEER.

2. BELOW GRADE UTILITY INFORMATION IS BASED ON INFORMATION PROVIDED BY EACH UTILITY. LOCATION OF PUBLIC UTILITIES SHOWN IS ONLY APPROXIMATE AND MAY NOT BE COMPLETE. PRIVATE UNDERGROUND UTILITIES SUCH AS, BUT NOT LIMITED TO, SEWER LINES, WATER LINES AND BURIED ELECTRICAL SERVICE ENTRANCES ARE NOT SHOWN. THE CONTRACTOR SHALL ASCERTAIN THE LOCATION AND SIZE OF EXISTING UTILITIES IN THE FIELD WITH THE RESPECTIVE UTILITY COMPANY REPRESENTATIVE PRIOR TO COMMENCING WORK. REFER TO SPECIFICATION SECTION 01050. ADDITIONAL TEST PITS, BEYOND THOSE SHOWN, MAY BE REQUIRED. UTILITY CONTACTS ARE AS FOLLOWS:

EAST BANK STP:
TEL: 504.277.5400

ELECTRIC:
ENTERGY NEW ORLEANS, LLC
TEL: 800.968.9243

WATER & SEWER:
SEWERAGE & WATER BOARD OF NEW ORLEANS
TEL: 504.529.2837

CABLE (SPECTRUM):
TEL: 504.577.2806

LOUISIANA 811 (CALL BEFORE YOU DIG):
TEL: 800.272.3020

TELEPHONE:
(INSERT PHONE)

OTHER:
(INSERT PHONE)

GAS:
(INSERT PHONE)

3. THE EXISTING DRAWINGS ARE PROVIDED FOR REFERENCE ONLY. THE CONTRACTOR SHALL FIELD VERIFY EXISTING INFRASTRUCTURE, EQUIPMENT, ELECTRICAL AND UNDERGROUND SYSTEMS AS PART OF THE DESIGN AND CONSTRUCTION EFFORT. THE CONTRACTOR SHALL NOT RELY SOLELY ON THE RECORD DRAWINGS, AS UNDOCUMENTED MODIFICATIONS MAY HAVE OCCURRED SINCE THE PREPARATION OF THE DRAWINGS. THE FOLLOWING DRAWINGS OF PHYSICAL CONDITIONS, IF ANY, RELATING TO EXISTING SURFACE AND SUBSURFACE STRUCTURES AT THE SITE (EXCEPT UNDERGROUND FACILITIES) ARE KNOW TO OWNER.
EXISTING RECORD PLANS:
RECORD DRAWINGS OF CONTRACT NO. 3050, EXPANSION OF THE EAST BANK SEWAGE TREATMENT FACILITIES, CITY OF NEW ORLEANS, LOUISIANA, DATED 1981, PREPARED BY WALDEMAR S. NELSON AND COMPANY, INC., RECORD DRAWING OF CONTRACT NO. 3075, MODIFICATIONS TO THE RETURN ACTIVATED SLUDGE PS AT THE EAST BANK SEWER TREATMENT PLANT, SEWERAGE & WATER BOARD OF NEW ORLEANS, DATED DECEMBER 2014, PREPARED BY TRIGON ASSOCIATES.
RECORD DRAWINGS OF THE SODIUM HYPOCHLORITE DISINFECTION SYSTEM AT THE EAST BANK WASTEWATER TREATMENT PLANT, SEWERAGE & WATER BOARD OF NEW ORLEANS, DATED AUGUST 2016, PREPARED BY TRIGON ASSOCIATES."

SITE DEMOLITION

1. A SOLID GREY HATCH HIGHLIGHTS AND REPRESENTS DEMOLITION ON AN ITEM(S) IN THE AREA ASSOCIATED WITH THE HATCH.

2. REFER TO THE EXISTING SITE PLAN, FOR ADDITIONAL INFORMATION REGARDING EXISTING FACILITIES. REFER TO THE LAYOUT DRAWING FOR LIMITS OF WORK.

3. REFER TO STRUCTURAL, PROCESS, MECHANICAL, INSTRUMENTATION AND ELECTRICAL DRAWINGS FOR SPECIFIC INFORMATION REGARDING DEMOLITION AND REMOVAL.

4. REFER TO SPECIFICATION SECTION 01010A, WHICH CONTAINS INFORMATION ON CONSTRAINTS OF CONSTRUCTION SEQUENCING.

5. DEMOLISH/REMOVE EXISTING PIPING AS REQUIRED FOR CONSTRUCTION OF NEW FACILITIES. ALL PIPING, EQUIPMENT AND MATERIALS TO BE DEMOLISHED AND/OR REMOVED FROM SERVICE SHALL BE COORDINATED WITH THE OWNER AND ENGINEER BEFORE COMMENCING THAT WORK. EXISTING PIPING THAT NEEDS TO BE REMOVED TO CONSTRUCT THE NEW FACILITIES, BUT IS TO REMAIN, SHALL BE REINSTALLED/REPLACED AS NEEDED. EXISTING PIPES AND CONDUIT DESIGNATED AS "ABANDONED" MAY BE REMOVED IF THE CONTRACTOR SO CHOOSES. IF ABANDONED PIPE CONFLICTS WITH NEW SITE PIPING OR FACILITIES, THEN A PORTION OF THE ABANDONED PIPE SHALL BE REMOVED, AND THE NEW ENDS OF ABANDONED PIPE CAPPED OR PLUGGED WITH CONCRETE.

6. ALL EXISTING PIPING AND UTILITIES WHICH ARE BENEATH PROPOSED STRUCTURES, AND ARE TO BE ABANDONED, SHALL BE REMOVED TO A MINIMUM OF 5-FEET OUTSIDE OF THE STRUCTURE. PIPE AND UTILITIES BENEATH PROPOSED STRUCTURES THAT ARE TO REMAIN SHALL BE CONCRETE ENCASED, UNLESS OTHERWISE INDICATED. REFER TO THE STRUCTURAL DRAWINGS FOR DETAILS.

7. SEVERING OF EXISTING UTILITIES FOR ABANDONMENT, OR REMOVAL OF A SEGMENT FROM SERVICE, SHALL BE PERFORMED IN SUCH A MANNER AS TO ALLOW THE REMAINING ACTIVE SEGMENT TO CONTINUE IN ITS INTENDED SERVICE. CAP ACTIVE SEGMENTS WITH APPROPRIATE FITTINGS, JOINT RESTRAINT, ETC. TO ENSURE THEIR INTEGRITY. PLUG ENDS OF ABANDONED PIPE SEGMENTS WITH CONCRETE UNLESS SPECIAL CIRCUMSTANCES DICTATE PLUGGING ABANDONED PIPES WITH BLIND FLANGES, RESTRAINED MECHANICAL JOINT PLUGS, ETC. AS APPROPRIATE.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF ALL DEMOLISHED PIPING, EQUIPMENT AND MATERIALS. DISPOSAL SHALL BE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS. THE OWNER RESERVES THE RIGHT TO RETAIN ANY SUCH PIPING, EQUIPMENT AND MATERIALS DESIGNATED FOR DEMOLITION. SUCH MATERIALS TO BE RETAINED SHALL BE PROPERLY STORED IN AN ON-SITE LOCATION. COORDINATE LOCATION AND MATERIALS TO BE SALVAGED WITH THE OWNER/ENGINEER. REFER TO SPECIFICATION SECTION 02050A.

9. THE CONTRACTOR SHALL KEEP A RECORD OF DEMOLITION AS PART OF THE PROJECT RECORD DOCUMENTS IN ACCORDANCE WITH SPECIFICATION SECTION 01720.

10. THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THAT ALL PROCESS FLOWS ARE MAINTAINED DURING CONSTRUCTION. GRAVITY OR PUMPED BYPASSES AND OTHER MEANS OF MAINTAINING FLOW SHALL BE SUBJECT TO THE REVIEW AND ACCEPTANCE OF THE ENGINEER. THE CONTRACTOR SHALL COORDINATE ANY TEMPORARY STOPPAGES OR BYPASSES WITH THE OWNER AND ENGINEER. FEDERAL AND STATE REGULATIONS REQUIRE THAT THE TREATMENT FACILITY REMAIN IN OPERATION (ALL TREATMENT, DISINFECTION, SLUDGE HANDLING AND DISPOSAL PROCESSES) THROUGHOUT CONSTRUCTION, AND THAT DISCHARGE PERMITS ARE MET. REFER TO SPECIFICATION SECTION 01010A.

11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE APPROPRIATE DISPOSAL OF FLOWS RESULTING FROM PRECIPITATION AND GROUNDWATER DEWATERING OPERATIONS.

SITE CLEARING, GRUBBING AND GRADING

1. STRIPPING OF TOPSOIL (LOAM) SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02115. REFER TO THE LAYOUT AND GRADING DRAWINGS FOR LIMIT OF WORK AND STRIPPING.

2. CONTRACTOR SHALL PROVIDE PROPER EROSION CONTROL AND DRAINAGE MEASURES IN ALL AREAS OF WORK, AND CONFINE SOIL SEDIMENT TO WITHIN THE LIMITS OF EXCAVATION AND GRADING. PRIOR TO BEGINNING EXCAVATION WORK, EROSION CONTROL FENCE SHALL BE INSTALLED AT THE DOWN GRADIENT PERIMETER OF THE ACTUAL LIMITS OF GRUBBING AND/OR GRADING, AND AS SHOWN ON THE DRAWINGS. EROSION CONTROL MEASURES SHOWN ON THE DRAWINGS ARE A MINIMUM, CONTRACTOR SHALL TAKE ALL OTHER NECESSARY MEASURES. EROSION CONTROL FENCE SHALL ALSO BE INSTALLED AT THE DOWN GRADIENT PERIMETER OF THE TOPSOIL STOCKPILES. ALL DISTURBED EARTH SURFACES SHALL BE STABILIZED IN THE SHORTEST PRACTICAL TIME AND TEMPORARY EROSION CONTROL DEVICES SHALL BE EMPLOYED UNTIL SUCH TIME AS ADEQUATE SOIL STABILIZATION HAS BEEN ACHIEVED. TEMPORARY STORAGE OF EXCAVATED MATERIAL SHALL BE STABILIZED IN A MANNER THAT WILL MINIMIZE EROSION. ALL INSTALLED EROSION CONTROL FACILITIES SHALL BE REMOVED AT THE END OF THE PROJECT. REFER TO SPECIFICATION SECTION 02000.

3. ALL STORM DRAINAGE INLETS SHALL BE PROTECTED BY HAY BALE FILTERS TO PREVENT ENTRY OF SEDIMENT FROM RUNOFF WATERS DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL COLLECTED SEDIMENT, AND THAT WHICH COLLECTS IN THE STORM DRAIN SYSTEM. REFER TO THE CIVIL DETAIL DRAWINGS.

4. THE GEOTECHNICAL DATA REPORT FOR THE PROJECT SITE IS INCLUDED IN APPENDIX A AND IS DESCRIBED IN SPECIFICATION SECTION 00800 (SUPPLEMENTAL CONDITIONS).

5. CONTRACTOR SHALL CONTROL DUST ON THE CONSTRUCTION SITE TO A REASONABLE LIMIT, AS DETERMINED BY THE ENGINEER, AND AS OUTLINED IN SPECIFICATION SECTION 01562.

6. CONTRACTOR SHALL NOT TRACK OR SPILL EARTH, DEBRIS OR OTHER CONSTRUCTION MATERIAL ON PUBLIC OR PRIVATE STREETS AND PLANT DRIVES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMMEDIATE ASSOCIATED CLEAN UP.

7. ALL CATCH BASINS, MANHOLES, VALVE PITS, VALVE BOXES AND OTHER BURIED FACILITIES WITH SURFACE ACCESS SHALL BE ADJUSTED TO MATCH FINAL GRADES, UNLESS OTHERWISE INDICATED.

8. THE CONTRACTOR SHALL NOT HAVE ANY RIGHT OF PROPERTY IN ANY MATERIALS TAKEN FROM ANY EXCAVATION. SUITABLE EXCAVATED MATERIAL MAY BE INCORPORATED IN THE PROJECT, WITH EXCESS MATERIAL DISPOSED OF AT A LOCATION PROVIDED BY THE CONTRACTOR. THESE PROVISIONS SHALL IN NO WAY RELIEVE THE CONTRACTOR OF OBLIGATIONS TO PROPERLY DISPOSE OF AND REPLACE ANY MATERIAL DETERMINED BY THE ENGINEER TO BE UNSUITABLE FOR BACKFILLING. THE CONTRACTOR SHALL DISPOSE OF UNSUITABLE AND EXCESS MATERIAL IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF THE CONTRACT DOCUMENTS.

9. CONTRACTOR SHALL REMOVE AND REPLACE, OR REPAIR, ALL CURBS, SIDEWALKS, PAVEMENT AND OTHER ITEMS DAMAGED BY CONSTRUCTION ACTIVITIES TO AT LEAST THEIR ORIGINAL CONDITION, TO THE SATISFACTION OF THE OWNER AND ENGINEER.

10. WHERE EXISTING PAVEMENT IS REMOVED AND REPLACED, MATCH EXISTING GRADES TO THE EXTENT POSSIBLE. COORDINATE FINE GRADING WITH THE ENGINEER.

11. ALL ROAD AND DRIVE CROSS SLOPES SHALL PITCH 1/4-INCH PER FOOT MINIMUM. ALL PAVED SURFACES SHALL PITCH 1% UNLESS OTHERWISE NOTED. REFER TO THE CIVIL DETAIL DRAWINGS.

12. ALL NON-ROADWAY AREAS THAT ARE EXCAVATED, FILLED, OR OTHERWISE DISTURBED BY THE CONTRACTOR SHALL BE LOAMED, GRADED, LIMED, FERTILIZED, SODDED AND MULCHED, UNLESS OTHERWISE NOTED. THE TOP 4-INCHES OF SOIL SHALL BE LOAM. REFER TO SPECIFICATION SECTION 02485, LANDSCAPING/LOAM AND SOD.

CIVIL SITE LAYOUT

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THIS PROVIDED LAYOUT INFORMATION THROUGHOUT THE COURSE OF CONSTRUCTION. REPORT ANY LAYOUT DISCREPANCIES IMMEDIATELY TO THE ENGINEER.

2. REFER TO THE SITE PIPING AND SITE GRADING DRAWINGS FOR ADDITIONAL LAYOUT INFORMATION.

3. CONTRACTOR SHALL EXCAVATE TEST PITS, WHERE NECESSARY, PRIOR TO CONSTRUCTION LAYOUT AND RESULTS REPORTED TO THE ENGINEER FOR REVIEW FOR CONFORMANCE TO THE PLANS. TEST PITS ARE REQUIRED WHERE SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.

4. IN GENERAL, THE GIVEN STRUCTURE LOCATIONS ARE TO THE OUTSIDE FACE OF THE STRUCTURE FOUNDATION WALL, NOT FOOTINGS. REFER TO THE STRUCTURAL DRAWINGS FOR BUILDING AND STRUCTURE DIMENSIONS. RADII SHOWN FOR ROADS ARE TO EDGE OF PAVEMENT.

5. PLACE CRUSHED STONE MOWING STRIP AROUND THOSE STRUCTURES AS INDICATED ON THE DRAWINGS. REFER TO THE CIVIL DETAIL DRAWINGS.

6. THE LOCATIONS AND LIMITS OF ALL ON-SITE WORK AND STORAGE AREAS SHALL BE REVIEWED/COORDINATED WITH, AND ACCEPTABLE TO, THE OWNER AND ENGINEER. THE CONTRACTOR SHALL LIMIT ACTIVITIES TO THESE AREAS.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-ESTABLISHING AND RESETTING ALL EXISTING PROPERTY MONUMENTATION DISTURBED BY CONSTRUCTION. THIS WORK SHALL BE DONE BY A LAND SURVEYOR REGISTERED IN THE STATE OF LOUISIANA, AT NO ADDITIONAL COST TO THE OWNER.

8. WRITTEN DIMENSIONS SHALL PREVAIL. DO NOT SCALE DISTANCES FROM THE DRAWINGS. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.

9. BOLLARD LOCATIONS SHOWN ARE APPROXIMATE. COORDINATE BOLLARD LOCATIONS WITH THE ENGINEER. REFER TO THE CIVIL DETAIL DRAWINGS.

10. ALL ELEVATIONS REFER TO THE NAVD88 DATUM UTILIZING GEOD18. THEY ARE DERIVED FROM GPS OBSERVATIONS REFERENCED TO LOUISIANA STATE UNIVERSITY CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS) NETWORK. ORIENTATION IS GRID NORTH ON THE NAD83 LOUISIANA SOUTHERN ZONE, STATE PLANE, US FOOT, COORDINATE SYSTEM. PROJECT BENCH MARKS ARE SHOWN ON THE DRAWINGS. CONTRACTOR SHALL VERIFY BENCHMARK ELEVATIONS PRIOR TO USING IN CONSTRUCTION.

11. EXISTING CONDITIONS SITE PLAN IS BASED ON SURVEY DRAWING AND EXISTING RECORD DRAWING INFORMATION.

CIVIL SITE PIPING

1. PROCESS FLOW DIAGRAM AND PIPING LEGEND ARE ON THE PROCESS DRAWINGS. THE PROCESS PIPING SCHEDULE AND ADDITIONAL PIPING NOTES ARE LOCATED IN SPECIFICATION SECTION 15050.

2. ALL PIPE LINES SHALL SLOPE UNIFORMLY BETWEEN ELEVATIONS INDICATED ON THE DRAWINGS. NO CRESTS IN PIPING WILL BE PERMITTED. CONCRETE THRUST BLOCKS OR OTHER ACCEPTABLE RESTRAINT SYSTEM IS REQUIRED ON ALL FITTINGS ON PRESSURE PIPE. WHERE A RESTRAINED JOINT SYSTEM IS USED, THE NUMBER OF PIPES WITH RESTRAINED JOINTS ON EITHER SIDE OF THE FITTING SHALL BE DESIGNED TO REFLECT THE PROJECT SOIL CONDITIONS AND PEAK SURGE PRESSURE IN THE PIPING SYSTEM. SEE THE CIVIL DETAIL DRAWINGS FOR THRUST BLOCK DETAILS. PROVIDE ALL BENDS (HORIZONTAL AND VERTICAL) AS REQUIRED TO MEET THE GRADES AND ALIGNMENT INDICATED ON THE DRAWINGS.

3. THE CONTRACTOR SHALL ASCERTAIN THE LOCATION AND SIZE OF EXISTING PIPING AND UTILITIES IN THE FIELD BY TEST PIT EXCAVATION PRIOR TO COMMENCING INSTALLATION OF ANY OF THE NEW PIPING AFFECTED. WHERE NEW PIPE CONNECTS TO EXISTING PIPING OR STRUCTURAL PENETRATION, CONTRACTOR SHALL VERIFY ELEVATION BY TEST PIT, AS REQUIRED, PRIOR TO INSTALLATION OF ANY OF THE ASSOCIATED/AFFECTED NEW PIPING. IDENTIFIED CONFLICTS WITH EXISTING PIPING AND UTILITIES WILL BE REVIEWED WITH THE ENGINEER PRIOR TO COMMENCING INSTALLATION. THE HORIZONTAL ALIGNMENT OF NEW PIPING MAY BE ADJUSTED IN THE FIELD SUBJECT TO PRIOR REVIEW AND ACCEPTANCE OF THE ENGINEER. CONTRACTOR SHALL BE RESPONSIBLE FOR LAYOUT OF ALL PROPOSED WORK AS SHOWN ON THE DRAWINGS AND REPORT ANY LAYOUT DISCREPANCIES IMMEDIATELY TO THE ENGINEER.

4. ALL WASTEWATER PIPING (EXCLUDING BUILDING DRAINS) AND ALL PRESSURIZED PIPES (I.E. PLANT WATER, CITY WATER, SOLUTION LINES, HEAT, ETC.) INSTALLED BENEATH STRUCTURES SHALL BE ENCASED IN CONCRETE. SEE STRUCTURAL DRAWING FOR DETAILS.

5. ALL BURIED CONNECTIONS TO STRUCTURES SHALL HAVE SLEEVE TYPE FLEXIBLE CONNECTIONS APPROXIMATELY 4-FEET FROM THE STRUCTURES. ALL SLEEVE TYPE COUPLINGS ON PRESSURE LINES SHALL BE RESTRAINED (SOLID SLEEVE). REFER TO SPECIFICATION SECTION 15088.

6. PROVIDE CAST OR DUCTILE IRON WALL CASTINGS, OR GALVANIZED STEEL PIPE SLEEVES, FOR ALL PIPE PENETRATIONS MADE THROUGH NEW CONCRETE FOUNDATIONS, WALLS AND SLABS. ALL WALL SLEEVES AND WALL CASTINGS SHALL HAVE WATERSTOPS. SEE PROCESS, MECHANICAL AND STRUCTURAL DRAWINGS FOR LOCATIONS OF PENETRATIONS. NEW PENETRATIONS THROUGH EXISTING STRUCTURE WALLS SHALL BE BY CORING MACHINE AND LINK-TYPE SEALS, UNLESS OTHERWISE INDICATED. OPENINGS TO BE COMPATIBLE WITH REQUIRED PIPING AND STANDARD LINK SEAL SIZES. SEE PROCESS DETAIL DRAWINGS. REFER TO SPECIFICATION SECTION 15092.

7. MANHOLES ARE 4-FEET IN DIAMETER UNLESS OTHERWISE NOTED. THE TOP OF MANHOLE FRAMES SHALL BE SET FLUSH WITH FINISH GRADE, UNLESS OTHERWISE NOTED ON DRAWINGS. SEWER MANHOLE INVERTS SHOWN ON THE DRAWINGS ARE TO THE INSIDE FACE OF THE MANHOLE.

8. PIPES WITHIN VALVE PITS (MANHOLES) SHALL BE SUPPORTED 12-INCHES ABOVE BOTTOM OF MANHOLE ON ADJUSTABLE PIPE SADDLE SUPPORTS, IN ACCORDANCE WITH SPECIFICATION SECTION 15094, UNLESS OTHERWISE INDICATED.

9. CONTRACTOR SHALL RE-SHAPE INVERTS AS REQUIRED WHEN CONNECTING INTO EXISTING MANHOLES.

10. REFER TO SPECIFICATION SECTION 02200 FOR PIPE AND STRUCTURE BEDDING AND BACKFILL REQUIREMENTS.

11. COMPACTION TESTS WILL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 02200. ANY SETTLEMENT OCCURRING WITHIN ONE-YEAR OF FINAL COMPLETION OF THE WORK SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST.

12. OPEN TRENCHES IN THE ROADWAY MUST BE BACKFILLED AT THE END OF THE WORKDAY. OPEN TRENCHES OUTSIDE OF THE ROADWAY MAY BE LEFT OPEN IF THE CONTRACTOR PROVIDES ADEQUATELY SAFE BARRICADING AND LIGHTS.

13. IN THOSE INSTANCES WHERE POWER OR TELEPHONE POLE SUPPORT IS REQUIRED, THE CONTRACTOR SHALL PROVIDE A MINIMUM 48-HOUR NOTICE TO THE RESPECTIVE UTILITY POLE OWNER. NO ADDITIONAL PAYMENT WILL BE PROVIDED FOR TEMPORARY BRACING OF UTILITIES.

14. WHERE NEW PIPING IS TO BE CONNECTED TO EXISTING PIPING, THE CONTRACTOR SHALL FURNISH AND INSTALL ALL ADAPTERS, FITTINGS, AND ADDITIONAL PIPE AS REQUIRED TO COMPLETE THE CONNECTION. CONTRACTOR SHALL VERIFY LOCATION, ELEVATION, ORIENTATION AND MATERIAL OF CONSTRUCTION. TEST PITS SHALL BE USED AS REQUIRED.

15. ALL EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION ARE TO REMAIN IN SERVICE UNLESS OTHERWISE NOTED ON THE CIVIL EXISTING CONDITIONS AND DEMOLITION PLAN. ANY EXISTING UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

16. WHENEVER SEWER AND WATER MAINS MUST CROSS, WATER LINES SHOULD BE INSTALLED ABOVE WASTEWATER OR SLUDGE LINES. A MINIMUM SEPARATION OF 18-INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE WASTEWATER OR SLUDGE LINE SHALL BE MAINTAINED. WHERE A WATER LINE CROSSES UNDER A WASTEWATER OR SLUDGE LINE, A FULL LENGTH OF PIPE SHALL BE CENTERED ABOVE THE WATER LINE SO THAT BOTH JOINTS WILL BE AS FAR FROM THE WATER LINE AS POSSIBLE.

17. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO ANY TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE TRENCH IS BACKFILLED. DAMAGE TO ANY SUCH STRUCTURES CAUSED BY OR RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE OWNER.

18. PIPING ON THE SITE PIPING PLAN HAS BEEN SHOWN BROKEN FOR CLARITY ONLY. PIPE BREAKS DO NOT INDICATE RELATIVE ELEVATIONS OF PIPING.

19. ELECTRICAL CONDUIT RUNS ARE INDICATED ON THE ELECTRICAL DRAWINGS AND ARE SHOWN IN DASHED/PHANTOM LINEWEIGHT ON THE CIVIL DRAWINGS FOR CONVENIENCE. CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION, EXCAVATION AND BACKFILLING REQUIRED FOR THE ELECTRICAL CONDUITS, AND SHALL FURNISH AND INSTALL ELECTRICAL MANHOLES AND HANDHOLES. COORDINATE THE LOCATION OF THE ELECTRICAL MANHOLES AND HANDHOLES, AND THE REQUIRED OPENING SIZES, WITH THE ELECTRICAL CONTRACTOR.

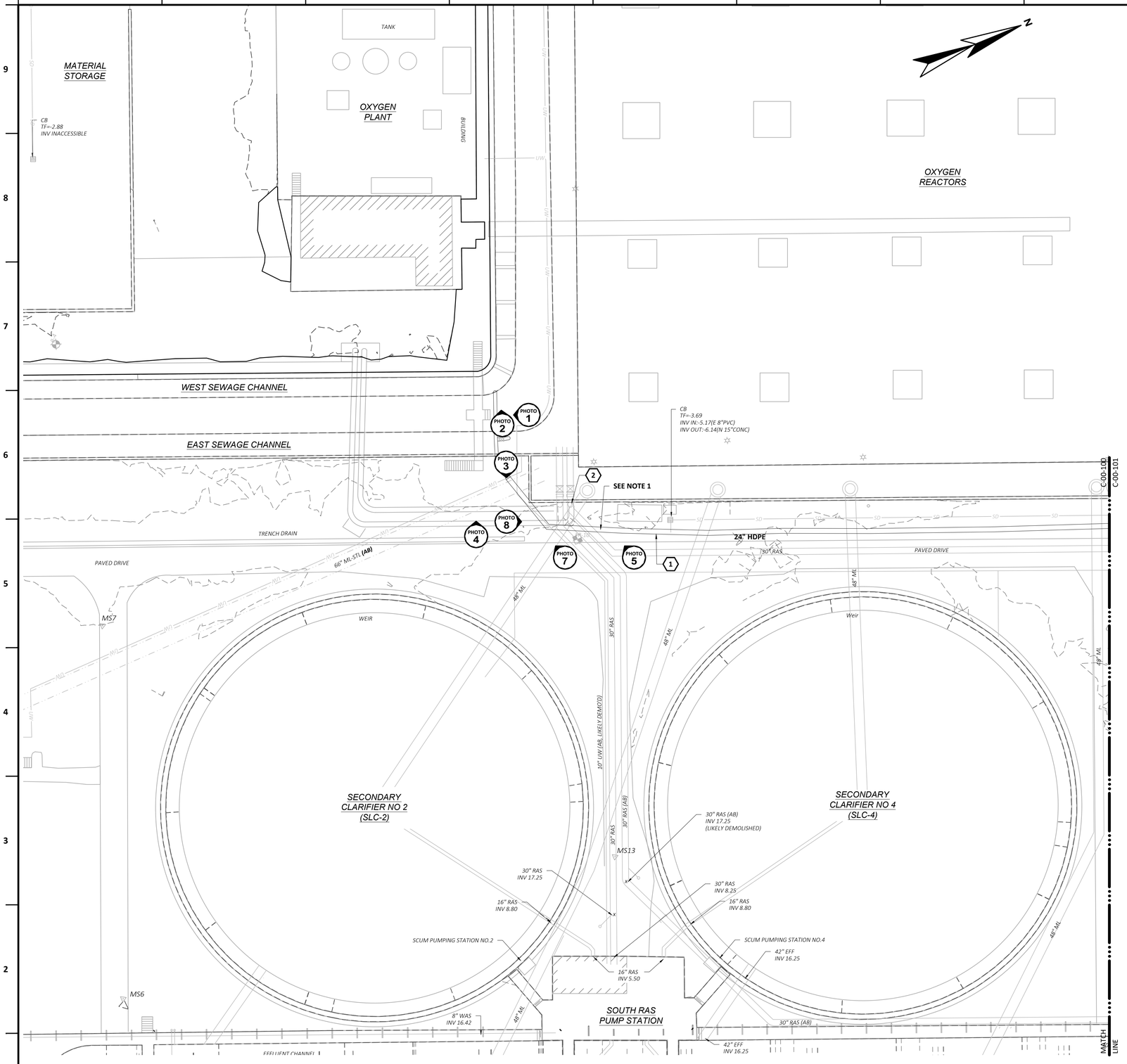
20. WHENEVER PROPOSED STRUCTURES ARE LOCATED PARTLY WITHIN A PAVED AREA AND PARTLY IN A NON-PAVED AREA, A BITUMINOUS CONCRETE PAVED APRON 2-FEET WIDE SHALL BE SUPPLIED AROUND THE PROPOSED COVER. PAVEMENT SHALL SLOPE AWAY FROM THE COVER

CIVIL ABBREVIATIONS

&	AND
A	AIR
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AB	ABANDONED
ALT	ALTERNATE
APP'D	APPROVED
BLDG	BUILDING
BOC	BOTTOM OF CONCRETE, BOTTOM OF CURB
BOH	BOTTOM OF HOLE
BR	BRICK
CB	CATCH BASIN
CEN	CENTER
CIP	CAST IN PLACE
CIPP	CURED-IN-PLACE PIPE
CL	CLEAR, CENTER LINE
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
COR	CORNER
CTRS	CENTERS
CY	CUBIC YARD
DEMO	DEMOLITION
DI	DUCTILE IRON PIPE
DIA, Ø	DIAMETER
DMH	DRAIN MANHOLE
DR	DRAIN
DWG	DRAWING
E	EAST
EA	EACH
EL/ELEV	ELEVATION
EMH	ELECTRIC HANDHOLE
EMH	ELECTRIC MANHOLE
EOP	EDGE OF PAVEMENT
FFE	FINISH FLOOR ELEVATION
FM	FORCE MAIN
G	GAS
GR	GRADE
HDPE	HIGH DENSITY POLYETHYLENE
HYD	HYDRANT
IN	INCH
INF	INFLUENT
INV	INVERT ELEVATION
LBR	LIMEROCK BEARING RATIO
LBS	POUNDS
LF	LINEAL FEET
LOC	LOCATION
LP	LIGHT POLE
MAX	MAXIMUM
MH	MANHOLE
MICC	MICROBIALLY-INDUCED CORROSION CONTROL
MIN	MINIMUM
N/A	NOT AVAILABLE/APPLICABLE
N	NORTH
NAVD	NORTH AMERICAN VERTICAL DATUM
NE	NORTHEAST
NGS	NATIONAL GEODETIC SURVEY
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NO, #	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHE	OVERHEAD ELECTRICAL
OUC	ORLANDO UTILITIES COMMISSION
OUT	OUTFALL
PC	POINT OF CURVATURE,
PSF	PERFORATED CLAY
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
REF	REFERENCE
REINF	REINFORCING
REQ'D	REQUIRED
R/W	RIGHT OF WAY
S	SEWER, SOUTH, SLOPE
SAN	SANITARY
SCHED	SCHEDULE
SD	STORM DRAIN
SE	SOUTHEAST
SEC	SECTION
SF	SQUARE FEET
SMH	SEWER MANHOLE
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STA	STATION
SW	SOUTHWEST
SWPP	STORMWATER POLLUTION PREVENTION PLAN
TBM	TEMPORARY BENCH MARK
TEL	TELEPHONE
THK	THICKNESS
TOC	TOP OF CONCRETE, TOP O

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SITE PIPING PARTIAL PLAN-I BYPASS PUMPING

SCALE: 1"=20'

0 20 40



PHOTO 1



PHOTO 2

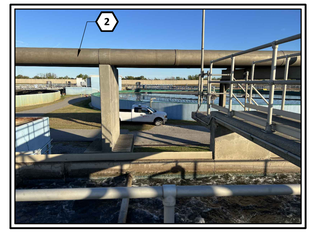


PHOTO 3



PHOTO 4

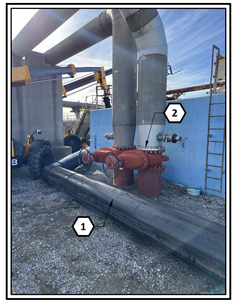


PHOTO 5



PHOTO 7

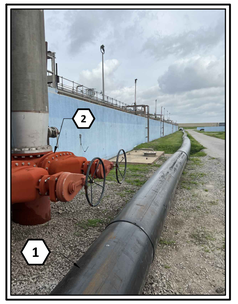


PHOTO 8

DEMO NOTE:

1. CONTRACTOR TO COORDINATE WITH OWNER/STP OPERATOR TO DRAIN, CUT, REMOVE, AND REINSTALL EXISTING HDPE TEMPORARY RAS PIPING AS NECESSARY TO FACILITATE THE NEW PIPE WORK.
2. REFER TO DWG C-01-105 FOR NEW WORK ON THE 24"/30" RAS PIPING.

NOTE:

1. REFER TO TEMPORARY RAS PIPING SCHEMATIC (DWG PR-00-012) FOR ADDITIONAL INFORMATION.
2. DEMO PHOTO 6 NOT USED UNDER THIS CONTRACT ON THIS SHEET.

REV.	DATE	DESCRIPTION	BY
3			
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

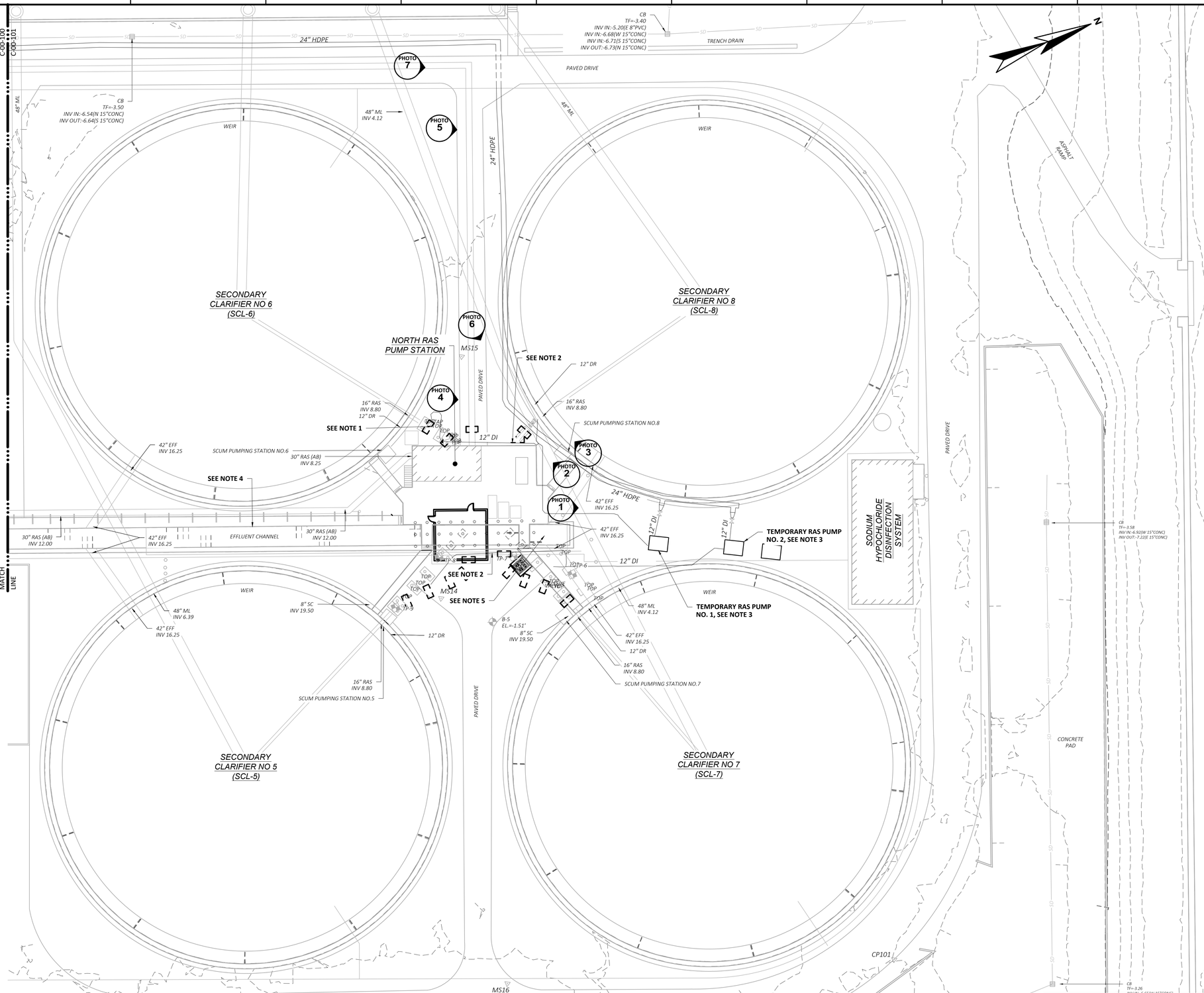
SITE PIPING PARTIAL PLAN - I BYPASS PUMPING

DR. J.MICHAUD	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. OF

C-00-100

DWG. No. 12221-W-33

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SITE PIPING PARTIAL PLAN-II
BYPASS PUMPING

SCALE: 1"=20'

0 20 40



PHOTO 1

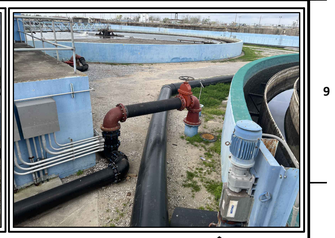


PHOTO 2



PHOTO 3



PHOTO 4



PHOTO 5



PHOTO 6

NOTES:

1. REFER TO THE TEMPORARY RAS PIPING SCHEMATIC (DWG PR-00-012) FOR ADDITIONAL INFORMATION.
2. CONTRACTOR TO COORDINATE WITH OWNER/STP OPERATOR TO DRAIN, CUT, REMOVE, AND REINSTALL TEMPORARY RAS PIPING AS NECESSARY TO FACILITATE THE NEW WORK (I.E. RAS PIPING, ELECTRICAL BUILDING, PILES, AND OTHER NORTH RAS PUMP STATION IMPROVEMENTS.)
3. CONTRACTOR TO FURNISH, INSTALL AND MAINTAIN DIESEL PUMPS, FUEL STORAGE, DISCHARGE AND SUCTION PIPING. REFER TO SPEC. SECTION 01515 FOR ADDITIONAL INFORMATION.
4. PRIOR TO THE COMMENCEMENT OF NEW WORK UNDER THE EFFLUENT CHANNEL, CONTRACTOR TO FURNISH, INSTALL AND MAINTAIN A TEMPORARY COFFERDAM. ONCE THE TEMPORARY COFFERDAM IS INSTALLED AND OPERATIONAL, CONTRACTOR TO COORDINATE WITH THE STP OPERATOR IN THE DRAINING AND DISPOSAL OF LIQUID AND OR SOLID CONTENTS IN THE EFFLUENT CHANNEL BETWEEN THE COFFERDAM AND END OF THE CHANNEL. ONCE DRAIN, CONTRACTOR TO INSTALL A SECONDARY TEMPORARY BULKHEADS WITHIN THE EFFLUENT CHANNEL. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF THE PRIMARY AND SECONDARY TEMPORARY COFFERDAM AND BULKHEADS. CONTRACTOR TO PROVIDE A MINIMUM 14 CALENDAR NOTICE TO THE STP OPERATOR PRIOR TO THE INSTALLATION OF THE TEMPORARY COFFERDAM TO ALLOW FOR THE DRAINING OF SECONDARY CLARIFIERS NOS. 7 AND 8 AND RELOCATE THE DISCHARGE LOCATION OF SODIUM HYPOCHLORITE WITHIN THE EFFLUENT CHANNEL.
5. CONTRACTOR TO INSTALL, OPERATE, AND MAINTAIN A TEMPORARY BULKHEAD AND PUMPING SYSTEM IN THE EFFLUENT CHANNEL TO CONVEY THE WASTEWATER FLOW FROM CLARIFIERS 7 AND/OR 8 AROUND THE DEWATERED WORK AREA IN THE EFFLUENT CHANNEL. REFER TO SPEC. SECTION 01515 FOR ADDITIONAL INFORMATION.

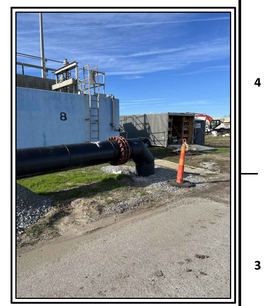


PHOTO 7

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SITE PIPING PARTIAL PLAN - II
BYPASS PUMPING

PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

DR. J.MICHAUD	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	

C-00-101

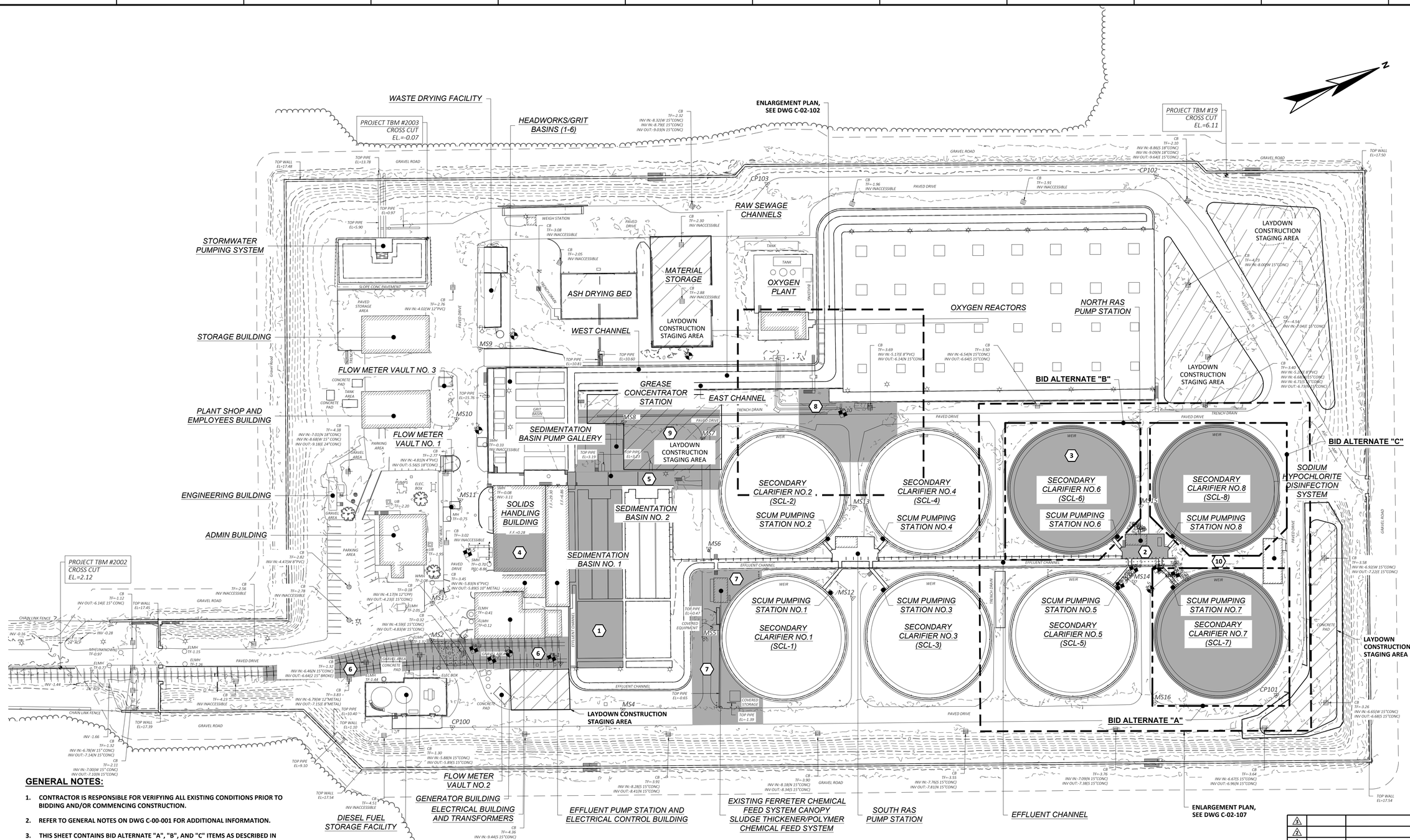
DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

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GENERAL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION.
2. REFER TO GENERAL NOTES ON DWG C-00-001 FOR ADDITIONAL INFORMATION.
3. THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100 – ALTERNATES.

DEMOLITION NOTES:

1. REFER TO THE CIVIL, STRUCTURAL, PROCESS, AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION WORK.

(1) SEDIMENTATION BASIN NO.1 TO BE RENOVATED FOR NEW SLUDGE STORAGE TANKS. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(2) RAS NORTH PUMP STATION TO BE RENOVATED WITH NEW PUMPS, PIPING, VALVES, AND OTHER ANCILLARY EQUIPMENT. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(3) SECONDARY CLARIFIERS (6, 7, & 8) TO BE RENOVATED WITH NEW MECHANISM, DRIVE, BRIDGE ASSEMBLY, PIPING, VALVES, AND OTHER ANCILLARY EQUIPMENT. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(4) EXISTING SLUDGE PIPING, VALVES, FITTINGS, SUPPORTS, ETC. TO BE REPLACED WITH NEW PIPING, VALVES, FITTINGS, AND OTHER ANCILLARY EQUIPMENT. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(5) EXISTING SLUDGE PIPING, VALVES, FITTINGS, SUPPORTS, ETC. WITHIN PIPING GALLERY TO BE REMOVED. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(6) EXISTING CHLORINE GAS RAILROAD OFFLOADING AREA TO BE RENOVATED. REFER TO THE CIVIL DRAWINGS FOR ADDITIONAL INFORMATION.

(7) EXISTING CHEMICAL FEED SYSTEM, ABOVE GRADE PIPING, VALVES, FITTINGS, PIPE SUPPORTS, CONCRETE, CONDUIT WIRING CONTROLS AND OTHER ANCILLARY UNDER CANOPY STRUCTURES SHALL BE REMOVED. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(8) EXISTING RAS PIPING AND VALVES TO BE REMOVED REFER TO THE CIVIL DRAWINGS FOR ADDITIONAL INFORMATION.

(9) EXISTING TOPSOIL, PIPING SUPPORTS CONDUIT AND WIRING TO BE REMOVED. REFER TO THE CIVIL DRAWINGS FOR ADDITIONAL INFORMATION.

(10) CONTRACTOR TO COORDINATE WITH STP OPERATOR THE RELOCATION OF THE TEMPORARY RAS PUMPING SYSTEM INCLUDING PUMPS, FUEL TANKS, PIPING, VALVING, ETC TO FACILITATE NEW CONSTRUCTION WORK.

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT 1B - SOLIDS HANDLING UPGRADE

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1"=60'

0 60 120

SHEET CONTAINS BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

EXISTING CONDITIONS AND DEMOLITION PLAN

PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. J.MICHAUD	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	
SET NO.	SHEET NO. OF

C-01-101

DWG. No. 12221-W-33

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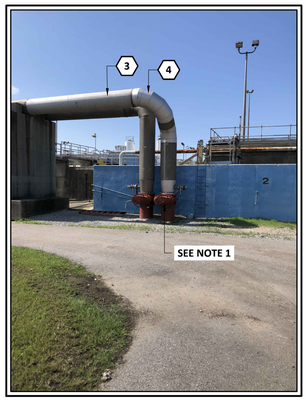


PHOTO 1

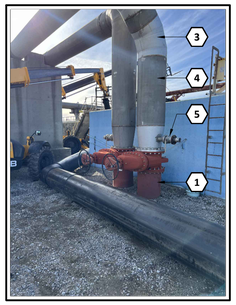
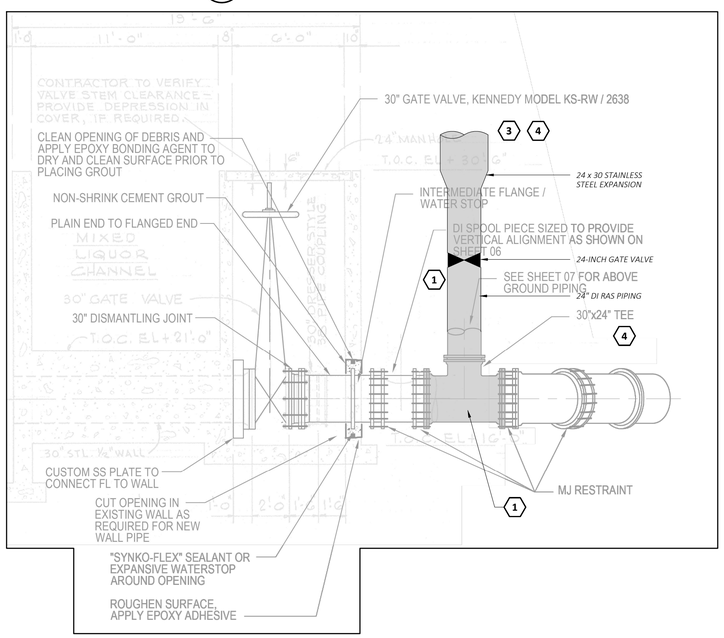
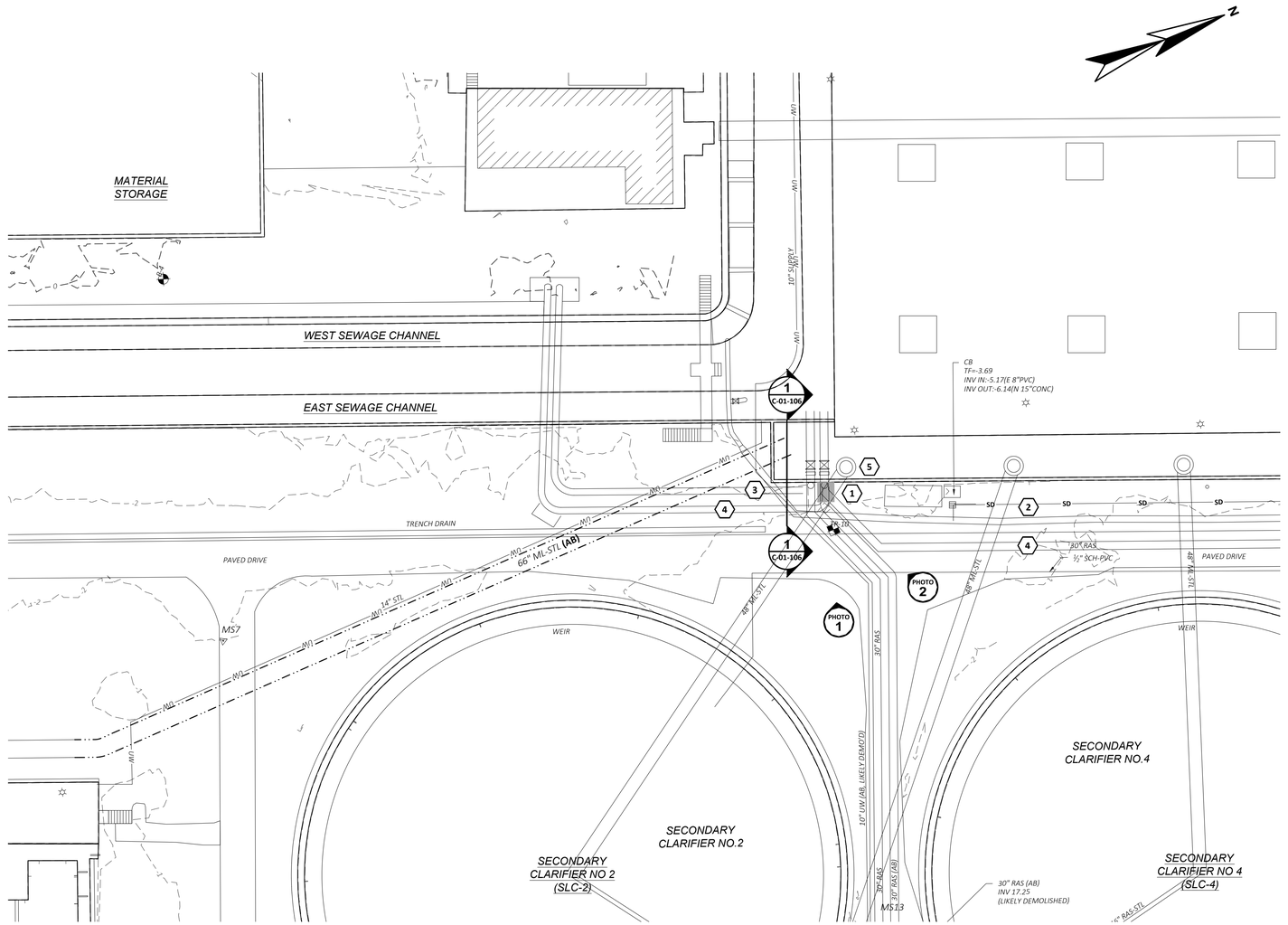


PHOTO 2



1 / C-01-106 SECTION
SCALE: NTS



GENERAL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION.
2. REFER TO GENERAL NOTES ON DWG C-00-001 FOR ADDITIONAL INFORMATION.
3. CONTRACTOR TO INSTALL AND MAINTAIN SILT SACK FOR THE DURATION OF THE PROJECT.

DEMOLITION NOTES:

1. REFER TO THE CIVIL, STRUCTURAL, PROCESS, AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION WORK.
2. REFER TO DWGS C-01-106 FOR SITE DEMOLITION WORK.

(1) CONTRACTOR SHALL EXCAVATE DOWN TO THE BURIED PIPE RETURN SLUDGE FORCE MAIN ASSOCIATED WITH THE NORTH RAS PUMP STATION, AND DEMOLISH/REMOVE THE 30 x 30 x 24 TEE, 24-INCH RAS PIPING, 24-GATE VALVE, 24 x 30 EXPANSION FITTING, HARDWARE AND ALL OTHER ASSOCIATED APPURTENANCES IN THEIR ENTIRETY. CONTRACTOR TO COORDINATE WITH STP OPERATOR WITH THE DRAINING AND DISPOSAL LIQUID WITHIN THE RAS PIPES (NORTH RAS PUMP STATION). CONTRACTOR TO PROVIDE/DELIVER THE EXISTING 24" GATE VALVE TO STP OPERATOR.

(2) CONTRACTOR TO COORDINATE WITH STP OPERATOR TO DRAIN, CUT, AND REMOVE THE EXISTING TEMPORARY RAS PIPING AS NECESSARY TO FACILITATE THE INSTALLATION OF NEW RAS PIPE, FITTINGS, AND VALVES. ONCE NEW RAS PIPING, FITTINGS, AND VALVES ARE OPERATIONAL, REINSTALL TEMPORARY RAS PIPING.

(3) CONTRACTOR TO FURNISH, INSTALL, AND MAINTAIN TEMPORARY PIPE SUPPORT ASSEMBLY FOR EXISTING 30" RAS LINE TO FACILITATE THE REMOVAL OF EXISTING PIPING AND VALVES AND INSTALL NEW PIPING AND VALVES.

(4) CONTRACTOR TO COORDINATE WITH THE STP OPERATOR THE DRAINING AND DISPOSAL OF LIQUID AND SOLIDS WITHIN THE EXISTING 30" RAS LINE FROM THE NORTH RAS PUMP STATION TO THE INFLUENT CHANNEL.

(5) CONTRACTOR TO REMOVE/REINSTALL EXISTING 4" SS GATE VALVE AND CAM LOCK CONNECTION.

DEMOLITION PLAN V
SCALE: 1"=20'

0 20 40

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
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PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DEMOLITION PLAN V

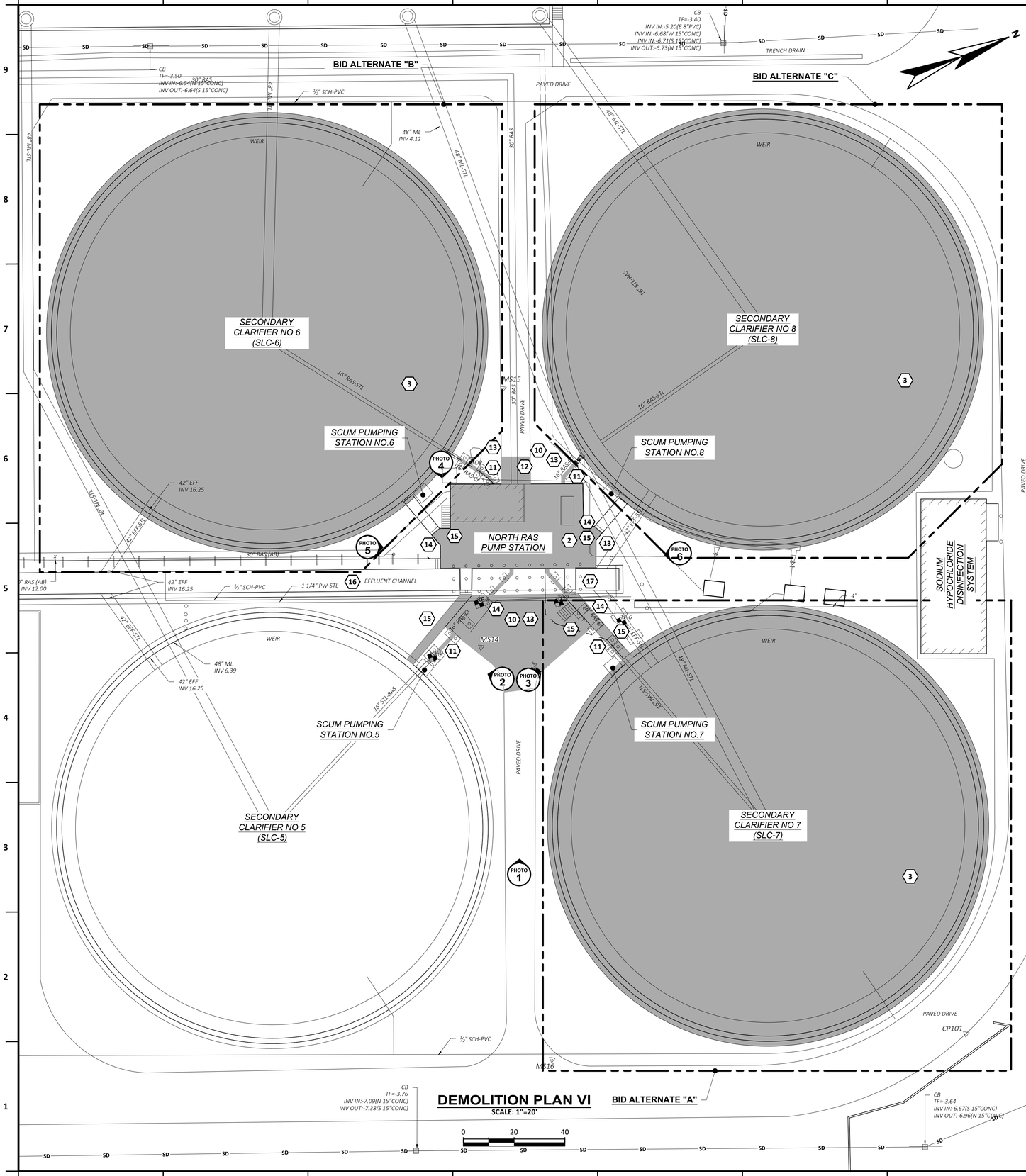
DR. J.MICHAUD	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

C-01-102

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

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DEMOLITION PLAN VI

SCALE: 1"=20'

BID ALTERNATE "A"



PHOTO 1



PHOTO 2



PHOTO 3



PHOTO 4



PHOTO 5



PHOTO 6

GENERAL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION.
2. REFER TO GENERAL NOTES ON DWG C-00-001 FOR ADDITIONAL INFORMATION.
3. THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100 – ALTERNATES.

DEMOLITION NOTES:

1. REFER TO THE CIVIL, STRUCTURAL, PROCESS, AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION WORK.
2. REFER TO DWG C-01-107 FOR SITE DEMOLITION WORK.

(2) NORTH RAS PUMP STATION TO BE RENOVATED WITH NEW PUMPS, PIPING, VALVES, AND OTHER ANCILLARY EQUIPMENT. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

(3) SECONDARY CLARIFIERS (6, 7, & 8) TO BE RENOVATED WITH NEW MECHANISM, DRIVE, BRIDGE ASSEMBLY, PIPING, VALVES, AND OTHER ANCILLARY EQUIPMENT. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

BID ALTERNATE "A", "B", AND "C"

(10) CONTRACTOR TO CONDUCT MULTIPLE TEST PITS AS NECESSARY TO LOCATE THE EXISTING PILES UNDERNEATH THE EFFLUENT CHANNEL. CONTRACTOR TO REPORT INFORMATION TO ENGINEER TO ADJUST RAS PIPE CARRIER LOCATION.

(11) REMOVE/DEMOLISH THE EXISTING 16" RAS PIPING TO THE EXTENTS SHOWN, INCLUDING BUT NOT LIMITED TO; PIPING, SUPPORTS AND ALL OTHER ASSOCIATED APPURTENANCES. REFER TO DRAWINGS C-01-116 THROUGH C-01-119 FOR ADDITIONAL INFORMATION.

(12) REMOVE/DEMOLISH THE EXISTING 30" RAS PIPING TO THE EXTENTS SHOWN, INCLUDING BUT NOT LIMITED TO; PIPING, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.

(13) CONTRACTOR TO COORDINATE WITH THE STP OPERATOR WITH THE REMOVAL EXISTING TEMPORARY RAS PIPING, FITTINGS AND VALVES AS NECESSARY TO FACILITATE THE CONSTRUCTION OF THE NEW RAS SUCTION PIPING, TEST PITS TO VERIFY THE LOCATION OF EXISTING TIMBER PILES UNDER THE EFFLUENT CHANNEL, OTHER DEMOLITION WORK AT THE N. RAS PS. ALL TEMPORARY RAS PIPING, FITTINGS, AND VALVES REMAIN THE PROPERTY OF THE OWNER/STP OPERATOR.

(14) PRIOR THE DEMOLITION OF ANY WORK AT THE N. RAS PS, CONTRACTOR TO REMOVE AND TEMPORARY RELOCATE EXISTING PIPING, CONDUIT, WIRING, ETC. CONTRACTOR TO COORDINATE WITH THE STP OPERATOR ON THE RELOCATION OF EXISTING PIPING, CONDUIT, WIRING, ETC. REFER TO THE PROCESS AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.

(15) REMOVE/DEMOLISH AND DISPOSE OF THE EXISTING CONCRETE SLAB AND STAIRS. PRIOR TO CONDUCTING THE DEMOLITION WORK, CONTRACTOR TO REMOVE/DEMOLISH OR RELOCATE EXISTING PIPING, CONDUIT AND WIRING AS NECESSARY UNDER THE ELEVATED PLATFORM, ALONG THE PS EXTERIOR WALLS AND EFFLUENT CHANNEL. CONTRACTOR TO COORDINATE WITH THE STP OPERATOR IN THE SCHEDULING OF THE RELOCATION OF PIPING AND ELECTRICAL CONDUIT. REFER TO THE STRUCTURAL, PROCESS AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.

(16) PRIOR TO THE COMMENCEMENT OF NEW WORK UNDER THE EFFLUENT CHANNEL, CONTRACTOR TO FURNISH, INSTALL AND MAINTAIN A TEMPORARY COFFERDAM. ONCE THE TEMPORARY COFFERDAM IS INSTALLED AND OPERATIONAL, CONTRACTOR TO COORDINATE WITH THE STP OPERATOR IN THE DRAINING AND DISPOSAL OF LIQUID AND OR SOLID CONTENTS IN THE EFFLUENT CHANNEL BETWEEN THE COFFERDAM AND END OF THE CHANNEL. ONCE DRAIN, CONTRACTOR TO INSTALL A SECONDARY TEMPORARY BULKHEAD WITHIN THE EFFLUENT CHANNEL. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF THE PRIMARY AND SECONDARY TEMPORARY CLAY COFFERDAM AND BULKHEAD. CONTRACTOR TO PROVIDE A MINIMUM 14 CALENDAR NOTICE TO THE STP OPERATOR PRIOR TO THE INSTALLATION OF THE TEMPORARY COFFERDAM TO ALLOW FOR THE DRAINING OF SECONDARY CLARIFIERS NOS. 7 AND 8 AND RELOCATE THE DISCHARGE LOCATION OF SODIUM HYPOCHLORITE WITHIN THE EFFLUENT CHANNEL.

(17) CONTRACTOR TO INSTALL, OPERATE, AND MAINTAIN A TEMPORARY BULKHEAD AND PUMPING SYSTEM IN THE EFFLUENT CHANNEL TO CONVEY THE WASTEWATER FLOW FROM CLARIFIERS 7 AND/OR 8 AROUND THE DEWATERED WORK AREA IN THE EFFLUENT CHANNEL. REFER TO SPEC. SECTION 01515 FOR ADDITIONAL INFORMATION.

SHEET CONTAINS BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

DEMOLITION PLAN VI

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe.044278
PROFESSIONAL ENGINEER
2/12/2026

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PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL	DR. J.MICHAUD	C-01-103
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. W.EDGERTON	
		AP. S.HALLOWELL	DWG. No. 12221-W-33
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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WASTE DRYING FACILITY

PROJECT TBM #2003
CROSS CUT
EL.=-0.07

ENLARGEMENT PLAN, SEE DWG C-01-111

ENLARGEMENT PLAN, SEE DWG C-01-112

PROJECT TBM #19
CROSS CUT
EL.=6.11

TOP WALL EL=17.50

CP102

CP103

RAW SEWAGE CHANNELS

STORMWATER PUMPING SYSTEM

MATERIAL STORAGE

ASH DRYING BED

OXYGEN PLANT

ENLARGEMENT PLAN, SEE DWG C-01-114

OXYGEN REACTORS

STORAGE BUILDING

MS9

FLOW METER VAULT NO. 3

GREASE CONCENTRATOR STATION

NORTH RAS PUMP STATION

BID ALTERNATE "B"

PLANT SHOP AND EMPLOYEES BUILDING

MS10

HEADWORKS/GRIT BASINS

MS8

MS7

ELECTRICAL BUILDING

BID ALTERNATE "C"

FLOW METER VAULT NO. 1

SLUDGE THICKENING

SECONDARY CLARIFIER NO.2 (SCL-2)

SECONDARY CLARIFIER NO.4 (SCL-4)

SECONDARY CLARIFIER NO.6 (SCL-6)

SECONDARY CLARIFIER NO.8 (SCL-8)

TEPORARY RAS PUMPING SYSTEM

SODIUM HYPOCHLORITE DISINFECTION SYSTEM

ENGINEERING BUILDING

MS11

SOLIDS HANDLING BUILDING

SEDIMENTATION BASIN NO. 2

MS13

MS6

ADMIN BUILDING

THICKENED SLUDGE STORAGE TANK

PROJECT TBM #2002
CROSS CUT
EL.=2.12

MS12

MS1

MS5

SECONDARY CLARIFIER NO.1 SCL-1

SECONDARY CLARIFIER NO.3 (SCL-3)

SECONDARY CLARIFIER NO.5 (SCL-5)

SECONDARY CLARIFIER NO.7 (SCL-7)

MS2

WAS STORAGE TANK

INV-1.44

MS4

MS16

CP101

CP100

BID ALTERNATE "A"

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT 1B - SOLIDS HANDLING UPGRADE.

FLOW METER VAULT NO.2

EMERGENCY GENERATOR BUILDING

EFFLUENT PUMP STATION AND ELECTRICAL CONTROL BUILDING

DIESEL FUEL STORAGE FACILITY

ELECTRICAL BUILDING AND TRANSFORMERS

LIQUID SLUDGE/SEPTAGE RECEIVING FACILITIES

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT 1B - SOLIDS HANDLING UPGRADE.

SOUTH RAS PUMP STATION

EFFLUENT CHANNEL

ENLARGEMENT PLAN, SEE DWG C-01-114

EXISTING FERRETER CHEMICAL FEED SYSTEM CANOPY
SLUDGE THICKENER/POLYMER CHEMICAL FEED SYSTEM

ENLARGEMENT PLAN, SEE DWG C-01-115

SHEET CONTAINS BID ALTERNATES

OVERALL SITE MODIFICATION PLAN

SCALE: 1"=60'

0 60 120

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

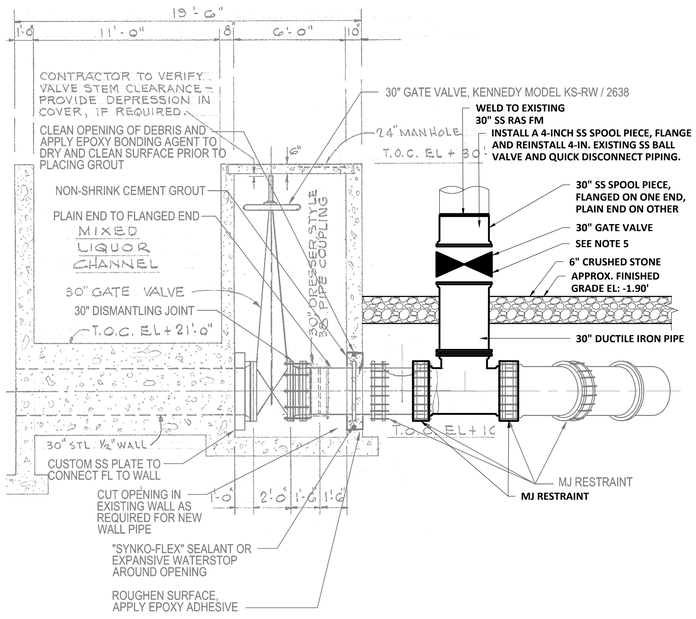
STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

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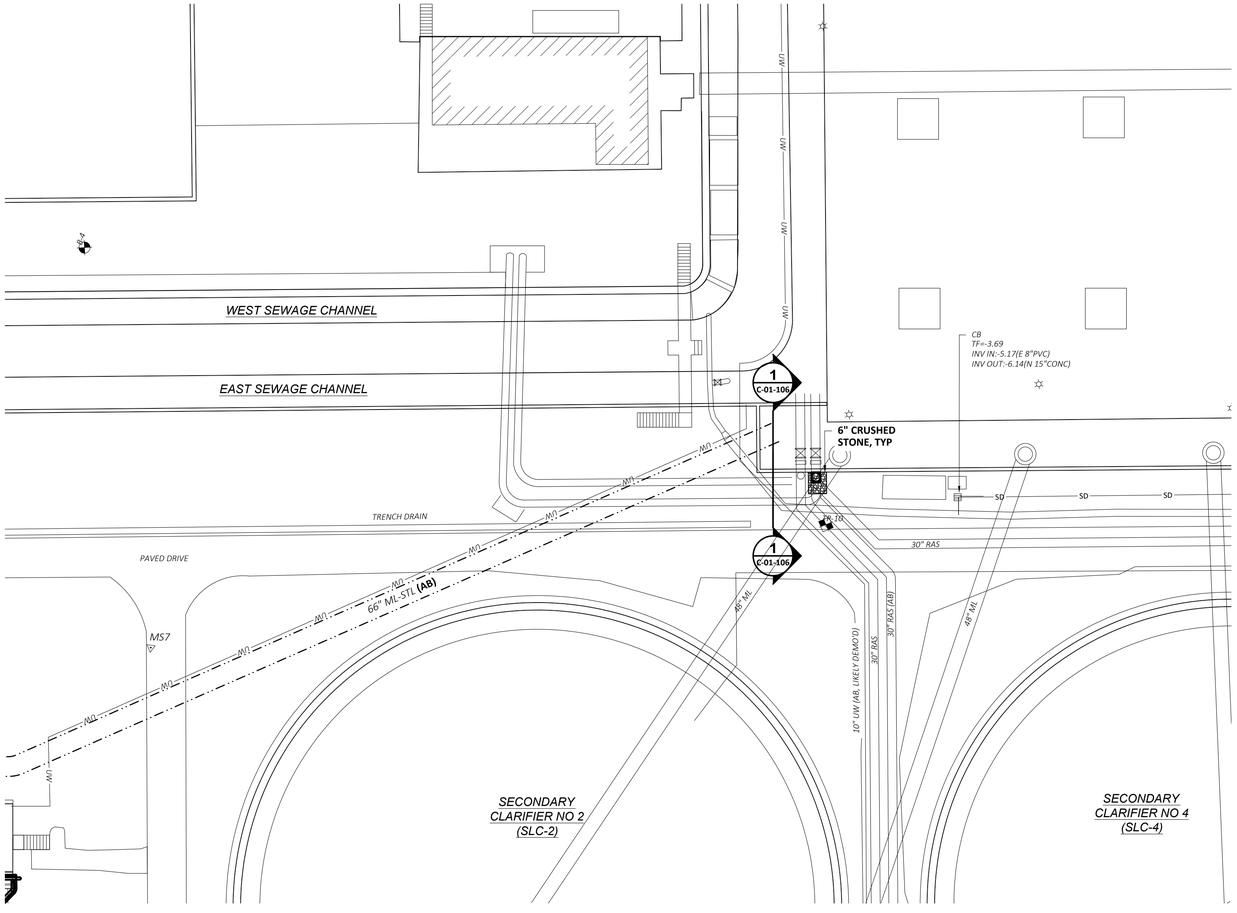
OVERALL SITE MODIFICATION PLAN

DR. J.MICHAUD	C-01-104
TRC. -	
CK. W.EDGERTON	
PROJECT NO: 21163 / DESIGNED BY: S.HALLOWELL	AP. S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
	DWG. No. 12221-W-33
	SET NO. / SHEET NO. / OF

LAST SAVED BY: CHRISTOPHER.HINKLEY 2/11/2026 2:34 PM
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1 C-01-106 **SECTION**
SCALE: NTS



GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. CONTRACTOR TO RECONNECT THE TEMPORARY RAS PIPING SYSTEM AFTER THE INSTALLATION OF THE NEW RAS PIPING, FITTING, AND VALVE (NORTH RAS PUMP STATION FORCE MAIN ASSEMBLY).
3. CONTRACTOR TO FURNISH AND INSTALL A TEMPORARY PIPE SUPPORT AND BRACE SYSTEM FOR THE N. RAS ABOVE GRADE PIPING TO FACILITATE THE REMOVAL OF EXISTING PIPING, VALVE AND INSTALLATION OF NEW PIPING AND VALVE.
4. NEW 316 STAINLESS STEEL PIPING SCHEDULE (0.375"+/-)TO MATCH EXISTING STAINLESS STEEL PIPING MATERIAL.
5. THE CONTRACTOR TO FIELD VERIFY THE HEIGHT OF THE SS PIPE SPOOL PIECE ABOVE GRADE TO MATCH THE SIMILAR HEIGHT AS THE 24-INCH LINE FROM THE NORTH RAS PUMP STATION.

SITE PIPING PARTIAL PLAN
AERATION TANKS AND INFLUENT CHANNEL
SCALE: 1"=20'

0 20 40

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — STEVEN CHARLES HALLOWELL — License No. PsC046278 — PROFESSIONAL ENGINEER
2/12/2026

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PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL	DR. C.HINKLEY	
SUBMISSION: CONTRACT DRAWINGS		TRC. -	C-01-105
CAD COORD: A.COUTURE		CK. W.EDGERTON	
SCALE: AS NOTED		AP. S.HALLOWELL	DWG. No. 12221-W-33
DATE: FEBRUARY 2026		SET NO.	SHEET NO. OF

SITE PIPING PARTIAL PLAN
AERATION TANKS AND INFLUENT CHANNEL

LAST SAVED BY: CHRISTOPHER.HINKLEY 2/11/2026 2:34 PM



PHOTO 1



PHOTO 2

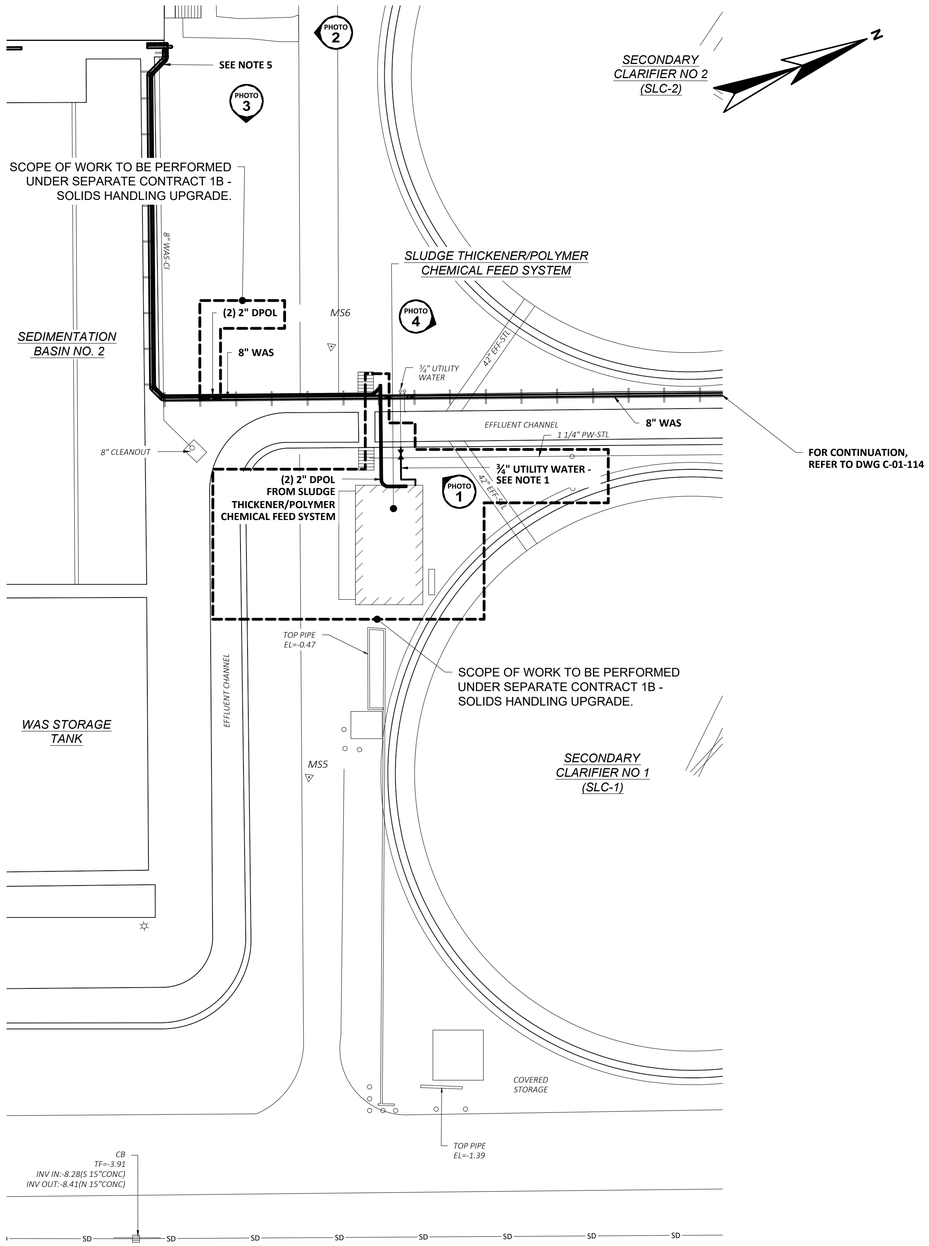




PHOTO 3



PHOTO 4

SITE PIPING PARTIAL PLAN
CHEMICAL FEED SYSTEM

SCALE: 1"=20'

0 20 40

GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 AND PR-00-001 FOR ADDITIONAL INFORMATION.
2. CONTRACTOR SHALL CONNECT TO EXISTING UTILITY WATER LINE AT THE YARD VALVE AND FIELD ROUTE NEW 3/4-INCH UTILITY WATER PIPING TO THE POLYMER CANOPY. REFER TO PROCESS DETAILS FOR DOWNSTREAM CONNECTION REQUIREMENTS.
3. REFER TO THE STRUCTURAL, PROCESS, AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION ON THE SLUDGE THICKENER CHEMICAL FEED SYSTEM.
4. CONTRACTOR TO COORDINATE THE LOCATION OF THE 8-INCH WAS LINE WITH OWNER AND ENGINEER.
5. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
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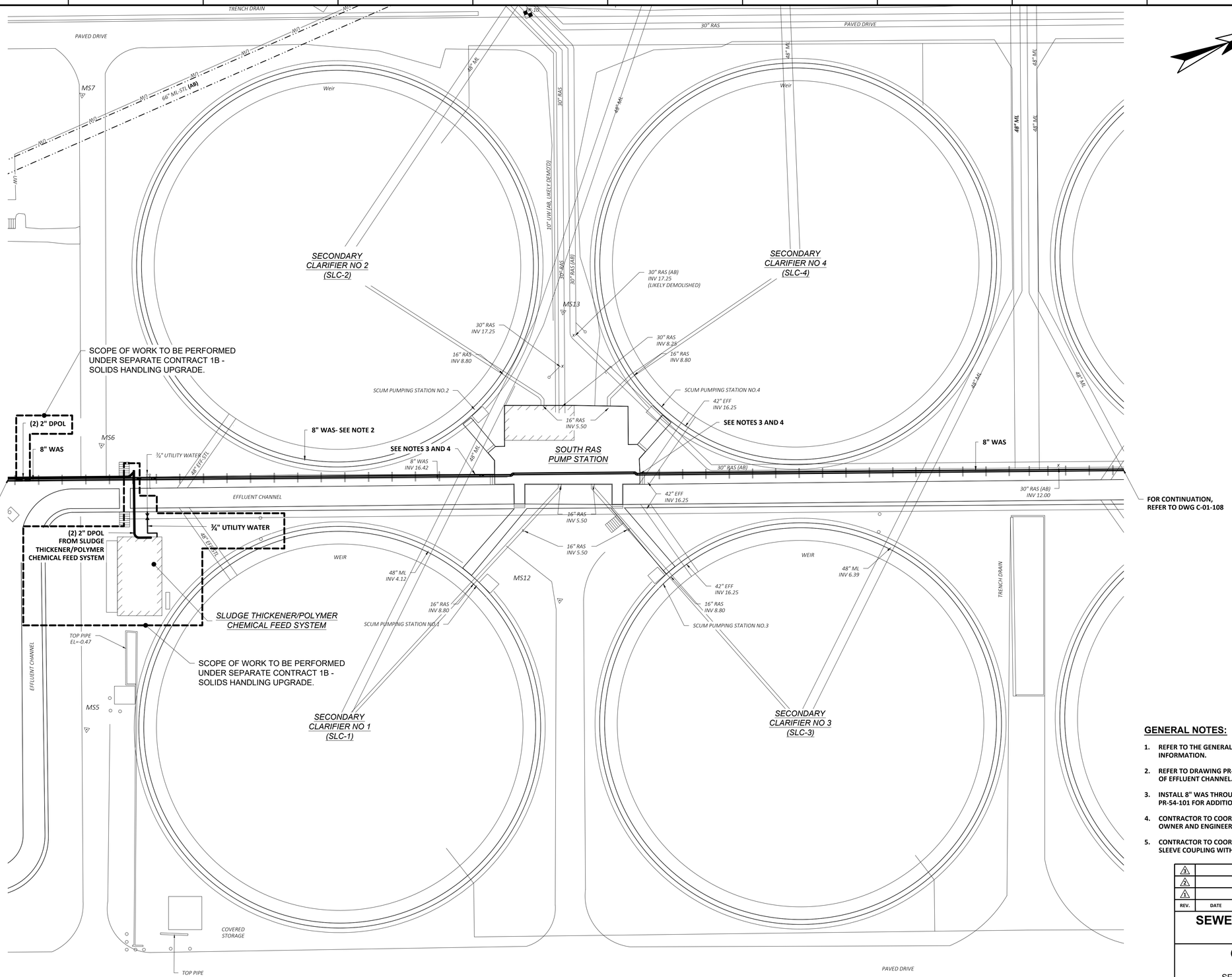
SITE PIPING PARTIAL PLAN
CHEMICAL FEED SYSTEM

DR. C.HINKLEY	C-01-106
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	DWG. No. 12221-W-33
PROJECT NO: 21163 / DESIGNED BY: S.HALLOWELL	
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
	SET NO. / SHEET NO. / OF

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SITE PIPING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 1, 2, 3, 4

SCALE: 1"=20'

0 20 40

GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001AND PR-00-001 FOR ADDITIONAL INFORMATION.
2. REFER TO DRAWING PR-60-101 FOR INSTALLATION OF 8" WAS PIPE ON SIDE OF EFFLUENT CHANNEL.
3. INSTALL 8" WAS THROUGH SOUTH RAS PUMP STATION. REFER TO DRAWING PR-54-101 FOR ADDITIONAL INFORMATION.
4. CONTRACTOR TO COORDINATE THE LOCATION OF THE 8-INCH WAS LINE WITH OWNER AND ENGINEER.
5. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
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2/12/2026

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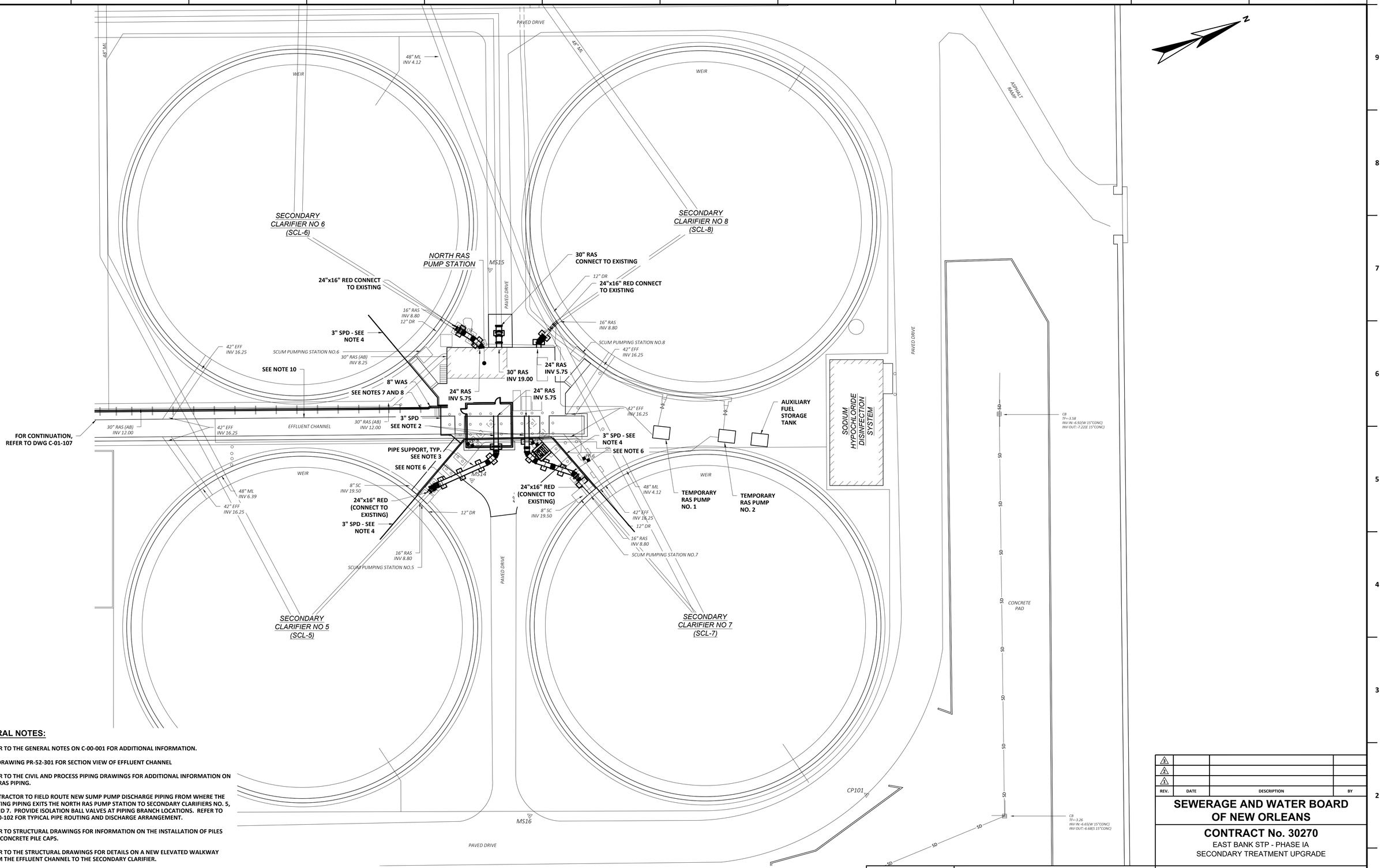
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

SITE PIPING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 1, 2, 3, 4

DR. C.HINKLEY	C-01-107
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. SEE DRAWING PR-52-301 FOR SECTION VIEW OF EFFLUENT CHANNEL
3. REFER TO THE CIVIL AND PROCESS PIPING DRAWINGS FOR ADDITIONAL INFORMATION ON THE RAS PIPING.
4. CONTRACTOR TO FIELD ROUTE NEW SUMP PUMP DISCHARGE PIPING FROM WHERE THE EXISTING PIPING EXITS THE NORTH RAS PUMP STATION TO SECONDARY CLARIFIERS NO. 5, 6, AND 7. PROVIDE ISOLATION BALL VALVES AT PIPING BRANCH LOCATIONS. REFER TO PR-50-102 FOR TYPICAL PIPE ROUTING AND DISCHARGE ARRANGEMENT.
5. REFER TO STRUCTURAL DRAWINGS FOR INFORMATION ON THE INSTALLATION OF PILES AND CONCRETE PILE CAPS.
6. REFER TO THE STRUCTURAL DRAWINGS FOR DETAILS ON A NEW ELEVATED WALKWAY FROM THE EFFLUENT CHANNEL TO THE SECONDARY CLARIFIER.
7. CONTRACTOR TO COORDINATE THE LOCATION OF THE 8-INCH WAS LINE WITH OWNER AND ENGINEER.
8. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.
9. 9. TIMBER PILES ARE APPROXIMATELY SHOWN. CONTRACTOR TO FIELD VERIFY PILE LOCATIONS.
10. REFER TO DWG C-00-101 FOR ADDITIONAL INFORMATION ON THE INSTALLATION OF A TEMPORARY COFFER DAM WITH THE EFFLUENT CHANNEL.

SITE PIPING AND PAVING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 5, 6, 7, 8

SCALE: 1"=20'

0 20 40

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — STEVEN CHARLES HALLOWELL — License No. Pe0046278 — PROFESSIONAL ENGINEER — 2/12/2026

WRIGHT-PIERCE

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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

SITE PIPING AND PAVING PARTIAL PLAN
SECONDARY CLARIFIERS NO. 5, 6, 7, 8

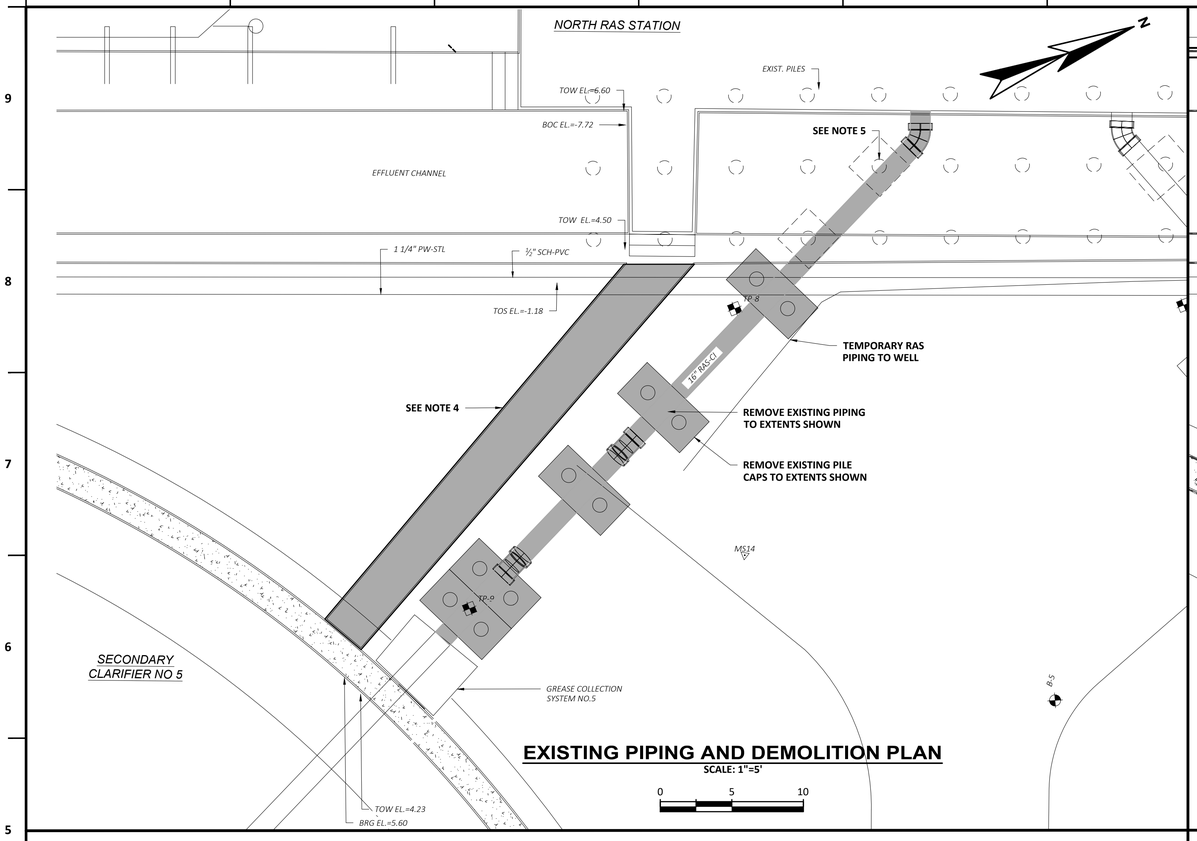
DR. C.HINKLEY	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

C-01-108

DWG. No. 12221-W-33

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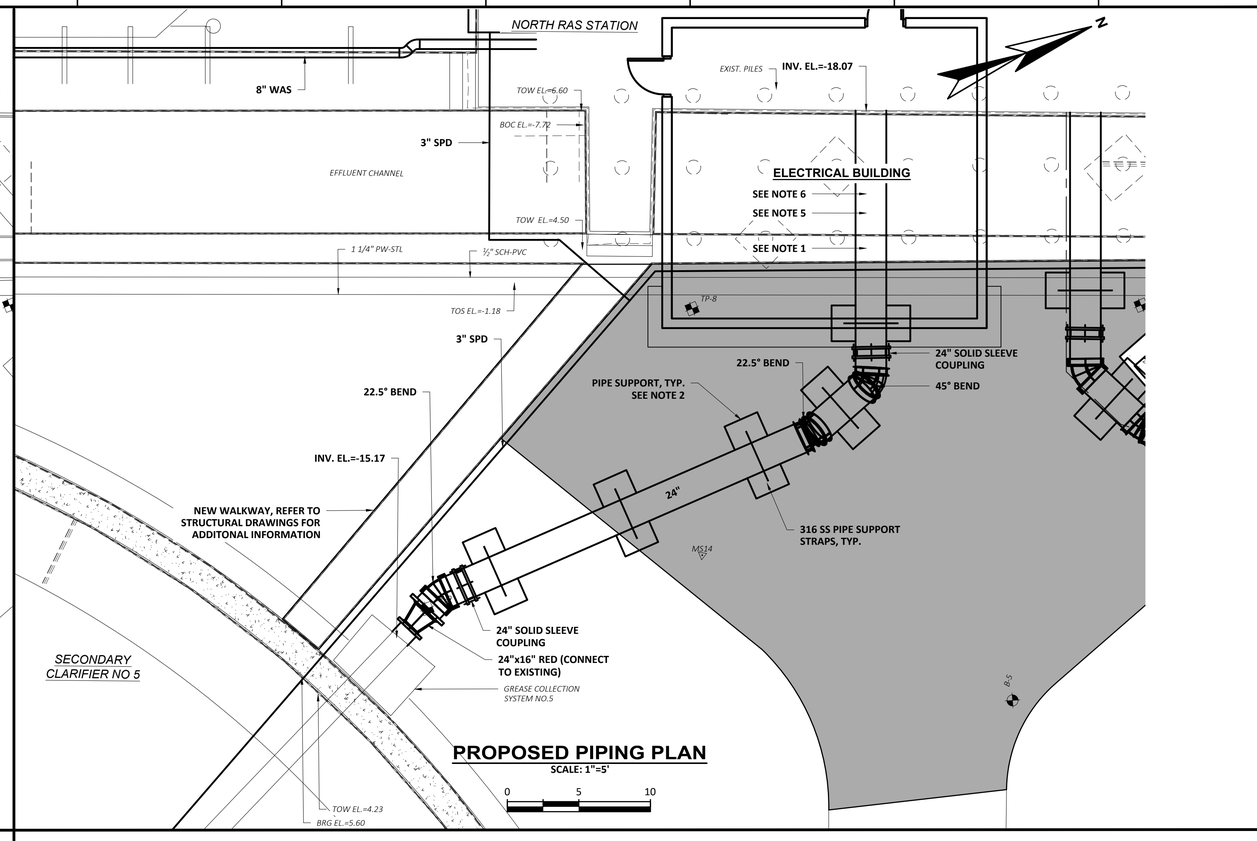
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EXISTING PIPING AND DEMOLITION PLAN

SCALE: 1"=5'

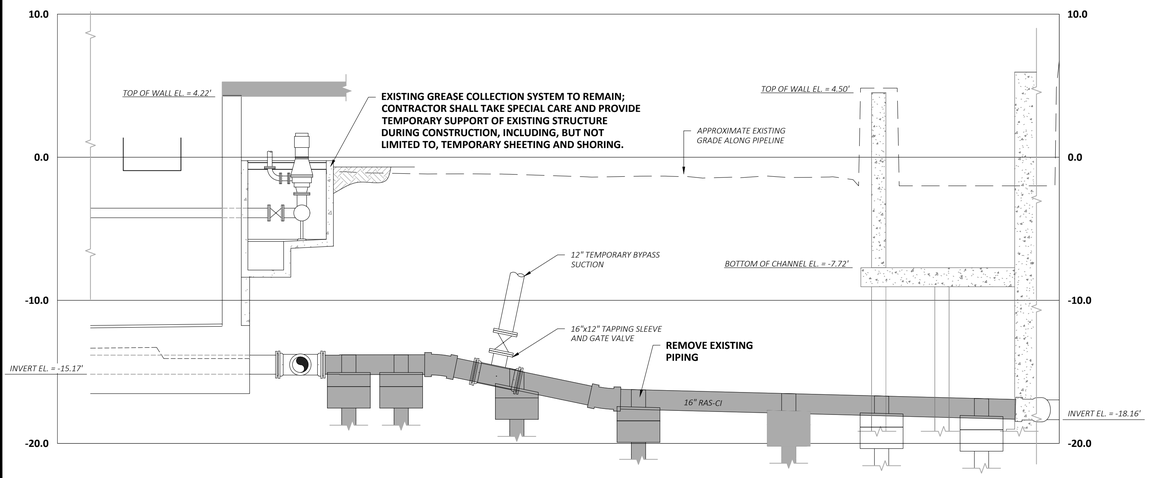
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PROPOSED PIPING PLAN

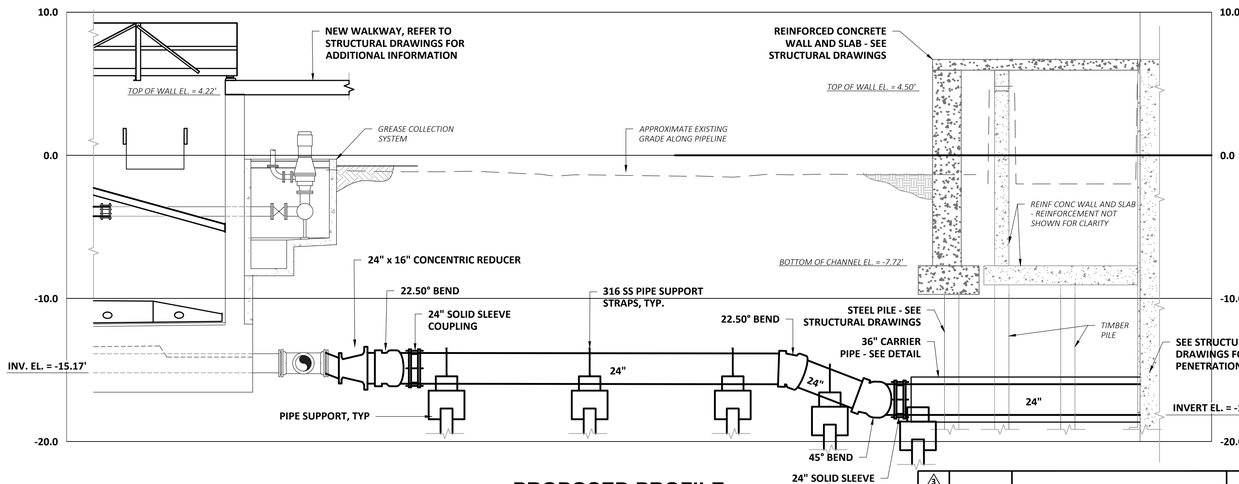
SCALE: 1"=5'

0 5 10



EXISTING PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'



PROPOSED PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'

GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. REFER TO DRAWINGS C-00-101 AND C-00-104 FOR ADDITIONAL INFORMATION REGARDING OVERALL DEMOLITION AND MODIFICATION PLANS FOR THIS WORK AREA.
3. TIMBER PILES ARE APPROXIMATELY SHOWN. CONTRACTOR TO FIELD VERIFY PILE LOCATIONS.
4. CONTRACTOR TO REMOVE/DEMOLISH AND DISPOSE THE EXISTING CONCRETE WALKWAY AND HANDRAIL FROM THE EFFLUENT CHANNEL TO THE CLARIFIER. RELOCATE CONDUIT, WIRE, PIPING, PANELS, AND LIGHTING.
5. PILES UNDER THE EFFLUENT CHANNEL ARE APPROXIMATE. PILES INDICATED AS [○] WERE CUT OFF AND CAPPED TO SUPPORT THE RAS PIPING. REFER TO DWG C-01-113 FOR ADDITIONAL INFORMATION.

NOTES:

1. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION AND DETAILS ON THE PILES AND PILE CAPS.
2. REFER TO THE PROCESS AND ELECTRICAL DRAWINGS FOR INFORMATION ON THE RELOCATION OF EXISTING PIPING AND CONDUIT.
3. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.
4. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION ON THE PIPE SUPPORT STRAPS.
5. PRIOR TO BACK FILL THE EXCAVATION UNDER THE EFFLUENT CHANNEL ENGINEER AND GEOTECHNICAL SUB-CONSULTANT TO REVIEW EXISTING TIMBER PILES.
6. CONTRACTOR TO BACKFILL THE AREA UNDER THE EFFLUENT CHANNEL WITH FLOWABLE FILL.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SECONDARY CLARIFIER NO. 5 EXISTING SITE PIPING, DEMOLITION AND PROPOSED SITE PIPING PLAN AND PROFILE

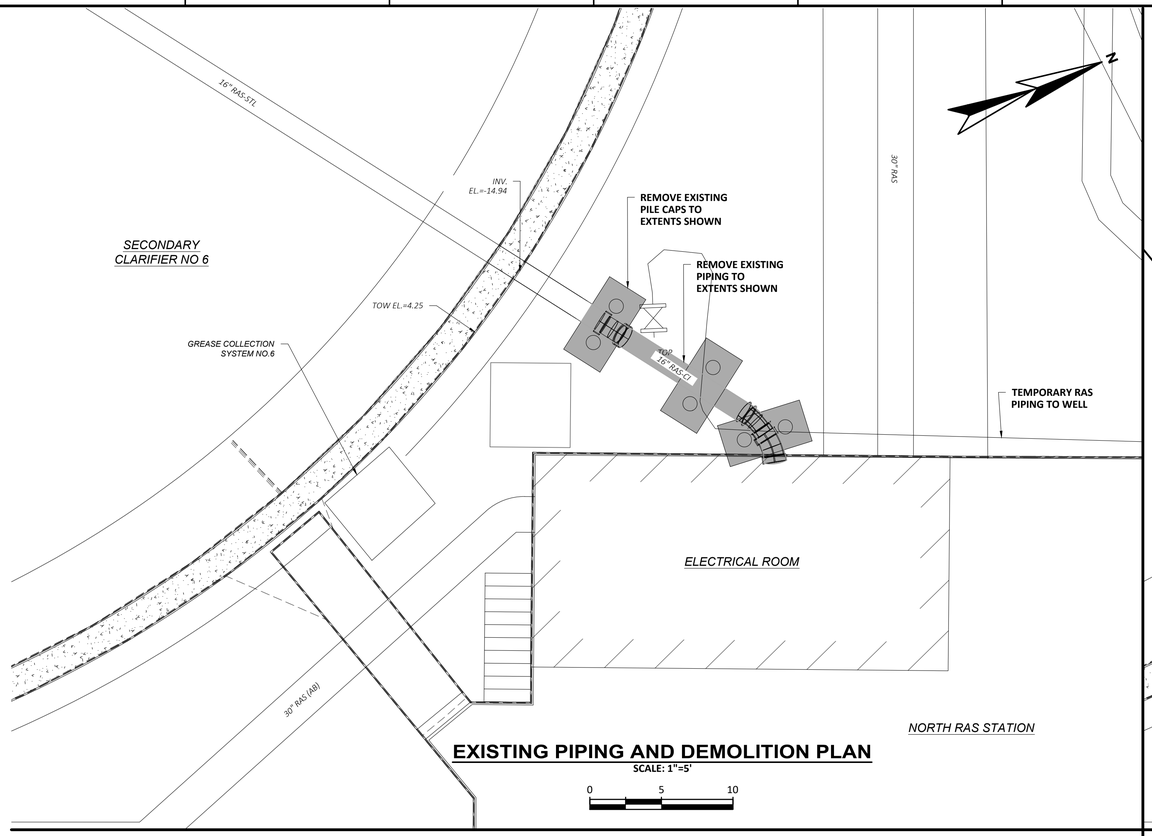
DR.	C.HINKLEY		
TRC.	-		
CK.	W.EDGERTON		
AP.	S.HALLOWELL		
PROJECT NO:	21163	DESIGNED BY:	S.HALLOWELL
SUBMISSION:	CONTRACT DRAWINGS	SCALE:	AS NOTED
CAD COORD:	A.COUTURE	DATE:	FEBRUARY 2026

C-01-109

DWG. No. 12221-W-33

SET NO. | SHEET NO. | OF

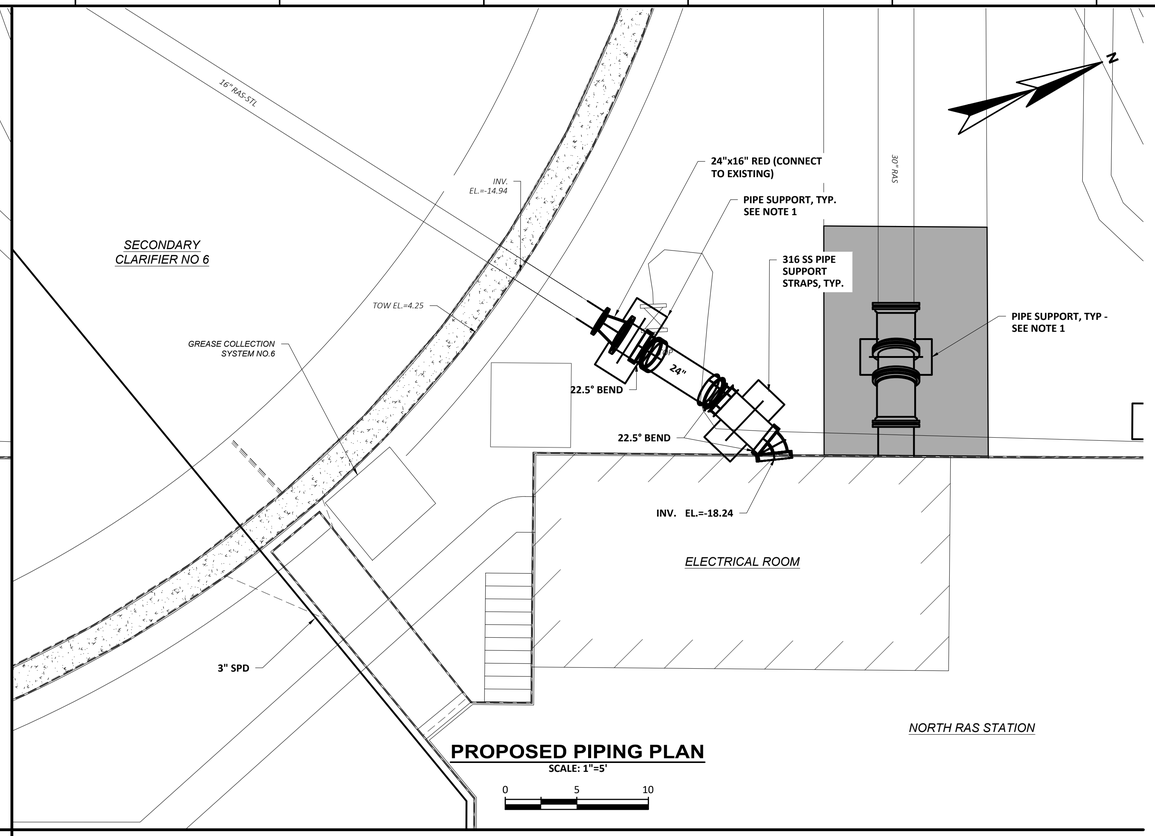
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EXISTING PIPING AND DEMOLITION PLAN

SCALE: 1"=5'

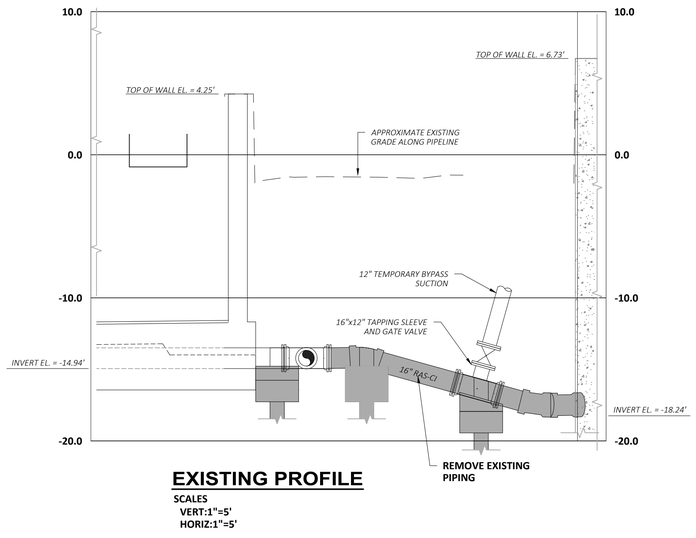
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PROPOSED PIPING PLAN

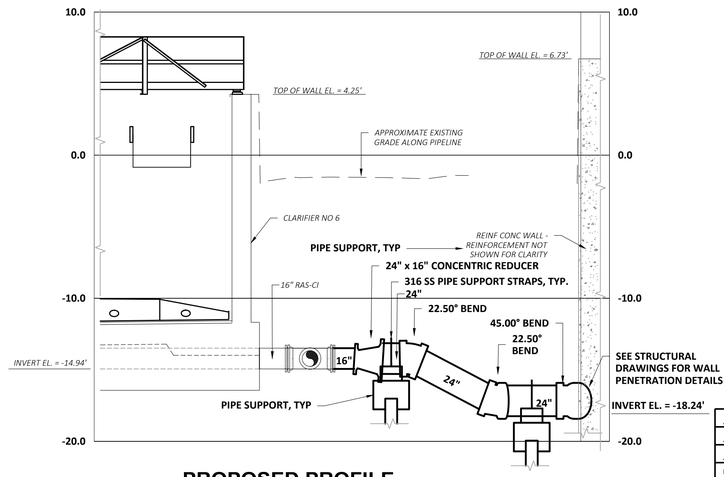
SCALE: 1"=5'

0 5 10



EXISTING PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'



PROPOSED PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'

GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. REFER TO DRAWINGS C-00-101 AND C-00-104 FOR ADDITIONAL INFORMATION REGARDING OVERALL DEMOLITION AND MODIFICATION PLANS FOR THIS WORK AREA.
3. CONTRACTOR TO MODIFY OR REHABILITATE THE EXISTING PIPE SUPPORTS TO FACILITATE THE INSTALLATION OF THE NEW RAS PIPE TO BE SUPPORTED. REFER TO STRUCTURAL DETAILS FOR ADDITIONAL INFORMATION.

NOTES:

1. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION AND DETAILS ON THE PILES AND PILE CAPS.
2. REFER TO THE PROCESS AND ELECTRICAL DRAWINGS FOR INFORMATION ON THE RELOCATION OF EXISTING PIPING AND CONDUIT.
3. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.
4. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION ON THE PIPE SUPPORT STRAPS.

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

REV.	DATE	DESCRIPTION	BY
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

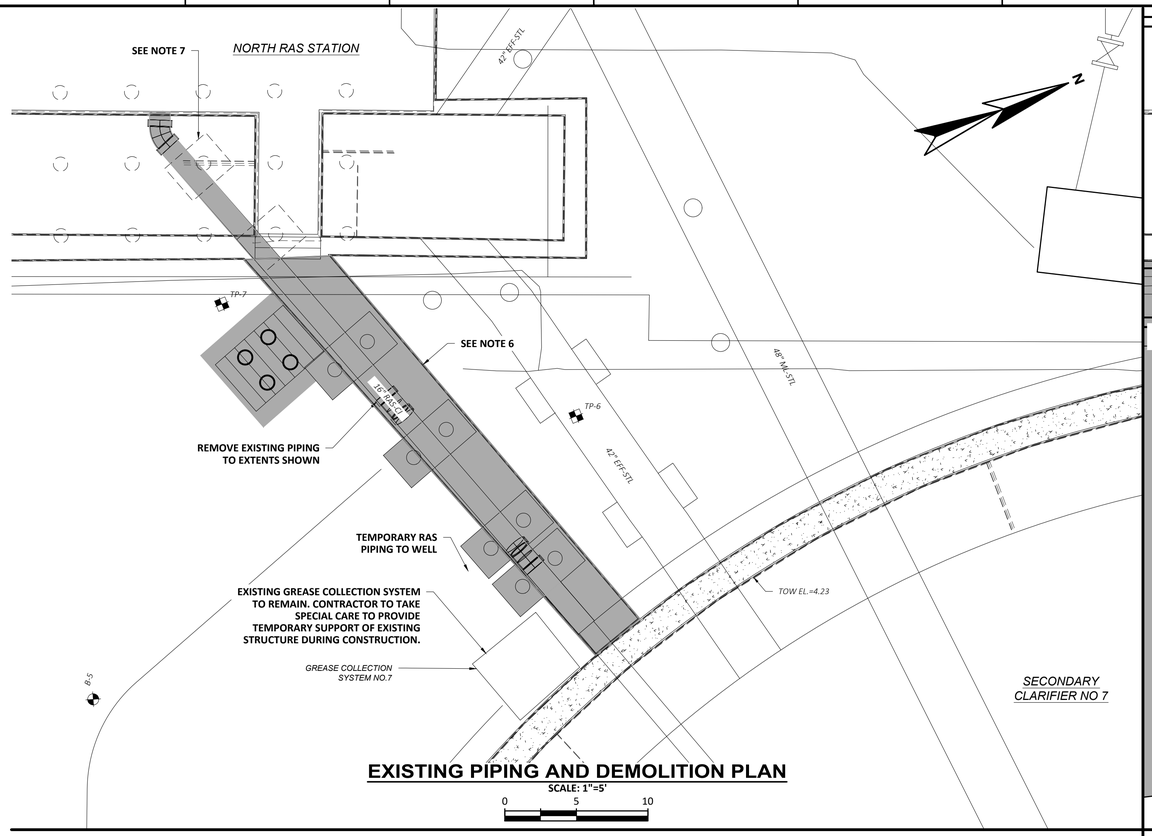
SECONDARY CLARIFIER NO. 6
EXISTING SITE PIPING, DEMOLITION, AND PROPOSED PIPING PLAN AND PROFILE

PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL	DR. C.HINKLEY	C-01-110
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. W.EDGERTON	
		AP. S.HALLOWELL	DWG. No. 12221-W-33
SCALE: AS NOTED		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

J:\ENGLA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\CIV\21163-CS-RASPIPINGPPLOWG | 21163-CS-RASPIPINGPPLOWG | 1:10.1236677 | — | 2/11/2026 2:53 PM | CHRISTOPHER.HINKLEY

LAST SAVED BY: CHRISTOPHER.HINKLEY 2/11/2026 2:35 PM

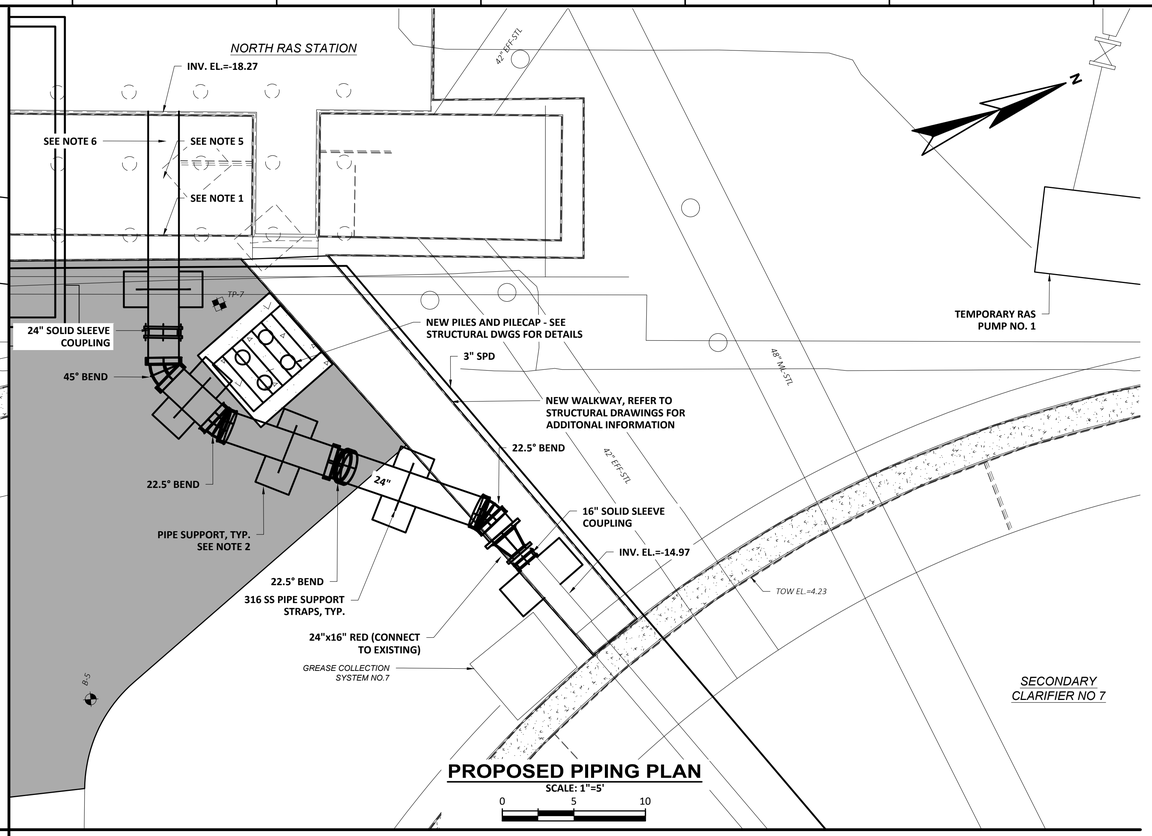
J:\ENGLA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\CIV\21163-CS-RASPipingPPIII.DWG | 21163-CS-RASPipingPPIII.DWG | 11:0.12354677 | — | 2/11/2026 2:45:13 PM | CHRISTOPHER.HINKLEY



EXISTING PIPING AND DEMOLITION PLAN

SCALE: 1"=5'

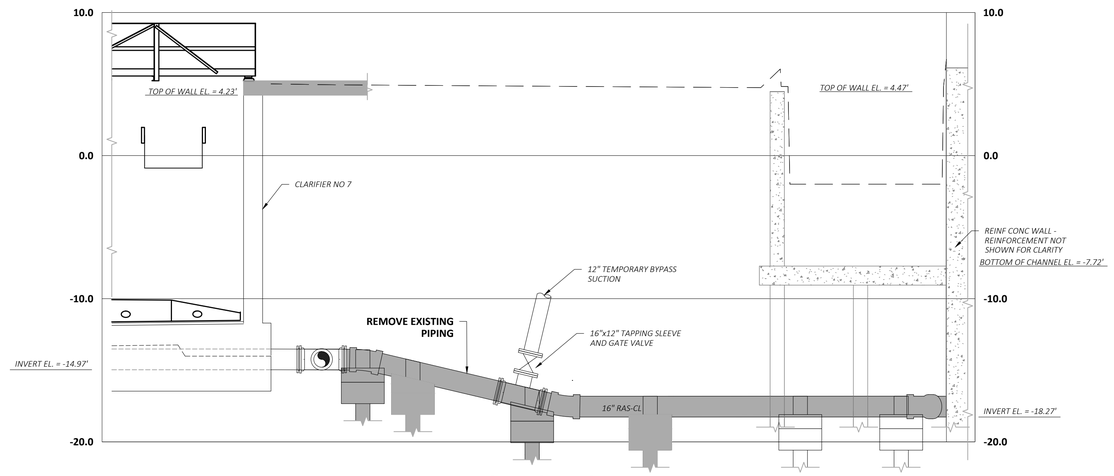
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PROPOSED PIPING PLAN

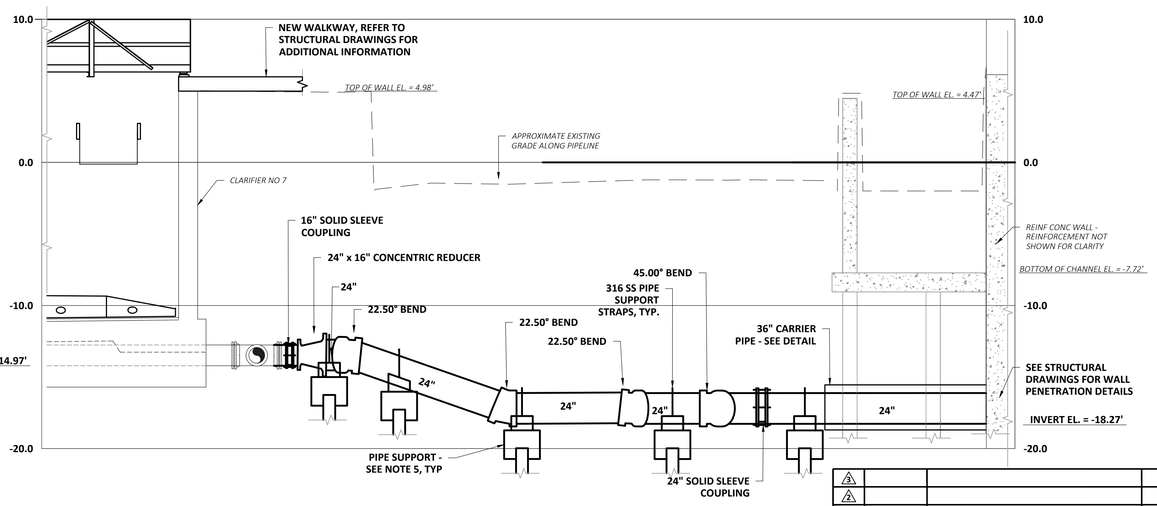
SCALE: 1"=5'

0 5 10



EXISTING PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'



PROPOSED PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'

GENERAL NOTES:

1. REFER TO THE GENERAL NOTES ON C-00-001 FOR ADDITIONAL INFORMATION.
2. SEE DRAWING PR-52-301 FOR SECTION VIEW OF EFFLUENT CHANNEL
3. CONTRACTOR TO MODIFY OR REHABILITATE THE EXISTING PIPE SUPPORTS TO FACILITATE THE INSTALLATION OF THE NEW RAS PIPE TO BE SUPPORTED. REFER TO STRUCTURAL DETAILS FOR ADDITIONAL INFORMATION.
4. REFER TO DRAWINGS C-00-101 AND C-00-104 FOR ADDITIONAL INFORMATION REGARDING OVERALL DEMOLITION AND MODIFICATION PLANS FOR THIS WORK AREA.
5. TIMBER PILES ARE APPROXIMATELY SHOWN. CONTRACTOR TO FIELD VERIFY PILE LOCATIONS.
6. CONTRACTOR TO REMOVE/DEMOLISH AND DISPOSE THE EXISTING CONCRETE WALKWAY AND HANDRAIL FROM THE EFFLUENT CHANNEL TO THE CLARIFIER. RELOCATE CONDUIT, WIRE, PIPING, PANELS, AND LIGHTING.
7. PILES UNDER THE EFFLUENT CHANNEL ARE APPROXIMATE. PILES INDICATED AS [○] WERE CUT OFF AND CAPPED TO SUPPORT THE RAS PIPING. REFER TO DWG C-01-113 FOR ADDITIONAL INFORMATION.

NOTES:

1. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION AND DETAILS ON THE PILES AND PILE CAPS.
2. REFER TO THE PROCESS AND ELECTRICAL DRAWINGS FOR INFORMATION ON THE RELOCATION OF EXISTING PIPING AND CONDUIT.
3. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.
4. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION ON THE SS PIPE SUPPORT STRAPS.
5. PRIOR TO BACK FILL THE EXCAVATION UNDER THE EFFLUENT CHANNEL ENGINEER AND GEOTECHNICAL SUB-CONSULTANT TO REVIEW EXISTING TIMBER PILES.
6. CONTRACTOR TO BACKFILL THE AREA UNDER THE EFFLUENT CHANNEL WITH FLOWABLE FILL.

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

REV.	DATE	DESCRIPTION	BY
3			
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

SECONDARY CLARIFIER NO. 7
EXISTING SITE PIPING, DEMOLITION AND PROPOSED PIPING PLAN AND PROFILE

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

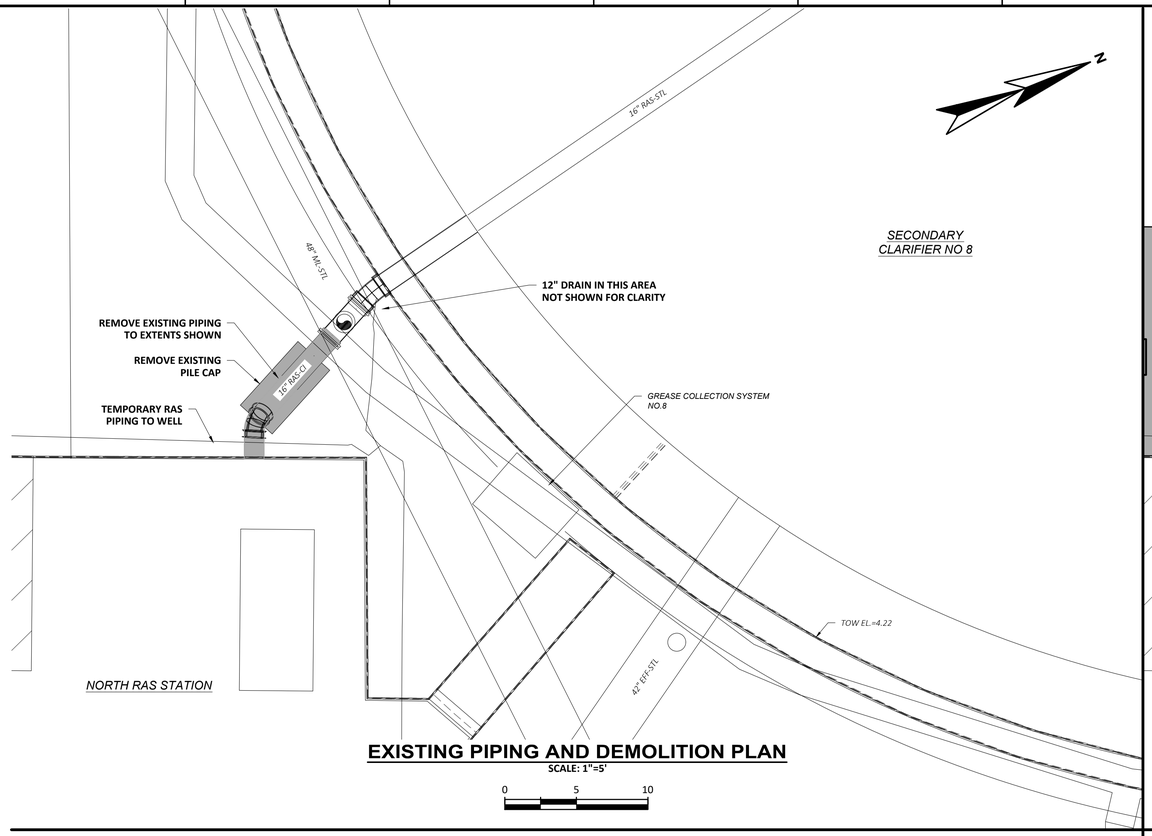
DR. C.HINKLEY	
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

C-01-111

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

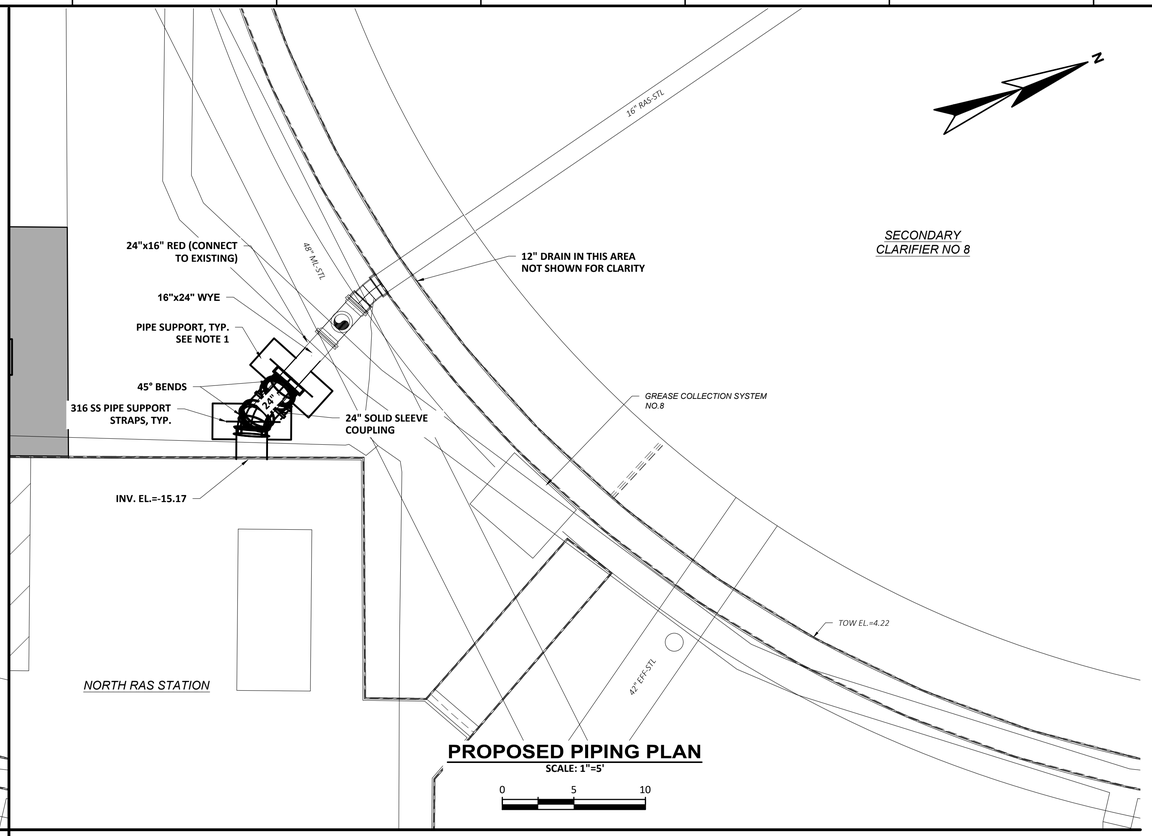
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EXISTING PIPING AND DEMOLITION PLAN

SCALE: 1"=5'

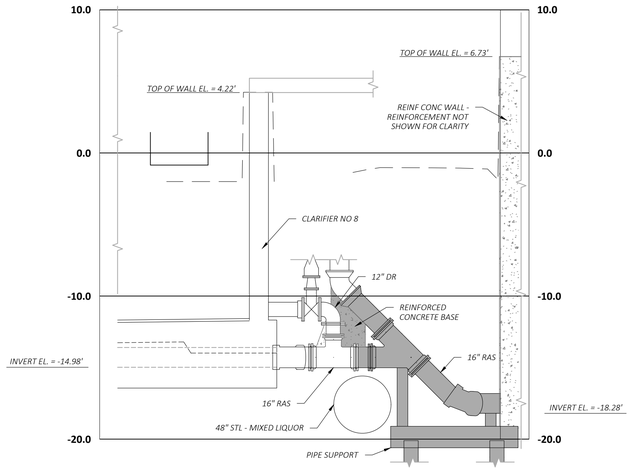
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PROPOSED PIPING PLAN

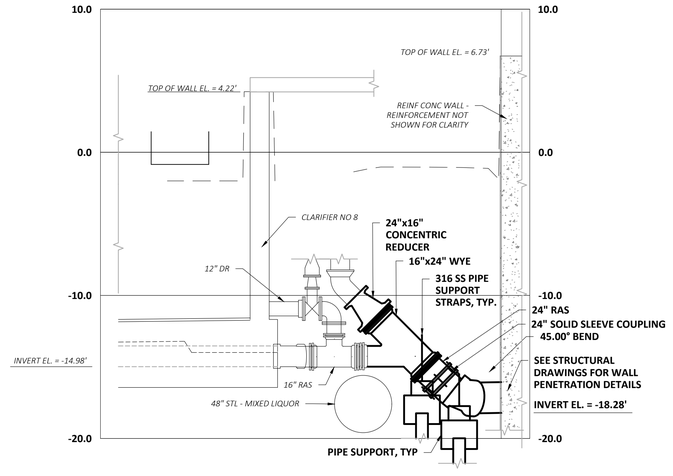
SCALE: 1"=5'

0 5 10



EXISTING PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'



PROPOSED PROFILE

SCALES
VERT:1"=5'
HORIZ:1"=5'

GENERAL NOTES:

1. CONTRACTOR TO MODIFY OR REHABILITATE THE EXISTING PIPE SUPPORTS TO FACILITATE THE INSTALLATION OF THE NEW RAS PIPE TO BE SUPPORTED. REFER TO STRUCTURAL DETAILS FOR ADDITIONAL INFORMATION.
2. REFER TO DRAWINGS C-00-101 AND C-00-104 FOR ADDITIONAL INFORMATION REGARDING OVERALL DEMOLITION AND MODIFICATION PLANS FOR THIS WORK AREA.

NOTES:

1. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION AND DETAILS ON THE PILES AND PILE CAPS.
2. REFER TO THE PROCESS AND ELECTRICAL DRAWINGS FOR INFORMATION ON THE RELOCATION OF EXISTING PIPING AND CONDUIT.
3. CONTRACTOR TO COORDINATE THE LOCATION OF THE RESTRAINED SOLID SLEEVE COUPLING WITH THE ENGINEER.
4. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION ON THE SS PIPE SUPPORT STRAPS.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SECONDARY CLARIFIER NO. 8
EXISTING SITE PIPING, DEMOLITION AND PROPOSED PIPING PLAN AND PROFILE

DR.	C.HINKLEY		
TRC.	-		
CK.	W.EDGERTON		
PROJECT NO:	21163	DESIGNED BY:	S.HALLOWELL
AP.	S.HALLOWELL		
SUBMISSION:	CONTRACT DRAWINGS	SCALE:	AS NOTED
CAD COORD:	A.COUTURE	DATE:	FEBRUARY 2026

C-01-112

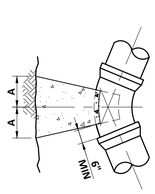
DWG. No. 12221-W-33

SET NO. SHEET NO. OF

J:\ENGLA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\CIV\21163-CS-RASPIPING PPVU.DWG | 21163-CS-RASPIPING PPVU | 1:10.12364677 | — | 2/11/2026 2:45:33 PM | CHRISTOPHER.HINKLEY

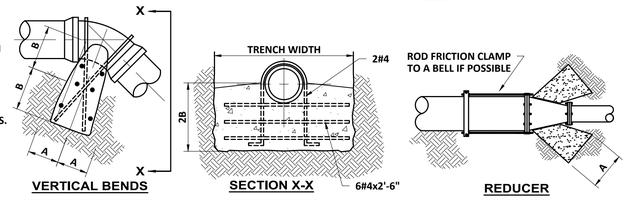
LAST SAVED BY: CHRISTOPHER.HINKLEY 2/11/2026 2:36 PM

J:\ENGV\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\CIV\21163-CS-DETAILS.DWG | 21163-CS-Details | 1:10.12364677 | --- | 2/11/2026 2:45:37 PM | CHRISTOPHER.HINKLEY



ALL BENDS | TEES | ELEVATION | CAP

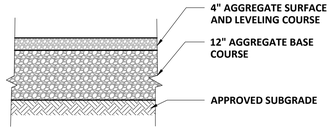
NOTES:
1. THRUST BLOCK SIZES SHOWN ARE BASED ON A SOIL BEARING CAPACITY OF 2000 PSF AND TEST PRESSURES OF 180 PSI.
2. ALL BENDS, TEES, WYES, HYDS. & DEAD ENDS SHALL BE BRACED WITH CONCRETE THRUST BLOCKS.
3. RODDING MAY BE REQUIRED



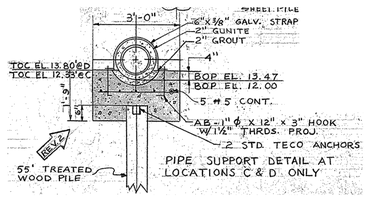
VERTICAL BENDS | SECTION X-X | REDUCER

PIPE SIZE	90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND		TEE		VERTICAL BEND (DOWN)		PLUG		REDUCER	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
4"	15"	12"	12"	9"	9"	6"	6"	6"	12"	12"	24"	21"	12"	12"	12"	12"
6"	15"	12"	12"	9"	9"	6"	6"	6"	12"	12"	24"	21"	12"	12"	12"	12"
8"	20"	15"	14"	12"	9"	9"	9"	6"	18"	12"	33"	24"	14"	14"	18"	12"
10"	21"	21"	18"	15"	15"	9"	9"	9"	20"	18"	40"	27"	16"	16"	20"	18"
12"	27"	24"	23"	15"	15"	12"	12"	9"	25"	18"	48"	30"	18"	18"	25"	18"
16"	37"	30"	30"	21"	21"	15"	13"	12"	32"	24"	57"	36"	22"	22"	32"	24"

THRUST BLOCKS
NTS

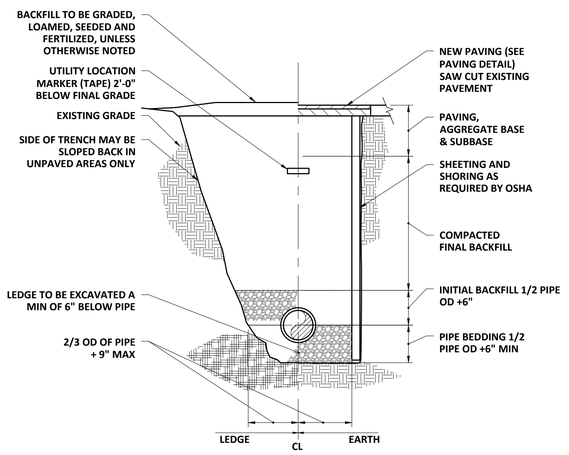


TYPICAL SECTION OF GRAVEL AREAS
SCALE: NTS



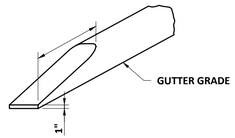
PIPE SUPPORT DETAIL
SCALE: NTS

NOTE:
1. SCANNED IMAGE TAKEN FROM RECORD DRAWINGS REFER TO DWG C-00-001 FOR ADDITIONAL INFORMATION.



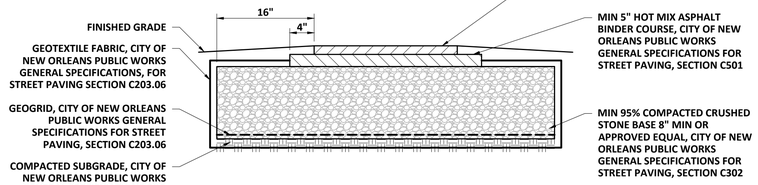
NOTES:
1. ALL EXCAVATION MUST MEET OSHA STANDARDS.
2. INSTALL 3 FOOT LONG IMPERVIOUS MATERIAL DAM IN BEDDING/INITIAL BACKFILL MATERIAL EVERY 100' AND WHERE SHOWN ON PLANS TO PREVENT TRENCH GROUNDWATER FROM BEING CHANNELED ALONG BEDDING/INITIAL BACKFILL.
3. SEE SPECIFICATIONS FOR BEDDING AND BACKFILL REQUIREMENTS.

PIPE TRENCH
SCALE: NTS



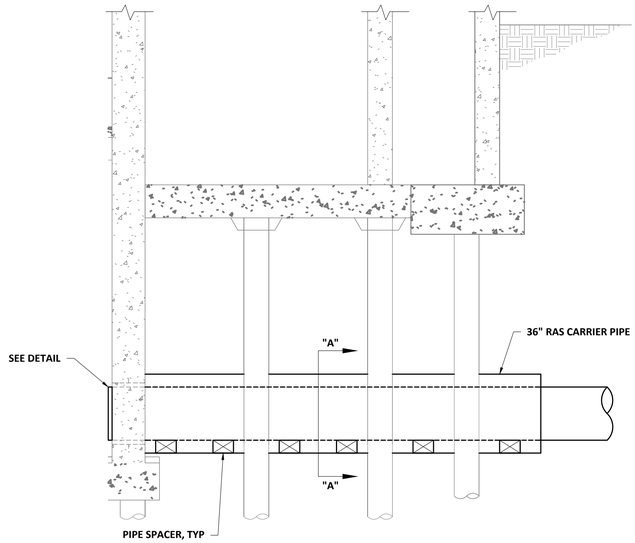
BITUMINOUS TERMINAL CURB
SCALE: NTS

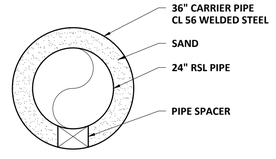
NOTE
PROVIDE TACK COAT BETWEEN ASPHALT LAYERS, CITY OF NEW ORLEANS PUBLIC WORKS GENERAL SPECIFICATIONS FOR STREET PAVING, SECTION C504.



ASPHALTIC CONCRETE PAVEMENT
SCALE: NTS

EFFLUENT CHANNEL





SECTION "A-A"

NOTES:
1. CONTRACTOR TO CONDUCT TEST PIT TO LOCATE EXISTING PILES BENEATH EFFLUENT CHANNEL.
2. CONTRACTOR TO PUSH CARRIER PIPE BETWEEN TIMBER PILES UP AGAINST EXTERIOR BUILDING FOUNDATION WALL. REMOVE AND DISPOSE SOIL MATERIAL WITHIN CARRIER PIPE. CARRIER PIPE TO BE LEVEL.
3. CARRIER PIPE TO BE A SINGLE PIECE OF PIPE AND SHALL EXTEND 12-INCHES BEYOND NEW ELECTRICAL BUILDING FOUNDATION FOOTER.
4. CORE OPENING IN EXTERIOR BUILDING FOUNDATION WALL TO FACILITATE INSTALLATION OF RSL PIPE.
5. RSL PIPING TO BE INSTALLED INSIDE CARRIER PIPE WITH SPACERS. SIZE AND NUMBER OF SPACERS TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR.
6. RSL PIPE TO BE A SINGLE PIECE WITH NO JOINTS WITHIN THE CARRIER PIPE. RSL PIPE SHALL EXTEND A MINIMUM 6-INCHES WITHIN THE BUILDING PUMP ROOM.
7. AFTER RSL PIPE IS INSTALLED, FILL VOID SPACE BETWEEN CARRIER PIPE AND RSL PIPE WITH SAND.
8. REFER TO THE STRUCTURAL DRAWINGS FOR ADDITIONAL DETAILS AND REQUIREMENTS.

RETURN SLUDGE CARRIER PIPE INSTALLATION
SCALE: NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

DETAILS I

DR. C.HINKLEY	C-01-113
TRC. -	
CK. W.EDGERTON	
AP. S.HALLOWELL	DWG. No. 12221-W-33
PROJECT NO: 21163	DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
SET NO.	SHEET NO. OF

LAST SAVED BY: JAMES.MICHAUD 2/11/2026 2:36 PM

EROSION AND SEDIMENTATION CONTROL NOTES:

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE "2007 EROSION CONTROL GUIDELINES" BY THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL MEASURES REQUIRED ARE SHOWN ON THE PERTINENT PROPOSED LAYOUT AND SITE PIPING PLANS. PROVIDE SILT FENCE, STONE CHECK DAMS, AND OTHER EROSION CONTROL MEASURES AS REQUIRED TO ADEQUATELY PREVENT SEDIMENT TRANSPORT AS NOTED IN THE BMP.

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE "2007 EROSION CONTROL GUIDELINES" BY THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE MAINTAINED IN AN UNTREATED OR NON-VEGETATED CONDITION FOR THE MINIMUM TIME REQUIRED. IN GENERAL, AREAS TO BE VEGETATED SHALL BE PERMANENTLY STABILIZED WITHIN 15 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 30 DAYS OF INITIAL DISTURBANCE OF THE SOIL.
3. SEDIMENT BARRIERS (SILT FENCE, STONE CHECK DAMS, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF UPGRADIENT DRAINAGE AREAS.
4. INSTALL SILT FENCE AT TOE OF SLOPES TO FILTER SILT FROM RUNOFF. SEE SILT FENCE DETAIL FOR PROPER INSTALLATION. SILT FENCE WILL REMAIN IN PLACE PER NOTE 5.
5. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED, AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSE. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE PERMANENTLY STABILIZED.
6. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN TWO HORIZONTAL TO ONE VERTICAL (2 TO 1) UNLESS STABILIZED WITH PERMANENT EROSION CONTROL MEASURES.
7. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT TO BE COMPLETED 30 DAYS PRIOR TO THE ANTICIPATED DATE OF THE FIRST KILLING FROST, USE TEMPORARY MULCHING (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY PERMANENT SEEDING, UNTIL UPGRADIENT AREAS ARE STABILIZED.
8. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS. POST SEEDING SEDIMENT, IF ANY, WILL BE DISPOSED OF IN AN ACCEPTABLE MANNER.
9. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND REVEGETATED AS FOLLOWS:
   - A. A MINIMUM OF FOUR INCHES (4") OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND SMOOTHED TO A UNIFORM SURFACE.
   - B. APPLY LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST. IF SOIL TESTING IS NOT DEEMED FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 300 POUNDS PER ACRE OR 7.5 POUNDS PER 1,000 SQUARE FEET USING 10-10-10 (N-P205-K20) OR EQUIVALENT. APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 4 TONS PER ACRE (180 POUNDS PER 1,000 SQUARE FEET) FOR CLAY, CLAY LOAM, AND HIGH ORGANIC SOIL. AT A RATE OF 3 TONS PER ACRE (135 POUNDS PER 1,000 SQUARE FEET) FOR SANDY LOAM, LOAM AND SILT LOAM. AT A RATE OF 2 TONS PER ACRE (90 POUNDS PER 1,000 SQUARE FEET) FOR LOAMY SAND, AND SAND.
   - C. FOLLOWING SEED BED PREPARATION, DITCHES AND BACK SLOPES WILL BE SEEDED WITH A MIXTURE OF 47% CREEPING RED FESCUE, 5% REDTOP, AND 48% TALL FESCUE. THE LAWN AREAS WILL BE SEEDED WITH A PREMIUM TURF MIXTURE OF 44% KENTUCKY BLUEGRASS, 44% CREEPING RED FESCUE, AND 12% PERENNIAL RYE GRASS: SEEDING RATE IS 3.0 POUNDS PER 1,000 SQUARE FEET. LAWN QUALITY SOD MAY BE SUBSTITUTED FOR SEED.
   - D. HAY MULCH AT THE RATE OF 2 TONS PER ACRE OR 90-95 POUNDS PER 1,000 SQUARE FEET OR A HYDRO-APPLICATION OF CELLULOSE FIBER SHALL BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER WILL BE USED ON HAY MULCH FOR WIND CONTROL.
11. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE WORK AREA IS STABILIZED.
12. WETLANDS (EXCEPTING THOSE WHICH ARE TO BE FILLED IN ACCORDANCE WITH STATE AND FEDERAL REGULATIONS) WILL BE PROTECTED WITH SILT FENCE INSTALLED AT THE EDGE OF THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE.
13. IN GENERAL, AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS SHALL HAVE A MAXIMUM PERIOD OF EXPOSURE OF NOT MORE THAN 15 DAYS.
14. FOLLOW APPROPRIATE EROSION CONTROL MEASURES PRIOR TO EACH STORM IN ALL AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STORMS.

MULCH ANCHORING:

ANCHOR MULCH WITH: MULCH NETTING (AS PER MANUFACTURER); ASPHALT EMULSION (0.05 GALLONS PER SQUARE YARD); CHEMICAL TACK (AS PER MANUFACTURER'S SPECIFICATIONS); OR BE WOOD CELLULOSE FIBER (2,000 POUNDS PER ACRE). WETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

MULCH AND MULCH ANCHORING

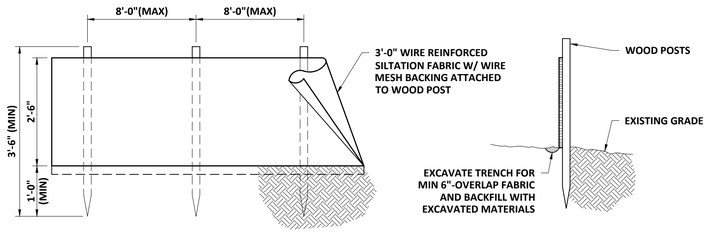
LOCATION	MULCH	RATE (PER 1,000 SF)
PROTECTED AREA	STRAW OR HAY *	100 POUNDS
WINDY AREAS	STRAW OR HAY (ANCHORED) *	100 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES (GREATER THAN 3:1)	JUTE MESH, EXCELSIOR MAT, OR EQUIV.	AS REQUIRED

* A HYDRO-APPLICATION OF CELLULOSE FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SHALL BE USED ON HAY MULCH FOR WIND CONTROL.

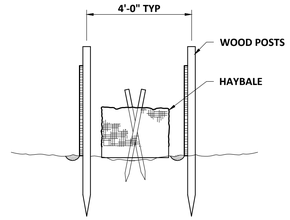
ADDITIONAL TEMPORARY SEED MIXTURE (OR PERIODS LESS THAN 12 MONTHS)

DATES	SEED	RATE
3/1 - 6/15 8/15 - 9/15	OATS	86 LB/ACRE
3/1 - 6/15 8/1 - 10/15	ANNUAL RYE GRASS	40 LB/ACRE
4/15 - 7/1 (8/15 - 10/15)	WINTER RYE	120 LB/ACRE
5/15 - 7/15	MILLET	20 LB/ACRE

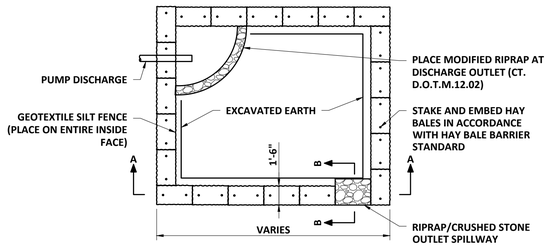
* SEED RATE ONLY



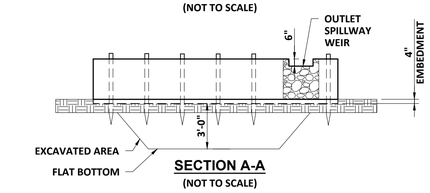
SILT FENCE INSTALLATION DETAIL
SCALE: NTS



COMBINATION SILT FENCE AND HAY BALE BARRIER
SCALE: NTS

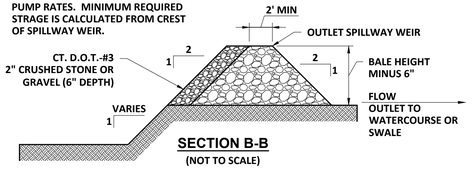


PLAN
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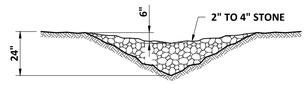
SECTION A-A
(NOT TO SCALE)

NOTES:
DIMENSION VARY ACCORDING TO PUMP RATES. MINIMUM REQUIRED STRAGE IS CALCULATED FROM CREST OF SPILLWAY WEIR.



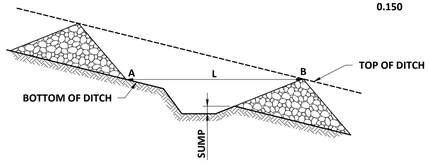
SECTION B-B
(NOT TO SCALE)

TYPE II SEDIMENTATION BASIN DETAIL
SCALE: NTS



CROSS SECTION

DITCH SLOPE (FT/FT)	L (FT)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13



PROFILE

STONE CHECK DAM DETAIL
SCALE: NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

EROSION CONTROL NOTES AND DETAILS

STATE OF LOUISIANA
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SCALE:	AS NOTED
DATE:	FEBRUARY 2026

PROJECT NO: 21163 | DESIGNED BY: S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

C-01-114
DWG. No. 12221-W-33
SET NO. | SHEET NO. OF

J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\CIV\21163-CS-EROSIONCONTROL.DWG | 21163-CS-ErosionControl | 1:10.12364677 | — | 2/11/2026 2:45:46 PM | CHRISTOPHER.HINKLEY

STRUCTURAL NOTES

GENERAL NOTES:

1. EXISTING DIMENSIONS AND/OR ELEVATIONS TAKEN FROM THE FOLLOWING RECORD DRAWINGS:
   1.1 "EAST BANK SEWAGE AND TREATMENT PLANT" BY RICE, DORNBLATT, AND ERNST DATED AUGUST, 1964
   1.2 "EXPANSION OF THE EAST BANK SEWAGE TREATEMENT FACILITIES" BY WALDEMAR S.NELSON AND COMPANY DATED JULY, 1981
2. GENERAL CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
3. * INDICATES THAT THE GENERAL CONTRACTOR SHALL COORDINATE EXACT DIMENSION AND/OR ELEVATION BASED ON EQUIPMENT SUPPLIED. ALL CHANGES SHALL BE REVIEWED WITH NO EXCEPTIONS TAKEN BY THE ENGINEER.
4. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
5. ALL STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS, SHOP DRAWINGS (REVIEWED WITH NO EXCEPTIONS TAKEN) AND SPECIFICATIONS.
6. THE CONTRACTOR SHALL COORDINATE PREPARED OPENING SIZES AND LOCATIONS WITH THE VARIOUS CONSTRUCTION TRADES AND EQUIPMENT MANUFACTURERS. MANY SLEEVE SIZES AND PREPARED OPENING SIZES ARE LARGER THAN THE NOMINAL DIMENSION IN ORDER TO ACCOMMODATE THE EQUIPMENT.
7. THE DETAILS, STRUCTURAL NOTES, ABBREVIATIONS AND LEGEND SHOWN ON DRAWINGS S-00-001 AND S-00-002. S-99-501 THROUGH S-99-506 SHOULD BE USED WHOLLY OR IN PART WHERE THEY APPLY EXCEPT WHERE MODIFIED BY THE DETAILED DRAWINGS OR SPECIFICATIONS.

CONCRETE DEMOLITION NOTES:

1. REFERENCE SPECIFICATION - 02050A - DEMOLITION.
2. STRUCTURAL DEMOLITION INCLUDES THAT SHOWN ON ALL OTHER DISCIPLINE DRAWINGS INCLUDING CIVIL, ARCHITECTURAL, PROCESS, MECHANICAL, PLUMBING AND ELECTRICAL, WHETHER OR NOT SHOWN ON STRUCTURAL DRAWINGS.
3. CONCRETE PADS SHALL BE DEMOLISHED AT ALL LOCATIONS WHERE EQUIPMENT IS DEMOLISHED, UNLESS NOTED OTHERWISE.
4. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF ALL CONCRETE, EQUIPMENT AND MATERIALS INDICATED TO BE DEMOLISHED UNLESS OTHERWISE INDICATED.
5. DETAILS AND SECTIONS SHOWN FOR REMOVING OR MODIFYING CONCRETE ARE BASED ON EXISTING REFERENCED DRAWINGS. IF CONDITIONS DIFFER FROM THOSE AS SHOWN ON THE REFERENCED DRAWINGS, GENERAL CONTRACTOR SHALL NOTIFY ENGINEER PRIOR TO BEGINNING THE DEMOLITION WORK.
6. VEHICLE-MOUNTED HYDRAULIC HAMMERS ARE NOT PERMITTED TO REMOVE CONCRETE FROM CONCRETE TO REMAIN, EXCEPT IF ABANDONED. UNLESS OTHERWISE PERMITTED, LINE DRILLING OR SAW CUTTING IS REQUIRED. GENERAL CONTRACTOR SHALL USE CAUTION TO AVOID DAMAGING EXISTING CONCRETE STRUCTURES TO REMAIN.
7. WHERE LIMIT OF CONCRETE DEMOLITION PROVIDES INTERFACE WITH NEW CONCRETE, USE OF SCABBLERS, SCARIFIERS, BUSH HAMMERS, AND PNEUMATIC HAMMERS GREATER THAN 15 POUNDS IS NOT PERMITTED UNLESS FOLLOWED BY STEEL SHOT-BLASTING, ABRASIVE BLASTING, OR HIGH-PRESSURE WATER-JETTING. PNEUMATIC HAMMERS GREATER 15 POUNDS ARE PERMITTED FOR REMOVAL OF CONCRETE FROM AROUND REINFORCEMENT TO REMAIN, WITH THE CONCRETE SURFACE PREPARED AS DESCRIBED ABOVE.
8. GENERAL CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING STRUCTURES AS A RESULT OF CONTRACTOR ACTIVITIES AT NO ADDITIONAL COST TO THE OWNER.
9. GENERAL CONTRACTOR SHALL THOROUGHLY CLEAN EXISTING CONCRETE TO BE MODIFIED PRIOR TO STARTING WORK.
10. ALL WALL AND/OR FLOOR PENETRATIONS REMAINING AFTER THE REMOVAL OF PIPING, CONDUIT, HATCHES AND OTHER EMBEDDED ITEMS ARE TO BE INFILLED WITH REINFORCED CONCRETE AND FINISHED FLUSH TO MATCH EXISTING SURFACES, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
11. GENERAL CONTRACTOR SHALL COORDINATE THE INDICATED DEMOLITION WITH THE ASSOCIATED PROPOSED NEW WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
12. WHEN REMOVING PORTIONS OF EXISTING CONCRETE OR CONCRETE FILL, ALL OVERCUT CONCRETE SHALL BE PATCHED WITH REPAIR MATERIAL FLUSH WITH REMAINING CONCRETE.
13. AT ALL CUT REINFORCEMENT WHERE SURFACES ARE TO REMAIN EXPOSED, AND EXCEPT WHERE BURIED, CHIP BACK SURROUNDING CONCRETE AS NECESSARY TO GRIND BACK REINFORCEMENT 2", AND PATCH WITH NON-SHRINK GROUT OR CONCRETE REPAIR MATERIAL.

FOUNDATION NOTES:

1. REFERENCE SPECIFICATION - DIVISION 02
2. BACKFILLING WALLS SHALL NOT COMMENCE UNTIL THEY HAVE BEEN IN PLACE AND CURED FOR A MINIMUM OF 7 DAYS AND THE 7 DAY LAB CURED CYLINDER BREAK RESULTS HAVE BEEN REVIEWED BY THE ENGINEER.
3. EXISTING SOIL CONDITIONS ARE DESCRIBED IN THE BORING LOGS. IF UNSUITABLE BEARING MATERIAL IS ENCOUNTERED NOTIFY THE ENGINEER.
4. GENERAL CONTRACTOR SHALL PROVIDE SUPPORT BELOW EXISTING FOUNDATIONS WHEN EXCAVATION FOR NEW WORK MAY OTHERWISE UNDERMINE OR CAUSE INSTABILITY OF THE EXISTING FOUNDATIONS.
5. OPEN END STEEL PILES SHALL MEET THE REQUIREMENTS OF LOUISIANA STANDARD SPECIFICATION FOR ROADS AND BRIDGES SECTION 1013.11 AND HAVE A MINUMUM WALL THICKNESS OF 1/2" OR GREATER AS NEEDED FOR HANDLING AND DRIVING STRESSES.
6. BOTTOM OF PILE ELEVATIONS INDICATED SHALL BE FIELD VERIFIED BASED ON PILE TESTING. INCREASE PILE EMBEDMENT AS NECESSARY TO ACHIEVE THE ALLOWABLE PILE CAPACITIES INDICATED. REFER TO SPECIFICATION 02468 FOR PILE TESTING CRITERIA.
7. REMOVE ANY EMBEDDED SOIL AND PLACE CLASS B CONCRETE IN PILES TO 30 FEET BELOW CUTOFF ELEVATION.

CAST-IN-PLACE REINFORCED CONCRETE NOTES:

1. REFERENCE SPECIFICATIONS - DIVISION 3
2. REINFORCED CONCRETE WAS DESIGNED IN ACCORDANCE WITH THE FOLLOWING:
   - ACI 318-19 - BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
   - ACI 350-20 - CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES
3. DESIGN CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
   STRUCTURAL CONCRETE - f'c = 5,000 PSI
   OTHER CONCRETE - SEE SPECIFICATIONS
4. INDEPENDENT TESTING LABORATORY WILL PERFORM TESTS FOR ALL CONCRETE TRUCKS IN ACCORDANCE WITH THE SPECIFICATIONS.
5. REINFORCEMENT SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A615/A615M OR A706/A706M, GRADE 60 DEFORMED BARS. FABRICATION SHALL BE IN ACCORDANCE WITH THE CRSI CODE OF STANDARD PRACTICE.
6. 90 DEGREE BENDS IN REINFORCEMENT SHALL BE ACI STANDARD LENGTH UNLESS SHOWN OTHERWISE, SUCH AS WHERE A SPLICE LENGTH IS REQUIRED.
7. REINFORCEMENT SHALL HAVE THE FOLLOWING CONCRETE CLEAR COVER UNLESS OTHERWISE NOTED:
   - CONCRETE CAST AGAINST EARTH: 3 INCHES
   - WHERE REQUIRED TO CLEAR 6" WATERSTOP: 3 INCHES
   - ALL OTHER CONCRETE SURFACES: 2 INCHES
8. PROVIDE ADDITIONAL REINFORCEMENT AT SLAB AND WALL OPENINGS AS INDICATED ON THE TYPICAL STRUCTURAL DETAILS.
9. CONSTRUCTION JOINTS SHALL NOT BE PLACED AT LOCATIONS OTHER THAN SHOWN ON THE DRAWINGS UNLESS REVIEWED WITH NO EXCEPTIONS TAKEN BY THE ENGINEER.
10. PVC WATERSTOPS SHALL BE INSTALLED IN CONSTRUCTION JOINTS OF ALL LIQUID RETAINING STRUCTURES AND IN ALL EXTERIOR CONSTRUCTION JOINTS OF BELOW GRADE SPACES, EXCEPT WHERE HYDROPHILIC RUBBER WATERSTOPS ARE SHOWN.
11. FORM TIES IN LIQUID RETAINING WALLS AND EXTERIOR WALLS OF BELOW GRADE SPACES SHALL INCLUDE WATERSTOP WASHERS OR OTHER SPECIFIED MEANS TO PREVENT LEAKAGE.
12. ALL CONCRETE PENETRATIONS ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS. SEE ALL INDIVIDUAL DISCIPLINE DRAWINGS FOR ALL REQUIRED PENETRATIONS, INCLUDING PIPE AND DUCT PENETRATIONS.
13. PIPE PENETRATIONS THAT ARE SHOWN ARE APPROXIMATE ONLY, AND SHALL BE OFFSET A MINIMUM OF 6 INCHES FROM ALL CONSTRUCTION JOINTS.
14. PROVIDE CHAMFERS AT ALL EXPOSED CORNERS AND EDGES, EXCEPT THOSE DIRECTLY BELOW MASONRY AND STUD WALLS.
15. SEE ALL INDIVIDUAL DISCIPLINE DRAWINGS FOR REQUIRED EQUIPMENT PADS AND PROVIDE A MINIMUM 4 INCH THICK REINFORCED CONCRETE PAD BELOW ALL EQUIPMENT, PIPE SUPPORTS, STANCHIONS, CONTROL PANELS, CHEMICAL TANKS, LOCKERS, ETC., AS APPLICABLE, UNLESS OTHERWISE NOTED. SIZE AND LOCATION OF EQUIPMENT PADS AND ANCHOR BOLTS SHALL BE AS REQUIRED BY THE EQUIPMENT MANUFACTURER UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
16. WHERE NEW CONCRETE IS TO BE PLACED AGAINST PRE-EXISTING CONCRETE, UNLESS NOTED OTHERWISE, ROUGHEN AND CLEAN SUBSTRATE AND APPLY BONDING AGENT AS SPECIFIED.
17. ALL PIPING INSTALLED BELOW STRUCTURAL SLABS ON GROUND SHALL BE ENCASED IN CONCRETE. GRAVITY SANITARY SEWER AND DRAIN PIPES BELOW NON-STRUCTURAL SLABS-ON-GROUND NEED NOT BE CONCRETE ENCASED, UNLESS NOTED OTHERWISE.

METAL DECK NOTES:

1. REFERENCE SPECIFICATION 05310 - METAL DECKING
2. METAL DECK SHALL CONFORM TO THE REQUIREMENTS OF ANSI/SDI RD-2010 STANDARD FOR STEEL ROOF DECK.
3. METAL DECK SHEETS SHALL BE PROVIDED IN THE LONGEST LENGTHS POSSIBLE BUT NO LESS THAN THREE (3) SPANS.
4. METAL DECK TYPE AND THICKNESS SHALL BE AS INDICATED ON THE DRAWINGS.
5. METAL DECK FINISH SHALL BE GALVANIZED.
6. DECK SHALL BE SCREWED TO ALL SUPPORTING ROOF STEEL TO ACCOMMODATE DIAPHRAGM ACTION AS INDICATED BELOW:
   6.1 SCREWED CONNECTIONS:
      6.1.1 AT END AND INTERIOR TRANSVERSE SUPPORTS (BEARING SUPPORTS PERPENDICULAR TO DECK SPAN) BY #12 TEK SCREWS AT THE BOTTOM OF EVERY SECOND RIB AT EACH SUPPORT AND AT A SPACING NOT TO EXCEED 12" WITH ONE SCREW ALWAYS OCCURRING AT THE SIDE LAPS (36/4 PATTERN).
      6.1.2 AT INTERIOR AND EXTERIOR LONGITUDINAL SUPPORTS (SUPPORTS PARALLEL TO DECK SPAN) BY #12 TEK SCREWS AT 12" ON CENTER
      6.1.3 THE DECK SHEETS SHALL BE CONNECTED ALONG THEIR SIDE LAPS BY #10 TEK SCREWS. THE NUMBER OF SIDE LAP FASTENERS SHALL BE NO LESS THAN 4 FASTENERS PER DECK SPAN. SIDE LAP ONE FLUTE.
7. OPENINGS IN DECK - ALL OPENINGS IN THE METAL DECK SHALL BE FIELD CUT. THE GENERAL CONTRACTOR SHALL COORDINATE THE WORK OF THE TRADES INVOLVED TO ENSURE PROPER PROVISION FOR THE SUPPORT AND ATTACHMENT OF DECK AROUND OPENINGS. OPENINGS SHALL BE REINFORCED AS FOLLOWS:
   7.1 OPENINGS LESS THAN 6" IN DIAMETER OR LARGEST SIDE LENGTH AND NO GREATER THAN 2 WEBS REMOVED, ADDITIONAL REINFORCING NOT REQUIRED.
   7.2 OPENINGS GREATER THAN OR EQUAL TO 6" AND LESS THAN OR EQUAL TO 12" PROVIDE REINFORCING PLATE. SIZE OF PLATE SHALL BE A MINIMUM 12" GREATER THAN THE OPENING ON ALL SIDES SUCH THAT THE PLATE SPANS ACROSS A MINIMUM 3 FLUTES.
   7.3 OPENINGS GREATER THAN 12 INCHES PROVIDE FRAMING AS INDICATED ON THE CONTRACT DRAWINGS. IF ADDITIONAL FRAMING IS NOT INDICATED ON THE CONTRACT DRAWINGS, PROVIDE THE MINIMUM FRAMING INDICATED BELOW:
      7.3.1 SPAN OF FRAMING MEMBER LESS THAN 3'-0" C8X11.5
      7.3.2 SPAN OF FRAMING MEMBER GREATER THAN OR EQUAL TO 3'-0" AND LESS THAN 6'-0" C10X20
      7.3.3 MAIN FRAMING SHALL BE INSTALLED PERPENDICULAR TO THE DECK SPAN SUCH THAT THE DECK BEARS ON THE TOP FLANGE. SECONDARY FRAMING INSTALLED PARALLEL WITH THE DECK SPAN WITH ADDITIONAL FRAMING WELDED TO THE TOP FLANGE TO PROVIDE POSITIVE BEARING AS REQUIRED.

PIPE SUPPORT NOTES:

1. THE FOLLOWING RESTRICTIONS FOR SUPPORTING PIPES FROM NEW AND EXISTING STRUCTURES IN THE TABLE BELOW SHALL APPLY TO ALL PIPE SUPPORTS:

AREA	EXISTING STRUCTURES	NEW STRUCTURES
FLOOR SYSTEMS		
REINFORCED CONCRETE SLAB:		
ELEVATED SLAB	NO	YES
MAT SLAB/ BASE SLAB	YES	YES
SLAB-ON-GROUND	YES	YES
ROOF SYSTEMS		
REINFORCED CONCRETE SLAB	NO	YES
STEEL JOISTS	NO	NO
STEEL FRAME	NO	YES
METAL DECK	NO	NO
OTHER SYSTEMS		
METAL AND CONCRETE STAIRS	NO	NO
CONCRETE WALLS	YES	YES

NOTE: "NO" INDICATES THAT PIPES MAY NOT BE SUPPORTED FROM THE INDICATED STRUCTURE AND "YES" INDICATES THAT PIPES MAY BE SUPPORTED FROM THE INDICATED STRUCTURE. THE RESTRICTIONS APPLY TO BEARING THE PIPE SUPPORT ABOVE, HANGING BELOW, OR HANGING THE PIPE FROM THE SIDE OF THE INDICATED STRUCTURAL ELEMENT. ALL PIPE SUPPORTS SUPPORTED FROM STRUCTURES SHALL BE SUBJECTED TO REVIEW WITH NO EXCEPTIONS TAKEN BY THE ENGINEER.

MASONRY NOTES:

1. REFERENCE SPECIFICATION - 04200 - UNIT MASONRY
2. DESIGN COMPRESSIVE STRENGTH OF MASONRY ASSEMBLAGE: f'm = 2000 PSI
3. MORTAR SHALL CONFORM TO ASTM C270 TYPE S WITH 28 DAY COMPRESSIVE STRENGTH OF 1800 PSI.
4. CMU BLOCK SHALL CONFORM TO ASTM C90 (NORMAL WEIGHT OR LIGHTWEIGHT) WITH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI.
5. GROUT SHALL CONFORM TO ASTM C476 FINE GROUT WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 2000 PSI.
6. GROUTED REINFORCEMENT SHALL BE NEW BILLET STEEL CONFORMING TO ASTM SPECIFICATION A615 GRADE 60 DEFORMED BARS. FABRICATION SHALL BE IN ACCORDANCE WITH THE CRSI CODE OF STANDARD PRACTICE.
7. GROUT CMU CELLS SOLID AT THE FOLLOWING LOCATIONS:
   7.1 EXPANSION AND EPOXY ADHERED ANCHORS
   7.2 REINFORCED CELLS
   7.3 CELLS BELOW LINTELS AND BEAMS BEARING ON CMU.
8. DEFINITIONS:
   BEARING WALL: WALL CARRYING VERTICAL LOADS GREATER THAN 200 LBS PER LINEAR FOOT IN ADDITION TO ITS OWN WEIGHT.
   SHEAR WALL: BEARING OR NON-BEARING WALL THAT IS DESIGNED TO CARRY IN-PLANE LATERAL LOADS OTHER THAN THOSE INDUCED BY ITS OWN MASS.
   EXTERIOR WALL: A WALL SUBJECTED TO WIND LOAD FOR ANY FRACTION OF ITS HEIGHT OR LENGTH.
   STRUCTURAL WALL: A BEARING OR SHEAR OR EXTERIOR WALL.
   PARTITION WALL: A NON-STRUCTURAL WALL.

STRUCTURAL STEEL NOTES:

1. REFERENCE SPECIFICATIONS - 05120 - - STRUCTURAL STEEL
2. STRUCTURAL STEEL AND STEEL LINTELS SHALL CONFORM TO THE FOLLOWING:
   2.1 WIDE FLANGE BEAM ("W" SHAPES) - ASTM A992
   2.2 STANDARD BEAMS ("S" SHAPES) - ASTM A36
   2.3 CHANNELS AND ANGLES - ASTM A36
   2.4 PLATES - ASTM A572 GRADE 50
   2.5 STRUCTURAL STEEL TUBING ("HSS" SHAPES) - ASTM A500 (GRADE C)
3. STRUCTURAL STEEL SHALL BE IN COMPLIANCE WITH THE LATEST EDITION OF THE AISC STEEL CONSTRUCTION MANUAL.
4. CONNECTIONS:
   4.1 FIELD BOLTED CONNECTIONS SHALL BE WITH ASTM F3125 GRADE 325 HIGH STRENGTH BOLTS EXCEPT AS NOTED. BOLTS SHALL BE 3/4" DIA IN 13/16" HOLES EXCEPT AS NOTED. ALL BOLTED CONNECTIONS SHALL BE CONSIDERED "SNUG TIGHTENED".
5. ANCHOR RODS SHALL CONFORM TO ASTM F1554, GRADE 55, ANCHOR RODS SHALL HAVE A 3" THREADED PROJECTION ABOVE THE BASE PLATE AND A HEADED END WITH WELDED WASHER AT THE EMBEDDED END.
6. ALL WELDING SHALL BE PERFORMED IN THE SHOP USING E70XX ELECTRODES IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE, UNLESS NOTES OTHERWISE.
7. ALL STRUCTURAL STEEL, BOLTS AND ANCHOR RODS SHALL BE HOT-DIPPED GALVANIZED AND/OR PAINTED AS SPECIFIED. GALVANIZE STEEL PRIOR TO BOLTING TO OTHER ASSEMBLIES AND AFTER ALL WELDING (IF POSSIBLE).
8. FLAME CUTTING OR BURNING OF STRUCTURAL STEEL IS NOT PERMITTED.
9. ALL SURFACES OF UNCOATED STRUCTURAL STEEL AND FASTENERS THAT ARE IN CONTACT WITH OR EMBEDDED IN CONCRETE, GROUT, OR MASONRY SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT) REFER TO SPECIFICATION 09900 - PAINTING FOR ADDITIONAL INFORMATION
10. ALL SURFACES OF DISSIMILAR METALS IN CONTACT SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT) REFER TO SPECIFICATION 09900 - PAINTING FOR ADDITIONAL INFORMATION.
11. ALL GALVANIZED COATINGS DAMAGED DURING SHIPMENT OR INSTALLATION SHALL BE COATED WITH A ZINC RICH COATING APPROPRIATE FOR THE APPLICATION.

METALS NOTES:

1. REFERENCE SPECIFICATION - 05500
2. ANCHOR RODS SHALL CONFORM TO ASTM F1554 GRADE 55.
3. STEEL BOLTS SHALL CONFORM TO ASTM F3125 GRADE 325 UNLESS OTHERWISE NOTED.
4. ALUMINUM SHAPES SHALL CONFORM TO ASTM B308 ALLOY 6061-T6 UNLESS OTHERWISE NOTED.
5. STAINLESS STEEL FASTENERS SHALL CONFORM TO ASTM F593 AND ASTM F594 (TYPE 316).
6. EPOXY AND EXPANSION ANCHORS SHALL BE TYPE 316 STAINLESS STEEL. EMBEDMENT DEPTH OF THESE ANCHORS SHALL BE NOT LESS THAN 6 INCHES UNLESS NOTED OTHERWISE.
7. NEOPRENE BEARING PADS SHALL BE HIGH GRADE WITH A SHORE A DUROMETER HARDNESS EQUAL TO SOFT (35-45).
8. ALL SURFACES OF UNCOATED STEEL (EXCEPT REINFORCING STEEL) AND ALUMINUM SHAPES AND FASTENERS THAT ARE IN CONTACT WITH OR EMBEDDED IN CONCRETE, GROUT, OR MASONRY SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT) REFER TO SPECIFICATION 09900 - PAINTING FOR ADDITIONAL INFORMATION
9. ALL SURFACES OF DISSIMILAR METALS IN CONTACT SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT) REFER TO SPECIFICATION 09900 - PAINTING FOR ADDITIONAL INFORMATION

MINIMUM REINFORCING BAR SPLICE LENGTHS (IN.) fy = 60,000 f'c = 5,000		
BAR SIZE	TOP BARS	OTHER BARS
4	18	14
5	22	17
6	26	20
7	38	29
8	44	34
9	54	42
10	66	51
11	80	61

NOTES:
1. THIS TABLE IS BASED ON NORMAL WEIGHT CONCRETE, UNCOATED BARS.
2. TOP BARS = HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
3. FOR f'c OTHER THAN 5,000 PSI, MULTIPLY THE VALUES IN THE TABLE BY THE SQUARE ROOT OF 5,000 BY THE SQUARE ROOT OF f'c.

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 39328 — 2/13/2026 — PROFESSIONAL ENGINEER

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

TYPICAL STRUCTURAL NOTES I

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

S-00-001

DWG. No. 12221-W-33

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SCHEDULE OF SPECIAL INSPECTIONS

LABC REFERENCE	MATERIAL / ACTIVITY	EXTENT	LABC REFERENCE	MATERIAL / ACTIVITY	EXTENT
1704.2.5.1	**INSPECTION OF FABRICATORS**		**1705.4**	**MASONRY CONSTRUCTION**	
	VERIFY FABRICATION/QUALITY CONTROL PROCEDURES	PERIODIC		1. VERIFY COMPLIANCE WITH APPROVED SUBMITTALS	PERIODIC
1705.2	**STEEL CONSTRUCTION**			2. VERIFICATION OF F'M PRIOR TO CONSTRUCTION	PERIODIC
	1. FABRICATOR AND ERECTOR DOCUMENTS (VERIFY REPORTS AND CERTIFICATES AS LISTED IN AISC 360, CHAPTER N, PARAGRAPH 3.2 FOR COMPLIANCE WITH CONSTRUCTION DOCUMENTS)	EACH SUBMITTAL		3. VERIFICATION OF SLUMP FLOW AND VISUAL STABILITY INDEX (VSI) OF SELF-CONSOLIDATING GROUT AS DELIVERED TO THE PROJECT	CONTINUOUS
	2. MATERIAL VERIFICATION OF STRUCTURAL STEEL	PERIODIC		4. VERIFY PLACEMENT OF MASONRY UNITS	PERIODIC
	3. EMBEDMENTS (VERIFY DIAMETER, GRADE, TYPE, LENGTH, EMBEDMENT. SEE 1705.3 FOR ANCHORS)	PERIODIC		5. VERIFY PROPORTIONS OF SITE-MIXED MORTAR AND GROUT	PERIODIC
	4. VERIFY MEMBER LOCATIONS, BRACES, STIFFENERS, AND APPLICATION OF JOINT DETAILS AT EACH CONNECTION COMPLY WITH CONSTRUCTION DOCUMENTS	PERIODIC		6. VERIFY GRADE, TYPE, AND SIZE OF REINFORCEMENT, CONNECTORS, AND ANCHOR BOLTS	PERIODIC
	5. STRUCTURAL STEEL WELDING:			7. VERIFY CONSTRUCTION OF MORTAR JOINTS	PERIODIC
	A. INSPECTION TASKS PRIOR TO WELDING (OBSERVE, OR PERFORM FOR EACH WELDED JOINT OR MEMBER, THE QA TASKS LISTED IN AISC 360, TABLE N5.4-1)	OBSERVE OR PERFORM AS NOTED		8. VERIFY PLACEMENT OF REINFORCEMENT, AND CONNECTORS	PERIODIC
	B. INSPECTION TASKS DURING WELDING (OBSERVE, OR PERFORM FOR EACH WELDED JOINT OR MEMBER, THE QA TASKS LISTED IN AISC 360, TABLE N5.4-2)	OBSERVE OR PERFORM AS NOTED		9. VERIFY GROUT SPACE PRIOR TO GROUTING	PERIODIC
	C. INSPECTION TASKS AFTER WELDING (OBSERVE, OR PERFORM FOR EACH WELDED JOINT OR MEMBER, THE QA TASKS LISTED IN AISC 360, TABLE N5.4-3)	OBSERVE OR PERFORM AS NOTED		10. VERIFY PLACEMENT OF GROUT	CONTINUOUS
	D. NONDESTRUCTIVE TESTING (NDT) OF WELDED JOINTS: SEE AISC COMMENTARY			11. VERIFY SIZE AND LOCATION OF STRUCTURAL MASONRY ELEMENTS	PERIODIC
	1) COMPLETE JOINT PENETRATION GROOVE WELDS 5/16" OR GREATER IN RISK CATEGORY III OR IV	PERIODIC		12. VERIFY TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION.	PERIODIC
	2) COMPLETE JOINT PENETRATION GROOVE WELDS 5/16" OR GREATER IN RISK CATEGORY II	PERIODIC		13. VERIFY PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40OF) OR HOT WEATHER (TEMPERATURE ABOVE 90OF)	PERIODIC
	3) WELDED JOINTS SUBJECT TO FATIGUE WHEN REQUIRED BY AISC 360, APPENDIX 3, TABLE A-3.1	PERIODIC		14. PREPARE GROUT AND MORTAR SPECIMENS	PERIODIC
	4) FABRICATOR'S NDT REPORTS WHEN FABRICATOR PERFORMS NDT	EACH SUBMITTAL		15. OBSERVE PREPARATION OF PRISMS	PERIODIC
	6. STRUCTURAL STEEL BOLTING:		**1705.6**	**SOILS**	
	A. INSPECTION TASKS PRIOR TO BOLTING (OBSERVE, OR PERFORM TASKS FOR EACH BOLTED CONNECTION, IN ACCORDANCE WITH QA TASKS LISTED IN AISC 360, TABLE N5.6-1)	OBSERVE OR PERFORM AS NOTED		1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	PERIODIC
	B.INSPECTION TASKS DURING BOLTING (OBSERVE THE QA TASKS LISTED IN AISC 360, TABLE N5.6-2)	OBSERVE		2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	PERIODIC
	1) PRE-TENSIONED AND SLIP-CRITICAL JOINTS			3. PERFORM CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS.	PERIODIC
	A) TURN-OF-NUT WITH MATCHING MARKINGS	PERIODIC		4. VERIFY USE OF PROPER MATERIALS, DENSITIES, AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF CONTROLLED FILL	CONTINUOUS
	B) DIRECT TENSION INDICATOR	PERIODIC		5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN...	PERIODIC
	C) TWIST-OFF TYPE TENSION CONTROL BOLT	PERIODIC	**1705.7**	**DRIVEN DEEP FOUNDATIONS**	
	D) TURN-OF-NUT WITHOUT MATCHING MARKINGS	CONTINUOUS		1. VERIFY ELEMENT MATERIALS, SIZES AND LENGTHS COMPLY WITH REQUIREMENTS	CONTINUOUS
	E) CALIBRATED WRENCH	CONTINUOUS		2. DETERMINE CAPACITIES OF TEST ELEMENTS AND CONDUCT ADDITIONAL LOAD TESTS, AS REQUIRED	CONTINUOUS
	2) SNUG-TIGHT JOINTS	PERIODIC		3. INSPECT DRIVING OPERATIONS AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ELEMENT	CONTINUOUS
	C. INSPECTION TASKS AFTER BOLTING (PERFORM TASKS FOR EACH BOLTED CONNECTION IN ACCORDANCE WITH QA TASKS LISTED IN AISC 360, TABLE N5.6-3)	PERFORM		4. VERIFY PLACEMENT LOCATIONS AND PLUMBNESS, CONFIRM TYPE AND SIZE OF HAMMER, RECORD NUMBER OF BLOWS PER FOOT OF PENETRATION, DETERMINE REQUIRED PENETRATIONS TO ACHIEVE DESIGN CAPACITY, RECORD TIP AND BUTT ELEVATIONS AND DOCUMENT ANY DAMAGE TO FOUNDATION ELEMENT	CONTINUOUS
1705.2.2	**COLD-FORMED STEEL DECK**			5. FOR STEEL ELEMENTS, PERFORM ADDITIONAL INSPECTIONS PER SECTION 1705.2	SEE SECTION 1705.2
	1. INSPECTION OF COLD-FORMED STEEL FLOOR AND ROOF DECK IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF SDI QA/QC.	PERIODIC		6. FOR CONCRETE ELEMENTS AND CONCRETE-FILLED ELEMENTS, PERFORM ADDITIONAL INSPECTIONS PER SECTION 1705.3	SEE SECTION 1705.3
1705.3	**CONCRETE CONSTRUCTION**			7. PERFORM ADDITIONAL INSPECTIONS AND TESTS IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS	IN ACCORDANCE WITH CONSTRUCTION DOCUMENTS
	1. INSPECTION OF REINFORCING STEEL INSTALLATION	PERIODIC	**1705.11.3**	**WIND-RESISTING COMPONENTS**	
	2. INSPECTION OF ANCHORS CAST IN CONCRETE	PERIODIC		1. ROOF CLADDING AND CONNECTIONS	PERIODIC
	3. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS			2. WALL CLADDING AND CONNECTIONS	PERIODIC
	A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS	CONTINUOUS			
	B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 3.A	PERIODIC			
	4. VERIFY USE OF APPROVED DESIGN MIX	PERIODIC			
	5. FRESH CONCRETE SAMPLING, PERFORM SLUMP AND AIR CONTENT TESTS AND DETERMINE TEMPERATURE OF CONCRETE	CONTINUOUS			
	6. INSPECTION OF CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	CONTINUOUS			
	7. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES	PERIODIC			
	8. INSPECTION OF FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS	PERIODIC			

ABBREVIATIONS

ALUMINUM	ALUM, AL	NOT TO SCALE	NTS		
AND	&	NUMBER	NO		
ANGLE	∠	ON CENTER	OC		
ARCHITECTURAL	ARCH	OPENING	OPNG		
AT	@	OUTSIDE DIAMETER	OD		
BEAM	BM	OUTSIDE FACE	OF		
BOTTOM	BOT, B/	PERIMETER	PERIM		
CROSS BRACING	CB	PLATE	PL		
CENTER	CTR	POUND	#		
CENTERLINE	CL	POUNDS PER SQUARE FOOT	PSF		
CLEAR	CLR	POUNDS PER SQUARE INCH	PSI		
COLUMN	COL	PRESSURE RELIEF VALVE	PRV		
CONCRETE	CONC	PROCESS	PROC		
CONCRETE MASONRY UNIT	CMU	PROJECTION	PROJ		
CONTINUOUS	CONT	REINFORCING	REINF		
CONTROL JOINT	CJ	REQUIRED	REQ'D		
CONTROL JOINT (TYPE 1)	CJ (1)	RISER	R		
CONTROL JOINT (TYPE 2)	CJ (2)	ROUGH OPENING	RO		
CONSTRUCTION JOINT	CNJ	SCHEDULE	SCH		
DETAIL	DET	SECTION	SECT		
DRY FILM THICKNESS	DFT	SHEET	SHT		
DIAMETER	DIA, Ø	SHORT LEG VERTICAL	SLV		
DOWEL BAR SPLICERS	DBS	SIMILAR	SIM		
DOWEL	DWL	SLOPE	SL		
EACH END	EE	SPACE(ING)	SP		
EACH FACE	EF	SPECIFICATION	SPEC		
EACH WAY	EW	SQUARE	SQ		
ELECTRICAL	ELEC	SYMMETRICAL	SYM		
ELEVATION	ELEV, EL	STANDARD	STD		
EQUAL	EQ	STRUCTURAL	STRUCT		
EXISTING	EXIST	STAINLESS STEEL	SS		
EXPANSION JOINT	EJ	STEEL	STL		
EXPANSION	EXP	THICKNESS	THK		
EXTERIOR	EXT	TOP	T, T/		
FEET	FT	TOP & BOTTOM	T & B		
FLOOR DRAIN	FD	TOP OF CONCRETE	T/ CONC, TOC		
FIBERGLASS REINFORCED PLASTIC	FRP	TOP OF PLATE	T/ PL		
GALVANIZED	GALV	TOP OF STEEL	T/ STL		
GAUGE	GA	TREAD	TR		
GRATING	GRTG	TYPICAL	TYP		
HIGH	H	UNLESS OTHERWISE NOTED	UON		
HIGH POINT	HP	WELDED WIRE FABRIC	WWF		
HIGH STRENGTH	HS	WIDE	W		
HORIZONTAL	HOR	WITH	W/		
HOT DIPPED GALVANIZED	HDG	WITHOUT	W/O		
INSIDE DIAMETER	ID	WOOD	WD		
INSIDE FACE	IF	WORKING POINT	WP		
INSULATION	INSUL				
LOAD AND RESISTANCE FACTOR DESIGN	LRFD				
JOINT	JT				
LONG LEG VERTICAL	LLV				
LOW POINT	LP				
MANUFACTURER	MFR				
MATCHING	MATCH				
MAXIMUM	MAX				
MECHANICAL	MECH				
MINIMUM	MIN				
MODULAR OPENING	MO				
MOUNTED	MTD				
NOT APPLICABLE	N/A				

STRUCTURAL DESIGN CRITERIA:

GEOTECHNICAL:

DESIGN GROUNDWATER ELEVATION: AT GRADE
DESIGN FLOOD ELEVATION: EL 4.00
LATERAL EARTH PRESSURES (BELOW GRADE STRUCTURES):
ABOVE GROUNDWATER = 65 PSF/FT (UNIFORM VARYING)
BELOW GROUNDWATER = 95 PSF/FT (UNIFORM VARYING)
SURCHARGE = 75 PSF/FT (BASED ON 300 PSF UNIFORM LOAD)
LATERAL HYDROSTATIC PRESSURES:
STATIC = 65 PSF/FT (UNIFORM VARYING)
ALLOWABLE SUBGRADE BEARING PRESSURE = N/A
NET ALLOWABLE SUBGRADE BEARING CAPACITY = N/A

LIVE LOADS:

REF:
ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
2021 INTERNATIONAL BUILDING CODE
BUILDING CODE 2021 OF LOUISIANA

RISK CATEGORY III

WIND LOADS

BASIC WIND SPEED (V):
Vult = 160 MPH (SAFFIR-SIMPSON HURRICANE WIND SCALE: CATEGORY 5)
Vasd = 123 MPH
IMPORTANCE FACTOR (I_w) = 1.00
EXPOSURE CATEGORY D
INTERNAL PRESSURE COEFFICIENT (GC_{pi}) = ±0.18

SNOW LOADS

GROUND SNOW LOAD (P_g) = 0 PSF
IMPORTANCE FACTOR (I_s) = 1.1
EXPOSURE FACTOR (C_e) = 0.8
THERMAL FACTOR (C_t) = 1.1
EXPOSURE CATEGORY D
SLOPE FACTOR (C_s) = 1.0

SEISMIC LOADS

EQUIVALENT LATERAL FORCE ANALYSIS
IMPORTANCE FACTOR (I_e) = 1.25
SITE CLASSIFICATION E
SEISMIC DESIGN CATEGORY C
MAPPED SPECTRAL RESPONSE ACCELERATION @ 0.2s (S_S) = 0.086
MAPPED SPECTRAL RESPONSE ACCELERATION @ 1.0s (S_1) = 0.053
DESIGN SPECTRAL RESPONSE ACCELERATION @ 0.2s (S_{DS}) = 0.138
DESIGN SPECTRAL RESPONSE ACCELERATION @ 1.0s (S_{D1}) = 0.149

NORTH RAS ELECTRICAL ROOM
Rw = 3.5 (INTERMEDIATE MASONRY SHEAR WALLS)
SEISMIC RESPONSE COEFFICIENT (Cs) = 0.049
BASE SHEAR (V) = 8.7 KIPS

ICE LOADS

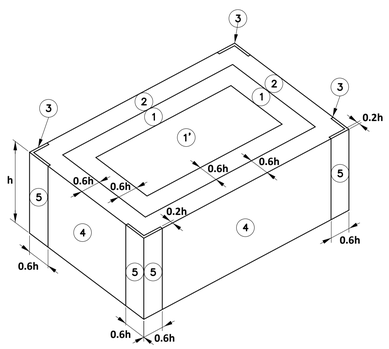
EQUIVALENT RADIAL ICE THICKNESS (t) = 0.25 INCH
3 SECOND WIND GUST SPEED (V_i) = 30 MPH
TOPOGRAPHIC FACTOR (K_{zt}) = 1.1
ICE IMPORTANCE FACTOR (I_i) = 1.15
WIND IMPORTANCE FACTOR (I_w) = 1.00

FLOOR LIVE LOADS

AS INDICATED ON THE DRAWINGS

ROOF LIVE LOADS

AS INDICATED ON THE DRAWINGS



COMPONENTS AND CLADDING PRESSURE DIAGRAMS

NTS

FLAT/HIP/GABLE/MANSARD ROOF:
θ ≤ 7 DEGREES; h ≤ 60 FT

COMPONENT	ZONE	EFF. AREA (ft^2)	PRES (+ve) (PSF)	PRES (-ve) (PSF)	OVERHANG PRES (-VE) (PSF)
< = 10 sf	1	10.0	27.5	-107.9	-107.9
100 sf	1	100.0	21.8	-84.2	-102.2
> 500 sf	1	500.0	21.8	-67.7	-67.7
< = 10 sf	1'	10.0	27.5	-62.0	
100 sf	1'	100.0	21.8	-62.0	
> 500 sf	1'	500.0	21.8	-39.0	
< = 10 sf	2	10.0	27.5	-142.3	-142.4
100 sf	2	100.0	21.8	-111.9	-102.2
> 500 sf	2	500.0	21.8	-90.7	-73.5
< = 10 sf	3	10.0	27.5	-193.9	-194.0
100 sf	3	100.0	21.8	-133.1	-125.1
> 500 sf	3	500.0	21.8	-90.7	-73.5
< = 10 sf	4	10.0	62.0	-67.1	
100 sf	4	100.0	52.8	-58.0	
> 500 sf	4	500.0	46.5	-51.6	
< = 10 sf	5	10.0	62.0	-82.6	
100 sf	5	100.0	52.8	-64.4	
> 500 sf	5	500.0	46.5	-51.6	

NOTES:
1. PLUS AND MINUS SIGNS SIGNIFY PRESSURES ACTING TOWARD AND AWAY FROM THE PROJECTED SURFACES, RESPECTIVELY.
2. PRESSURES ARE BASED ON ULTIMATE WIND SPEED INDICATED IN STRUCTURAL DESIGN CRITERIA.

LEGEND

PLAN
- EXISTING STRUCTURE
- EXISTING STRUCTURE TO BE DEMOLISHED
- STRUCTURE
- GUARD
- CONCRETE CURB
- GRATING
- HIDDEN OBJECT
- FLOOR PLATE
- METAL DECK
- CONSTRUCTION JOINT
- CONTROL JOINT
- OPENING
- CONCRETE MASONRY UNIT (CMU) WALL

SECTION
- EXISTING CAST-IN-PLACE CONCRETE
- CAST-IN-PLACE CONCRETE
- STRUCTURAL STEEL
- STRUCTURAL ALUMINUM
- CONCRETE MASONRY
- PRECAST CONCRETE
- CONCRETE FILL/ SAND
- FINISH GRADE
- FILL OR STONE
- GRATING
- LUMBER
- RIGID INSULATION

TEXT
- CONCRETE WALL — EXISTING STRUCTURE
- CONCRETE WALL — PROPOSED WORK
- 1" — DIMENSION OF EXISTING STRUCTURE
- 1" — DIMENSION OF PROPOSED STRUCTURE

SYMBOLS
- CONCRETE EQUIPMENT PAD
- PIPE
- PRV — PRESSURE RELIEF VALVE
- FD — FLOOR DRAIN
- RD — ROOF DRAIN
- # — LIFT HOOK (# = CAPACITY IN TONS)
- A — CONCRETE FILL ELEVATIONS
- A — CONCRETE FOOTING TYPE
- # — CONCRETE PILASTER TYPE
- # — STRUCTURAL STEEL PIPE SUPPORT FRAME TYPE
- A — PIPE GUIDE TYPE
- EL 12.83' — LIQUID ELEVATION

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STRUCTURAL NOTES II, LEGEND AND ABBREVIATIONS

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 34328 — 2/13/2026 — PROFESSIONAL ENGINEER

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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
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CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

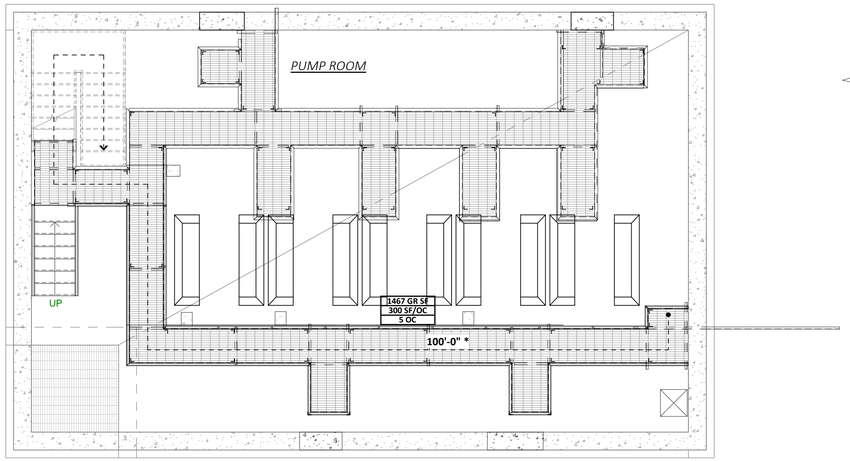
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DWG. No. 12221-W-33

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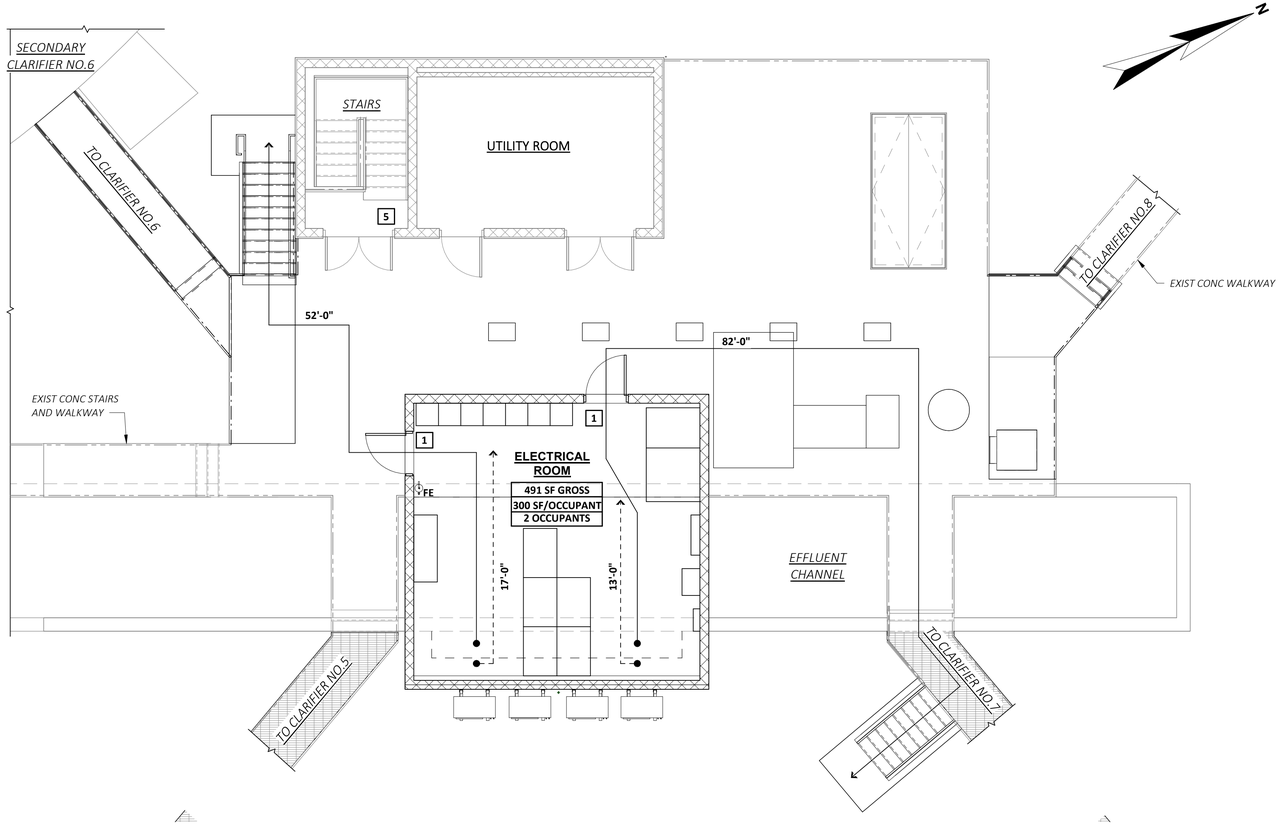
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LOWER LEVEL EGRESS PLAN

SCALE: 3/16" = 1'-0"



FIRST FLOOR EGRESS PLAN

SCALE: 3/16" = 1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.

CODE NOTES - GENERAL

APPLICABLE CODES:

2021 LOUISIANA STATE UNIFORM CONSTRUCTION CODES
- 2021 INTERNATIONAL EXISTING BUILDING CODE (IEBC) AS AMENDED
- 2021 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED
- 2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) AS AMENDED

LOUISIANA STATE FIRE CODE
- 2015 NFPA 101 LIFE SAFETY CODE

NORTH RAS PUMP STATION - CODE NOTES

DESCRIPTION OF WORK:

THE LOWER LEVEL OF THE RAS PUMP STATION WILL CONSIST OF REPLACEMENT IN KIND. AN ADDITION TO HOUSE NEW ELECTRICAL EQUIPMENT WILL BE CONSTRUCTED OVER THE EXISTING EFFLUENT CHANNEL. THE NEW ELECTRICAL BUILDING WILL HOUSE VFDS, MCC'S, THE BUILDING WILL BE MASONRY WALLS WITH A STEEL FRAME ROOF. WORK ON THE FIRST FLOOR WILL BE CLASSIFIED AS A LEVEL 2 ALTERATION WITH AN ADDITION.

OCCUPANCY CLASSIFICATION:

THE BUILDING WILL BE CLASSIFIED AS FACTORY INDUSTRIAL (F-1)

CONSTRUCTION TYPE:

TYPE IIB (IBC 602.2) BUILDING ELEMENTS LISTED IN TABLE 601 ARE OF NON-COMBUSTIBLE MATERIALS WITH A 0-HOUR RATING.

AUTOMATIC SPRINKLER SYSTEMS:

AUTOMATIC SPRINKLER SYSTEMS ARE NOT REQUIRED (IBC SECTION 903)

STAIRWAYS (EXISTING STAIRS NFPA 7.2.2.2.1.1(B))
- WIDTH - 36 in
- MAX RISER HEIGHT 8 in
- MIN TREAD DEPTH 9 in
- MIN HEADROOM - 6' - 8"
- MAX HEIGHT BETWEEN LANDINGS 12 ft

ENERGY CONSERVATION CLIMATE ZONE

THE ENERGY CONSERVATION CLIMATE ZONE FOR NEW ORLEANS IS 2A

BUILDING ENVELOPE REQUIREMENTS (C402.1.2)

THE BUILDING HOUSES ELECTRICAL EQUIPMENT IN COMPLAINCE WITH C402.1.2.

WALLS AND ROOF WILL HAVE A U-FACTOR OF LESS THAN 0.200.

EGRESS LEGEND

FE	FIRE EXTINGUISHER
●- - - - →	COMMON PATH OF TRAVEL
●——→	MAXIMUM PATH OF TRAVEL
0 SF GROSS 300 SF/OCCUPANT 1 OCCUPANTS	GROSS SF OCCUPANTS PER GROSS SF OCCUPANT LOAD
1	CUMULATIVE OCCUPANT LOAD
*	ALTERATIONS SHALL BE DONE IN A MANNER THAT MAINTAINS THE LEVEL OF PROTECTION PROVIDED FOR THE MEANS OF EGRESS (IECC 704.1) NO INCREASE IN THE EXISTING COMMON PATH OF TRAVEL

EGRESS CODE NOTES

MAXIMUM COMMON PATH OF TRAVEL

75' (IBC TABLE 1006.2.1)
50' (NFPA 101 TABLE 40.2.5.1 & TABLE 42.2.5)

MAXIMUM TRAVEL DISTANCE

200' (IBC TABLE 1017.2)
200' (NFPA 101 38.2.6.2 & TABLE 42.2.6)

ONE MEANS OF EGRESS

ALLOWED IF EXIT CAN BE REACHED WITHIN THE COMMON PATH OF TRAVEL (IBC 1066.2.1 & NFPA 101 38.2.4.2, 40.2.4.1.2 & 42.2.4.1(2)).

FIRE EXTINGUISHERS

LOCATE WHERE SHOWN ON PLAN AND INSTALL IN ACCORDANCE WITH NFPA 10 AND IBC 906.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION CODE NOTES AND PLANS

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 34326
2/13/2026
PROFESSIONAL ENGINEER

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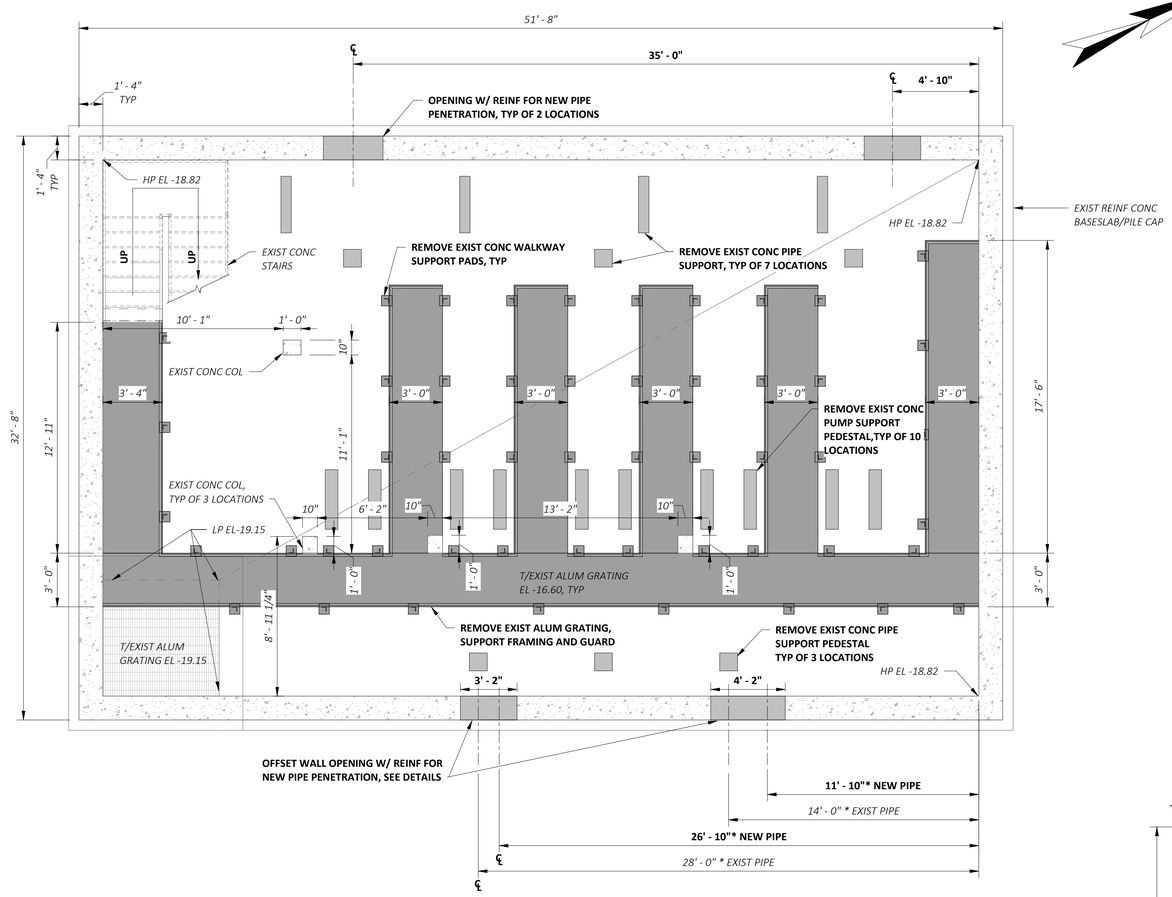
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

S-52-001

DWG. No. 12221-W-33

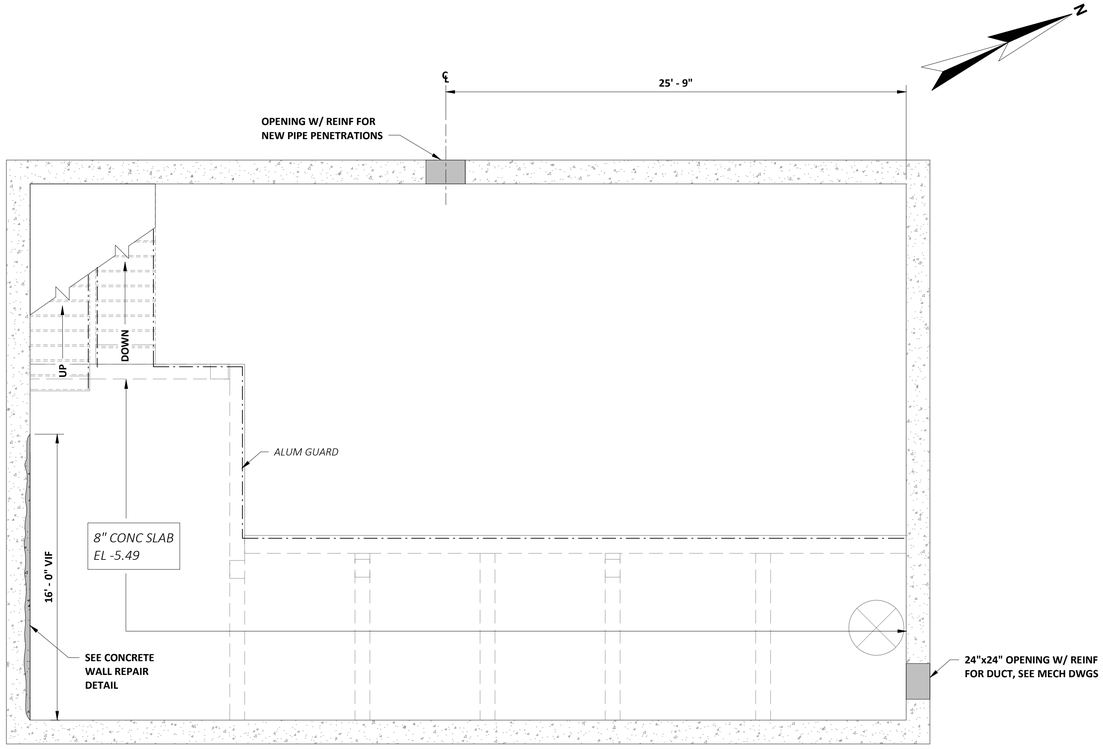
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NOTES:
1. REFER TO TYPICAL DETAILS ON SHEET S-99-501 FOR ADDITIONAL MODIFICATIONS REQUIRED AFTER REMOVALS.

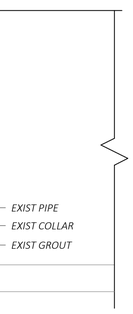
LOWER LEVEL DEMOLITION PLAN

SCALE: 1/4" = 1'-0"



MEZZANINE DEMOLITION PLAN

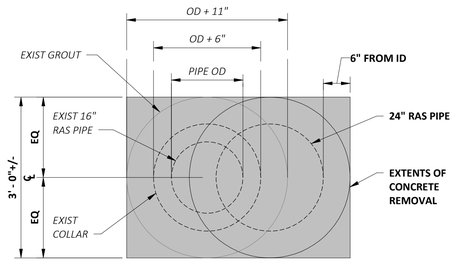
SCALE: 1/4" = 1'-0"



NOTE:
1. MINIMUM AREA INDICATED TO REMOVE EXISTING PIPE. COORDINATE AREA WITH REQUIRED OPENING FOR NEW PIPE.

TYPICAL WALL OPENING DEMOLITION

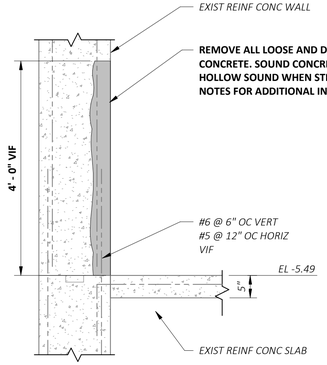
SCALE: 1 1/2" = 1'-0"



NOTES:
1. CONFIRM LIMITS OF DEMOLITION WITH REQUIRED ANNULAR SPACE FOR WALL PENETRATION SEAL.
2. INSTALL WALL OPENING REINFORCEMENT AND ALLOW EPOXY ADHESIVE TO ACHIEVE DESIGN STRENGTH PRIOR TO WALL REMOVAL. SEE TYPICAL REINFORCEMENT AT ROUND OPENING IN STRUCTURAL SLAB/WALL DETAIL FOR ADDITIONAL INFORMATION.

OFFSET WALL OPENING DEMOLITION

SCALE: 3/4" = 1'-0"



REPAIR NOTES:
1. PROVIDE A 1/2" DEEP PERIMETER SAWCUT AROUND THE ENTIRE AREA TO BE REPAIRED. ALL SAWCUTS ARE TO BE PERPENDICULAR TO THE SURFACE PLANE OF THE WALL. ALL CUTS SHALL FORM 90 DEGREE INTERSECTIONS. DO NOT CUT THE STEEL REINFORCEMENT.
2. REMOVE ALL DETERIORATED CONCRETE BY USING CHIPPING HAMMERS, BY HAND, OR OTHER MEANS NECESSARY TO REMOVE THE DEFECTED CONCRETE TO SOUND CONCRETE. STOP ALL CONCRETE REMOVAL WHEN SOUND OR SOLID CONCRETE IS UNCOVERED.
3. REMOVE ALL CONCRETE 1" BEYOND ALL EXPOSED REINFORCEMENT. IF CORROSION IS OBSERVED ON THE STEEL REINFORCEMENT, REMOVE ALL CONCRETE TO 1" BEYOND THE CORRODED PORTIONS OF THE STEEL. USE CAUTION NOT TO DAMAGE THE REINFORCEMENT THAT WILL REMAIN.
4. SAND BLAST ALL STEEL SURFACES AND CLEAN ALL CONCRETE SURFACES IN THE REPAIR AREA IN ACCORDANCE TO SPECIFICATIONS 03010 & 03930. IF THE STEEL REINFORCEMENT HAS MORE THAN 25% OF SECTION LOSS AFTER SANDBLASTING, CONTACT THE STRUCTURAL ENGINEER TO CONDUCT A VISUAL ASSESSMENT AND FOR SPLICING REQUIREMENTS AND DETAILS.
5. COAT ALL CONCRETE SURFACES AND STEEL REINFORCEMENT TO RECEIVE PATCHING MORTAR WITH A CONCRETE BONDING AGENT/PRIMER/RUST INHIBITOR SUCH AS SIKA ARMETEC EPOCEM 110 (OR APPROVED EQUAL). PROVIDE A MINIMUM OF TWO COATS ON THE STEEL REINFORCEMENT.
6. REBUILD WALL WITH TYPE 1 PATCHING MORTAR. REFER TO SPECIFICATIONS 03010 & 03930 FOR ADDITIONAL DETAILS AND RECOMMENDED PATCHING MORTAR MANUFACTURERS. BUILD UP ALL REPAIRS TO BRING THE WALL BACK TO THE ORIGINAL WALL THICKNESS, AND TO MATCH THE SURFACE PLANE TEXTURE OF THE EXISTING CONCRETE WALL. FOR ALL SPALLS GREATER THAN 4" IN DEPTH, ADD PEA GRAVEL (OR 3/8" STONE) TO THE PATCHING MORTAR PER THE MANUFACTURER'S RECOMMENDATIONS. ALL REPAIR MORTAR SHALL BE CURED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

CONCRETE WALL REPAIR DETAIL

SCALE: 3/4" = 1'-0"

NOTES:
1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.
2. REFER TO THE PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION WORK.
3. WHERE REINFORCING IS INDICATED FOR NEW OPENINGS IN EXISTING WALLS, INSTALL REINFORCING AND ALLOW EPOXY ADHESIVE TO REACH DESIGN STRENGTH PRIOR TO DEMOLISHING OPENING.

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 39328 — 2/13/2026 — PROFESSIONAL ENGINEER

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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION
LOWER LEVEL DEMOLITION PLAN

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG	DR. M.DOLAN	S-52-101
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. J.KELLOGG	DWG. No. 12221-W-33
		AP. R.CYR	
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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SECONDARY CLAIRFIER NO.6

SCUM PIT

SAWCUT SLAB (TO BE REMOVED) FLUSH WITH CLARIFIER TANK WALL. GRIND EXISTING STEEL REINF REMAINING BACK 2" AND PATCH WITH NON-SHRINK GROUT

REMOVE EXIST STAIRS AND GUARD

4' - 0"

7' - 8"

8' - 4"

6" CONC SLAB T/SLAB EL 5.18 TO CLARIFIER NO.6

REMOVE EXIST CONC BEAM AND SLAB

CONC SLAB ON GROUND (BELOW)

REMOVE EXIST CONC COL

REMOVE EXIST CONC BEAM

REMOVE SLAB FOR TRUSS AND PILE CAP CONSTRUCTION

REMOVE EXIST CONC SLAB ON GROUND AS NECESSARY FOR PILE CAP INSTALLATION

6' - 5"

DOWN

27' - 4"

24' - 4"

STAIRS

UTILITY ROOM

T/ SLAB EL 6.85

13' - 3"

2' - 0" | 5' - 4" | 3' - 4" | 3' - 4" | 6' - 0" | 5' - 3" | 2' - 1"

EXIST HATCH

EXIST ALUM GUARD

6" CONC SLAB T/SLAB EL 5.18 TO CLARIFIER NO.8

3' - 4" TYP

3' - 4" TYP

CONC SLAB ON GROUND (BELOW)

REMOVE EXIST RAS PUMP EQUIP PADS (5 LOCATIONS)

9" CONC SLAB T/ SLAB EL 6.60

EXIST CONC BEAMS BELOW NOT SHOWN

REMOVE EXIST EXHAUST FAN CURB AND EQUIP PAD

3' - 9"

3' - 9"

REMOVE EXIST CONC SLAB ON GROUND AS NECESSARY TO CONSTRUCT PILE CAP

REMOVE SLAB FOR TRUSS AND PILE CAP CONSTRUCTION

9' - 5 3/8"

6" CONC SLAB T/SLAB EL 5.18

1' - 0" | 4' - 11"

4' - 0"

1' - 0"

9' - 0"

1' - 0"

9" CONC SLAB T/SLAB EL 6.60

EFFLUENT CHANNEL

9" CONC SLAB T/SLAB EL 6.60

5' - 0"

10 1/2"

1'-6" CONC SLAB T/SLAB EL 5.18 TO CLARIFIER NO.5

SEE SHEET S-52-105 FOR CONTINUATION

REMOVE EXIST STAIRS AND GUARD RAILS

2' - 6"

DOWN

UP

5' - 0"+

6' - 8"

1'-6" CONC SLAB T/SLAB EL 5.19 TO CLARIFIER NO.7

REMOVE EXIST REINF CONC PILE CAP

CUT OFF EXIST TIMBER PILES BELOW PILE CAP

SEE SHEET S-52-105 FOR CONTINUATION

FIRST FLOOR DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

ROOF OVERHANG | 27' - 6" | ROOF OVERHANG

13' - 6"

5" CONC SLAB T/ SLAB EL 17.93

8"

REMOVE AN 8"x8" SECTION (MAX) OF ROOF SLAB. INSTALL PREFABRICATED ROOF CURBS

UTILITY ROOM ROOF DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

REMOVE EXIST REINF CONC STAIRS DOWELED INTO EXIST CONC WALL

GRADE

6"

2"

REMOVE 1'-0"x1'-2" REINF CONC CANTILEVERED GRADE BEAM

EXIST REINF CONC WALL

4 SECTION S-52-102 SCALE: 1/2" = 1'-0"

1' - 4" | 9"

EL 5.18

4"

1' - 6"

REMOVE EXIST REINF CONC SLAB

REMOVE EXIST REINF CONC BEAM

EXIST CONC CORBEL

EXIST TANK WALL

1 SECTION S-52-102 SCALE: 1/2" = 1'-0"

REMOVE EXIST SURFACE-MOUNTED ALUM GUARD SEE PLAN FOR LOCATIONS

EL 6.60

EL 5.18

6"

1' - 6"

REMOVE EXIST REINF CONC SLAB

REMOVE EXIST REINF CONC STAIRS

REMOVE EXIST REINF CONC SLAB

REMOVE EXIST REINF CONC BEAM

1' - 0" SQ

REMOVE EXIST REINF CONC COLUMN

EXIST CONC SLAB

T/ SLAB EL -0.82 VIF

T/ PILE CAP EL -1.32

TO REMAIN

REMOVE

EXIST CONC PILE CAP

EXIST TIMBER PILE

2 SECTION S-52-102 SCALE: 1/2" = 1'-0"

TO REMAIN | REMOVE

2" | VARIES

REMOVE EXIST SURFACE-MOUNTED ALUM GUARD SEE PLAN FOR LOCATIONS

EL 6.60

9"

REMOVE EXIST REINF CONC SLAB

EXIST REINF CONC SLAB

EXIST REINF CONC WALL

EXIST CONC SLAB

GRADE

3 SECTION S-52-102 SCALE: 1/2" = 1'-0"



PHOTO 1



PHOTO 2



PHOTO 3

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.
2. REFER TO THE PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL DEMOLITION WORK.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG License No. 50328 — 2/13/2026 — PROFESSIONAL ENGINEER

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PROJECT NO: 21163 | DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

NORTH RAS PUMP STATION
TOP DEMOLITION PLAN

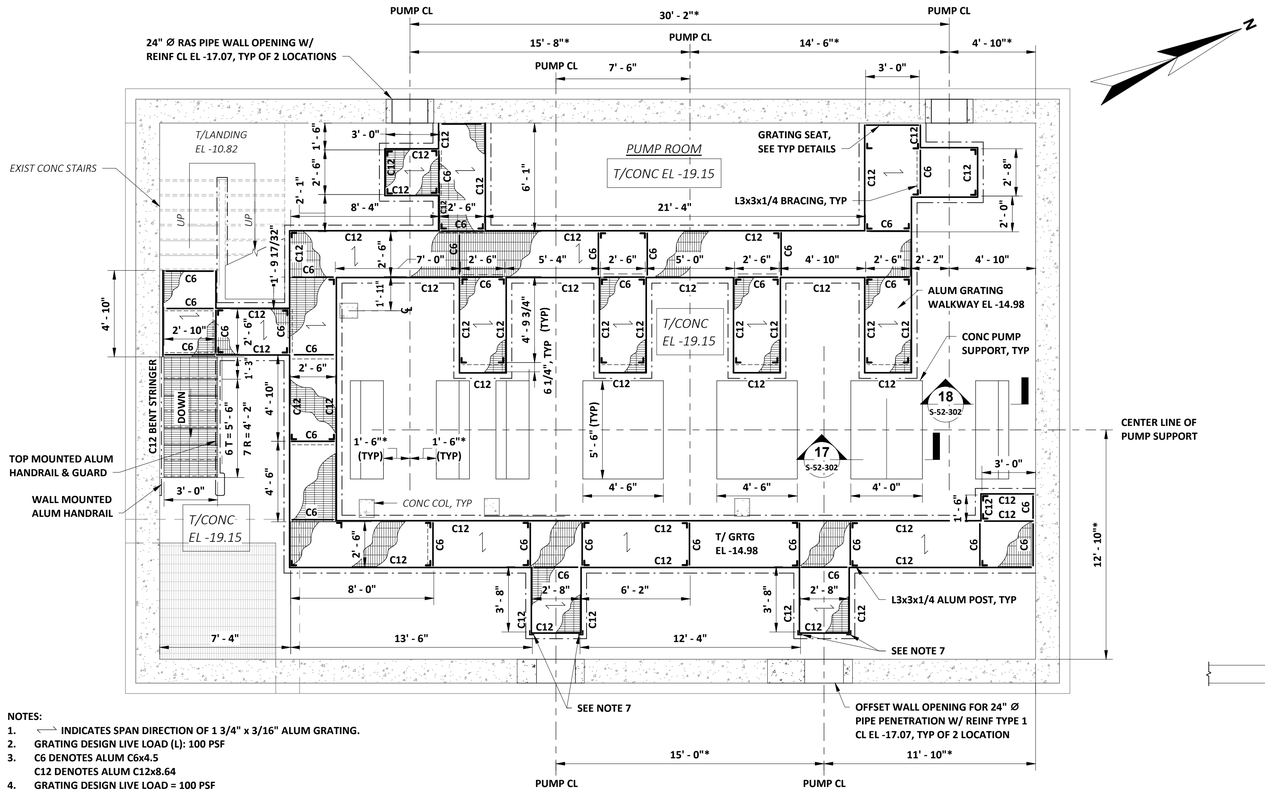
DR. M.DOLAN
TRC. -
CK. J.KELLOGG
AP. R.CYR
SCALE: AS NOTED
DATE: FEBRUARY 2026

S-52-102

DWG. No. 12221-W-33

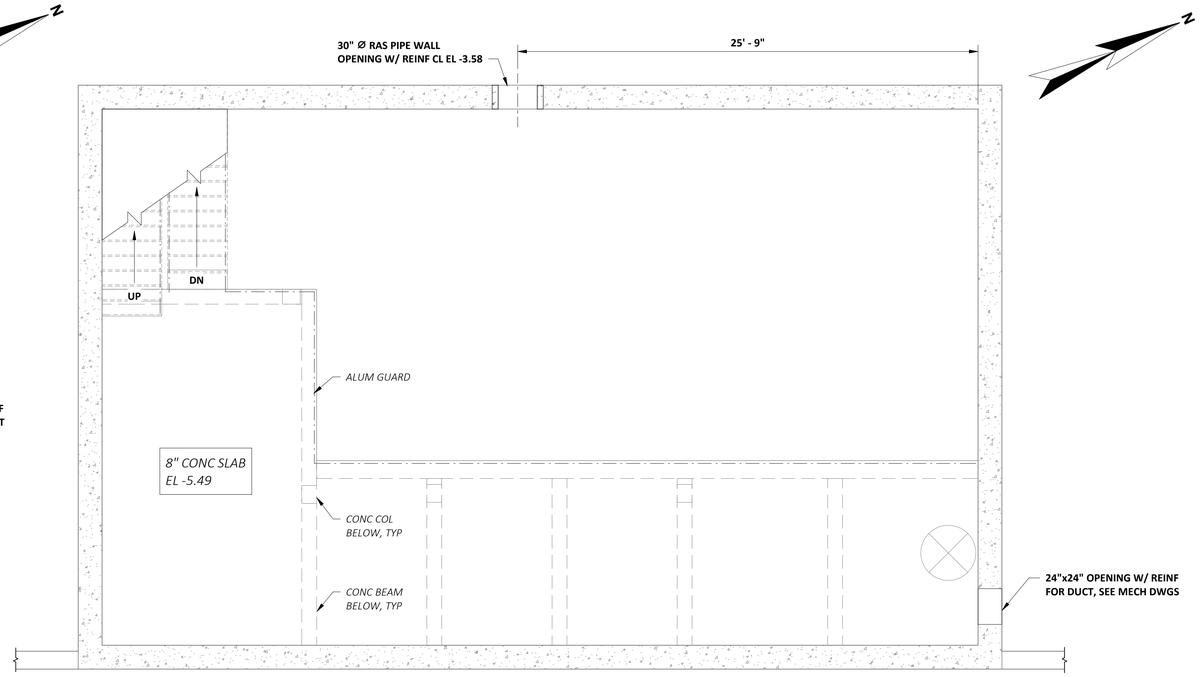
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MODIFICATION PLAN @ EL -19.15

SCALE: 1/4" = 1'-0"

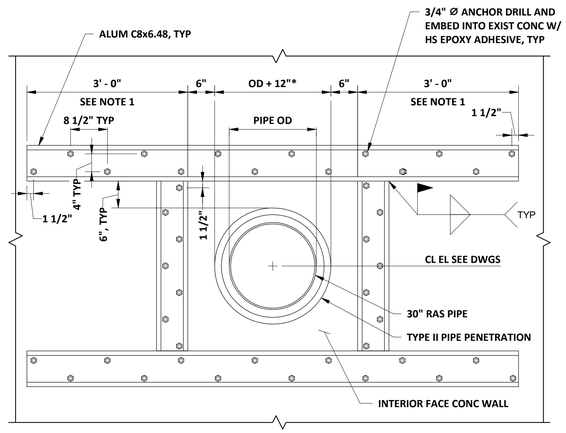


MEZZANINE MODIFICATION PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. ⟷ INDICATES SPAN DIRECTION OF 1 3/4" x 3/16" ALUM GRATING.
2. GRATING DESIGN LIVE LOAD (L): 100 PSF
3. C6 DENOTES ALUM C6x4.5
   C12 DENOTES ALUM C12x8.64
4. GRATING DESIGN LIVE LOAD = 100 PSF
5. PIPING NOT SHOWN FOR CLARITY, SEE PROCESS DWGS
6. CONTRACTOR TO COORDINATE WALKWAY SUPPORTS WITH PROCESS PIPPING PRIOR TO WALKWAY FABRICATION.
7. INSTALL WALKWAY-SUPPORTING ANGLES UNDER CHANNEL FLANGES WHERE INDICATED. PROVIDE CAP PLATE ON ANGLES TO BOLT (1) 5/8" Ø BOLT INTO CHANNEL FLANGE.

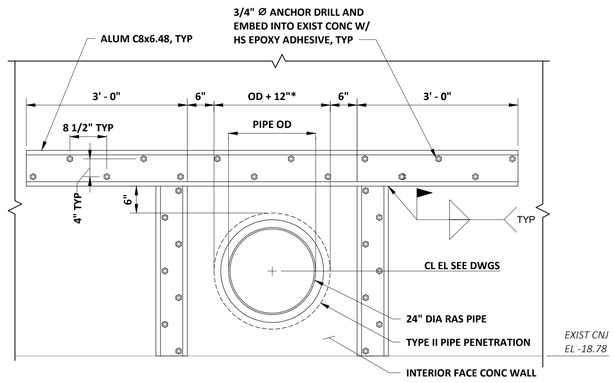


NOTE:

1. DETAIL IS APPLICABLE TO 24"x24" DUCT OPENING. REDUCE CHANNEL EXTENSION AS NECESSARY AT DUCT OPENING.

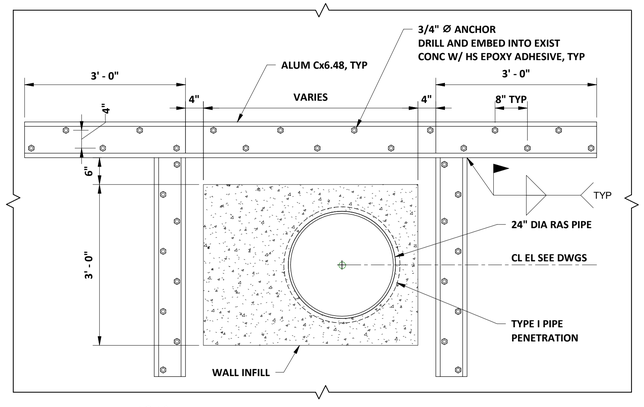
30" RAS PIPE WALL OPENING REINFORCING

SCALE: NTS



24" RAS PIPE WALL OPENING REINFORCING

SCALE: NTS



NOTES:

1. TERMINATE SURFACE APPLIED WATERSTOP FOR WALL INFILL TIGHT WITH NEW WALL PENETRATION.
2. ALLOW WALL INFILL CONCRETE TO ACHIEVE 75% DESIGN STRENGTH PRIOR TO INSTALLING 24" DIA RAS PIPE.

OFFSET WALL OPENING MODIFICATION

SCALE: NTS

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.
2. REFER TO CIVIL AND PROCESS DRAWINGS FOR ADDITIONAL INFORMATION ON THE RAS PIPE INSTALLATION WORK.
3. CONCRETE SURFACE REPAIR WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 100 SF).
4. CONCRETE CRACK REPAIRS WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION (APPROX 25 LF).

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 32028 — 2/13/2026 — PROFESSIONAL ENGINEER

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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION FOUNDATION MODIFICATION PLAN

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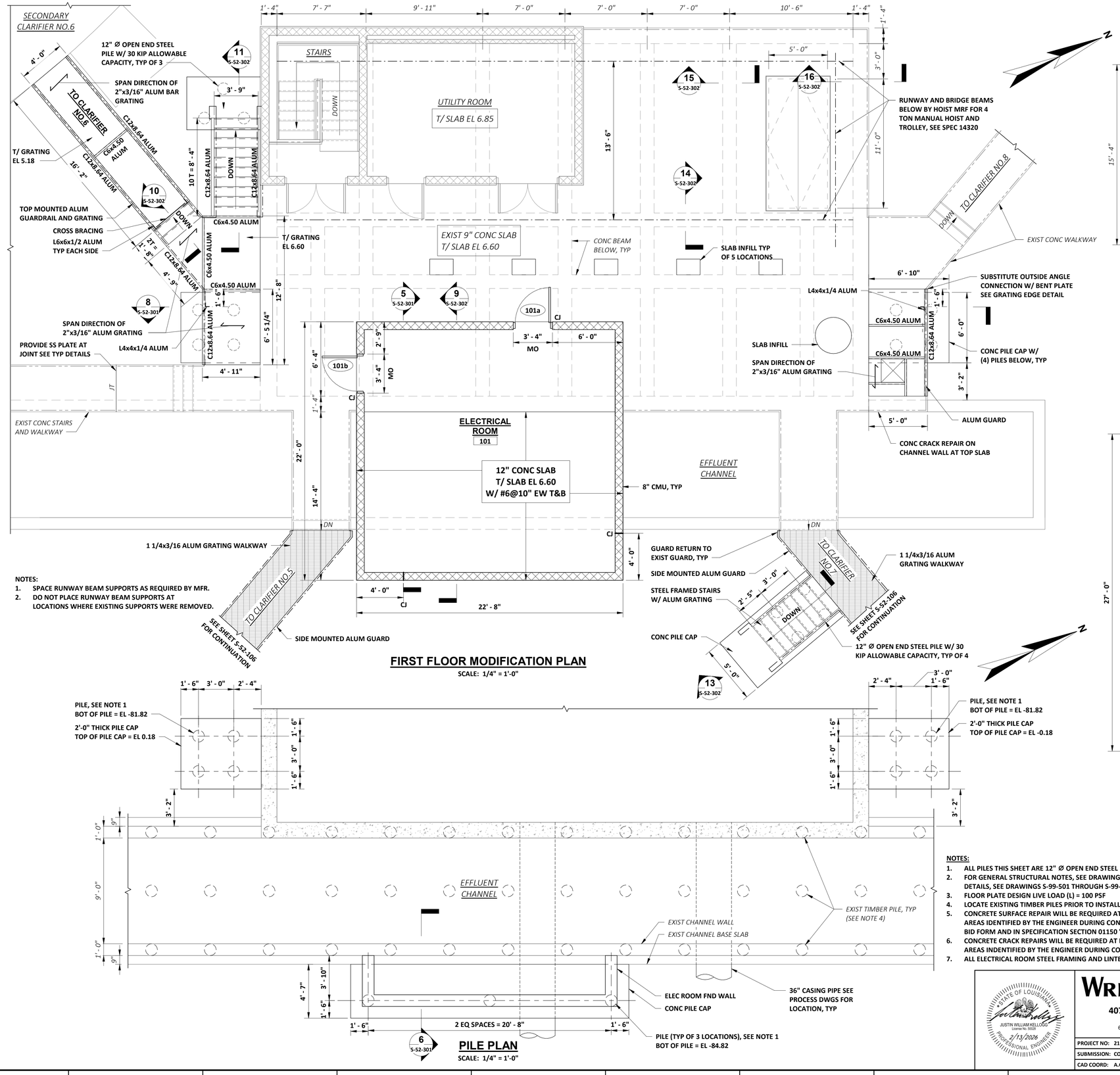
DR. M.DOLAN			
TRC. -			
CK. J.KELLOGG			
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG	AP. R.CYR	
SUBMISSION: CONTRACT DRAWINGS		SCALE: AS NOTED	
CAD COORD: A.COUTURE		DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

S-52-103

DWG. No. 12221-W-33

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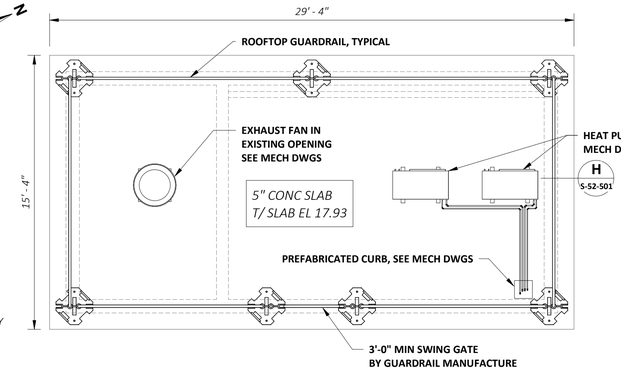
FIRST FLOOR MODIFICATION PLAN

SCALE: 1/4" = 1'-0"

NOTES:
1. SPACE RUNWAY BEAM SUPPORTS AS REQUIRED BY MFR.
2. DO NOT PLACE RUNWAY BEAM SUPPORTS AT LOCATIONS WHERE EXISTING SUPPORTS WERE REMOVED.

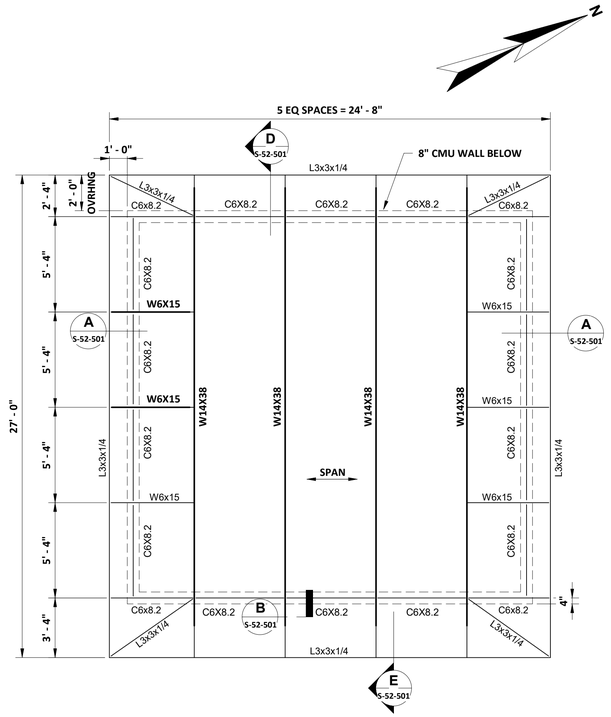
PILE PLAN

SCALE: 1/4" = 1'-0"



UTILITY ROOM ROOF MODIFICATION PLAN

SCALE: 1/4" = 1'-0"



ELECTRICAL ROOM ROOF FRAMING PLAN

SCALE: 1/4" = 1'-0"

NOTES:
1. ALL PILES THIS SHEET ARE 12" Ø OPEN END STEEL PIPE PILES W/ 50 KIP ALLOWABLE CAPACITY, UNO.
2. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.
3. FLOOR PLATE DESIGN LIVE LOAD (L) = 100 PSF
4. LOCATE EXISTING TIMBER PILES PRIOR TO INSTALLING CASING PIPE TO AVOID DAMAGE TO TIMBER PILES.
5. CONCRETE SURFACE REPAIR WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 100 SF).
6. CONCRETE CRACK REPAIRS WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS INDENTIFIED BY THE ENGINEER DURING CONSTRUCTION (APPROX 25 LF).
7. ALL ELECTRICAL ROOM STEEL FRAMING AND LINTELS SHALL BE HOT DIPPED GALVANIZED.

REV.	DATE	DESCRIPTION	BY
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION
TOP, ROOF AND PILE MODIFICATION PLANS

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 34328 — 2/13/2026 — PROFESSIONAL ENGINEER

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

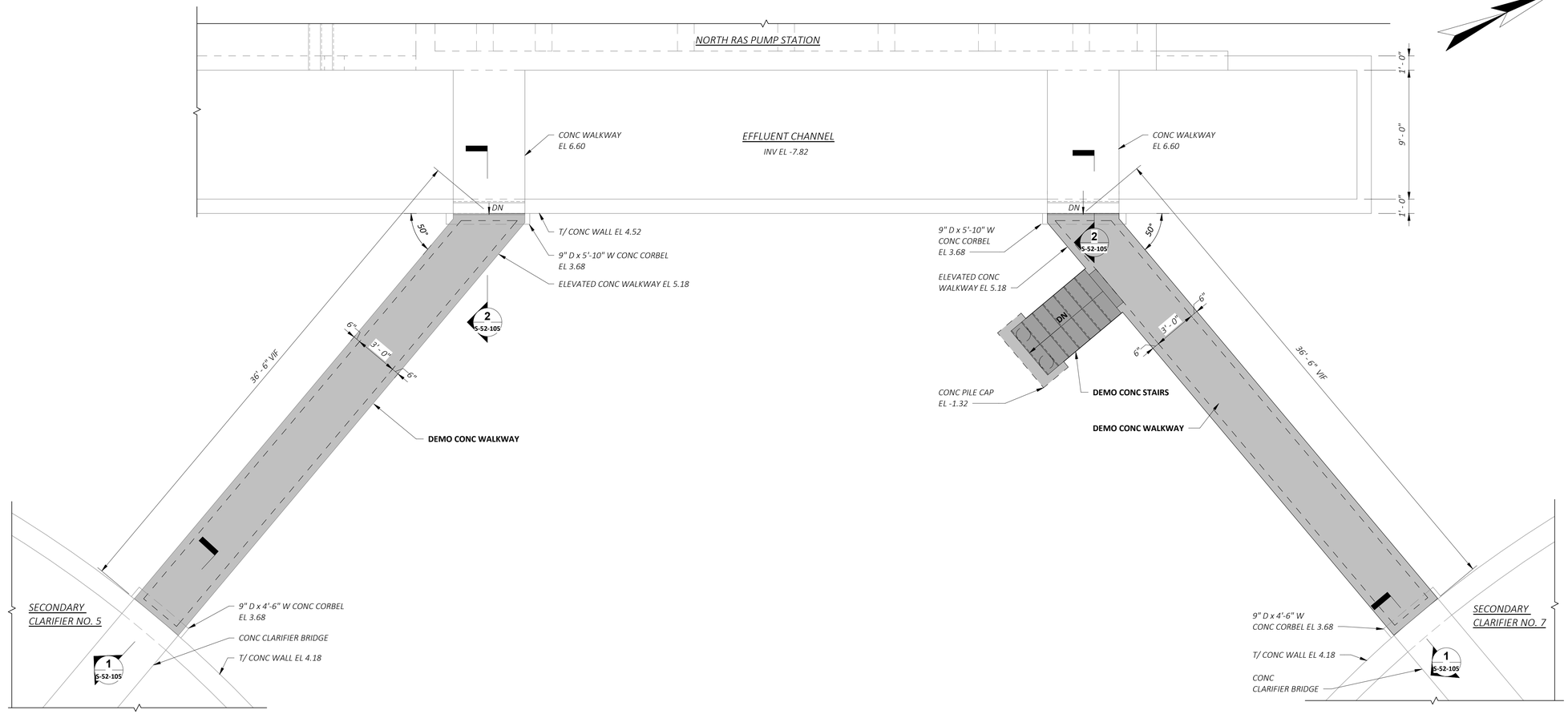
DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

S-52-104

DWG. No. 12221-W-33

SET NO. | SHEET NO. | OF

Autodesk Docs://1A-NewOrleans-21163-EastBank STP-Phase1/21163-SM-RAS-PS-North.rvt



WALKWAY DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

1 S-52-105 **SECTION**

SCALE: 3/4" = 1'-0"

2 S-52-105 **SECTION**

SCALE: 3/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION
WALKWAY DEMOLITION PLANS AND DETAILS

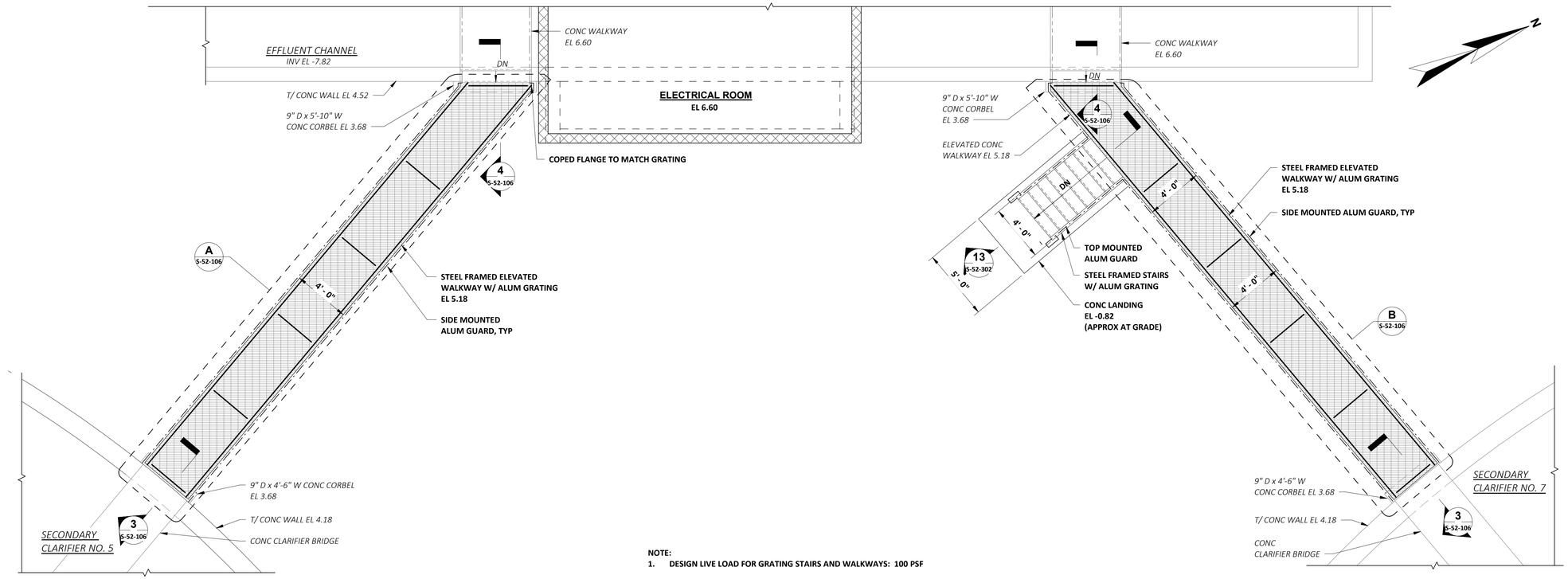
STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 34328
2/13/2026
PROFESSIONAL ENGINEER

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN	
TRC. -	**S-52-105**
CK. J.KELLOGG	
AP. R.CYR	**DWG. No. 12221-W-33**
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

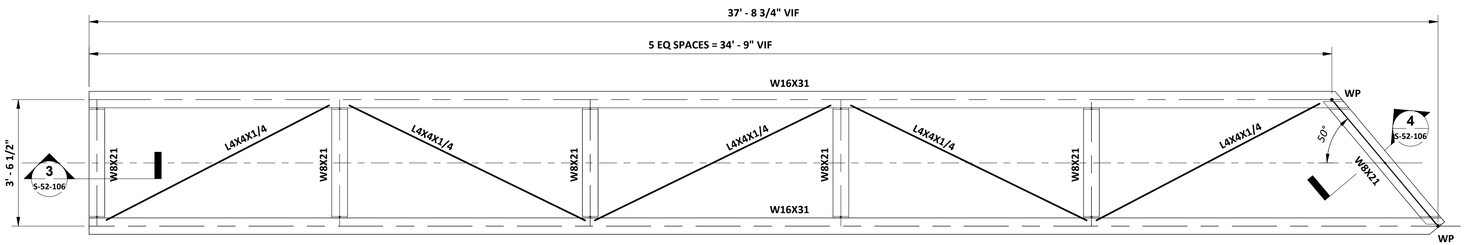
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NOTE:
1. DESIGN LIVE LOAD FOR GRATING STAIRS AND WALKWAYS: 100 PSF

WALKWAY MODIFICATIONS PLAN

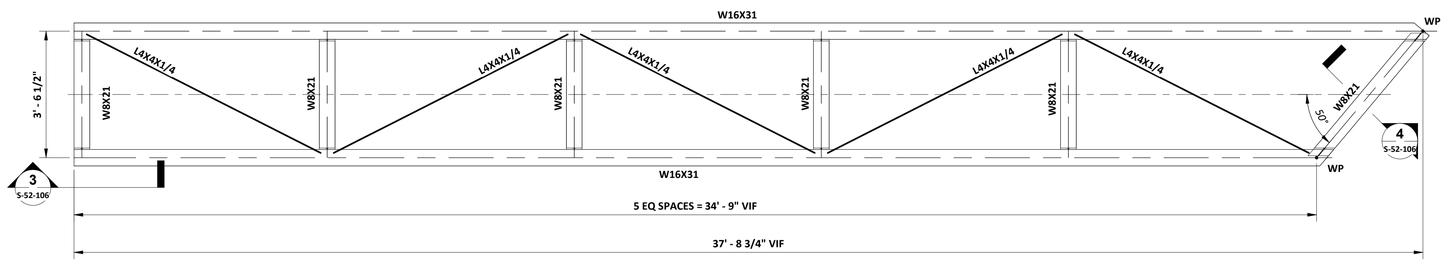
SCALE: 1/4" = 1'-0"



NOTES:
1. ALL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED WITH AN ADDITIONAL POLYAMIDE EPOXY PRIMER AND COLOR-PIGMENTED TOP COAT. REFER TO SPECIFICATION 05120 FOR ADDITIONAL INFORMATION.
2. TYPICAL W8 TO W16 CONNECTION: 3/8" SINGLE-PLATE CONNECTION W/ (2) 3/4" BOLTS
3. TYPICAL L4 CONNECTION: 3/8" GUSSET PLATE WELDED TO BOTTOM OF W8 TOP FLANGE W/ (2) 3/4" BOLTS TO L4

A WALKWAY FRAMING PLAN

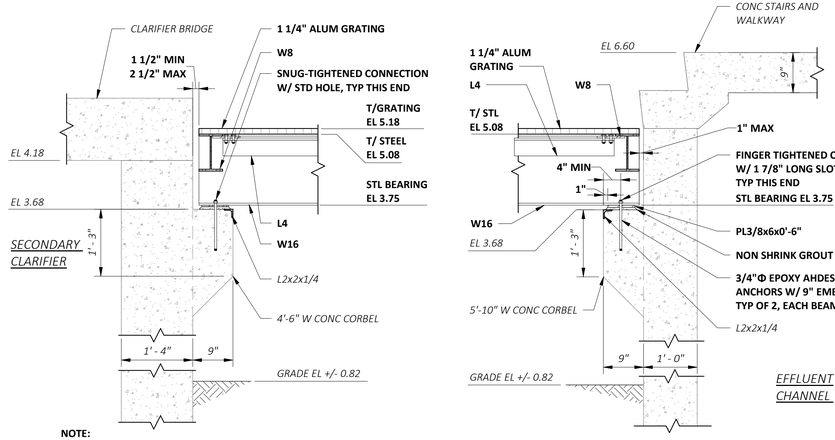
A S-52-106 SCALE: 1/2" = 1'-0"



NOTES:
1. ALL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED WITH AN ADDITIONAL POLYAMIDE EPOXY PRIMER AND COLOR-PIGMENTED TOP COAT. REFER TO SPECIFICATION 05120 FOR ADDITIONAL INFORMATION.
2. TYPICAL W8 TO W16 CONNECTION: 3/8" SINGLE-PLATE CONNECTION W/ (2) 3/4" BOLTS
3. TYPICAL L4 CONNECTION: 3/8" GUSSET PLATE WELDED TO BOTTOM OF W8 TOP FLANGE W/ (2) 3/4" BOLTS TO L4

B WALKWAY FRAMING PLAN

B S-52-106 SCALE: 1/2" = 1'-0"



NOTE:
1. REFER TO SECTION 3 FOR INFORMATION NOT SHOWN

3 SECTION

3 S-52-106 SCALE: 3/4" = 1'-0"

4 SECTION

4 S-52-106 SCALE: 3/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION
WALKWAY MODIFICATION PLANS AND DETAILS

JUSTIN WILLIAM KELLOGG
License No. 30020
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2/13/2026
PROFESSIONAL ENGINEER

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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

S-52-106

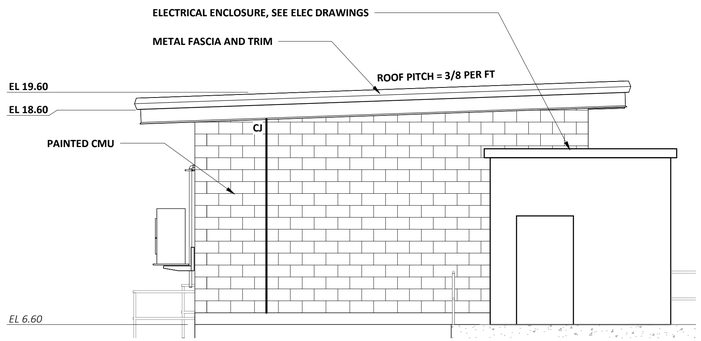
DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

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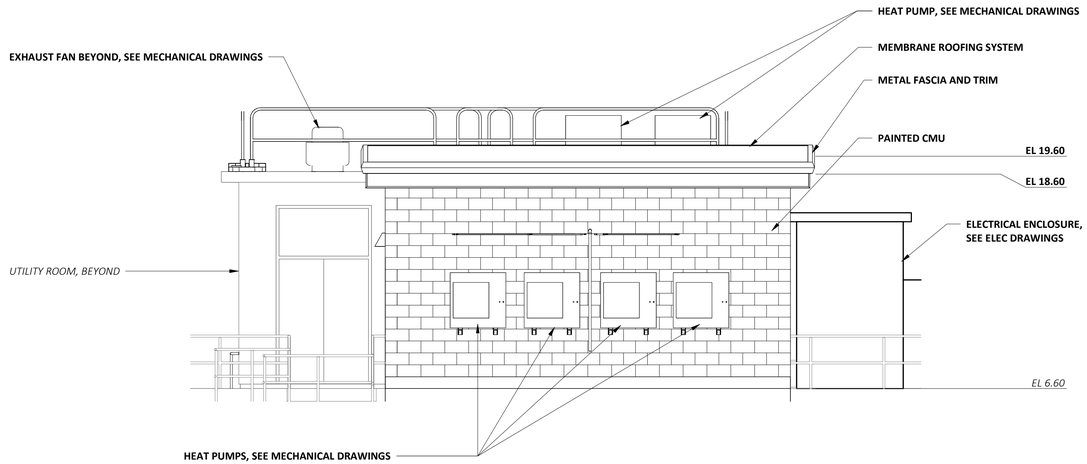
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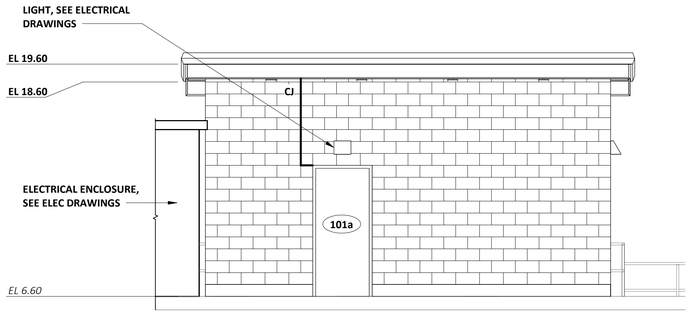
ELECTRICAL ROOM NORTH ELEVATION

SCALE: 1/4" = 1'-0"



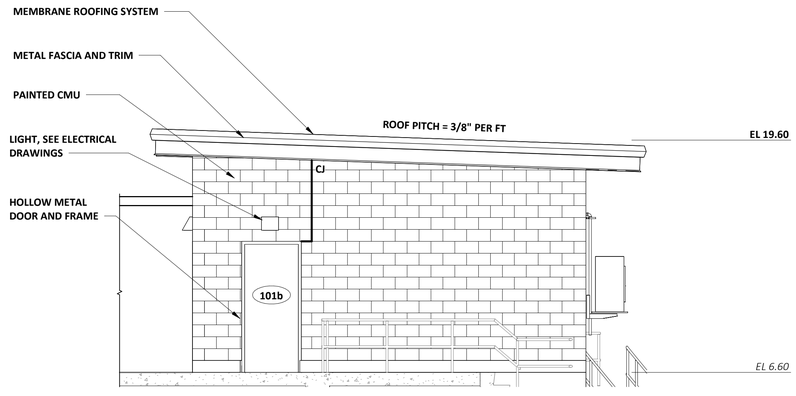
ELECTRICAL ROOM EAST ELEVATION

SCALE: 1/4" = 1'-0"



ELECTRICAL ROOM WEST ELEVATION

SCALE: 1/4" = 1'-0"



ELECTRICAL ROOM SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — License No. 39328 — 2/13/2026 — PROFESSIONAL ENGINEER

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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION EXTERIOR ELEVATIONS

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO.

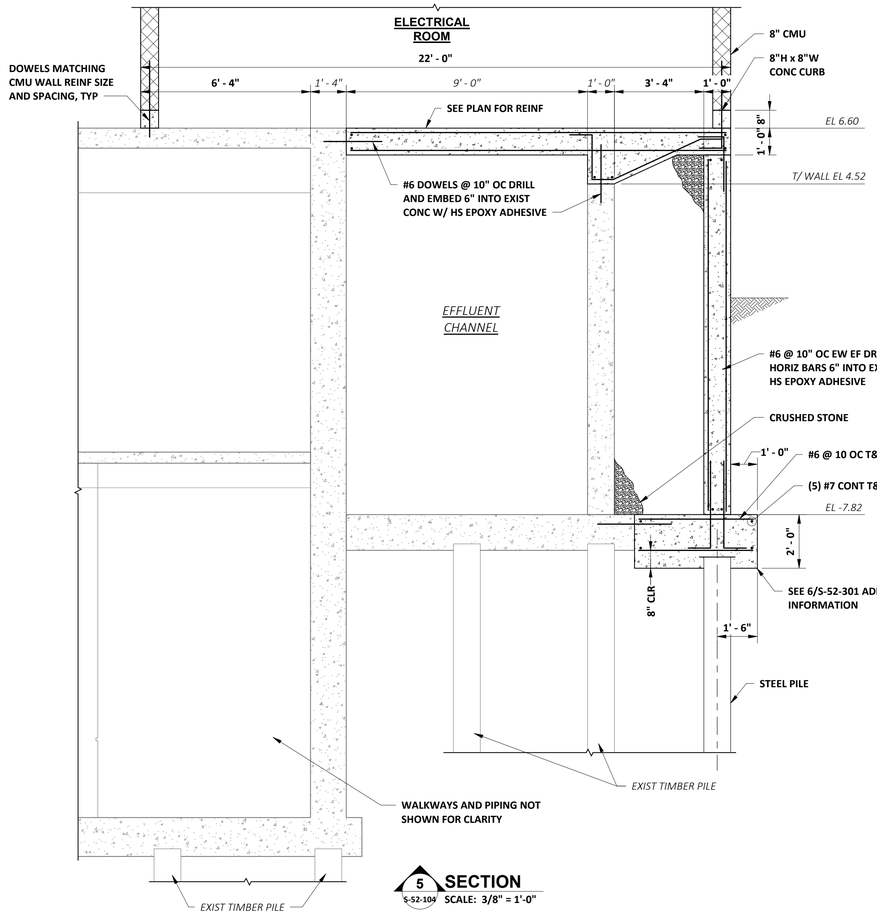
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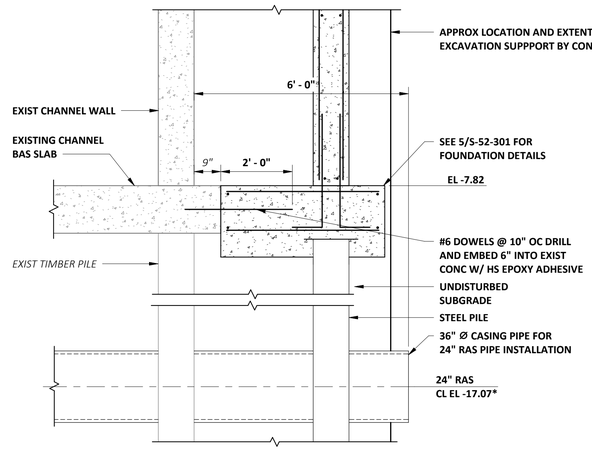
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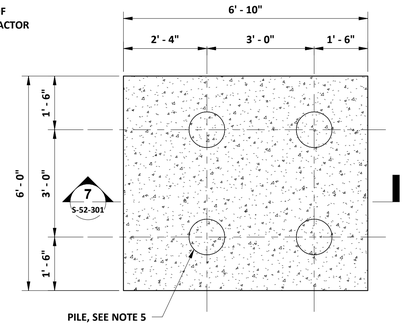


5 SECTION
S-52-104 SCALE: 3/8" = 1'-0"

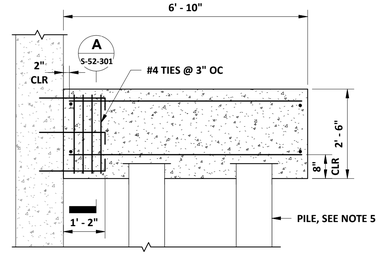


NOTES:
1. CONFIRM LOCATION OF EXISTING TIMBER PILES PRIOR TO INSTALLING CASING PIPE. DO NOT DISTURB EXISTING PILES.
2. REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION.

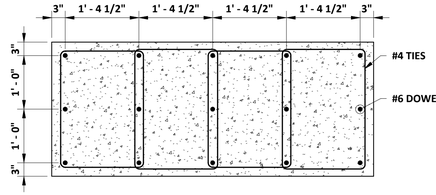
6 SECTION
S-52-104 SCALE: 1/2" = 1'-0"



PC3 DETAIL
SCALE: 1/2" = 1'-0"

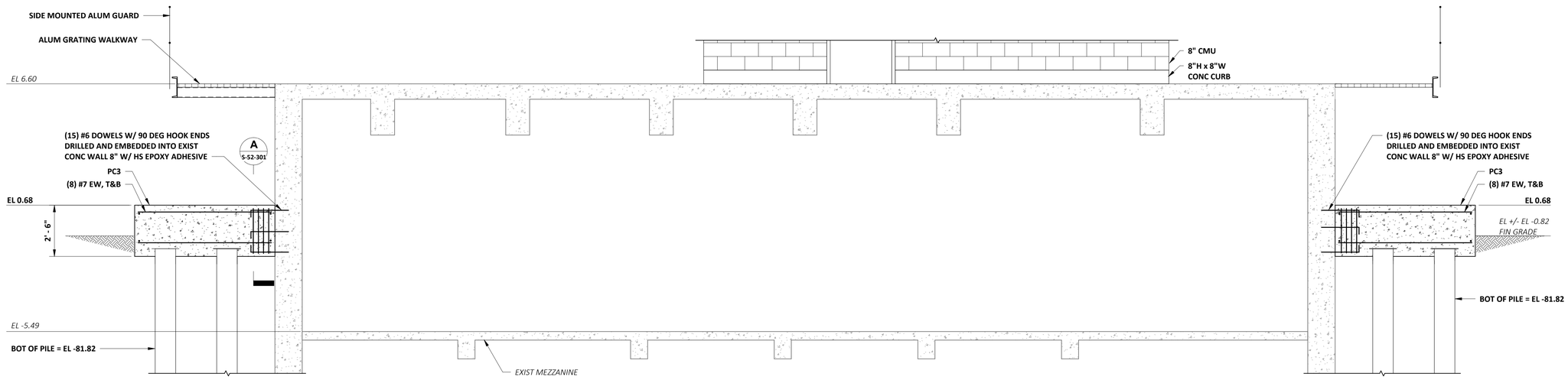


7 SECTION
S-52-301 SCALE: 1/2" = 1'-0"



NOTE:
1. PRIMARY PILE CAP REINFORCING NOT SHOWN FOR CLARITY.

A DETAIL
S-52-301 SCALE: 3/4" = 1'-0"



8 SECTION
S-52-104 SCALE: 3/8" = 1'-0"

NOTES:
1. FABRICATE TRUSS IN SEGMENTS AS INDICATED.
2. CONTRACTOR TO CONFIRM TRUSS SEGMENTS CAN BE LOWERED INTO PUMP STATION AND ERECTED WITHOUT REMOVAL OF THE EXISTING STRUCTURE BEYOND WHAT IS INDICATED ON THESE DRAWINGS.
3. STEEL FABRICATOR TO PROVIDE LOOSE WEB MEMBERS AND BOLTS WHERE INDICATED TO BE INSTALLED DURING TRUSS ERECTION.
4. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.
5. ALL PILES THIS SHEET ARE 12 Ø OPEN END STEEL PIPE PILES W/ 50 KIP ALLOWABLE CAPACITY.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION
SECTIONS I

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 39028
2/13/2026
PROFESSIONAL ENGINEER

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PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

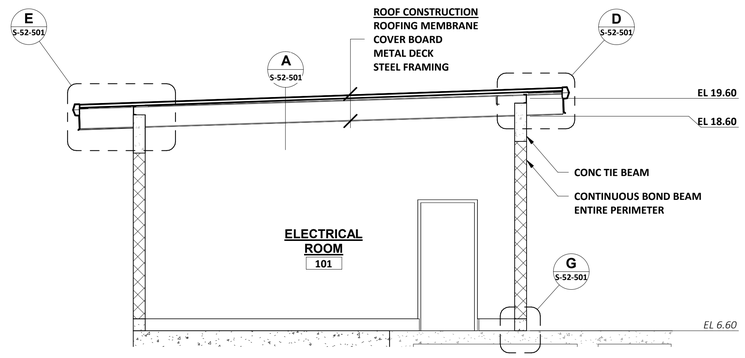
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DWG. No. 12221-W-33

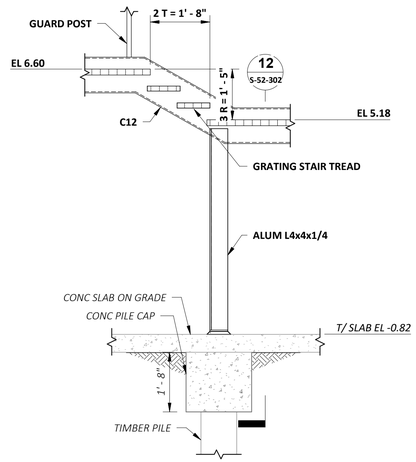
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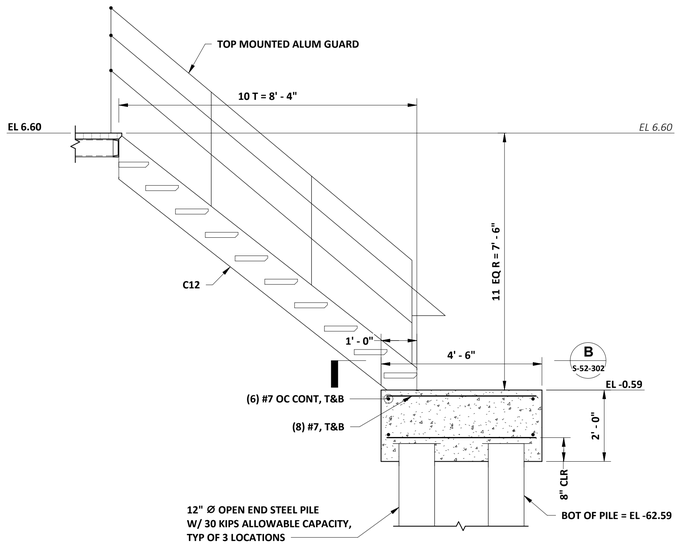


9 SECTION
S-52-104 SCALE: 1/4" = 1'-0"

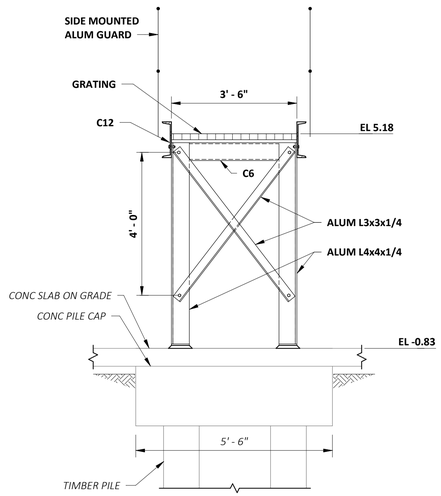


NOTE:
1. REFER TO BASE OF STAIR TO DETAIL LANDING FOR ELEMENTS NOT SHOWN.
2. CONTRACTOR TO CONFIRM EXISTING PILE CAP HAS NOT SHIFTED DURING CONSTRUCTION PRIOR TO WALKWAY INSTALLATION.

10 SECTION
S-52-104 SCALE: 1/2" = 1'-0"

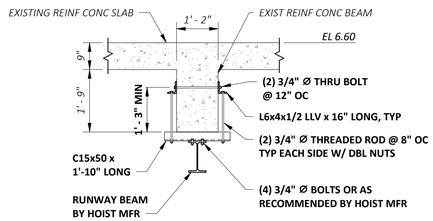


11 SECTION
S-52-104 SCALE: 1/2" = 1'-0"

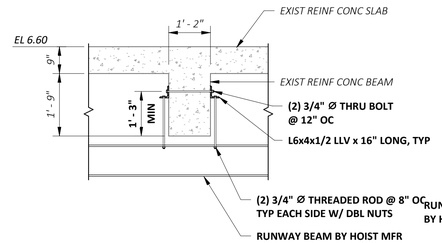


NOTE: REFER TO BASE OF STAIR TO LANDING DETAIL FOR ELEMENTS NOT SHOWN.

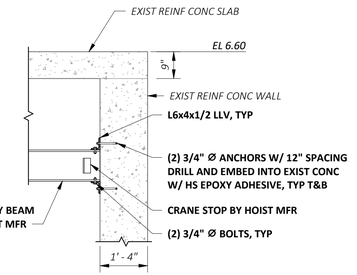
12 SECTION
S-52-302 SCALE: 1/2" = 1'-0"



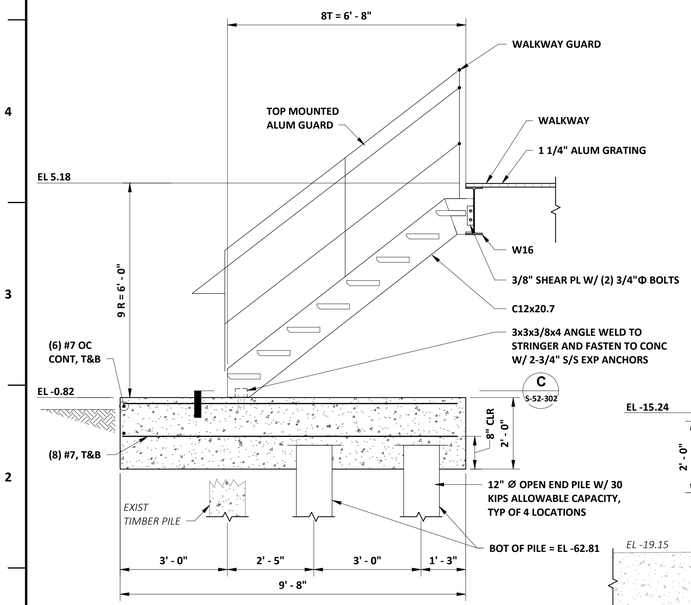
14 SECTION
S-52-104 SCALE: 1/2" = 1'-0"



15 SECTION
S-52-104 SCALE: 1/2" = 1'-0"

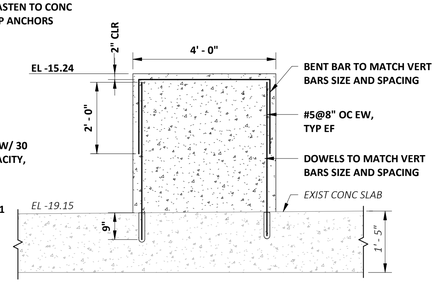


16 SECTION
S-52-104 SCALE: 1/2" = 1'-0"



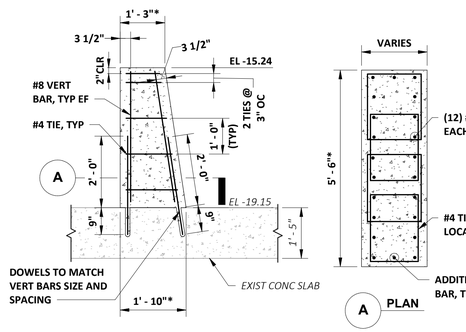
NOTE:
1. ALL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED WITH AN ADDITIONAL POLYAMIDE EPOXY PRIMER AND COLOR-PIGMENTED TOP COAT. REFER TO SPECIFICATION 05120 FOR ADDITIONAL INFORMATION.

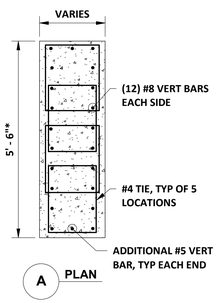
13 SECTION
S-52-104 SCALE: 1/2" = 1'-0"



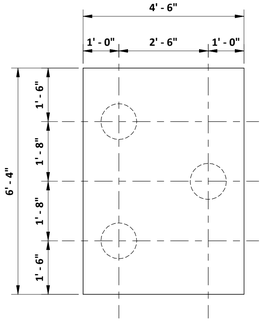
NOTE:
1. CONTRACTOR SHALL REDUCE HEAT GENERATION FOR MASS CONCRETE POURS (GREATER THAN 3 FT IN ALL DIRECTIONS) PER ACI 301 OR BY LIMITING CONCRETE TEMPERATURE AT POINT OF PLACEMENT PER HOT WEATHER CONCRETING PROCEDURES.

17 SECTION
S-52-103 SCALE: 1/2" = 1'-0"

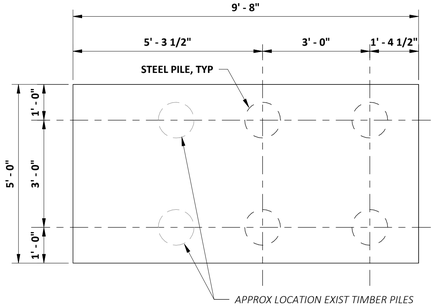




18 SECTION
S-52-103 SCALE: 1/2" = 1'-0"



B DETAIL
S-52-302 SCALE: 1/2" = 1'-0"



C DETAIL
S-52-302 SCALE: 1/2" = 1'-0"

NOTES:
1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.

REV.	DATE	DESCRIPTION	BY
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2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION SECTIONS II

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STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG — 2/13/2026 — PROFESSIONAL ENGINEER

DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

S-52-302

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase/21163-SM-RAS-PS-North.rvt

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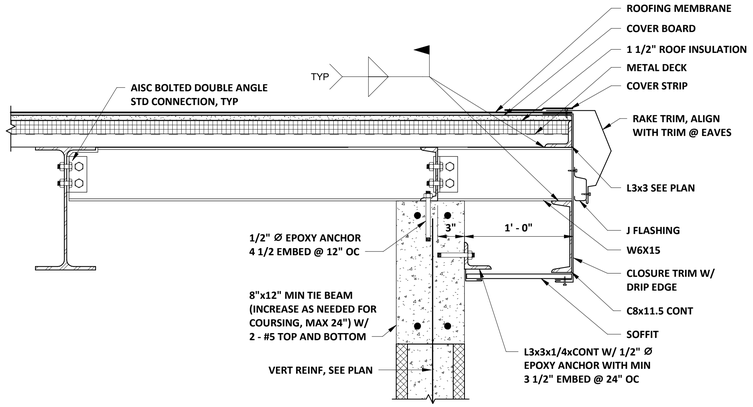
DOOR AND FRAME SCHEDULE

X APPLICABLE
- NON APPLICABLE

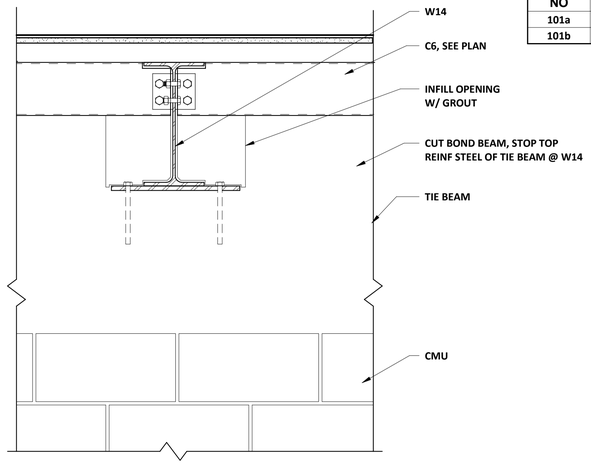
DOOR NO	DOOR W	DOOR H	DOOR THK	DOOR GLASS	TYPE	MATERIAL	RATING	FRAME HEAD	FRAME JAMB	FRAME SILL	HARDWARE SET	REMARKS
101a	3' - 0"	7' - 2"	1 3/4"	-	F	HM		B	E	THRESHOLD	1	
101b	3' - 0"	7' - 2"	1 3/4"	-	F	HM		B	E	THRESHOLD	1	

DOORS AND FRAMES KEY:

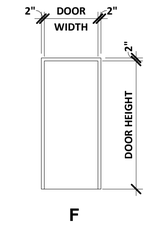
HM HOLLOW METAL



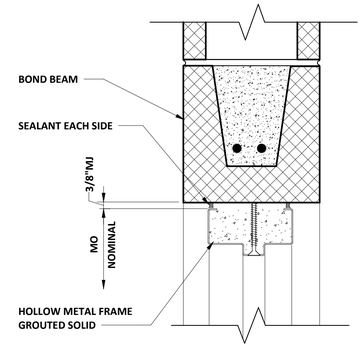
A S-52-104 **RAKE DETAIL**
SCALE: 1 1/2" = 1'-0"



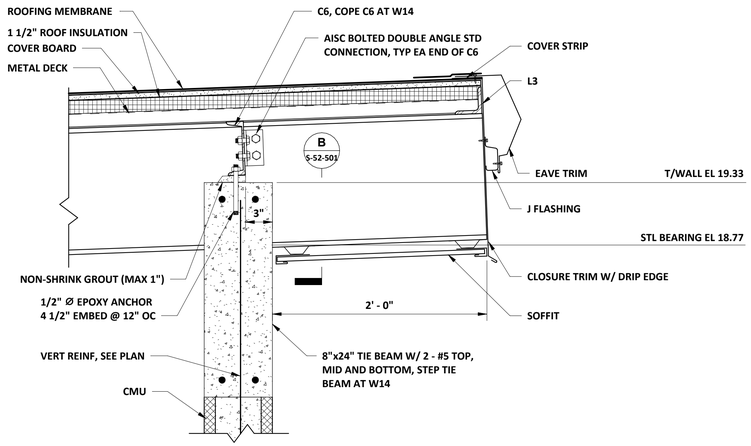
B S-52-104 **WALL DETAIL**
SCALE: 1 1/2" = 1'-0"



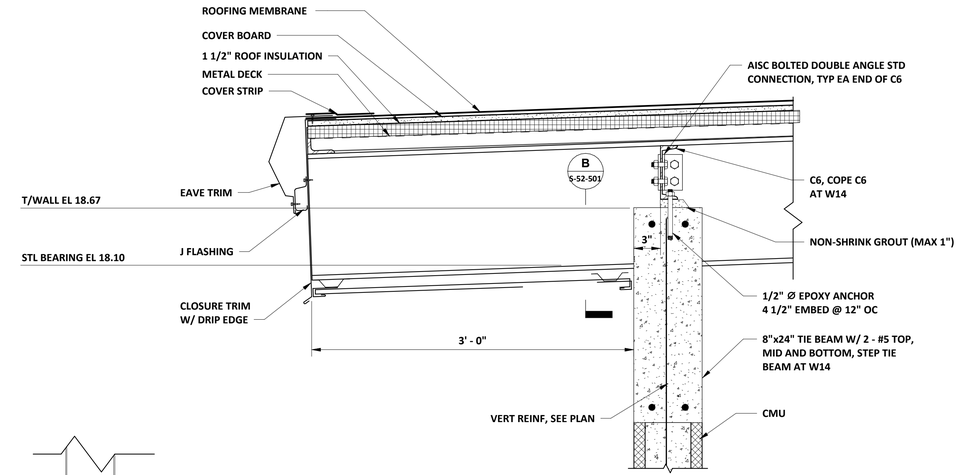
DOOR TYPES



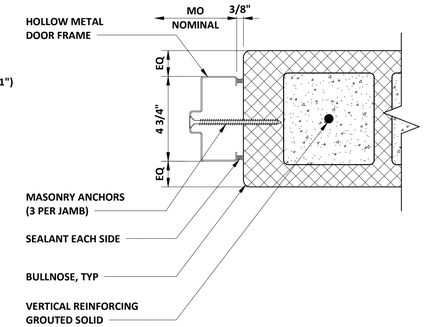
C **HEAD DETAIL**
SCALE: 3" = 1'-0"



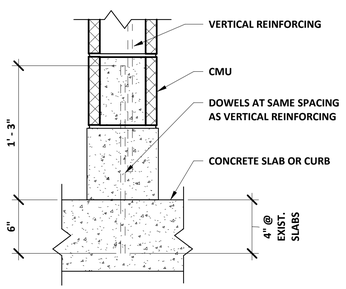
D S-52-104 **HIGH EAVE DETAIL**
SCALE: 1 1/2" = 1'-0"



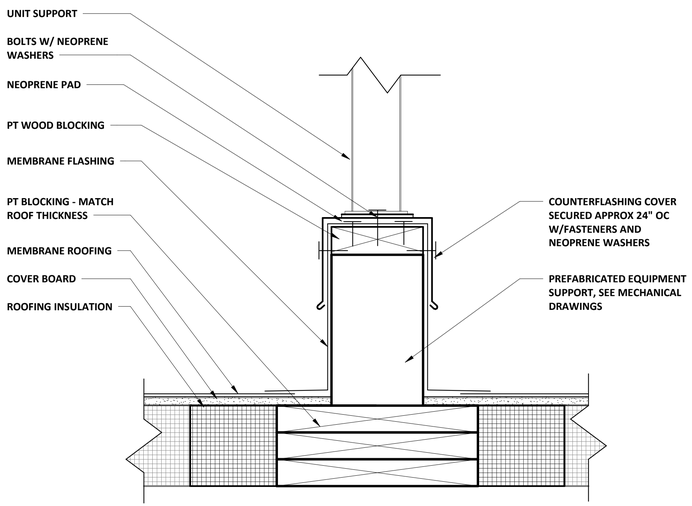
E S-52-104 **EAVE DETAIL**
SCALE: 1 1/2" = 1'-0"



F **JAMB DETAIL**
SCALE: 3" = 1'-0"



G S-52-302 **WALL DETAIL**
SCALE: 1 1/2" = 1'-0"



H S-52-104 **EQUIPMENT SUPPORT DETAIL**
SCALE: 3" = 1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-00-001 AND S-00-002. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-99-501 THROUGH S-99-506.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 50028
2/13/2026
PROFESSIONAL ENGINEER

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

NORTH RAS PUMP STATION
SCHEDULES AND DETAILS

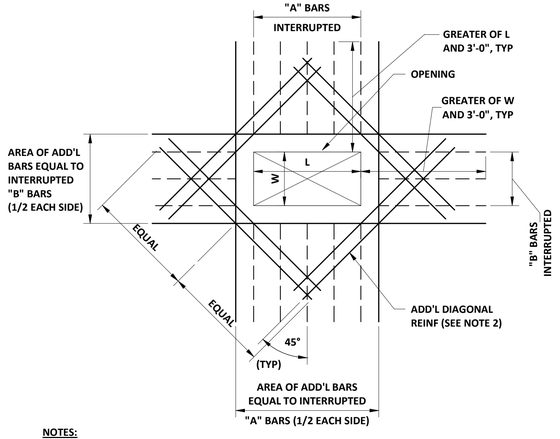
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.DOLAN
TRC. -
CK. J.KELLOGG
AP. R.CYR
SCALE: AS NOTED
DATE: FEBRUARY 2026

S-52-501
DWG. No. 12221-W-33
SET NO. SHEET NO. OF

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase/21163-SM-RAS-PS-North.rvt

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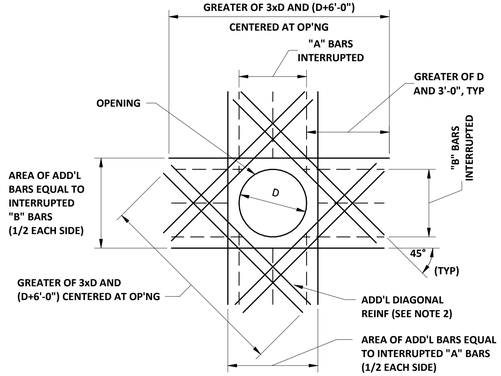


NOTES:

1. DETAILS ARE FOR OPENINGS 12" OR LARGER. SPREAD NORMAL REINFORCEMENT AT SMALLER OPENINGS AND OMIT DIAGONAL BARS.
2. PROVIDE ADDITIONAL DIAGONAL BARS 3" OC AS FOLLOWS:
   - 2.1 CONCRETE LESS THAN 12" THICK: 2-#5 x 4'-0", MID
   - 2.2 CONCRETE GREATER THAN OR EQUAL TO 12" THICK: 2 - #5 x 4'-0" EACH FACE
3. SPACE ADDITIONAL BARS AT SIDES OF OPENING 3" OC.
4. ADDITIONAL BARS NOT REQUIRED AT EDGE OF OPENING WITHIN 6 INCHES OF PARALLEL BEAM OR WALL.
5. PROVIDE STANDARD END HOOKS WHERE EXTENSION OF ADDITIONAL BARS SHOWN IS NOT POSSIBLE.
6. WHERE DOWELS FROM FOUNDATION ARE INTERRUPTED AT OPENING NEAR BASE OF WALL, ADDITIONAL FOUNDATION DOWELS ARE SIMILARLY REQUIRED AT EACH SIDE OF OPENING AT EACH FACE OF WALL.

REINFORCEMENT AT RECTANGULAR OPENING IN STRUCTURAL SLAB/WALL

NTS

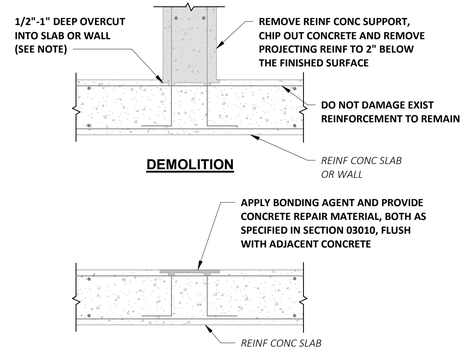


NOTES:

1. DETAILS ARE FOR OPENINGS 12" AND LARGER. SPREAD NORMAL REINFORCEMENT AT SMALLER OPENINGS AND OMIT DIAGONAL BARS.
2. PROVIDE ADDITIONAL DIAGONAL BARS 3" OC AS FOLLOWS:
   - 2.1 CONCRETE LESS THAN 12" THICK: 2-#5 MID
   - 2.2 CONCRETE GREATER THAN OR EQUAL TO 12" THICK: 2-#5 EACH FACE
3. SPACE ADDITIONAL BARS AT SIDES OF OPENING 3" OC.
4. ADDITIONAL BARS NOT REQUIRED AT EDGE OF OPENING WITHIN 6 INCHES OF BEAM OR WALL.
5. PROVIDE STANDARD END HOOKS WHERE EXTENSION OF ADDITIONAL BARS SHOWN IS NOT POSSIBLE.
6. WHERE DOWELS FROM FOUNDATION ARE INTERRUPTED AT OPENING NEAR BASE OF WALL, ADDITIONAL FOUNDATION DOWELS ARE SIMILARLY REQUIRED AT EACH SIDE OF OPENING AT EACH FACE OF WALL.

REINFORCEMENT AT ROUND OPENING IN STRUCTURAL SLAB/WALL

NTS



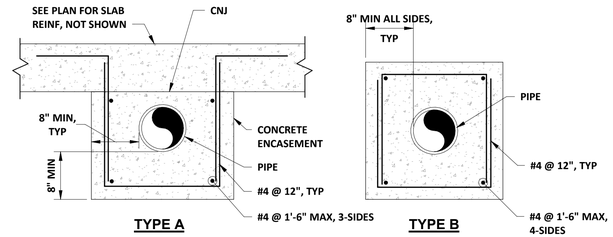
DEMOLITION

MODIFICATION

NOTE: IF THERE'S A CONSTRUCTION JOINT AT THE FACE OF THE SLAB OR WALL TO REMAIN, CONCRETE OVERCUT IS NOT REQUIRED. REMOVE REINF TO 2" BELOW FINISHED SURFACE AND REPAIR AS INDICATED.

CONCRETE SUPPORT REMOVAL

NTS

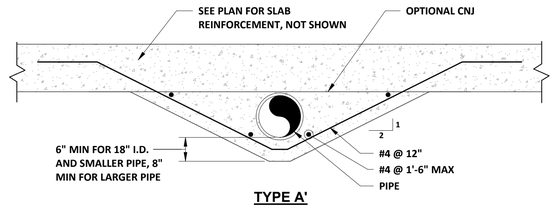


TYPE A

(FOR PIPES WITHIN 2 FEET OF BOTTOM OF SLAB)

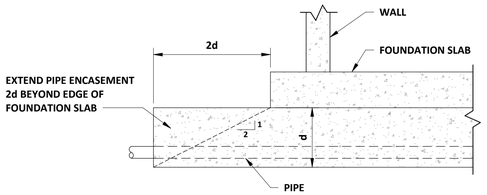
TYPE B

(FOR ALL OTHER PIPES)



TYPE A'

(FOR PIPES WITHIN 2 FEET OF BOTTOM OF SLAB AND AS OTHERWISE INDICATED)

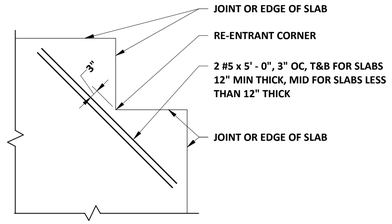


NOTE: REINFORCEMENT NOT SHOWN FOR CLARITY.

DETAIL AT EDGE OF FOUNDATION

CONCRETE PIPE ENCASEMENT

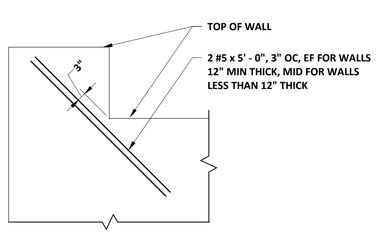
NTS



NOTE: SLAB REINFORCEMENT NOT SHOWN FOR CLARITY.

SLAB-ON-GROUND RE-ENTRANT CORNER - PLAN VIEW

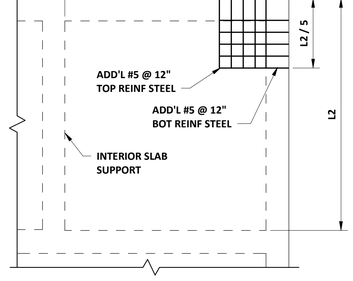
NTS



NOTE: WALL REINFORCEMENT NOT SHOWN FOR CLARITY.

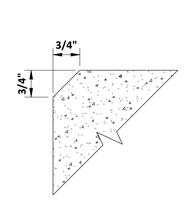
WALL CORNER - ELEVATIONAL VIEW

NTS



ELEVATED STRUCTURAL SLAB EXTERIOR CORNER

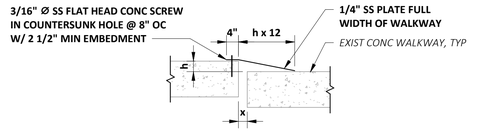
NTS



NOTE: CHAMFER ALL CORNERS AND EDGES, EXCEPT THOSE DIRECTLY BELOW MASONRY AND WOOD WALLS, AT WALL-MOUNTED ANGLES SUPPORTING GRATING OR PLATE AND WHERE COVERED BY BACKFILL.

CHAMFER

NTS

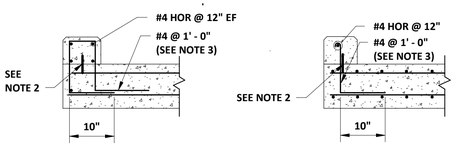


NOTES:

1. DETAIL APPLIES TO EXISTING CONCRETE WALKWAYS WITH VERTICAL OR LATERAL SEPARATION AT JOINT.
2. MAXIMUM VERTICAL SEPARATION (h) = 2"
3. MAXIMUM LATERAL SEPERATION (x) = 4"

PLATE AT EXIST CONCRETE JOINT

NTS



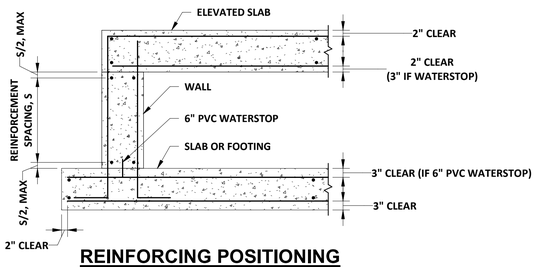
CURB (GREATER THAN 8" WIDE) **CURB (8" OR LESS IN WIDTH)**

NOTES:

1. PROVIDE CORNER BARS MATCHING HORIZONTAL BARS AT CURB CORNERS.
2. ADD WATERSTOP IN CONTAINMENT CURBS AND CURBS EXPOSED TO THE EXTERIOR. (UNLESS OTHERWISE NOTED)
   - 2.1 USE SURFACE APPLIED WATERSTOP W/ CURBS PLACED ON EXISTING SLABS.
   - 2.2 USE PVC WATERSTOPS W/ CURBS PLACED ON NEW SLABS.
3. FOR CURBS PLACED ON EXISTING CONCRETE, DRILL HOLES AND INSTALL #5 @ 12" W/ HS EPOXY (MIN 6" EMBEDMENT).
4. REFER TO DRAWINGS FOR CURB HEIGHT "H" AND WIDTH "W".

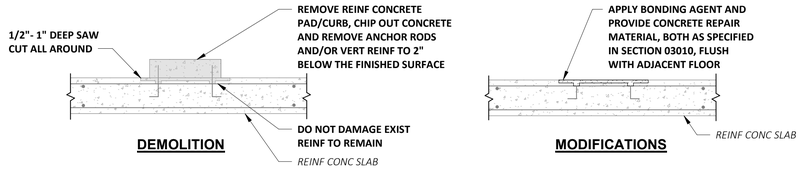
CONCRETE CURBS

NTS



REINFORCING POSITIONING

NTS



DEMOLITION **MODIFICATIONS**

CONCRETE PAD REMOVAL

NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

TYPICAL STRUCTURAL DETAILS I

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
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2/13/2026
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DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

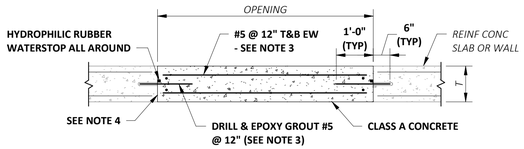
S-99-501

DWG. No. 12221-W-33

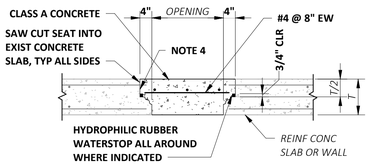
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EXISTING OPENINGS > 1'-6"

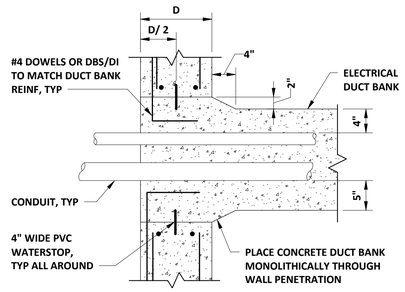


EXISTING OPENINGS ≤ 1'-6"

NOTES:
1. OPENING TO BE FILLED IS AN EXISTING OPENING OR AN OPENING REMAINING AFTER REMOVAL OF A HATCH OR EMBEDDED FRAME.
2. OPENING SIZE INDICATED IS THE DIAMETER OF A ROUND OPENING OR THE LEAST DIMENSION OF A RECTANGULAR OPENING.
3. FOR OPENINGS > 1'-6":
   IF $T \geq 12"$, USE 2 ROWS DOWELS LOCATED 4" FROM EACH FACE
   IF $T < 12"$, USE 1 ROW DOWELS CENTERED IN THE SLAB/WALL (AS SHOWN) AND #5 @ 12" EW MID
4. PREPARE SUBSTRATE AND APPLY BONDING AGENT AS SPECIFIED IN SECTION 03010.
5. THESE DETAILS APPLY TO FILLED OPENINGS UNLESS OTHERWISE DETAILED.
6. DO NOT DAMAGE EXISTING REINFORCING STEEL INSTALLING DOWEL BARS.
7. DO NOT SAWCUT EXISTING SLAB WHERE OPENING IS ADJACENT TO A CONCRETE BEAM.

FILLED OPENING IN EXISTING CONC SLAB/WALL

NTS

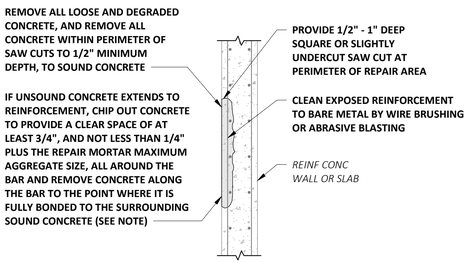


SECTION

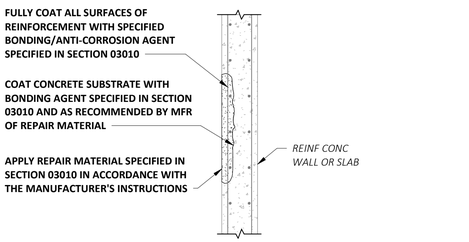
NOTES:
1. PROVIDE ADD'L WALL REINFORCEMENT AROUND DUCT BANK PENETRATIONS IN ACCORDANCE WITH "REINFORCEMENT AT RECTANGULAR OPENING" DETAIL.
2. DUCT BANK REINFORCEMENT (WHERE REQUIRED) NOT SHOWN FOR CLARITY.
3. IF SPACING BETWEEN ADJACENT CONDUIT EXCEEDS 1'-0", PROVIDE SEPARATE WALL PENETRATIONS.
4. WATERSTOP IS NOT REQUIRED IN FROST WALLS.

ELECTRICAL DUCT BANK PENETRATION IN FOUNDATION WALL

NTS



DEMOLITION

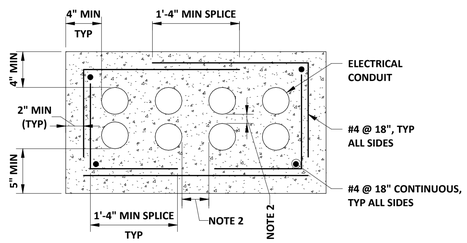


MODIFICATION

NOTE: NOTIFY THE ENGINEER IF EXCESSIVELY CORRODED REINFORCEMENT IS ENCOUNTERED SO THAT IT CAN BE EVALUATED. THIS INCLUDES 1/8 INCH OR GREATER LOSS OF THE ORIGINAL BAR DIAMETER AFTER REMOVAL OF CORROSION.

SPALLING CONCRETE REPAIRS

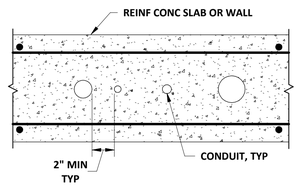
NTS



NOTES:
1. SEE ALL ELECTRICAL DRAWINGS FOR ADDITIONAL DETAILS.
2. THE FOLLOWING MINIMUM SPACING REQUIREMENTS ARE REQUIRED BY THE ELECTRICAL CONTRACT DOCUMENTS: 3" CLEAR SPACING BETWEEN CONDUIT AND 12" CLEAR SPACING BETWEEN POWER AND SIGNAL/CONTROL CONDUIT.

ELECTRICAL DUCT BANK REINFORCEMENT

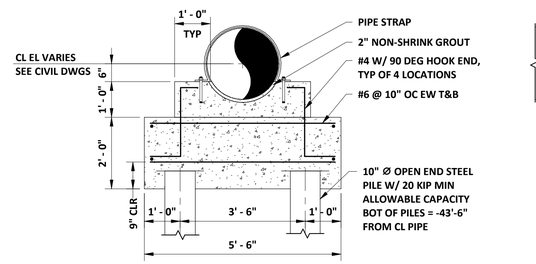
NTS



NOTES:
1. PIPES AND CONDUITS EMBEDDED IN A SLAB OR WALL, OTHER THAN THOSE PASSING THROUGH, SHALL:
   A. BE LOCATED BETWEEN THE REINFORCEMENT MATS EXCEPT WHERE REINFORCED PIPE ENCASEMENTS ARE LOCATED BELOW THE BOTTOM MAT,
   B. NOT REQUIRE REINFORCEMENT OR WATERSTOP TO BE CUT, BENT, OR OTHERWISE DISPLACED FROM ITS PROPER LOCATION,
   C. NOT BE LARGER IN OUTSIDE DIAMETER THAN ONE-THIRD (1/3) THE THICKNESS OF THE WALL OR SLAB,
   D. NOT EXCEED TWO CROSSING AT ANY POINT AND WITH THE SUM OF THE OUTSIDE DIAMETERS NOT EXCEEDING ONE-THIRD THE THICKNESS OF THE WALL OR SLAB,
   E. NOT BE SPACED CLOSER THAN THREE DIAMETERS (OF THE LARGER DIAMETER) ON CENTER.
   F. BE LOCATED WITH AT LEAST 2" CLEAR BETWEEN ADJACENT CONDUIT.
2. GC SHALL ALSO COORDINATE WITH CONDUIT PLACEMENT REQUIREMENTS OF SPECIFICATION SECTION 16050.

CONDUIT PLACEMENT IN SLAB OR WALL

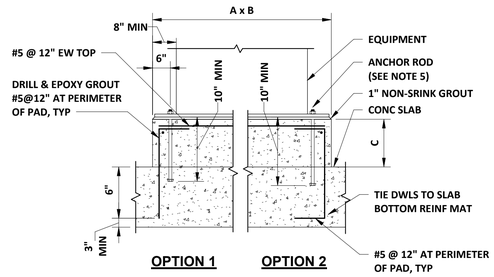
NTS



NOTE:
1. SEE CIVIL DRAWINGS FOR LOCATIONS AND SPACING.
2. DETAIL APPLIES WHERE PIPES ARE SUPPORTED AT FITTINGS.

RAS PIPE SUPPORT

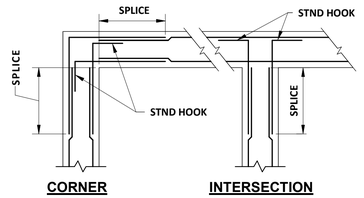
NTS



NOTES:
1. PROVIDE A MINIMUM 4" THICK REINFORCED CONCRETE PAD BELOW ALL EQUIPMENT, PIPE SUPPORTS, STANCHIONS, CONTROL PANELS, CHEMICAL STORAGE TANKS, ETC. UNLESS OTHERWISE NOTED.
2. A, B AND C DIMENSIONS SHALL BE DETERMINED BY THE GENERAL CONTRACTOR BASED ON EQUIPMENT SUPPLIED.
3. CONCRETE PAD SHALL ATTAIN THE DESIGN COMPRESSIVE STRENGTH PRIOR TO STARTUP OF EQUIPMENT.
4. FOR CONCRETE PADS PLACED ON EXISTING CONCRETE, DRILL & EPOXY GROUT #5 @ 12" AT PERIMETER OF PAD.
5. FOR CONCRETE PADS PLACED ON EXISTING CONCRETE, USE SS EPOXY ANCHORS.
6. PREPARE SUBSTRATE AND APPLY BONDING AGENT AS SPECIFIED PRIOR TO PLACING CONCRETE PAD.

EQUIPMENT PAD

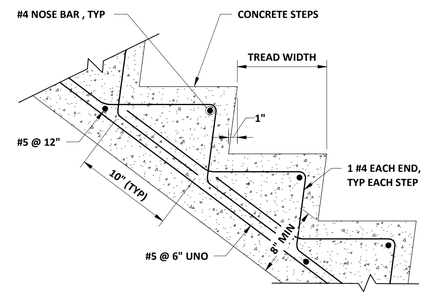
NTS



NOTES:
1. DETAILS APPLY UNLESS OTHERWISE NOTED.
2. VERTICAL REINFORCEMENT NOT SHOWN.
3. CORNER BARS SHALL MATCH HORIZONTAL BARS IN SIZE AND SPACING, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
4. FOR SIZE AND SPACING OF REINFORCEMENT, SEE APPLICABLE WALL SECTIONS.

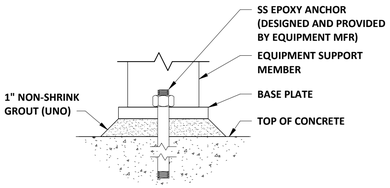
RECTANGULAR WALL HORIZONTAL CORNER REINFORCEMENT II

NTS



CONCRETE STAIR STEP

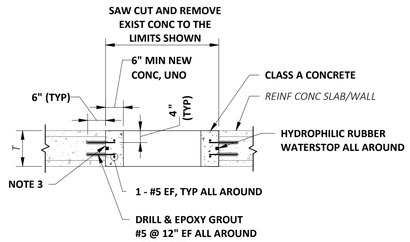
NTS



NOTE: THIS DETAIL APPLIES TO VERTICAL SUPPORTS BEARING ON A SLAB. REFER TO EQUIPMENT PAD DETAIL FOR SUPPORT OF ALL OTHER EQUIPMENT.

EQUIPMENT AND WALKWAY VERTICAL SUPPORT BASE

NTS



NOTES:
1. IF REQUIRED, ADDITIONAL SUPPORT FRAMING NOT SHOWN.
2. IF $T \geq 12"$, USE 2 ROWS DOWELS (AS SHOWN).
   IF $T < 12"$, USE 1 ROW DOWELS CENTERED IN THE SLAB/WALL.
3. PREPARE SUBSTRATE AND APPLY BONDING AGENT AS SPECIFIED IN SECTION 03010.

NEW OPENING IN EXISTING CONCRETE SLABS/WALLS

NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG, License No. 33028 — 2/13/2026 — PROFESSIONAL ENGINEER

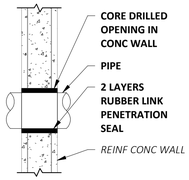
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

TYPICAL STRUCTURAL DETAILS II

DR. M.DOLAN	
TRC. -	S-99-502
CK. J.KELLOGG	
AP. R.CYR	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP Phase I/21163-SM-NotesandDetails.rvt

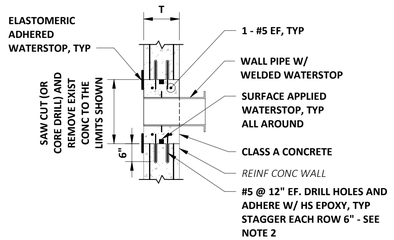
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NOTE: COAT EXPOSED REINF STEEL WITH EPOXY PAINT.

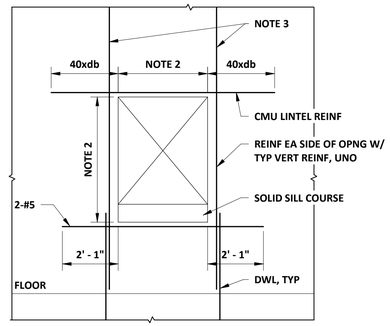
NOTES:
1. TYPE I SHALL BE USED WHERE A PIPE SLEEVE IS NOT REQUIRED. TYPE II SHALL BE USED WHERE A PIPE SLEEVE IS REQUIRED AND/OR PIPE DIAMETER IS 16" OR GREATER.
2. IF T > 8", USE 2 ROWS OF REINF STEEL DOWELS. IF T ≤ 8" USE 1 ROW CENTERED IN THE WALL.

PIPE PENETRATION IN EXISTING WALL TYPE I
NTS



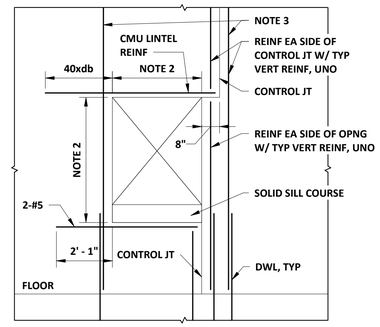
NOTES:
1. TYPE I SHALL BE USED WHERE A PIPE SLEEVE IS NOT REQUIRED. TYPE II SHALL BE USED WHERE A PIPE SLEEVE IS REQUIRED AND/OR PIPE DIAMETER IS 16" OR GREATER.
2. IF T > 8", USE 2 ROWS OF REINF STEEL DOWELS. IF T ≤ 8" USE 1 ROW CENTERED IN THE WALL.

PIPE PENETRATION IN EXISTING WALL TYPE II
NTS



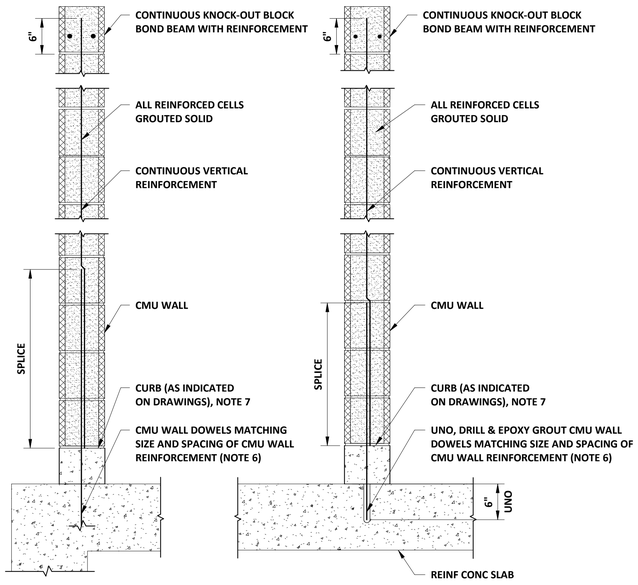
NOTES:
1. SIMILAR DETAIL APPLICABLE AT DOOR OPENINGS.
2. 2-#5 BOT BARS REQ'D WHEN DIMENSION EXCEEDS 16".
3. REINFORCE SIDES OF OPNG WHEN DIMENSION EXCEEDS 16". WHEN DIMENSION EXCEEDS 4'-0" REINFORCE TWO ADJACENT CELLS W/ TYPICAL VERTICAL REINFORCEMENT EACH SIDE OF OPNG.
4. VERTICAL REINFORCEMENT AT SPECIFIED SPACING ABOVE AND BELOW OPENINGS 4'-0" AND GREATER IN WIDTH IS NOT SHOWN.

CMU WALL REINF @ OPENING - CMU LINTEL
NTS



NOTES:
1. SIMILAR DETAIL APPLICABLE AT DOOR OPENINGS.
2. 2-#5 BOT BARS REQ'D WHEN DIMENSION EXCEEDS 16".
3. REINFORCE SIDES OF OPNG WHEN DIMENSION EXCEEDS 16". WHEN DIMENSION EXCEEDS 4'-0" REINFORCE TWO ADJACENT CELLS W/ TYPICAL VERTICAL REINFORCEMENT EACH SIDE OF OPNG.
4. VERTICAL REINFORCEMENT AT SPECIFIED SPACING ABOVE AND BELOW OPENINGS 4'-0" AND GREATER IN WIDTH IS NOT SHOWN.
5. SEE PLAN FOR ACTUAL CONTROL JOINT LOCATIONS.
6. RAKE CONTROL JOINT, AND PROVIDE BACKER ROD & SEALANT.

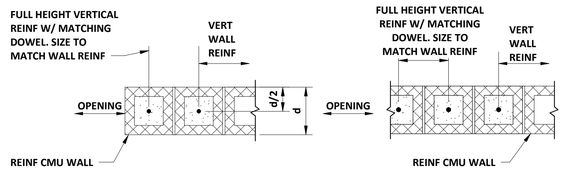
CMU WALL REINF @ OPNG/CJ - CMU LINTEL
NTS



STRUCTURAL WALL PARTITION WALL

NOTES:
1. DETAIL SHOWN FOR WALL REINFORCED WITH SINGLE ROW OF VERTICAL REINFORCEMENT. PROVIDE SIMILAR FOR WALL REINFORCED WITH TWO ROWS OF VERTICAL REINFORCEMENT.
2. SEE WALL SECTIONS FOR INFORMATION NOT SHOWN, INCLUDING JOINT REINFORCEMENT, VENEER, CAVITY INSULATION, TOP OF WALL SUPPORT, ETC.
3. G.C. SHALL COORDINATE LOCATIONS OF ALL SPLICED BARS WITH MASONRY SUBCONTRACTOR PRIOR TO SUBMISSION OF REINFORCEMENT SHOP DRAWINGS.
4. ALL SPLICE LENGTHS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
5. SEE STRUCTURAL WALL SECTIONS FOR SPECIFIC BUILDING WALLS FOR DOWEL DETAILS.
6. CONCRETE CURB REINFORCEMENT NOT SHOWN.

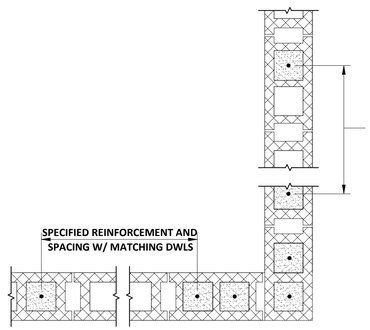
TYPICAL CMU WALL REINFORCEMENT - SECTIONS
NTS



LESS THAN OR EQUAL TO 3'-6" GREATER THAN 3'-6"

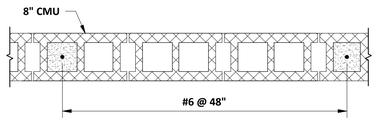
NOTE: REFER TO CMU WALL REINFORCING SCHEDULE FOR VERTICAL REINFORCEMENT.

REINFORCING AT CMU WALL OPENINGS
NTS



NOTE: DETAIL SHOWN FOR WALL REINFORCED WITH SINGLE ROW OF VERTICAL REINFORCEMENT. PROVIDE SIMILAR FOR WALL REINFORCED WITH TWO ROWS OF VERTICAL REINFORCEMENT.

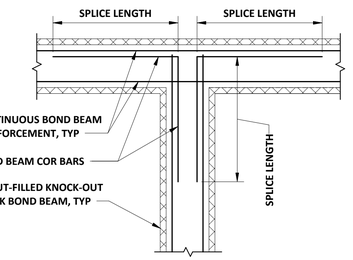
CMU REINFORCEMENT AT CORNER



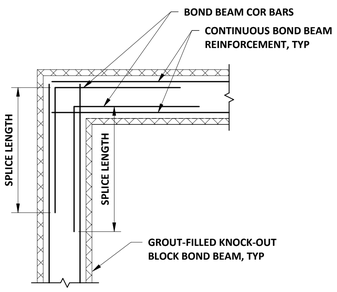
8" STRUCTURAL WALL

NOTES:
1. VERTICAL REINFORCEMENT SHALL BE LAID OUT SUCH THAT CORNERS, INTERSECTIONS, WITHIN 8" OF WALL ENDS, AND WITHIN 8" OF EACH SIDE OF CONTROL JOINTS ARE REINFORCED. EACH SIDE OF OPENINGS WIDER THAN 16" SHALL BE REINFORECED WITHIN 16" OF EACH FACE OF OPENING.
2. VERTICAL REINFORCEMENT AT SIDES OF OPENING SHALL EXTEND UP TO THE NEXT FLOOR OR ROOF LEVEL.
3. PROVIDE 2 - #5 HORIZONTAL BARS AT BOTTOM OF OPENINGS TALLER THAN 16". EXTEND BOTTOM BARS 25" PAST, AND LINTEL BARS 40 BAR DIAMETERS PAST, EACH FACE OF OPENING, EXCEPT AT CONTROL JOINTS AND ISOLATION JOINTS.
4. SEE DETAILS FOR WALL REINFORCEMENT AT OPENINGS.
5. PROVIDE KNOCK-OUT BLOCK BOND BEAMS WITH 2 - #5 HORIZONTAL BARS AT TOP OF WALLS, CONTINUOUS AT CONTROL JOINTS.
6. WHERE MASONRY WYTHE CONTAINS A SINGLE VERTICAL ROW OF REINFORCEMENT, IT SHALL BE POSITIONED AT THE CENTER OF THE UNITS, EQUIDISTANT FROM EACH MASONRY FACE, WITH A TOLERANCE OF PLUS OR MINUS 1/2".
7. PROVIDE HOT-DIPPED GALVANIZED BAR SUPPORTS AND SPACERS TO PREVENT REINFORCEMENT DISPLACEMENT BEYOND THE PERMITTED TOLERANCES. BAR SUPPORTS AND SPACERS SHALL BE INCLUDED UNDER SECTION 04200.
8. PLACE REINFORCEMENT IN GROUT SPACES PRIOR TO GROUTING, PUSHING REINFORCEMENT INTO GROUT IS PROHIBITED.

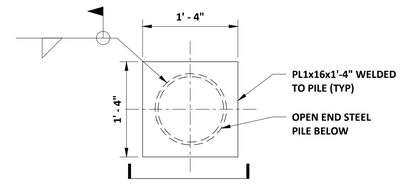
TYPICAL CMU WALL REINFORCEMENT - PLANS & NOTES
NTS



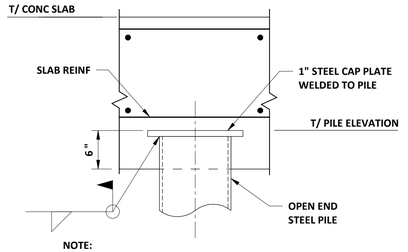
BOND BEAM INTERSECTION REINFORCEMENT
NTS



BOND BEAM CORNER REINFORCEMENT
NTS



PLAN



NOTE:
1. REMOVE ANY EMBEDDED SOIL AND PLACE CLASS B CONCRETE IN PILE TO 30 FEET BELOW CUTOFF ELEVATION.

SECTION
PILE CONNECTION
NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — JUSTIN WILLIAM KELLOGG, License No. 50028 — 2/13/2026 — PROFESSIONAL ENGINEER

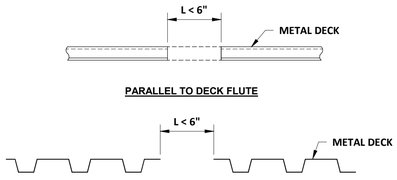
WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

TYPICAL STRUCTURAL DETAILS III

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG	DR. M.DOLAN	S-99-503
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. J.KELLOGG	DWG. No. 12221-W-33
		AP. R.CYR	
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

Autodesk Docs://1A-NewOrleans-21163-EastBank-STP-Phase/21163-SM-NotesandDetails.rvt

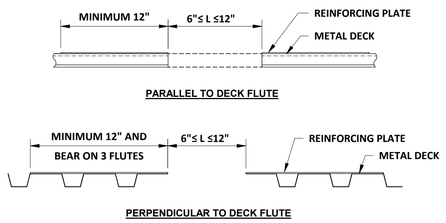
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NOTE: ADDITIONAL REINFORCING OF METAL DECK NOT REQUIRED IF A MAXIMUM OF 2 WEBS ARE REMOVED.

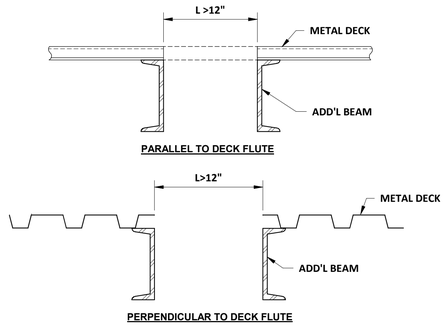
REINFORCING AT METAL DECK < 6" OPENING

NTS



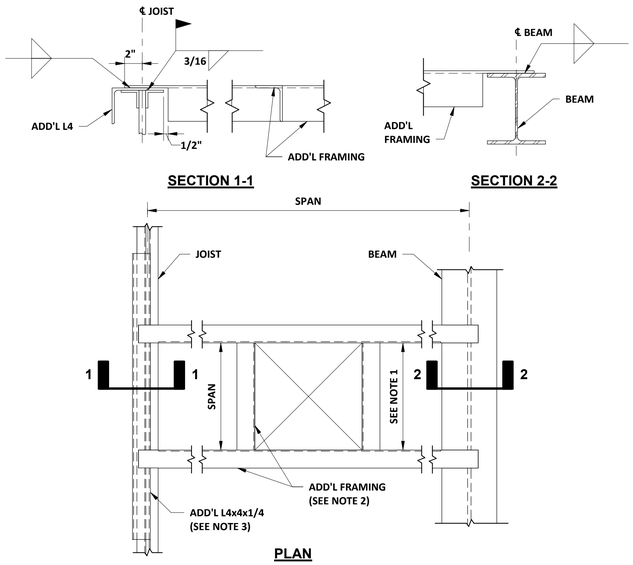
REINFORCING AT METAL DECK ≤ 6" OPENING ≤ 12"

NTS



REINFORCING AT METAL DECK OPENINGS OPENING > 12"

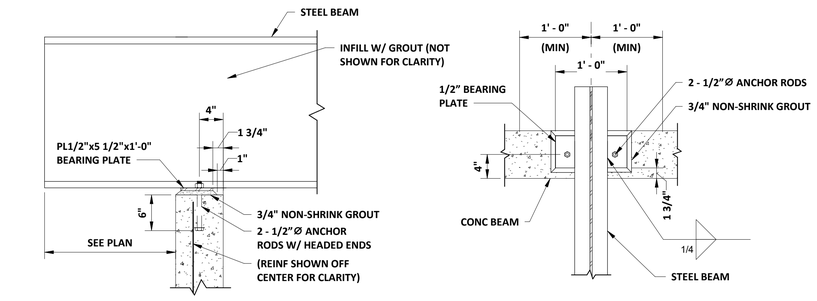
NTS



NOTES:
1. GENERAL CONTRACTOR SHALL COORDINATE SIZE OF OPENING WITH EQUIPMENT SUPPLIED.
2. ADDITIONAL FRAMING SHALL BE AS FOLLOWS UNLESS OTHERWISE NOTED:
   - A. SPAN ≤ 5'-0": L4x3x1/4 (LLV)
   - B. 5'-0" < SPAN ≤ 8'-0": L5x3 1/2x1/4 (LLV)
   - C. SPAN > 8'-0": C10x20
3. EXTEND ADDITIONAL L4 FRAMING 12" PAST BAR JOIST PANEL POINTS. PROVIDE AT BAR JOISTS WHERE ROOF OPENING FRAMING SUPPORTS EQUIPMENT WEIGHING 200 LBS AND GREATER.

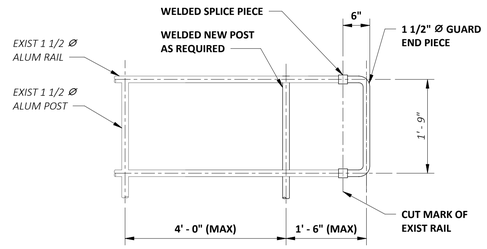
METAL DECK OPENING FRAMING

NTS



BEAM BEARING ON CMU PERPENDICULAR TO WALL (FRAMING)

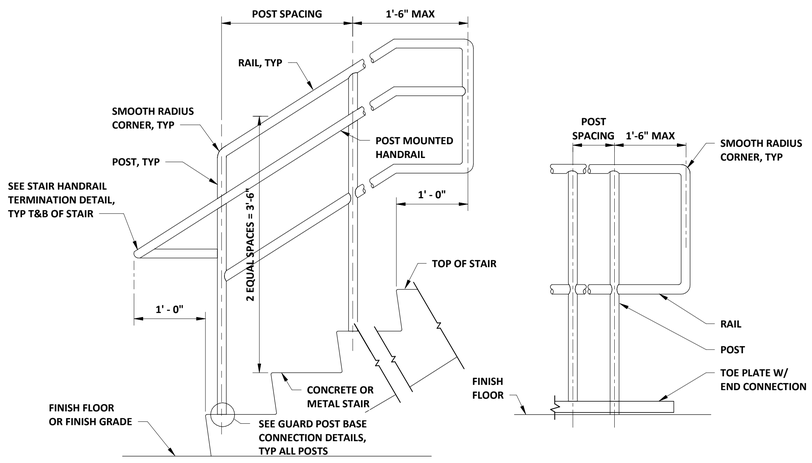
NTS



NOTES:
1. DETAIL TYPICAL AT ENDS OF ALL EXISTING RAILS THAT WILL BE CUT.
2. ALL NEW MATERIALS SHALL MATCH EXISTING.
3. POST BASE CONNECTION SHALL BE THAT WHICH IS APPLICABLE TO EXISTING CONDITIONS.
4. IF CUT LOCATION IS GREATER THAN 1'- 0" FROM AN EXISTING POST, A NEW POST SHALL BE INSTALLED AS SHOWN.

EXISTING CUT RAIL END PIECE

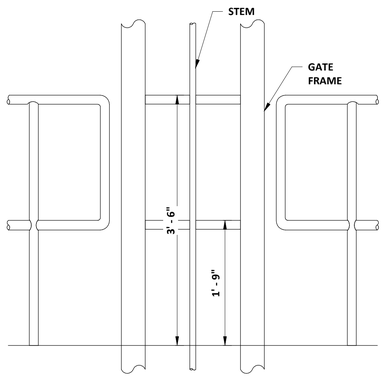
NTS



NOTES:
1. MATERIALS OF CONSTRUCTION AS INDICATED ON DRAWINGS.
2. PROVIDE TOE PLATE ON ALL GUARDS WHERE SUPPORTING CHANNEL DOES NOT PROJECT ABOVE WALKING SURFACE.
3. PROVIDE HANDRAIL EXTENSIONS AT THE BOTTOM OF ALL STAIRS (UON).
4. RAIL HEIGHT SHALL BE MEASURED TO THE TOP OF THE RAIL.
5. RAILS AND GUARDS SHALL BE 1 1/2" SCH 40 PIPE, POSTS SHALL BE 1 1/2" SCH 80 PIPE.

HANDRAILS AND GUARDS

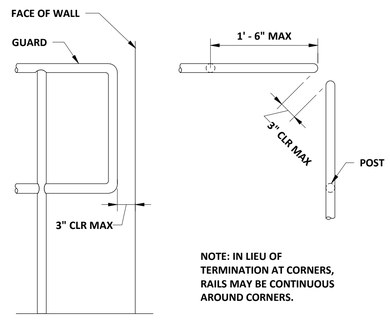
NTS



NOTE: GATE FRAMES SHALL BE FABRICATED WITH TOP AND MID LEVEL FRAMES AT THE HEIGHTS INDICATED.

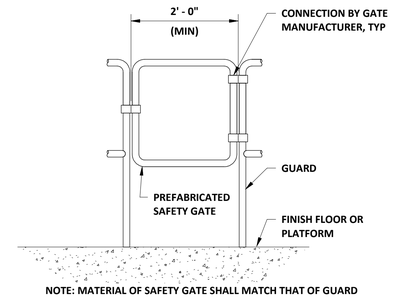
TERMINATION OF GUARDS AT GATE FRAMES

NTS



GUARD END TERMINATION AND CORNERS

NTS



NOTE: MATERIAL OF SAFETY GATE SHALL MATCH THAT OF GUARD

GUARD MOUNTED SWING GATE

NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

TYPICAL STRUCTURAL DETAILS IV

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 34328
2/13/2026
PROFESSIONAL ENGINEER

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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

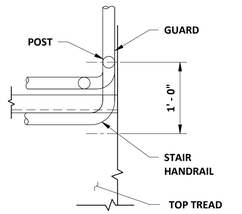
DR. M.DOLAN	
TRC. -	
CK. J.KELLOGG	
AP. R.CYR	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO.

S-99-504

DWG. No. 12221-W-33

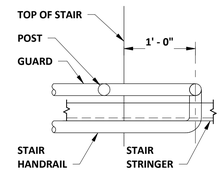
SHEET NO. OF

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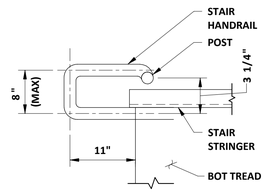
NOTE: MATERIALS OF CONSTRUCTION AS INDICATED ON DRAWINGS.

STAIR HANDRAIL TERMINATION TOP (CASE I)
NTS



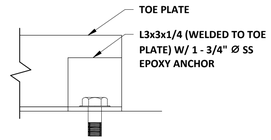
NOTE: MATERIALS OF CONSTRUCTION AS INDICATED ON DRAWINGS.

STAIR HANDRAIL TERMINATION TOP (CASE II)
NTS

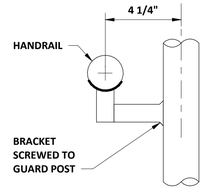


NOTE: MATERIALS OF CONSTRUCTION AS INDICATED ON DRAWINGS.

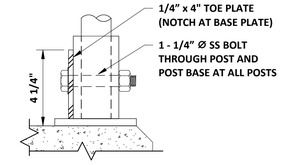
STAIR HANDRAIL TERMINATION BOTTOM
NTS



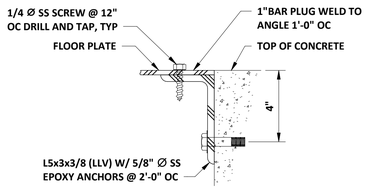
TOE PLATE END CONNECTION
NTS



POST MOUNTED HANDRAIL
NTS

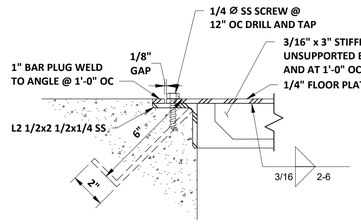


TOE PLATE TOP MOUNTED
NTS



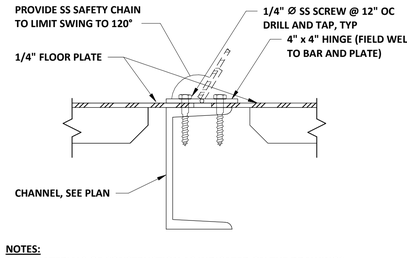
NOTES:
1. MATERIALS OF CONSTRUCTION AS INDICATED ON THE DRAWINGS.
2. GAS TIGHT FLOOR PLATES ARE REQUIRED WHERE INDICATED ON THE DRAWINGS.
3. HINGE REQUIRED ONLY WHERE INDICATED ON DRAWINGS.
4. STIFFENERS SHALL BE INSTALLED IN THE SPAN DIRECTION OF THE PLATE INDICATED ON THE DRAWINGS. SPAN DIRECTION IS THE SHORT DIRECTION UNLESS OTHERWISE NOTED.
5. WIDTH OF FLOOR PLATE SHALL BE 3'-0" MAXIMUM. PLATE SECTIONS OVER STOP GATES SHALL BE 1'-0" WIDTH AND CENTERED OVER STOP GATE.
6. SUPPORT SCHEDULE:
   - 6.1 UNLESS OTHERWISE NOTED, USE SUPPORT 1
   - 6.2 SUPPORT 2 - INTERMEDIATE BEAM SUPPORT
   - 6.3 SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH WITH THE FLOOR PLATE
7. OVERSIZE FASTENER HOLES IN PLATE 1/8" MIN TO ALLOW THERMAL MOVEMENTS

FLOOR PLATE (NON GAS TIGHT) SUPPORT III
NTS



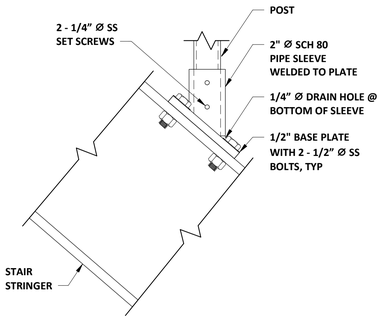
NOTES:
1. MATERIALS OF CONSTRUCTION AS INDICATED ON THE DRAWINGS.
2. ALL FLOOR PLATES SHALL BE CONSIDERED NON GAS TIGHT UNLES SPECIFICALLY INDICATED AS GAS TIGHT ON THE DRAWINGS.
3. HINGE REQUIRED ONLY WHERE INDICATED ON DRAWINGS.
4. STIFFENERS SHALL BE INSTALLED IN THE SPAN DIRECTION OF THE PLATE INDICATED ON THE DRAWINGS. SPAN DIRECTION IS THE SHORT DIRECTION UON.
5. WIDTH OF FLOOR PLATE SHALL BE 4'-0" MAXIMUM. PLATE SECTIONS OVER STOP GATES SHALL BE 1'-0" WIDTH AND CENTERED OVER STOP GATE.
6. SUPPORT SCHEDULE:
   - 6.1. UNLESS OTHERWISE NOTED, USE SUPPORT 1
   - 6.2. SUPPORT 2 - INTERMEDIATE BEAM SUPPORT
   - 6.3 SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH WITH THE FLOOR PLATE
7. APPLY POLYAMIDE EPOXY PRIMER BETWEEN CONTACTING STAINLESS STEEL AND ALUMINUM SURFACES
8. OVERSIZE FASTENER HOLES IN PLATE 1/8" MIN TO ALLOW THERMAL MOVEMENTS.

FLOOR PLATE (NON GAS TIGHT) SUPPORT I
NTS



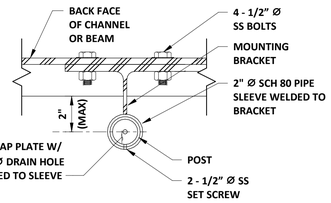
NOTES:
1. MATERIALS OF CONSTRUCTION AS INDICATED ON THE DRAWINGS.
2. ALL FLOOR PLATES SHALL BE CONSIDERED NON GAS TIGHT UNLESS SPECIFICALLY INDICATED AS GAS TIGHT ON THE DRAWINGS.
3. HINGE REQUIRED ONLY WHERE INDICATED ON DRAWINGS.
4. STIFFENERS SHALL BE INSTALLED IN THE SPAN DIRECTION OF THE PLATE INDICATED ON THE DRAWINGS. SPAN DIRECTION IS THE SHORT DIRECTION UON.
5. WIDTH OF FLOOR PLATE SHALL BE 4'-0" MAXIMUM. PLATE SECTIONS OVER STOP GATES SHALL BE 1'-0" WIDTH AND CENTERED OVER STOP GATE.
6. SUPPORT SCHEDULE:
   - 6.1. UNLESS OTHERWISE NOTED, USE SUPPORT 1
   - 6.2. SUPPORT 2 - INTERMEDIATE BEAM SUPPORT
   - 6.3 SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH WITH THE FLOOR PLATE
7. APPLY POLYAMIDE EPOXY PRIMER BETWEEN CONTACTING STAINLESS STEEL AND ALUMINUM SURFACES
8. DETAIL APPLIES TO LOCATIONS WITH AND WITHOUT HATCHES
9. OVERSIZE FASTENER HOLES IN PLATE 1/8" MIN TO ALLOW THERMAL MOVEMENTS.

FLOOR PLATE (NON GAS TIGHT) SUPPORT II
NTS



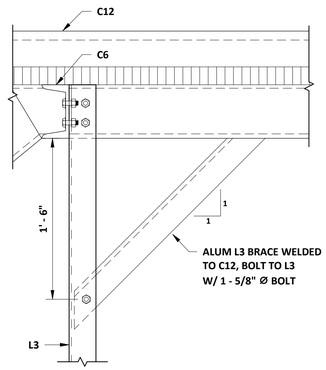
NOTES:
1. TOE PLATES NOT SHOWN FOR CLARITY.
2. MATERIAL OF CONSTRUCTION AS INDICATED ON DRAWINGS.
3. PREMANUFACTURED RAIL BASES MAY BE USED PROVIDED THE REQUIREMENTS OF THE ABOVE DETAILS ARE MET.

GUARD POST BASE CONNECTION (METAL SUPPORT) TOP MOUNTED (STAIR STRINGER)
NTS

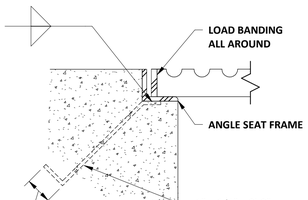


NOTES:
1. TOE PLATES NOT SHOWN FOR CLARITY.
2. MATERIAL OF CONSTRUCTION AS INDICATED ON DRAWINGS.
3. PREMANUFACTURED RAIL BASES MAY BE USED PROVIDED THE REQUIREMENTS OF THE ABOVE DETAILS ARE MET.

GUARD POST BASE CONNECTION (METAL SUPPORT) SIDE MOUNTED
NTS

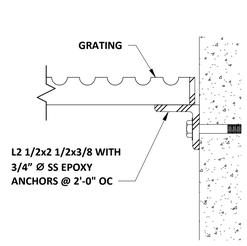


STEEL TYPICAL KNEE BRACE DETAIL
NTS



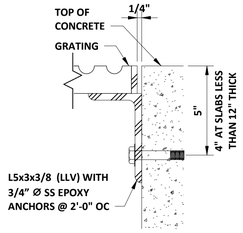
NOTES:
1. MATERIAL (ALUMINUM OR STEEL) AS INDICATED ON DRAWINGS.
2. ANGLE SEAT FRAME SHALL BE CONTINUOUS ON ALL SIDES OF THE OPENING. ANGLE FRAME TO BE MITERED AND WELDED AT CORNERS ON BACK SIDE, GRIND SMOOTH. ANGLE SEAT SHALL BE AS FOLLOWS WITH THE VERTICAL LEG CUT TO FIT.
   - 2.A. L2x2x1/4 (1 3/4" THICK GRATING AND SMALLER)
   - 2.B. L2 1/2x2x1/4 (GRATING GREATER THAN 1 3/4" THICK)
3. SUPPORT SCHEDULE
   - 3.A. UNLESS OTHERWISE NOTED USE SUPPORT 1
   - 3.B. SUPPORT 2 - CONTINUOUS VERTICAL WALLS (EXISTING AND NEW)
   - 3.C. SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH W/ THE GRATING
4. GRATING SEATS SHALL BE PROVIDED FOR BOTH LOAD BEARING AND NON-LOAD BEARING EDGES OF GRATING.

GRATING SEAT DETAILS SUPPORT I
NTS



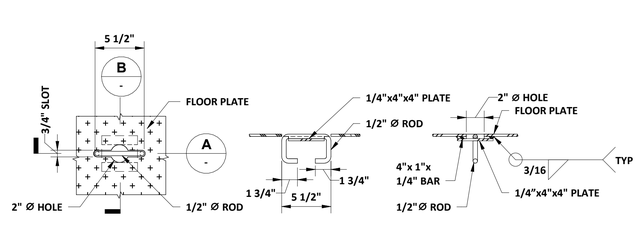
NOTES:
1. MATERIAL (ALUMINUM OR STEEL) AS INDICATED ON DRAWINGS.
2. ANGLE SEAT FRAME SHALL BE CONTINUOUS ON ALL SIDES OF THE OPENING. ANGLE FRAME TO BE MITERED AND WELDED AT CORNERS ON BACK SIDE, GRIND SMOOTH. ANGLE SEAT SHALL BE AS FOLLOWS WITH THE VERTICAL LEG CUT TO FIT.
   - 2.A. L2x2x1/4 (1 3/4" THICK GRATING AND SMALLER)
   - 2.B. L2 1/2x2x1/4 (GRATING GREATER THAN 1 3/4" THICK)
3. SUPPORT SCHEDULE
   - 3.A. UNLESS OTHERWISE NOTED USE SUPPORT 1
   - 3.B. SUPPORT 2 - CONTINUOUS VERTICAL WALLS (EXISTING AND NEW)
   - 3.C. SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH W/ THE GRATING
4. GRATING SEATS SHALL BE PROVIDED FOR BOTH LOAD BEARING AND NON-LOAD BEARING EDGES OF GRATING.

GRATING SEAT DETAIL SUPPORT II
NTS



NOTES:
1. MATERIAL (ALUMINUM OR STEEL) AS INDICATED ON DRAWINGS.
2. ANGLE SEAT FRAME SHALL BE CONTINUOUS ON ALL SIDES OF THE OPENING. ANGLE FRAME TO BE MITERED AND WELDED AT CORNERS ON BACK SIDE, GRIND SMOOTH. ANGLE SEAT SHALL BE AS FOLLOWS WITH THE VERTICAL LEG CUT TO FIT.
   - 2.A. L2x2x1/4 (1 3/4" THICK GRATING AND SMALLER)
   - 2.B. L2 1/2x2x1/4 (GRATING GREATER THAN 1 3/4" THICK)
3. SUPPORT SCHEDULE
   - 3.A. UNLESS OTHERWISE NOTED USE SUPPORT 1
   - 3.B. SUPPORT 2 - CONTINUOUS VERTICAL WALLS (EXISTING AND NEW)
   - 3.C. SUPPORT 3 - CONCRETE BEAMS AND EXISTING CONCRETE FLUSH W/ THE GRATING
4. GRATING SEATS SHALL BE PROVIDED FOR BOTH LOAD BEARING AND NON-LOAD BEARING EDGES OF GRATING.

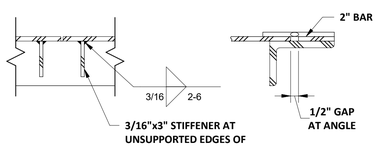
GRATING SEAT DETAIL SUPPORT III
NTS



PLAN DETAIL A DETAIL B

NOTES:
1. PROVIDE 2 LIFT HANDLES FOR EACH PLATE SECTION. HANDLES SHALL BE CENTERED ON THE PLATE OR OTHERWISE LOCATED SUCH THAT THE PLATE SECTION IS BALANCED WHILE BEING LIFTED.
2. MATERIALS OF CONSTRUCTION AS INDICATED ON THE DRAWINGS.

FLOOR PLATE LIFT HANDLES NON GAS TIGHT
NTS



DETAIL AT PLATE EDGE

FLOOR PLATE (NON GAS TIGHT) DETAIL AT PLATE EDGE
NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

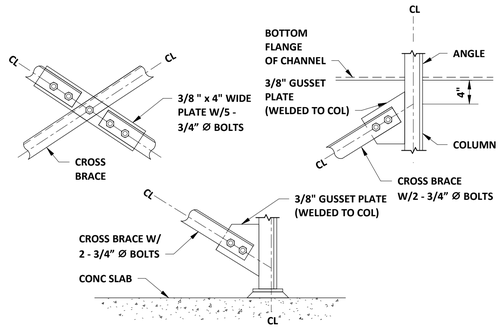
CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 50328
2/13/2026
PROFESSIONAL ENGINEER

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

TYPICAL STRUCTURAL DETAILS V

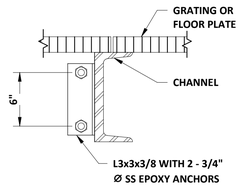
PROJECT NO: 21163	DESIGNED BY: J.KELLOGG	DR. M.DOLAN	S-99-505
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. J.KELLOGG	DWG. No. 12221-W-33
		AP. R.CYR	
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF



NOTE: DETAILS ARE APPLICABLE FOR ALL STAIRS AND PLATFORMS. REFER TO DRAWINGS FOR ALL SIZES AND MATERIALS

PLATFORM CROSS BRACING DETAILS

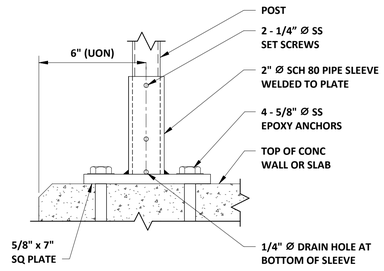
NTS



NOTES:
1. DETAILS SHALL APPLY TO ALL SUPPORTS UNLESS OTHERWISE NOTED.
2. MATERIALS OF CONSTRUCTION AS INDICATED ON DRAWINGS.
3. SUPPORT SCHEDULE:
   TYPE 1 - BEAM IS PERPENDICULAR TO SUPPORT WALL
   TYPE 2, 3 - BEAM IS PARALLEL TO SUPPORT WALL

GRATING AND FLOOR PLATE SUPPORT BEAM CONNECTION TYPE I

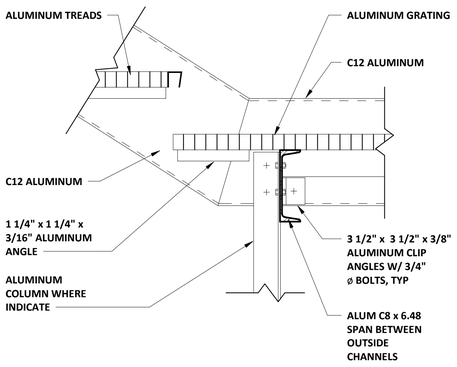
NTS



NOTES:
1. TOE PLATES NOT SHOWN FOR CLARITY.
2. MATERIAL OF CONSTRUCTION AS INDICATED ON DRAWINGS.
3. PREMANUFACTURED RAIL BASES MAY BE USED PROVIDED THE REQUIREMENTS OF THE ABOVE DETAILS ARE MET.
4. UNLESS OTHERWISE NOTED, USE TYPE 1.
5. TYPE 2 SHALL BE USED WHEN MOUNTING TO CONCRETE WITH A DEPTH GREATER THAN OR EQUAL TO 12" AND LESS THAN 18".

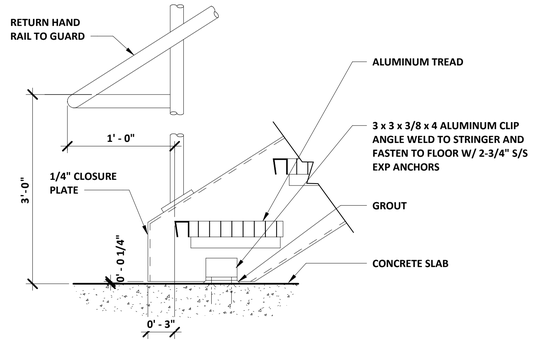
GUARD POST BASE CONNECTION (CONCRETE SUPPORT) TOP MOUNTED

NTS



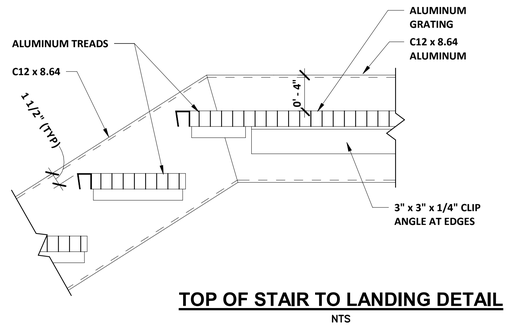
BASE OF STAIR TO LANDING DETAIL

NTS



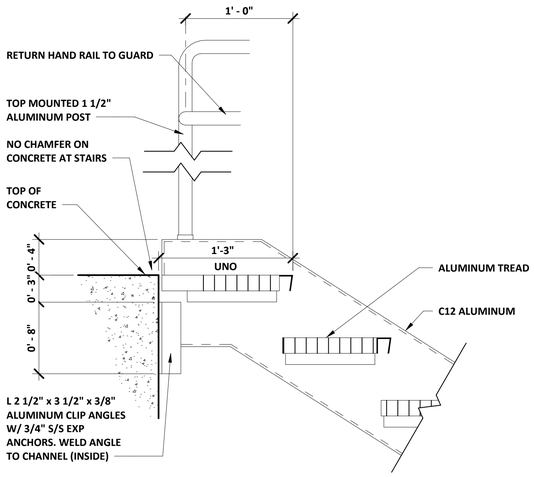
GRATED BASE OF STAIR TO CONCRETE SLAB DETAIL

NTS



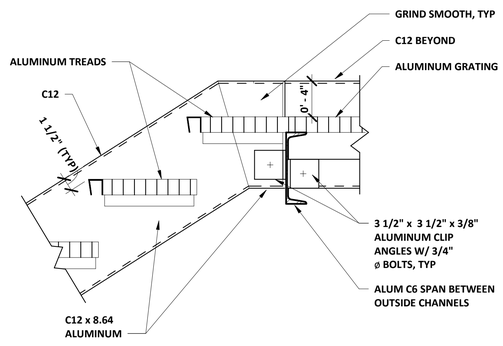
TOP OF STAIR TO LANDING DETAIL

NTS



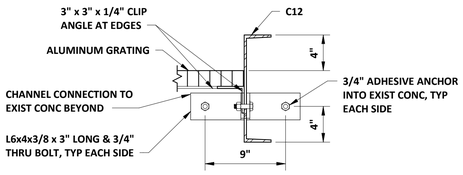
TOP OF STAIR TO CONCRETE SLAB DETAIL

NTS



TOP OF STAIR TO LANDING DETAIL

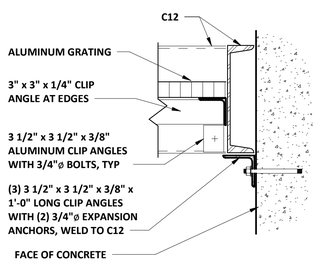
NTS



NOTE: SUBSTITUTE L6x4 WITH BENT PLATE MATCHING EXIST CONC SURFACE WHERE INDICATED.

GRATING EDGE DETAIL

NTS



LANDING MOUNTING DETAIL

NTS

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
JUSTIN WILLIAM KELLOGG
License No. 50328
2/13/2026
PROFESSIONAL ENGINEER

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

TYPICAL STRUCTURAL DETAILS VI

PROJECT NO: 21163	DESIGNED BY: J.KELLOGG	DR. M.DOLAN	S-99-506
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. J.KELLOGG	
		AP. R.CYR	DWG. No. 12221-W-33
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

Autodesk Docs://LA-NewOrleans-21163-EastBank STP-Phase2/21163-SM-NotesandDetails.rvt

LAST SAVED BY: ADAM.COUTURE 2/19/2026 3:06 PM

PROCESS GENERAL NOTES

1. ALL EQUIPMENT AND PIPING LAYOUT DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED WITH EQUIPMENT SUPPLIED, AND/OR EXISTING CONDITIONS. SOME INFORMATION ASSOCIATED WITH EXISTING STRUCTURES, PIPING AND EQUIPMENT LOCATIONS, ELEVATIONS AND SIZES, WERE TAKEN FROM EXISTING RECORD DRAWINGS. THE EXISTING DRAWINGS ARE FOR REFERENCE ONLY. THE CONTRACTOR SHALL NOT RELY SOLELY ON THE RECORD DRAWINGS, AS UNDOCUMENTED MODIFICATIONS MAY HAVE OCCURRED SINCE THE PREPARATION OF THE BELOW DRAWINGS.
   - RECORD DRAWINGS OF CONTRACT NO. 3050, EXPANSION OF THE EAST BANK SEWAGE TREATMENT FACILITIES, CITY OF NEW ORLEANS, LOUISIANA, DATED 1981, PREPARED BY WALDEMAR S. NELSON AND COMPANY, INC.
   - RECORD DRAWING OF CONTRACT NO. 3075, MODIFICATIONS TO THE RETURN ACTIVATED SLUDGE PS AT THE EAST BANK SEWER TREATMENT PLANT, SEWERAGE & WATER BOARD OF NEW ORLEANS, DATED DECEMBER 2014, PREPARED BY TRIGON ASSOCIATES
   - RECORD DRAWINGS OF THE SODIUM HYPOCHLORITE DISINFECTION SYSTEM AT THE EAST BANK WASTEWATER TREATMENT PLANT, SEWERAGE & WATER BOARD OF NEW ORLEANS, DATED AUGUST 2016, PREPARED BY TRIGON ASSOCIATES

   CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES, EQUIPMENT OR PIPING THAT MAY BE AFFECTED. IN SOME SPECIFIC INSTANCES, WHERE SPECIAL ATTENTION MAY BE REQUIRED BY THE CONTRACTOR, SOME DIMENSIONS, ELEVATIONS, ETC. HAVE BEEN NOTED WITH AN " * ". THIS DOES NOT HOWEVER, LIMIT THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND COORDINATE ALL NECESSARY INFORMATION FOR CONSTRUCTION.
2. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DIMENSIONS, LAYOUT OR ELEVATION CHANGES REQUIRED TO SUIT THE SPECIFIC EQUIPMENT BEING PROVIDED UNDER THIS CONTRACT. WHEN SUCH EQUIPMENT REQUIRES PADS, PIERS, CURBING, ETC., THAT DIFFERS FROM THAT SHOWN ON THE CONSTRUCTION DRAWINGS, THE CONTRACTOR SHALL COORDINATE THE STEEL REINFORCING SHOP DRAWINGS ACCORDINGLY.
3. ALL BURIED CONNECTIONS TO STRUCTURES, INCLUDING BUT NOT LIMITED TO THE PRIMARY SEDIMENTATION BASINS, EFFLUENT CHANNEL, SECONDARY CLARIFIERS, AND SOLIDS HANDLING BUILDING, SHALL HAVE SLEEVE TYPE FLEXIBLE CONNECTIONS APPROXIMATELY 4-FEET FROM THE STRUCTURES. ALL SLEEVE TYPE COUPLINGS ON PRESSURE LINES SHALL BE RESTRAINED (SOLID SLEEVE TYPE). REFER TO SPECIFICATION SECTION 15088.
4. ALL PIPING INSTALLED BELOW SLABS-ON-GROUND SHALL BE ENCASED IN CONCRETE (EXCLUDING DRAINS/SEWERS UNDER NON-STRUCTURAL SLABS-ON-GROUND), UNLESS OTHERWISE NOTED. PROCESS DRAWINGS DO NOT SHOW CONCRETE ENCASEMENT FOR CLARITY. SEE STRUCTURAL DRAWINGS FOR DETAILS.
5. PROVIDE CAST OR DUCTILE IRON WALL PIPE CASTINGS OR GALVANIZED STEEL PIPE SLEEVES FOR ALL PIPE PENETRATIONS MADE THROUGH NEW CONCRETE WALLS AND SLABS, UNLESS OTHERWISE NOTED ON THE DRAWINGS. ALL WALL SLEEVES AND WALL PIPE CASTINGS SHALL HAVE SEALING/ANCHORING COLLARS. SEE PROCESS, MECHANICAL, AND STRUCTURAL DRAWINGS FOR LOCATIONS OF PENETRATIONS. NOTE THAT NOT ALL PIPE PENETRATIONS ARE SHOWN ON THE STRUCTURAL DRAWINGS. NEW PENETRATIONS THROUGH EXISTING STRUCTURE WALLS AND SLABS SHALL BE BY CORING MACHINE AND LINK TYPE COMPRESSION SEALS, UNLESS OTHERWISE INDICATED. OPENINGS TO BE COMPATIBLE WITH REQUIRED PIPING AND STANDARD LINK TYPE COMPRESSION SEAL SIZES. FOR ADDITIONAL INFORMATION, REFER TO SPECIFICATION SECTION 15092.
6. FOR PIPING MATERIAL, SEE THE PIPE SCHEDULE IN SPECIFICATION SECTION 15050.
7. WHERE 90-DEGREE BENDS ARE USED ON SLUDGE, GRIT, SEPTAGE AND SCUM LINES THEY SHALL BE LONG RADIUS TYPE, EXCEPT WHERE DIMENSIONAL CONSTRAINTS NECESSITATE THE USE OF STANDARD BENDS. THESE EXCEPTIONS SHALL BE SUBJECT TO ENGINEER'S REVIEW AND ACCEPTANCE.
8. ALL LIQUID TYPE FLOW ELEMENTS SHALL BE LOCATED A MINIMUM OF FIVE PIPE DIAMETERS DOWNSTREAM AND THREE DIAMETERS UPSTREAM OF ANY HYDRAULIC DISTURBANCE, EXCEPT IN SITUATIONS WHERE DIMENSIONAL CONSTRAINTS PRECLUDE THESE SEPARATION DISTANCES. IN THESE CASES, THE ENGINEER WILL REVIEW THE LAYOUT AND PROVIDE REVISED MINIMUM SEPARATION DISTANCES.
9. ALL BLIND FLANGES ON SCUM, SLUDGE, AND SUPERNATANT LINES SHALL HAVE A 1-1/2-INCH BALL VALVE AND AN ATTACHMENT FOR FLUSHING WITH PLANT WATER, UNLESS OTHERWISE NOTED. GRIT LINES AND SOME SEPTAGE, SCUM, AND SLUDGE LINES SHALL BE HARD PIPED WITH PLANT WATER FOR FLUSHING, WHERE INDICATED ON THE DRAWINGS. REFER TO SPECIFICATION SECTION 15200.
10. PROVIDE DRIP PANS, WITH CENTRAL COLLECTION POINT AND DRAIN TO FLOOR, FOR ELECTRICAL AND INSTRUMENTATION EQUIPMENT LOCATED BENEATH LIQUID CARRYING PIPES.
11. ALL PROCESS AND PLANT WATER HOSE BIBBS SHALL BE PROVIDED WITH A HOSE RACK AND HOSE, ALONG WITH A SIGN INDICATING "NOT SUITABLE FOR DRINKING". FOR ADDITIONAL HOSE BIBB AND HOSE RACK INFORMATION, SEE SPECIFICATION SECTION 15200 AND DRAWINGS.
12. INSTALL CORPORATION COCKS ON ALL BUILDING AND STRUCTURE INTERIOR PIPING HIGH POINTS TO PREVENT AIR BINDING. CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXACT NUMBER AND LOCATIONS OF THESE CORPORATION COCKS BASED UPON INFORMATION DEPICTED ON DRAWINGS AND ACTUAL FIELD ROUTING OF PIPING. REVIEW LOCATIONS WITH ENGINEER BEFORE INSTALLATION. THESE MANUAL AIR RELEASES SHALL INCLUDE A 1/2-INCH BRASS CORPORATION COCK WITH 1/2-INCH COPPER TUBING ADEQUATELY SUPPORTED, EXTENDING TO A LOCAL AREA DRAIN. ROUTING OF TUBING AND SELECTED DRAIN TO BE REVIEWED WITH, AND ACCEPTED BY, ENGINEER.
13. PIPES 3-INCH IN DIAMETER AND UNDER SHALL HAVE UNIONS INSTALLED ADJACENT TO EQUIPMENT AND TANKS, UNLESS OTHERWISE NOTED ON DRAWINGS. FLANGES ARE ACCEPTABLE ON 3-INCH DIAMETER PIPING.
14. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH SPECIFICATION SECTION 15094.
15. AFTER INSTALLATION, ALL PIPELINES SHALL BE PRESSURE TESTED FOR TIGHTNESS IN ACCORDANCE WITH SPECIFICATION SECTION 15050. ALL LEAKS SHALL BE CORRECTED AND RETESTED UNTIL PRESSURE TEST IS SATISFACTORILY COMPLETED.
16. ALL PIPING SHALL BE CLEANED, TO THE SATISFACTION OF THE ENGINEER, BEFORE TESTING.
17. PROVIDE 4-INCH HIGH (MIN.) REINFORCED CONCRETE PAD UNDER ALL EQUIPMENT, CONTROL PANELS, PIPE AND EQUIPMENT SUPPORTS, TANKS, ETC. UNLESS OTHERWISE INDICATED.
18. REFER TO SPECIFICATION SECTION 01070 AND DRAWING PR-00-002 FOR A LISTING OF COMMONLY USED ABBREVIATIONS.
19. ALL PLANT WATER AND PROCESS WATER PIPING IN THE BELT FILTER PRESS AREA AND RAS PUMP STATIONS, ARE TO BE INSULATED AND PROVIDED WITH A PVC JACKET, IN ADDITION TO OTHER PIPING INSULATION CALLED FOR IN SPECIFICATION SECTION 15180.
20. ALL REDUCERS SHALL BE CONCENTRIC TYPE UNLESS DESIGNATED AS ECCENTRIC (ECC) ON THE DRAWINGS. ECCENTRIC REDUCERS SHALL BE INSTALLED WITH FLAT SIDE UP.
21. FLEXIBLE CONNECTIONS ON AIR LINES ARE TO BE PROVIDED WHERE SHOWN ON THE DRAWINGS; AND AS REQUIRED FOR EXPANSION/CONTRACTION, AS REQUIRED BY THE MANUFACTURER.
22. ALL PENETRATIONS BETWEEN CLASS 1, DIVISION 1 AND DIVISION 2 AREAS AND UNCLASSIFIED AREAS SHALL BE GAS TIGHT.
23. WHERE NEW PIPING IS TO BE CONNECTED TO EXISTING PIPING, THE CONTRACTOR SHALL FURNISH, AND INSTALL ADAPTERS, FITTINGS AND ADDITIONAL PIPE AS REQUIRED TO COMPLETE THE INSTALLATION. THE USE OF UNI-FLANGES WILL NOT BE ALLOWED UNLESS INDICATED ON THE DRAWINGS.
24. ALL 316 STAINLESS STEEL FASTENERS FOR PIPING, EQUIPMENT, SUPPORTS, ETC., SHALL BE HAND TIGHTENED IN ORDER TO LIMIT THE POTENTIAL FOR GALLING.
25. CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. THE EXCEPTION IS WHEN SCANNED IMAGES ARE UTILIZED FROM THE PREVIOUS CONSTRUCTION PROJECTS NOTED IN GENERAL NOTE NO. 1, ABOVE. WHEN REVIEWING DRAWINGS NOTED AS "SCANNED" UNDER DRAWING TITLE, THE CONTRACTOR SHALL IGNORE ANY REFERENCE TO PREVIOUS CONTRACT WORK. SCANNED IMAGES ARE NOT TO SCALE; HOWEVER, AN APPROXIMATE SCALE MAY BE GIVEN FOR CONVENIENCE.
26. CONTRACTOR SHALL COORDINATE INSTRUMENTATION MOUNTING DETAILS WITH THE INSTRUMENTATION SUPPLIER AND THE ELECTRICAL CONTRACTOR. REFER TO DETAILS ON THE INSTRUMENTATION DRAWINGS, AND/OR EQUIPMENT MANUFACTURER MOUNT DETAILS AND REQUIREMENTS.
27. ALL FIXED WEIRS MUST BE LEVELED TO WITHIN +/- 0.005-FEET OF THE ELEVATIONS INDICATED ON THE DRAWINGS. CONTRACTOR SHALL SURVEY THE WEIRS TO CONFIRM LEVEL TOLERANCES ALONG THE ENTIRE WEIR LENGTH AT INTERVALS NO GREATER THAN 5-FEET. CONTRACTOR SHALL CONFIRM THE LEVEL TOLERANCE BY FILLING THE STRUCTURE WITH WATER TO THE LEVEL OF THE WEIR. WEIRS WHICH DO NOT MEET TOLERANCE SHALL BE ADJUSTED AT NO ADDITIONAL COST TO THE OWNER.
28. ALL CHECK VALVES SHALL BE SWING TYPE CHECK VALVES UNLESS SPECIFICALLY CALLED OUT ON THE DRAWINGS.
29. PHOTO TAGS, AS SHOWN ON THE PLAN, INDICATE THE LOCATION AND DIRECTION FROM WHICH THE PHOTO WAS TAKEN.

    PHOTO # D-# — PHOTO TITLE — # D-#
30. ALL LUBRICATION FITTINGS SHALL BE BROUGHT TO LOCATIONS THAT ARE READILY ACCESSIBLE TO OPERATORS. REFER TO SPECIFICATION SECTION 11000 FOR ADDITIONAL REQUIREMENTS.
31. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
32. THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN THE TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS/PERSPECTIVES PROVIDED.
33. IT IS IMPORTANT TO NOTE THAT THESE MODELS HAVE BEEN DEVELOPED USING A 3D PIPING PACKAGE. IN ORDER TO PRESERVE THE 2D DESIGN MODEL, IN MANY INSTANCES THE SYMBOLS DEPICTING VALVES AND EQUIPMENT DO NOT NECESSARILY PORTRAY THE ACTUAL EQUIPMENT SPECIFIED IN THE SPECIFICATIONS. MOST NOTABLY, FOR INSTANCES, WOULD BE THE VALVE OPERATORS AND THE DESIRED ORIENTATION. THE SPECIFICATIONS WILL PREVAIL AND THE VALVES SHOWN WITHIN THE DRAWING SET SHOULD BE CONSIDERED PURELY SYMBOLIC.
34. PROVIDE SOLID SLEEVE TYPE COUPLINGS AS SHOWN ON THE DRAWINGS. ALL SLEEVE TYPE COUPLINGS ON PRESSURE LINES SHALL BE RESTRAINED WITH 316 STAINLESS STEEL RODS AND HARDWARE. REFER TO SPECIFICATION SECTION 15088 FOR ADDITIONAL INFORMATION.

GENERAL DEMOLITION NOTES

1. REFER TO INDIVIDUAL DRAWINGS FOR SPECIFIC DEMOLITION NOTES.
2. INDICATES EXISTING PIPING/EQUIPMENT TO REMAIN FOR RE-USE.
   INDICATES EXISTING PIPING/EQUIPMENT TO BE DEMOLISHED.
   INDICATES EXISTING PIPING/EQUIPMENT TO BE RELOCATED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL DEMOLISHED PIPING, EQUIPMENT AND MATERIALS. THE OWNER RESERVES THE RIGHT TO RETAIN PIPING, EQUIPMENT AND/OR MATERIALS ON SITE FOR THEIR USE AS SPECIFIED IN SPECIFICATION SECTION 02050. SUCH MATERIAL TO BE RETAINED SHALL BE PLACED IN AN ON-SITE STORAGE AREA, REVIEWED/COORDINATED WITH, AND ACCEPTABLE TO THE OWNER AND ENGINEER. RETAINED EQUIPMENT SHALL BE REMOVED IN SUCH A WAY AS NECESSARY TO MAINTAIN ITS FUNCTIONAL AND PHYSICAL INTEGRITY.
4. THE CONTRACTOR SHALL KEEP A RECORD OF DEMOLITION AND LOCATION OF UTILITIES FOUND AS PART OF THE PROJECT RECORD DOCUMENTS, AS SPECIFIED IN SPECIFICATION SECTION 01720.
5. REFER TO THE DEMOLITION SPECIFICATION SECTION 02050, SUMMARY OF WORK SPECIFICATION SECTION 01010, AND SITE DEMOLITION DRAWING FOR ADDITIONAL INFORMATION REGARDING DEMOLITION REQUIREMENTS AND CONSTRUCTION SEQUENCING.
6. REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION REGARDING EXISTING UTILITIES. THE SIZES, LOCATIONS, AND MATERIALS OF CONSTRUCTION INDICATED ARE FROM THE BEST AVAILABLE INFORMATION AND MAY NOT BE COMPLETE OR ACCURATE. ALL SIZES, LOCATIONS, AND MATERIALS OF CONSTRUCTION SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD AS REQUIRED. ALL EXISTING UTILITIES THAT ARE TO REMAIN, AND ARE DAMAGED BY THE CONTRACTORS ACTIVITIES, SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
7. SEVERING THE EXISTING UTILITIES FOR ABANDONMENT, OR REMOVAL OF A SEGMENT FROM SERVICE, SHALL BE PERFORMED IN SUCH A MANNER AS TO ALLOW THE REMAINING ACTIVE SEGMENT TO CONTINUE IN ITS INTENDED SERVICE. CAP ACTIVE SEGMENTS WITH APPROPRIATE FITTING, JOINT RESTRAINT, ETC. TO ENSURE THEIR INTEGRITY. THE METHOD OF CAPPING SHALL BE REVIEWED WITH, AND ACCEPTABLE TO, THE ENGINEER.
8. ALL PIPING, EQUIPMENT AND MATERIALS TO BE DEMOLISHED AND/OR REMOVED FROM SERVICE MUST BE COORDINATED WITH THE OWNER AND ENGINEER BEFOREHAND.
9. THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THAT ALL FLOWS, FLOW METERING AND LEVEL CONTROLS ARE MAINTAINED DURING CONSTRUCTION. GRAVITY, PUMPED BYPASSES OR OTHER MEANS OF FLOW MAINTENANCE SHALL BE REVIEWED WITH, AND ACCEPTABLE TO, THE ENGINEER. THE CONTRACTOR SHALL COORDINATE ANY TEMPORARY STOPPAGES WITH THE OWNER AND ENGINEER. CONTRACTOR SHALL VERIFY WITH OWNER/ENGINEER ALL VALVES, GATES, EQUIPMENT, ETC., ARE FUNCTIONAL PRIOR TO ASSUMING UTILIZATION FOR FLOW ISOLATION.
10. WHERE PIPING OR CONDUIT THAT IS TO BE REMOVED PASSES THROUGH THE WALL OF THE STRUCTURE, IT SHALL BE CUT OFF AS NEAR TO THE WALL AS PRACTICAL AND PROPERLY SEALED ON EACH SIDE OF THE WALL, OR AS SHOWN ON THE DRAWINGS. SEAL METHOD SHALL BE SUBJECT TO REVIEW AND ACCEPTANCE OF THE ENGINEER.
11. ALL WALL AND/OR FLOOR PENETRATIONS REMAINING AFTER THE REMOVAL OF PIPING OR CONDUIT ARE TO BE PATCHED AND FINISHED FLUSH TO MATCH EXISTING SURFACES.
12. REMOVE ALL PUMP AND EQUIPMENT PADS NOT BEING RE-USED AND FINISH FLUSH TO FLOOR LEVEL.
13. REMOVE ALL WALL BRACKETS, PIPE HANGERS AND PIPE SUPPORTS NOT BEING RE-USED. PATCH BOLT HOLES TO MATCH THE EXISTING SURFACE.
14. ALL WALL AND FLOOR SURFACES DAMAGED OR DISTURBED AS A RESULT OF DEMOLITION BY THE CONTRACTOR OR ITS SUB-CONTRACTORS, SHALL BE PATCHED AND PAINTED PER SPECIFICATION SECTION 09900.
15. WHERE PIPING AND/OR EQUIPMENT THAT IS NOTED AS ABANDONED INTERFERES WITH THE CONTRACTOR'S CONSTRUCTION ACTIVITIES, CONTRACTOR SHALL REMOVE AND DISPOSE OF AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.
16. ALL ANCHOR BOLTS TO BE REMOVED SHALL BE CUT/MELTED TO A MINIMUM OF 3/4-INCH BELOW EXISTING CONCRETE OR MASONRY SURFACES AND PATCHED/FILLED FLUSH TO SURFACE WITH NON-SHRINK GROUT.

GENERAL CHEMICAL SCHEMATIC NOTES

1. REFER TO PROCESS GENERAL NOTES ON THIS DRAWING FOR ADDITIONAL REQUIREMENTS.
2. CONTRACTOR SHALL FIELD LOCATE/ROUTE ALL PIPING, EQUIPMENT AND APPURTENANCES AS REQUIRED TO ENSURE A FULLY FUNCTIONAL AND INTEGRATED CHEMICAL FEED SYSTEM AS SPECIFIED. CONTRACTOR MUST REVIEW THE PROPOSED CHEMICAL FEED SYSTEM LAYOUT WITH THE ENGINEER AND OWNER IN THE FIELD PRIOR TO INSTALLATION.
3. CONTRACTOR SHALL COORDINATE TUBING SIZES AS REQUIRED FOR CONNECTIONS TO PUMPS AND ANALYZERS. PROVIDE REDUCERS, FITTINGS AND OTHER APPURTENANCES AS REQUIRED, AT NO ADDITIONAL COST TO THE OWNER.
4. PROVIDE PUMP SUCTION AND DISCHARGE PULSATION DAMPENERS WHERE REQUIRED BY THE EQUIPMENT MANUFACTURER, AND WHEN SPECIFIED OR SHOWN ON THE DRAWINGS.
5. CHEMICAL FEED PIPING SHALL BE INSTALLED IN SUCH A WAY AS TO ALLOW EQUIPMENT ACCESS AND SPACE FOR MAINTENANCE. PROVIDE PIPE GUARDS TO PROTECT PIPING FROM PHYSICAL DAMAGE WHERE, IN THE OPINION OF THE ENGINEER, THE POTENTIAL FOR DAMAGE EXISTS. PROTECTION SYSTEM SHALL BE CORROSION RESISTANT.
6. THE SYSTEM SCHEMATICS DO NOT SHOW ALL UNIONS. HOWEVER, CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUFFICIENT UNIONS TO PERMIT THE REMOVAL OF EQUIPMENT, VALVES AND OTHER SYSTEM APPURTENANCES FOR MAINTENANCE.
7. FIELD LOCATE CALIBRATION COLUMN SUCH THAT TOP OF COLUMN ELEVATION IS NO HIGHER THAN LIQUID LEVEL IN THE STORAGE TANKS WHEN HALF FULL.
8. REFER TO INSTRUMENTATION DRAWING I-00-001 FOR INSTRUMENTATION ABBREVIATIONS, LEGEND AND NOTES AND OTHER ADDITIONAL REQUIREMENTS.
9. PROVIDE CHEMICAL NAME PLATE IDENTIFICATION ON ALL FILL LINES AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
10. PROVIDE BACK PRESSURE VALVES AT DISCHARGE LOCATIONS WHERE NECESSARY TO POSITIVELY STOP CHEMICAL FLOW WHEN PUMPS STOP.

REV.	DATE	DESCRIPTION	BY
3			
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

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PROCESS NOTES

DR. A.COUTURE	
TRC. -	**PR-00-001**
CK. D.STILES	
PROJECT NO: 21163 / DESIGNED BY: W.EDGERTON	AP. S.HALLOWELL
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
	DWG. No. 12221-W-33
	SET NO. / SHEET NO. OF

J:\ENGL\A\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\21163-PRS-GENERALNOTES.DWG | ProcessNotes | 1:10.12364677 | — | 2/19/2026 3:06:15 PM | ADAM.COUTURE

LAST SAVED BY: ADAM.COUTURE 6/6/2024 5:20 PM

VALVES

	SCHEMATIC	ORTHOGRAPHIC
3-WAY VALVE		
BACKPRESSURE VALVE (BPV)	BPV	
BALL VALVE (BV)		
BALL CHECK VALVE (BCV)		
BUTTERFLY VALVE (BFV)		
CHECK VALVE (CKV)		
DIAPHRAGM VALVE (DFV)		
DOUBLE DISC CHECK VALVE (DDCV)		
DUCK-BILL TYPE CHECK VALVE (DCKV)		
GATE VALVE (GV)		
GLOBE VALVE (GBV)		
KNIFE GATE VALVE (KV)		
MUD VALVE (MDV)		
NEEDLE VALVE (NV)		
PINCH VALVE (PCHV)		
PLUG VALVE (PV)		
PRESSURE REDUCING VALVE (PRV)	PRV	
PRESSURE SAFETY (RELIEF) VALVE (PSV)	PSV PSV	
SURGE ANTICIPATION VALVE (SAV)	SAV	
SURGE RELIEF VALVE (SRV)	SRV	
TELESCOPING VALVE (TELV)	T	
VACUUM RELIEF VALVE (VRV)	V V	
VOLUME DAMPER (VD)	VD	

FITTINGS/APPURTENANCES

- BACKFLOW PREVENTER (RPZ)
- BARBED FITTING
- CALIBRATION COLUMN
- DIAPHRAGM SEAL
- EXPANSION JOINT *(air or liquid)*
- HOSE BIBB (HB, HBF, OR HBW) — HB | HBF | HBW
- QUICK DISCONNECT
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- ROTAMETER
- SLEEVE COUPLING
- STRAINER (DUPLEX) — D
- STRAINER (SIMPLEX) — S
- UNION
- WYE STRAINER

ACTUATORS

- CONTROL ACTUATOR — M
- LIMIT SWITCH — LS
- PNEUMATIC DIAPHRAGM ACTUATOR
- PNEUMATIC/HYDRAULIC CYLINDER
- PNEUMATIC/HYDRAULIC CYLINDER (spring return) — S
- SOLENOID ACTUATOR

LINETYPES

	EXISTING	NEW
MAIN PROCESS FLOW PATH		
STORAGE/BYPASS FLOW		
STRUCTURES		
EQUIPMENT/PIPING		
FUTURE EQUIPMENT/PIPING		
AIR - COMPRESSED		
AIR - LOW PRESSURE		
HYDRAULIC		
HEAT TRACE/INSUL/JACKETING		

EQUIPMENT

SCHEMATIC PUMPS

- AIR DIAPHRAGM PUMP
- CENTRIFUGAL PUMP
- CHEMICAL METERING PUMP
- CHEMICAL TRANSFER PUMP
- DOUBLE DISK PUMP
- HOSE PUMP
- PLUNGER PUMP
- PROGRESSIVE CAVITY PUMP
- ROTARY LOBE PUMP
- SCREW PUMP
- SUBMERSIBLE PUMP
- VERTICAL TURBINE PUMP

SCHEMATIC BLOWERS

- BLOWER - CENTRIFUGAL
- BLOWER - POSITIVE DISPLACEMENT
- COMPRESSOR

SCHEMATIC MISCELLANEOUS

- AIR INTAKE FILTER
- CONVEYOR - SCREW
- GRINDER
- MIXER — OR
- MIXER - INLINE STATIC
- MIXING - COMPRESSED AIR — OR
- MOTOR — M

SCHEMATIC GATES

- SHEAR GATE — SG
- SLIDE GATE — SLD-XXX
- SLUICE GATE — SLG-XXX
- STOP GATE — STG-XXX
- WEIR *(straight, compound, or "v-notch weir")* — FW-XXX

FIELD INSTRUMENTS

FOR ADDITIONAL INFORMATION REFER TO INSTRUMENTATION DWG I-1

INSTRUMENTS

- FIELD PIPE MOUNTED DEVICE — XX / XXX
- FIELD MOUNTED DEVICE — LE XXA
- BUBBLE LIQUID ELEMENT — XX XXX
- CAPACITANCE OR ADMITTANCE TYPE PROBE — XX XXX
- FLOAT SWITCH — XX XXX
- GUIDED WAVE RADAR — XX XXX
- PADDLE OR LEVER TYPE PROBE — XX XXX
- RADAR LEVEL TRANSDUCER — XX XXX
- SUBMERSIBLE PRESSURE TRANSDUCER — XX XXX
- ULTRASONIC LEVEL TRANSDUCER — XX XXX

PROVIDED BY EQUIPMENT MANUFACTURER — LE XX / XXA / M

- ELEMENT TYPE (SEE TYPE LISTING BELOW)
- ELEMENT TYPE
- ELEMENT NUMBER

TYPICAL INSTRUMENTATION SYMBOL DESCRIPTION

TYPE LIST IDENTIFICATION

DO	DISSOLVED OXYGEN PROBE	P	PHOSPHORUS PROBE
NH3	AMMONIA PROBE	PC	PULL CHORD
NO2	NITRITE PROBE	PH	pH
NO3	NITRATE PROBE	TSS	TOTAL SUSPENDED SOLIDS PROBE

SCHEMATIC FLOW METER

- AVERAGING PITOT FLOW METER — FE-XXX
- MAGNETIC FLOW METER — FE-XXX M
- ORIFICE PLATE
- PARSHALL FLUME — FE-XXX
- PITOT FLOW METER — FE-XXX
- THERMAL MASS FLOW METER — FE-XXX
- TURBINE FLOW METER — FE-XXX M
- ULTRASONIC FLOW METER — FE-XXX
- VENTURI FLOW METER — FE-XXX

FLOW/CONTINUATION SYMBOLS

- CHEMICAL INJECTION — CHEMICAL IDENTIFICATION: XXX FROM PR-XX; CONTINUATION/ID TAG: XX; DRAWING NO.:
- FLOW ARROW
- TO/FROM IN-CONTRACT PIPE OR PROCESS — CONTINUATION/ID TAG: # XX-#; DRAWING NO.: XX-# #
- TO/FROM OUT-OF-CONTRACT PIPE OR PROCESS — FROM XXXX; TO XXXX

PROCESS ABBREVIATIONS - GENERAL

AE	ANALYZING ELEMENT	EL (ELEV)	ELEVATION	HB	HOSE BIBB	NO	NUMBER	SAM	SAMPLE LINE
AL	ALUMINUM	ELL	ELBOW	HBF	HOSE BIBB FLUSHING	NPT	NATIONAL PIPE THREAD	SCH	SCHEDULE
ALT	ALTERNATE	EQUIP	EQUIPMENT	HBW	HOSE BIBB WASHDOWN	NTS	NOT TO SCALE	SECT	SECTION
BF	BLIND FLANGE	EXIST (EX)	EXISTING	HDPE	HIGH DENSITY POLYETHYLENE	NV	NEEDLE VALVE	SHT	SHEET
BLDG	BUILDING	EXP	EXPANSION	HP	HIGH POINT	OC	ON CENTER	SMH	SANITARY SEWER MANHOLE
BOT	BOTTOM	FC	FLUSHING CONNECTION	HYD	HYDRANT	OD	OUTSIDE DIAMETER	SP	SUMP PUMP
CAR	CARRIER PIPE	FD	FLOOR DRAIN	ID	INSIDE DIAMETER	ODOR	ODOR CONTROL DUCT	SPD	SUMP PUMP DISCHARGE
CI	CAST IRON	FE	FLOW ELEMENT	IND	INDUSTRIAL	OH	OVERHEAD	SQ	SQUARE
CIP	CLEAN-IN-PLACE	FFE	FINISHED FLOOR ELEVATION	INL	INLET	OUT	OUTLET	SS	STAINLESS STEEL
CO	CLEANOUT	FLG	FLANGE	INSTR	INSTRUMENT	PAC	POWDER ACTIVATED CARBON	STD	STANDARD
CON	CONTAINMENT PIPE	FLR	FLOOR	INV	INVERT	PCCP	PRESTRESSED CONCRETE CYLINDER PIPE	STL	STEEL
CONC	CONCRETE	FOT	FLAT ON TOP	JT	JOINT			THK	THICKNESS
CONT	CONTINUED	FP	FIRE PROTECTION	LE	LEVEL ELEMENT	PE	POLYETHYLENE OR PRESSURE ELEMENT	TK	TANK
CPL	COUPLING	FPHB	FROST PROOF HOSE BIBB	LR	LONG RADIUS			TYP	TYPICAL
DET	DETAIL	FRP	FIBERGLASS REINFORCED PLASTIC	MAX	MAXIMUM	PP	POLYPROPYLENE	UV	ULTRAVIOLET
DI	DUCTILE IRON	FS	FLOW SWITCH	MECH	MECHANICAL	PS	PRESSURE SWITCH	VERT	VERTICAL
DIA (Ø)	DIAMETER	FW	FIXED WEIR (WW)	MFG	MANUFACTURER	PVC	POLYVINYL CHLORIDE	WSE	WATER SURFACE ELEVATION
DIM	DIMENSION	GA	GAUGE	MH	MANHOLE	RCP	REINFORCED CONCRETE PIPE	XP	EXPLOSION PROOF
DMH	DRAIN MANHOLE	GAC	GRANULAR ACTIVATED CARBON	MIN	MINIMUM	RED	REDUCER	YH	YARD HYDRANT
DN	DOWN	GAL	GALLON	MJ	MECHANICAL JOINT	RES	RESIDUALS		
DWG	DRAWING	GALV	GALVANIZED	MTD	MOUNTED	REQ'D	REQUIRED		
ECC	ECCENTRIC	GR	GREASE	NIC	NOT IN CONTRACT	RD	ROOF DRAIN/ROOF DRAINAGE PIPING		

PROCESS ABBREVIATIONS - FLUID

A	AIR (LOW PRESSURE)	DGSL	DIGESTER SLUDGE	GTSL	GRAVITY THICKENER SLUDGE	PCI	PRIMARY CLARIFIER INFLUENT	SL	SLUDGE
AC	AIR (COMPRESSED)	DGSR	DIGESTER SLUDGE RECIRCULATION	HCL	HYDROCHLORIC ACID - HYDROGEN CHLORIDE GAS	PER	POTASSIUM PERMANGANATE	SPC	SUPPLEMENTAL CARBON (NOT METHANOL/ NOT XP)
AI	AIR (INSTRUMENT/PNEUMATIC)	DGST	DIGESTER SLUDGE TRANSFER			PHOS	PHOSPHATE		
ALUM	ALUMINUM SULFATE	DPOL	DILUTED POLYMER	HSL	HUMUS SLUDGE	POL	POLYMER (NEAT)	SPD	SUMP PUMP DISCHARGE
AM	AMMONIA SOLUTION	DR	DRAIN	HW	HOT WATER	PRW	PROCESS WATER (NON-POTABLE WATER)	SUL	SULFURIC ACID
ATE	AERATION TANK EFFLUENT	DSL	DEWATERING SLUDGE	HYP	SODIUM HYPOCHLORITE			SUP	SUPERNATANT
ATI	AERATION TANK INFLUENT	EFF	EFFLUENT (FINAL)	INF	INFLUENT	PSL	PRIMARY SLUDGE	SW	SEAL WATER
BIS	SODIUM BISULFITE	EFW	EFFLUENT FLUSHING WATER	IR	INTERNAL RECYCLE	PSLS	PRIMARY SLUDGE SAMPLE	TBSL	THICKENED BLENDED SLUDGE
BSL	BLENDED SLUDGE	F	FLUORIDE (SODIUM FLUORIDE)	ISS	INFLUENT SEWAGE SAMPLE	PTE	PRELIMINARY TREATMENT EFFLUENT	TE	TERTIARY EFFLUENT
BW	BACKWASH	FCE	FINAL CLARIFIER EFFLUENT	JW	JACKET WATER	PW	PLANT WATER	TFI	TRICKLING FILTER INFLUENT
BWW	BELT WASHWATER OR BACKWASH WASTE	FCI	FINAL CLARIFIER INFLUENT	KOH	POTASSIUM HYDROXIDE	REC	RECYCLE	TFE	TRICKLING FILTER EFFLUENT
CEN	CENTRATE	FECL	FERRIC CHLORIDE	LOX	LIQUID OXYGEN	REJ	REJECT WATER	TFR	TRICKLING FILTER RECIRCULATION
CIT	CITRIC ACID	FES	FINAL EFFLUENT SAMPLE	LS	LIME SLURRY	RSL	RETURN SLUDGE	TI	TERTIARY INFLUENT
CIW	CHLORINE INJECTOR WATER	FIL	FILTRATE	METH	METHANOL (XP)	RW	RAW WATER	TPSL	THICKENED PRIMARY SLUDGE
CLO2	CHLORINE DIOXIDE	FM	FORCE MAIN	ML	MIXED LIQUOR	S	SEWER	TSL	TERTIARY SLUDGE
CLS	CHLORINE SOLUTION (FROM CHLORINE GAS)	FSW	FOAM SPRAY WATER	MR	MICROSAND RECYCLE	SA	SODIUM ALUMINATE	TW	TEMPERED WATER
		FTW	FILTER TO WASTE	MS	MAGNESIUM HYDROXIDE SLURRY	SAN	SANITARY WASTE	TWSL	THICKENED WASTE SLUDGE
CO2	CARBON DIOXIDE	FW	FINISH WATER (W)	N	NITROGEN	SC	SCUM	UD	UNDERDRAIN
CRS	CHLORINE RESIDUAL SAMPLE	G	GAS	NAOH	SODIUM HYDROXIDE	SCD	SCUM DECANT	UW	UTILITY WATER
CSL	COSETTLED SLUDGE	GCE	GRIT CHAMBER EFFLUENT	NG	NATURAL GAS	SCE	SECONDARY CLARIFIER EFFLUENT	V	VENT
DCT	DECANT	GCES	GRIT CHAMBER EFFLUENT SAMPLE	NIT	NITRIC ACID	SCI	SECONDARY CLARIFIER INFLUENT	W	WATER - POTABLE
DEF	DEFOAMER	GT	GRIT	O3	OZONE	SCS	SCUM SAMPLE	WSL	WASTE SLUDGE
DGG	DIGESTER GAS	GTDW	GRAVITY THICKENER DILUTION WATER	OFL	OVERFLOW	SD	STORM DRAIN	WSS	WASTE SLUDGE SAMPLE
DGS	DIGESTER SUPERNATANT	GTO	GRAVITY THICKENER OVERFLOW	PACL	POLY-ALUMINUM CHLORIDE	SEP	SEPTAGE		
				PCE	PRIMARY CLARIFIER EFFLUENT	SILI	HYDROFLUOSILICIC ACID		

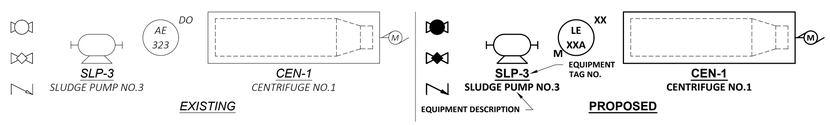
PROCESS ABBREVIATIONS - ACTUATING CONTROL VALVES

ACV	ANALYSIS CONTROL VALVE	LCV	LEVEL CONTROL VALVE	TCV	TEMPERATURE CONTROL VALVE
FCV	FLOW CONTROL VALVE	PCV	PRESSURE CONTROL VALVE	SV	SOLENOID VALVE

PROCESS ABBREVIATIONS - EQUIPMENT/STRUCTURES/TANKAGE

***T	*** CHEMICAL TANK	DSTP-#	DIGESTER SLUDGE TRANSFER	HYPP-#	SODIUM HYPOCHLORITE PUMP NO.__	POLP-#	POLYMER (NEAT) PUMP NO.__	SLSC-#	SLUDGE SCREW CONVEYOR NO.__
***T	*** CHEMICAL TANK	DTB-#	DIGESTER BLOWER NO.__	HYPT-#	SODIUM HYPOCHLORITE TANK NO.__	POLT-#	POLYMER (NEAT) TANK NO.__	SLTB-#	SLUDGE TANK BLOWER NO.__
AB-#	AERATION (DIFFUSED BUBBLE OR PACKED TOWER) BLOWER NO.__	ECB-#	EFFLUENT CHANNEL BLOWER NO.__	I-#	INCINERATOR NO.__	PSLG-#	PRIMARY SLUDGE GRINDER NO.__	SLTP-#	DEWATERED SLUDGE TRANSFER PUMP NO.__
ABS-#	AUTOMATIC BASKET STRAINER NO.__	ED-#	EDUCTOR NO.__	IEQP-#	INFLUENT EQUALIZATION PUMP NO.__	PSLP-#	PRIMARY SLUDGE PUMP NO.__		
AGT-#	AERATED GRIT TANK NO.__	EEQP-#	EFFLUENT EQUALIZATION PUMP NO.__	INFG-#	INFLUENT GRINDER NO.__	PSP-#	PUMP STATION NO.__	SMX-#	STATIC MIXER (IN-LINE) NO.__
ALUMP-#	ALUMINUM SULFATE PUMP NO.__	EFFP-#	EFFLUENT PUMP NO.__	INFP-#	INFLUENT PUMP NO.__	PT-#	POLYMER TOTE NO.__	SP-#	SUMP PUMP NO.__
AMP-#	AMMONIA SOLUTION PUMP NO.__	EFWP-#	EFFLUENT FLUSHING WATER PUMP NO.__	IRP-#	INTERNAL RECYCLE PUMP NO.__	PTA-#	PACKED TOWER AERATION NO.__	SPCP-#	SUPPLEMENTAL CARBON (NON-METHANOL/ NON-XP) PUMP NO.__
AMX-#	AERATOR-MIXER NO.__	FECLP-#	FERRIC CHLORIDE PUMP NO.__	ISC-#	INTAKE SCREEN (WATER) NO.__	PTMX-#	POLYMER TOTE MIXER NO.__		
AS-X	AUTOMATIC SAMPLER NO.__	FIL-#	FILTER NO.__	KOHP-#	POTASSIUM HYDROXIDE PUMP NO.__	PTP-#	PROCESS TRANSFER PUMP NO.__	SRU-#	SEPTAGE RECEIVING UNIT NO.__
ASMX-#	ACTIVATED SLUDGE MIXER NO.__	FILP-#	FILTRATE PUMP NO.__	LSMX-#	LIME SLURRY MIXER NO.__	PWP-#	PLANT WATER PUMP NO.__	SULP-#	SULFURIC ACID PUMP NO.__
ATB-#	AERATION TANK BLOWER NO.__	FMX-#	FLOC MIXER NO.__	LSP-#	LIME SLURRY PUMP NO.__	RDT-#	ROTARY DRUM THICKENER NO.__	SWP-#	SCREENINGS WASH PRESS NO.__
BC-#	BELT CONVEYOR (NON-SLUDGE) NO.__	FP-#	FLUORIDE (SODIUM FLUORIDE) PUMP NO.__	MBR-#	MANUAL BAR RACK NO.__	RECP-#	RECYCLE PUMP NO.__	TCL-#	TERTIARY CLARIFIER MECHANISM/DRIVE NO.__
BFP-#	BELT FILTER PRESS NO.__	FP-#	HYDROFLUOSILICIC ACID PUMP NO.__	METH-#	METHANOL (XP) PUMP NO.__	RESP-#	RESIDUALS PUMP NO.__	TDP-#	TANK DRAIN PUMP NO.__
BISP-#	SODIUM BISULFITE PUMP NO.__	FRL-#	FILTER-REGULATOR-LUBRICATOR NO.__	MPP-#	MEMBRANE PERMEATE PUMP NO.__	RMX-#	RAPID MIXER (CHEMICAL) NO.__	TFD-#	TRICKLING FILTER DISTRIBUTOR MECHANISM/DRIVE NO.__
BP-#	BOOSTER PUMP NO.__	FSWP-#	FOAM SPRAY WATER NO.__	MRP-#	MICROSAND RECYCLE PUMP NO.__	RP-#	ROTARY PRESS NO.__	TPSP-#	THICKENED PRIMARY SLUDGE PUMP NO.__
BWP-#	BACKWASH PUMP NO.__	FWP-#	FINISHED WATER PUMP NO.__	MSMX-#	MAG HYDROXIDE SLURRY MIXER NO.__	RSC-#	ROTATING SCUM COLLECTOR NO.__		
CA-#	COMPRESSOR-AIR (HIGH PRESSURE) NO.__	GBT-#	GRAVITY BELT THICKENER NO.__	MSP-#	MAGNESIUM HYDROXIDE SLURRY NO.__	RSLP-#	RETURN SLUDGE PUMP NO.__	TR-#	TURBINE NO.__
CEN-#	CENTRIFUGE NO.__	GCHS-#	GANTRY CRANE HOIST SYSTEM NO.__	NAOHP-#	SODIUM HYDROXIDE PUMP NO.__	RT-#	ROCK TRAP NO.__	TRX-#	TRANSFORMER NO.__
CENP-#	CENTRATE PUMP NO.__	GF-#	GAS FLARE NO.__	NITP-#	NITRIC ACID PUMP NO.__	RWP-#	RAW WATER PUMP NO.__	TSLP-#	TERTIARY SLUDGE PUMP NO.__
CG-#	COMPRESSOR-GAS (HIGH PRESSURE) NO.__	GSC-#	GRIT SCREW CONVEYOR NO.__	OCF-#	ODOR CONTROL FAN NO.__	SAP-#	SODIUM ALUMINATE PUMP NO.__	TSMX-#	THICKENED SLUDGE MIXER NO.__
CITP-#	CITRIC ACID PUMP NO.__	GTB-#	GRIT TANK BLOWER NO.__	OCRP-#	ODOR CONTROL RECIRCULATION PUMP NO.__	SC-#	SCREW CONVEYOR (NON-SLUDGE) NO.__	TWSG-#	THICKENED WASTE SLUDGE GRINDER NO.__
DBA-#	DIFFUSED BUBBLE AERATION (LOWRY-TYPE, TANK) NO.__	GTC-#	GRIT CLASSIFIER NO.__	OCS-#	ODOR CONTROL SYSTEM NO.__	SCDP-#	SCUM DRAIN PUMP NO.__	TWSP-#	THICKENED WASTE SLUDGE PUMP NO.__
DC-#	DRYER/CHILLER NO.__	GTCY-#	GRIT CYCLONE NO.__	PACLP-#	POLYALUMINUM CHLORIDE PUMP NO.__	SCFP-#	SCUM FINAL PUMP NO.__	UWP-#	UTILITY WATER PUMP NO.__
DCT-#	DECANTER NO.__	GTMX-#	GRIT MIXER (VORTEX UNIT) NO.__	PACP-#	POWDERED ACTIVATED CARBON PUMP NO.__	SCL-#	SECONDARY CLARIFIER MECHANISM/DRIVE NO.__	UV-#	ULTRAVIOLET LIGHT DISINFECTION NO.__
DFP-#	DEWATERING FEED PUMP NO.__	GTP-#	GRIT PUMP NO.__	PBU-#	POLYMER BLENDING UNIT NO.__	SCP-#	SCUM PIT NO.__	WSLG-#	WASTE SLUDGE GRINDER NO.__
DPMX-#	DILUTE POLYMER MIXER NO.__	GTR-#	GRAVITY THICKENER MECHANISM/DRIVE NO.__	PCL-#	PRIMARY CLARIFIER MECHANISM/DRIVE NO.__	SCPP-#	SCUM PRIMARY PUMP NO.__	WSLP-#	WASTE SLUDGE PUMP NO.__
DPOLP-#	DILUTE POLYMER PUMP NO.__	GTW-#	GRIT WASHER NO.__	PERP-#	POTASSIUM PERMANGANATE PUMP NO.__	SCR-#	MECHANICAL SCREEN NO.__	WSMX-#	WASTE SLUDGE MIXER NO.__
DPOLT-#	DILUTE POLYMER TANK NO.__	HCLP-#	HYDROCHLORIC ACID PUMP NO.__	PFP-#	PLATE AND FRAME PRESS NO.__	SCSP-#	SCUM SECONDARY PUMP NO.__	WSTP-#	WASTE SLUDGE TRANSFER PUMP NO.__
DSLG-#	DEWATERING SLUDGE GRINDER NO.__	HOP-#	HYDRAULIC OIL PUMP NO.__	PHOSP-#	PHOSPHATE PUMP NO.__	SEPB-#	SEPTAGE TANK BLOWER NO.__		
DSLP-#	DEWATERING SLUDGE PUMP NO.__	HSLP-#	HUMUS SLUDGE PUMP NO.__			SEPP-#	SEPTAGE PUMP NO.__	WWBP-#	WASH WATER BOOSTER PUMP NO.__
DSRP-#	DIGESTER SLUDGE PUMP NO.__	HYDT-#	HYDROPNEUMATIC TANK NO.__			SLBC-#	SLUDGE BELT CONVEYOR NO.__	YWP-#	YARD WASTE PUMP NO.__
						SLC-#	SLUDGE COLLECTOR NO.__		
						SLG-#	SLUDGE GRINDER NO.__		
						SLP-#	SLUDGE PUMP NO.__		

EXISTING VS. PROPOSED IDENTIFICATION



AS IDENTIFIED IN THE PROCESS GENERAL NOTES, CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. EXISTING VALVES DO NOT HAVE A FILL ASSOCIATED WITH THEM. REFER TO EXAMPLES IN THIS BOX.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — STEVEN CHARLES HALLOWELL — License No. Pe0046278 — PROFESSIONAL ENGINEER — 2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROCESS LEGEND AND ABBREVIATIONS

PROJECT NO: 21163	DESIGNED BY: W.EDGERTON	DR. A.COUTURE	PR-00-002
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
		CK. D.STILES	
CAD COORD: A.COUTURE	SCALE: AS NOTED	AP. S.HALLOWELL	DWG. No. 12221-W-33
	DATE: FEBRUARY 2026	SET NO.	SHEET NO. OF

J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\21163-PRS-LEGEND.DWG | Legend | 1:10.12364677 | — | 2/12/2026 3:55:19 PM | ADAM.COUTURE

LAST SAVED BY: ADAM.COUTURE 4/16/2025 3:53 PM

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RAS
RAS
RAS
RAS
RAS
RAS

INFLUENT
FE-XXX
M
INFLUENT
FE-XXX
M
INFLUENT
FE-XXX
M

HEADWORKS

RAW INFLUENT CHANNEL (WEST)
RAW INFLUENT CHANNEL (EAST)

OXYGEN REACTORS

MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR
MIXED LIQUOR

SCUM STORAGE TANK
SECONDARY CLARIFER NO.8 SCL-8
EFFLUENT
RAS
MIXED LIQUOR
MIXED LIQUOR

SECONDARY CLARIFER NO.6 SCL-6
SCUM STORAGE TANK
SC
RAS
EFFLUENT
EFFLUENT

MIXED LIQUOR
SECONDARY CLARIFER NO.4 SCL-4
SCUM STORAGE TANK
SC
RAS
SODIUM HYPO
MIXED LIQUOR
MIXED LIQUOR

MIXED LIQUOR
SECONDARY CLARIFER NO.2 SCL-2
SCUM STORAGE TANK
SC
RAS
EFFLUENT

EFFLUENT CHANNEL

SCUM STORAGE TANK
SECONDARY CLARIFER NO.7 SCL-7
SC
EFFLUENT
EFFLUENT
RAS
RAS
RAS

SECONDARY CLARIFER NO.5 SCL-5
SCUM STORAGE TANK
SC
EFFLUENT
EFFLUENT
RAS

SECONDARY CLARIFER NO.3 SCL-3
SCUM STORAGE TANK
SC
RAS
RAS
RAS

SECONDARY CLARIFER NO.1 SCL-1
SCUM STORAGE TANK
SC
RAS
EFFLUENT
EFFLUENT

NORTH RAS PUMP STATION
RSLP-10
RSLP-9
RSLP-8
RSLP-7
RSLP-6
RAS PUMPS
RAS
RAS
RAS
M FE-5220
WAS

THICKENED SLUDGE STORAGE TANK AND WAS STORAGE TANK

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT IB - SOLIDS HANDLING UPGRADE

SOUTH RAS PUMP STATION
RSLP-5
RSLP-4
RSLP-3
RSLP-2
RSLP-1
RAS PUMPS
RAS
RAS
RAS
WAS

66" EFF (FM)
TO MISSISSIPPI RIVER

THICKENED SLUDGE STORAGE TANK AND WAS STORAGE TANK
WAS
66" EFF (FM)

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT IB - SOLIDS HANDLING UPGRADE

EFFP-1
EFFP-2
EFFP-3
EFFP-4
EFFP-5
FE-XXX
M
EFFLUENT PUMP STATION

TWSL
SLUDGE THICKENING AND DEWATERING
SOLIDS INCINERATOR
ASH DISPOSAL DRYING BEDS
DEWATERED SLUDGE TO LANDFILL

FORMER SEDIMENTATION BASINS
SCUM STORAGE TANK
SC
SECONDARY CLARIFERS (NO.1-NO.8)
TWSL
THICKENED SLUDGE STORAGE TANK
WAS STORAGE TANK
WAS
WAS
NORTH AND SOUTH RAS PUMP STATIONS

LIQUID SLUDGE WEST BANK STP
SEPTAGE DELIVERY TRUCK
LIQUID SLUDGE/SEPTAGE RECEIVING FACILITY
FE-6820
M
SEP

SCOPE OF WORK TO BE PERFORMED UNDER SEPARATE CONTRACT IB - SOLIDS HANDLING UPGRADE

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

OVERALL PROCESS FLOW SCHEMATIC

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
12/12/2026

WRIGHT-PIERCE
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DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

PR-00-003

DWG. No. 12221-W-33

SET NO. | SHEET NO. | OF

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RAW SEWAGE CHANNEL NO.2 (WEST)

PR-00-005 B — TO OXYGEN REACTORS

RAW SEWAGE CHANNEL NO.1 (EAST)

PR-00-005 A — TO OXYGEN REACTORS

T PR-00-008 — 30" RAS — FROM NORTH RAS PUMP STATION

U PR-00-008 — 30" RAS — FROM SOUTH RAS PUMP STATION

30" RAS — 30" — 30" RAS — 4" QUICK CONNECT — 24" RAS — 24" — 30"x24" — 4" QUICK CONNECT — 12" BF

6" GT — PR-00-006 I — TO GRIT CLASSIFIERS

10" A — TO RAW SEWAGE CHANNELS

6" GT — PR-00-006 H — TO GRIT CLASSIFIERS

6" GT — PR-00-006 G — TO GRIT CLASSIFIERS

6" GT — PR-00-006 F — TO GRIT CLASSIFIERS

6" GT — PR-00-006 E — TO GRIT CLASSIFIERS

6" GT — PR-00-006 D — TO GRIT CLASSIFIERS

COMMON EFFLUENT CHANNEL

SLD-XXX

FW-XXX

2" A

10" A

6" GT

4" GR

BC-1
GRIT AND SCREENINGS BELT CONVEYOR

SCREENINGS

WASHED GT

II PR-00-006 — FROM GRIT WASHER NO.3

HH PR-00-006 — FROM GRIT WASHER NO.2

GG PR-00-006 — FROM GRIT WASHER NO.1

SCR-6
MECHANICAL SCREEN NO.6

SCR-5
MECHANICAL SCREEN NO.5

SCR-4
MECHANICAL SCREEN NO.4

SCR-3
MECHANICAL SCREEN NO.3

SCR-2
MECHANICAL SCREEN NO.2

SCR-1
MECHANICAL SCREEN NO.1

COMMON INFLUENT CHANNEL

STG-XXX

CHANNEL

48" FM (INFLUENT)

FF PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.6

EE PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.5

DD PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.4

CC PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.3

KK PR-00-006 — 3" SPD — FROM SUMP PUMP NO.X

JJ PR-00-006 — 3" SPD — FROM SUMP PUMP NO.X

RR PR-00-007 — 6" SC — FROM SCUM STORAGE TANK

36" FM (INFLUENT)

BB PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.2

AA PR-00-006 — 12" DR — FROM GRIT CYCLONE NO.1

54" FM (INFLUENT)

S PR-00-005 — 4" GR — FROM CLARIFIERS

R PR-00-005 — 4" GR — FROM CLARIFIERS

FROM AIR BLOWERS

GSC-6
GRIT SCREW

AERATED GRIT BASIN NO.6

GSC-5
GRIT SCREW

AERATED GRIT BASIN NO.5

GSC-4
GRIT SCREW

AERATED GRIT BASIN NO.4

GSC-3
GRIT SCREW

AERATED GRIT BASIN NO.3

AERATED GRIT BASIN NO.2

AERATED GRIT BASIN NO.1

3" A — 6" A — 6" GT

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe046278
PROFESSIONAL ENGINEER
2/12/2026

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PROCESS FLOW SCHEMATICS I

DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

PR-00-004

DWG. No. 12221-W-33

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NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "A","B", AND "C" ITEMS DESCRIBED IN SPECIFICATION SECTION 01100 - ALTERNATIVES.

SHEET CONTAINS BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

PROCESS FLOW SCHEMATICS II

PR-00-005

DWG. No. 12221-W-33

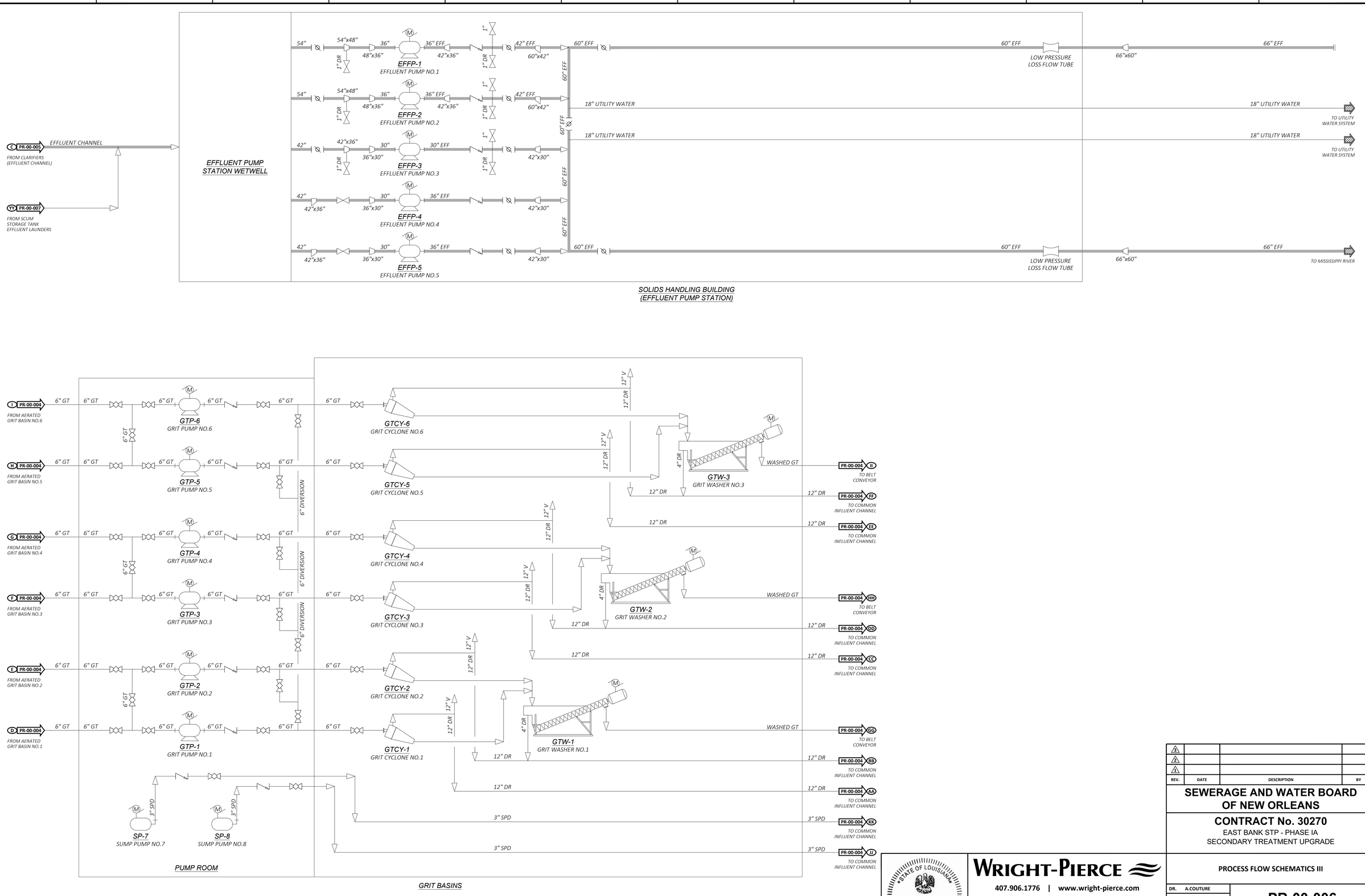
STEVEN CHARLES HALLOWELL
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STATE OF LOUISIANA
2/12/2026

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PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR.	A.COUTURE
TRC.	-
CK.	D.STILES
AP.	S.HALLOWELL
SCALE:	AS NOTED
DATE:	FEBRUARY 2026
SET NO.	SHEET NO. OF

LAST SAVED BY: ADAM.COUTURE 2/5/2026 8:32 AM



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2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

PROCESS FLOW SCHEMATICS III

STATE OF LOUISIANA
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2/12/2026

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DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

PR-00-006

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

J:\ENG\LA\NEWORLEANS\12163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\12163-PRS-SCHEMATICS.DWG | PR-00-006 | 1:10.12364677 | — | 2/12/2026 3:55:35 PM | ADAM.COUTURE

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J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\21163-PRS-SCHEMATICS.DWG | PR-00-007 | 1:10.12364677 | — | 2/12/2026 3:55:36 PM | ADAM.COUTURE

4" SPD
6" SC
SCDP-2
SCUM DRAIN PUMP NO.2
SCDP-1
SCUM DRAIN PUMP NO.1
(RELOCATED)
6" SEP
8" WAS
12" FIL
8" OFL
8" TWSL
3" UW
3"x2"
2" DPOL
8" WAS
10"x8"
8"x6"
8"x4"
2"
66" MIXED LIQUOR
48" MIXED LIQUOR
(ABANDONED)
FW
FWFW
PR-00-004
FROM OXYGEN REACTORS
BF
PR-00-008
FROM LIQUID SLUDGE/SEPTAGE RECEIVING FACILITY
FROM NORTH RAS PUMP STATION
FROM SOUTH RAS PUMP STATION WAS PUMPS
BF/FC
BASE BID COMPONENTS
FROM UTILITY WATER SYSTEM
TO EFFLUENT CHANNEL
TO GRIT BASIN NO.3
TO SOLIDS HANDLING BUILDING
MANUFACTURER SUPPLIED EQUIPMENT
TWSL
MIXED LIQUOR CHANNEL (ABANDONED)
SCUM STORAGE TANK
(FORMER SEDIMENTATION BASIN NO.2)
(FORMER SEDIMENTATION BASIN NO.1)
THICKENED SLUDGE STORAGE TANK
WAS STORAGE TANK
THICKENED SLUDGE PUMP GALLERY
(FORMER PUMP GALLERY)
SLD-1
MOV-6640
MOV-6641
MOV-6665
MOV-6666
MOV-6667
MOV-6668
PS 6640
PS 6641
LE 6640
LSHH 6640
ZS 6640A
ZS 6640B
ZS 6640C
HS 6640B
LE 6641
LSHH 6641
ZS 6641A
ZS 6641B
ZS 6641C
HS 6641B
LE 6660
LSLL 6660
LSHH 6660
LE 6670
LSLL 6670
LSHH 6670
FE-6620
FE-6621
FE-6686
FE-6687
PSL 6630
PSH 6630
PSL 6631
PSH 6631
PSL 6685A
PSH 6685
PSL 6684A
PSH 6684
PSL 6683A
PSH 6683
SV-6685
SV-6684
SV-6683
SEAL WATER
HOP-1 HYDRAULIC OIL PUMP NO.1
HOP-2 HYDRAULIC OIL PUMP NO.2
GBT-1 GRAVITY BELT THICKENER NO.1
GBT-2 GRAVITY BELT THICKENER NO.2
WWBP-1 WASH WATER BOOSTER PUMP NO.1
WWBP-2 WASH WATER BOOSTER PUMP NO.2
SP-5 SUMP PUMP NO.5
SP-6 SUMP PUMP NO.6
TSMX-1 THICKENED SLUDGE MIXER NO.1
TSMX-2 THICKENED SLUDGE MIXER NO.2
TSMX-3 THICKENED SLUDGE MIXER NO.3
TSMX-4 THICKENED SLUDGE MIXER NO.4
WSMX-1 WASTE SLUDGE MIXER NO.1
WSMX-2 WASTE SLUDGE MIXER NO.2
WSTP-1 WASTE SLUDGE TRANSFER PUMP NO.1
WSTP-2 WASTE SLUDGE TRANSFER PUMP NO.2
WSTP-3 WASTE SLUDGE TRANSFER PUMP NO.3
TWSG-3 THICKENED WASTE SLUDGE GRINDER NO.3 (RELOCATED)
TWSG-2 THICKENED WASTE SLUDGE GRINDER NO.2 (RELOCATED)
TWSG-1 THICKENED WASTE SLUDGE GRINDER NO.1 (RELOCATED)
TWSP-3 THICKENED WASTE SLUDGE PUMP NO.3
TWSP-2 THICKENED WASTE SLUDGE PUMP NO.2
TWSP-1 THICKENED WASTE SLUDGE PUMP NO.1

NOTES:

1. THIS WORK ON THIS SHEET TO BE SUPPLIED AND INSTALLED BY OWNER/OPERATOR EXCEPT FOR THE 8" WAS TO FORMER SEDIMENTATION BASINS.
2. ALL OTHER WORK NOTED ON THIS SHEET, OTHER THAN IDENTIFIED BASE BID SCOPE OF WORK, WILL BE PREFORMED UNDER SEPARATE CONTRACT IB SOLIDS HANDLING UPGRADE.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROCESS FLOW SCHEMATICS IV

DR.	A.COUTURE
TRC.	-
CK.	D.STILES
AP.	S.HALLOWELL
PROJECT NO:	21163
DESIGNED BY:	W.EDGERTON
SUBMISSION:	CONTRACT DRAWINGS
SCALE:	AS NOTED
CAD COORD:	A.COUTURE
DATE:	FEBRUARY 2026

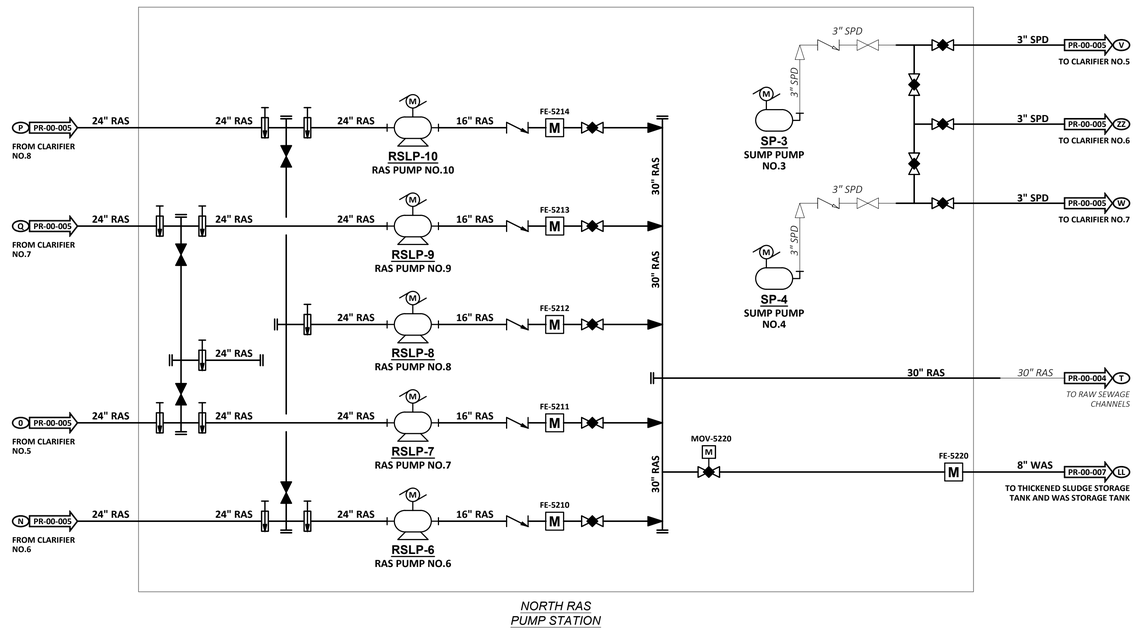
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DWG. No. 12221-W-33

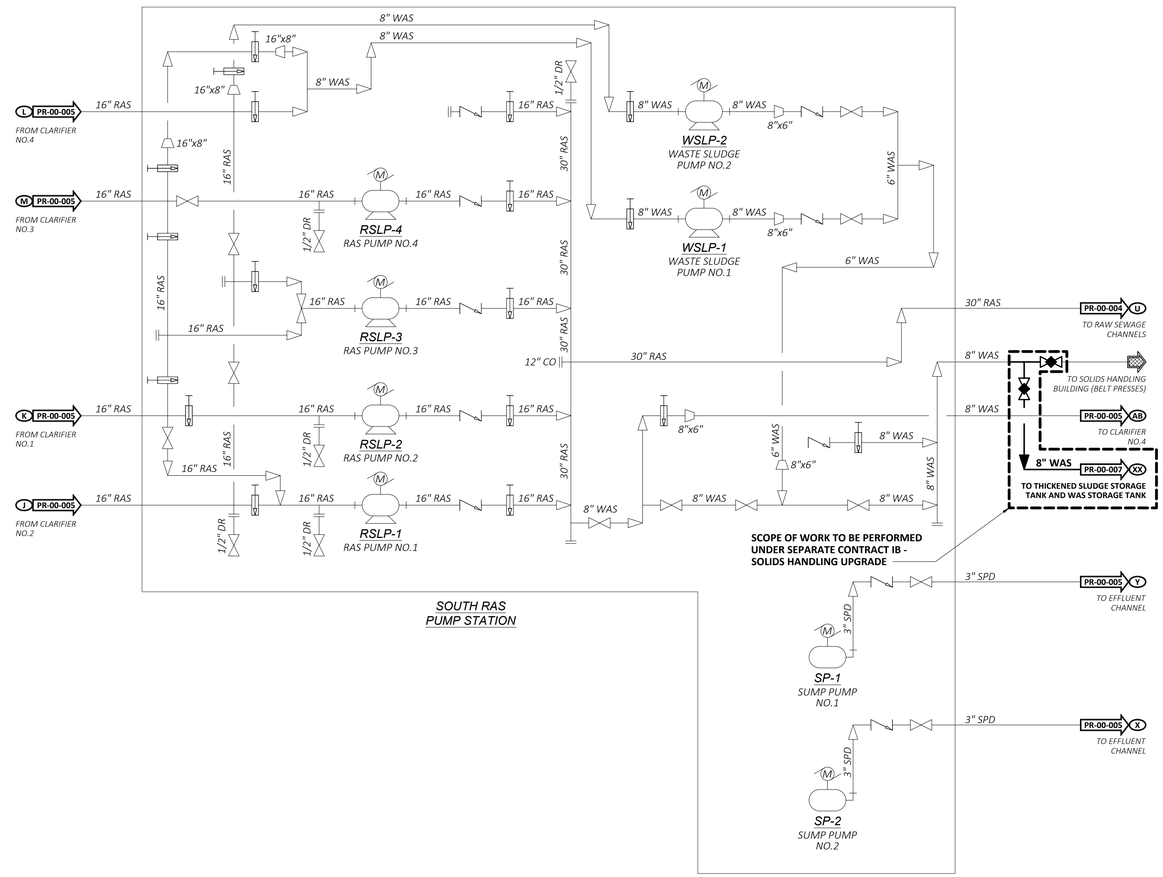
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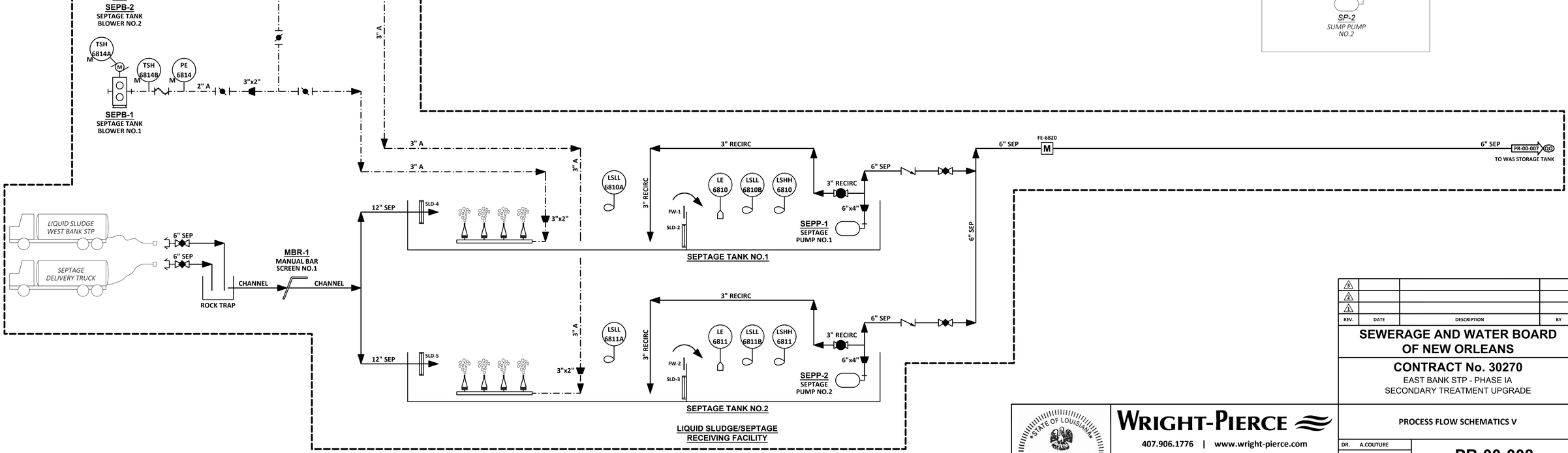
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NORTH RAS PUMP STATION



SOUTH RAS PUMP STATION



REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
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2/12/2026

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PROCESS FLOW SCHEMATICS V

DR.	A.COUTURE
TRC.	-
CK.	D.STILES
AP.	S.HALLOWELL
SCALE:	AS NOTED
DATE:	FEBRUARY 2026

PROJECT NO: 21163 | DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

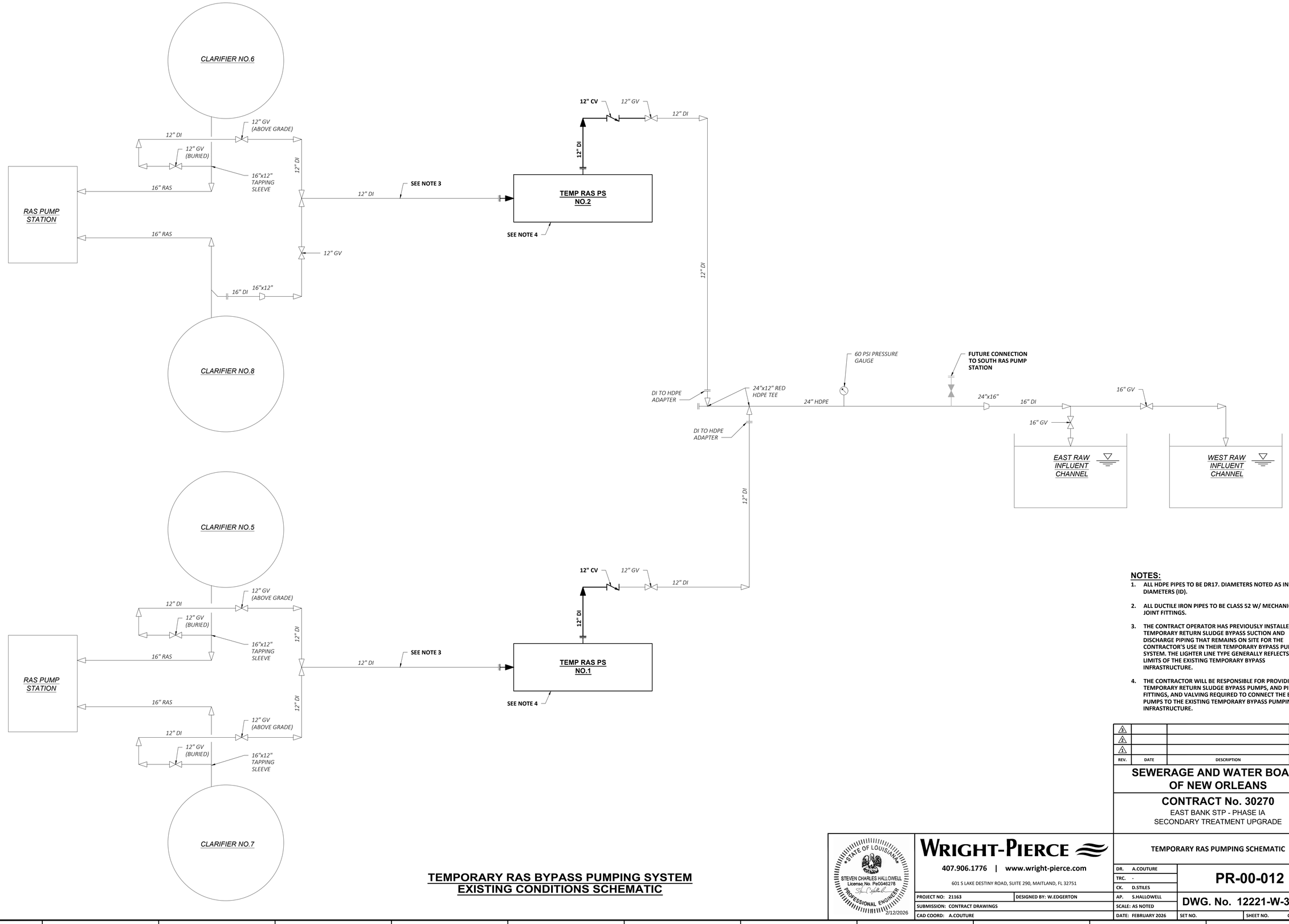
PR-00-008

DWG. No. 12221-W-33

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TEMPORARY RAS BYPASS PUMPING SYSTEM EXISTING CONDITIONS SCHEMATIC

NOTES:

1. ALL HDPE PIPES TO BE DR17. DIAMETERS NOTED AS INSIDE DIAMETERS (ID).
2. ALL DUCTILE IRON PIPES TO BE CLASS 52 W/ MECHANICAL JOINT FITTINGS.
3. THE CONTRACT OPERATOR HAS PREVIOUSLY INSTALLED TEMPORARY RETURN SLUDGE BYPASS SUCTION AND DISCHARGE PIPING THAT REMAINS ON SITE FOR THE CONTRACTOR'S USE IN THEIR TEMPORARY BYPASS PUMPING SYSTEM. THE LIGHTER LINE TYPE GENERALLY REFLECTS THE LIMITS OF THE EXISTING TEMPORARY BYPASS INFRASTRUCTURE.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING TEMPORARY RETURN SLUDGE BYPASS PUMPS, AND PIPING, FITTINGS, AND VALVING REQUIRED TO CONNECT THE BYPASS PUMPS TO THE EXISTING TEMPORARY BYPASS PUMPING INFRASTRUCTURE.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
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TEMPORARY RAS PUMPING SCHEMATIC

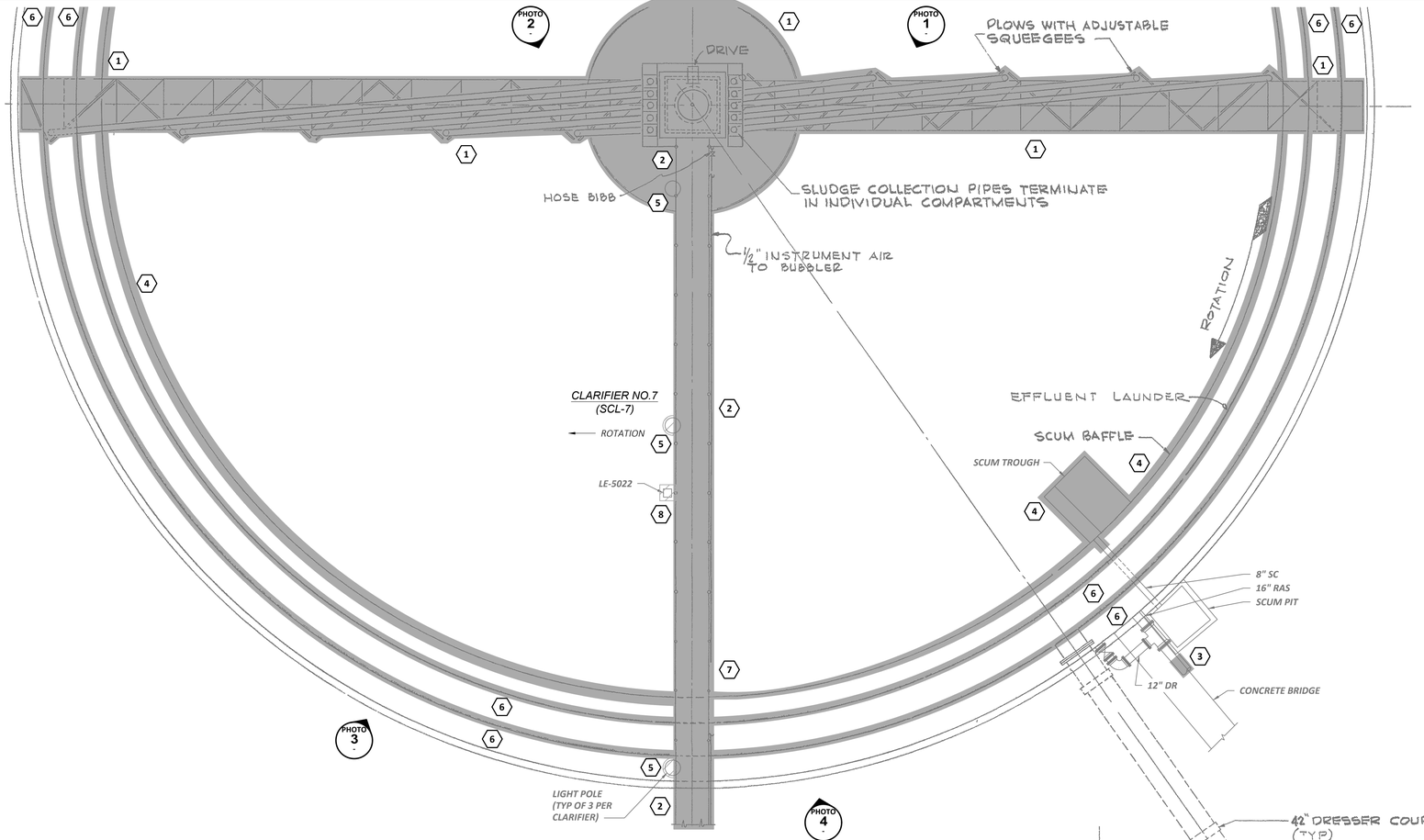
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	
DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

PR-00-012

DWG. No. 12221-W-33

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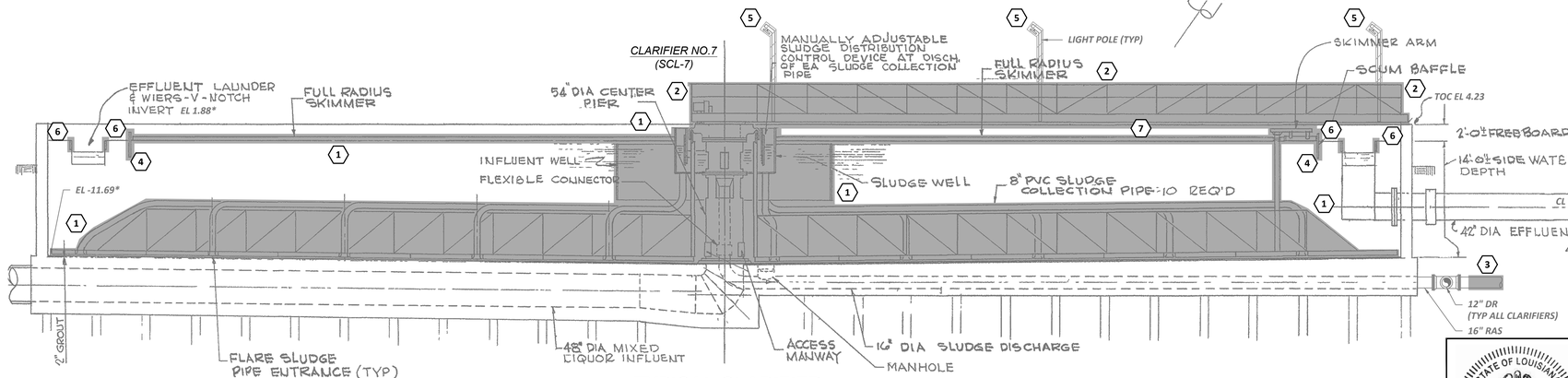
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TYPICAL CLARIFIER DEMOLITION PLAN (NO.6, 7, & 8)

SCALE: "SCANNED" (APPROXIMATELY: 1/8"=1'-0")

NOTE: CLARIFIER COMPONENTS ARE ROTATED FOR CLARITY.



TYPICAL CLARIFIER DEMOLITION SECTION (NO.6, 7, & 8)

SCALE: "SCANNED" (APPROXIMATELY: 1/8"=1'-0")

NOTE: CLARIFIER COMPONENTS ARE ROTATED FOR CLARITY.



PHOTO 1

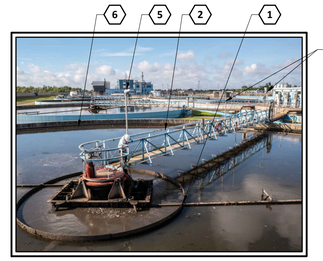


PHOTO 2



PHOTO 3



PHOTO 4

DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING CLARIFIER MECHANISM IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; RAKE ARM, DRIVE, CENTER WELL, SLUDGE WITHDRAWAL PIPING, RAKE BLADE, SCRAPPER BLADES WITH SQUEEGEE, SUPPORTS, CONDUIT, WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH THE EXISTING BRIDGE ASSEMBLY IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO; GRATING, STEEL SUPPORTS, HANDRAIL, HARDWARE, AND ALL OTHER ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING 16" RAS PIPING TO THE EXTENTS SHOWN, INCLUDING BUT NOT LIMITED TO; PIPING, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES. REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION.
4. REMOVE/DEMOLISH THE EXISTING SCUM BAFFLE IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; SCUM BAFFLE, TROUGH, SUPPORTS, PIPING, AND ALL OTHER ASSOCIATED APPURTENANCES.
5. REMOVE/REINSTALL EXISTING LIGHT POLE AND FIXTURE. EXISTING LIGHT POLE AND FIXTURE TO BE REINSTALLED AFTER NEW BRIDGE ASSEMBLY IS INSTALLED. REMOVE/DEMOLISH AND DISPOSE OF EXISTING CONDUIT, WIRE, CONTROLS, HARDWARE AND ALL ASSOCIATED APPURTENANCES FOR THE BRIDGE LIGHT POLES IN THEIR ENTIRETY.
6. REMOVE/DEMOLISH THE EFFLUENT WEIR IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; SUPPORT, HARDWARE AND ALL ASSOCIATED APPURTENANCES. LAUNDER TO REMAIN.
7. REMOVE/DEMOLISH THE EXISTING UTILITY WATER AND SUMP PUMP DISCHARGE PIPING IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; PIPING, VALVES, SUPPORTS, HARDWARE, AND ALL OTHER ASSOCIATED APPURTENANCES.
8. REMOVE/REINSTALL THE EXISTING LEVEL ELEMENT. EXISTING LEVEL ELEMENT TO BE REINSTALLED AFTER NEW BRIDGE ASSEMBLY IS INSTALLED.

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR THE CLARIFIERS DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-00-001.
3. IN GENERAL, WORK DESCRIBED IN THESE NOTES AND ON THE DRAWINGS ARE TYPICAL FOR CLARIFIERS NO.6, 7, & 8.
4. CLARIFIER COMPONENTS MAY BE ROTATED FOR CLARITY. REFER TO THE CLARIFIER OVERALL DEMOLITION PLAN FOR ADDITIONAL INFORMATION.
5. OWNER SHALL DRAIN EACH TANK AND REMOVE ALL LIQUID AND SOLIDS. ONCE DRAINED, OWNER SHALL HOSE OFF CLARIFIER MECHANISM, WALLS, LAUNDER, BASE, AND REMOVE ALL LIQUID AND SOLIDS. ONCE CLEANED, THE CONTRACTOR SHALL COMMENCE THE DEMOLITION OF THE EQUIPMENT. AFTER EQUIPMENT HAS BEEN REMOVED, ENGINEER TO INSPECT AND DETERMINE IF ANY CONCRETE STRUCTURAL REPAIRS ARE TO BE PERFORMED BY THE CONTRACTOR.
6. ALL WORK INCLUDED IN THIS SHEET FALLS UNDER BID ALTERNATES "A","B", AND "C" AS DESCRIBED IN SPECIFICATION SECTION 01100 - ALTERNATIVES.

FULL SHEET BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STEVEN CHARLES HALLOWELL
License No. Pe0046278
STATE OF LOUISIANA
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163 | DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

SECONDARY CLARIFIERS DEMOLITION PLAN AND SECTIONS

DR.	A.COUTURE
TRC.	-
CK.	D.STILES
AP.	S.HALLOWELL
SCALE:	AS NOTED
DATE:	FEBRUARY 2026

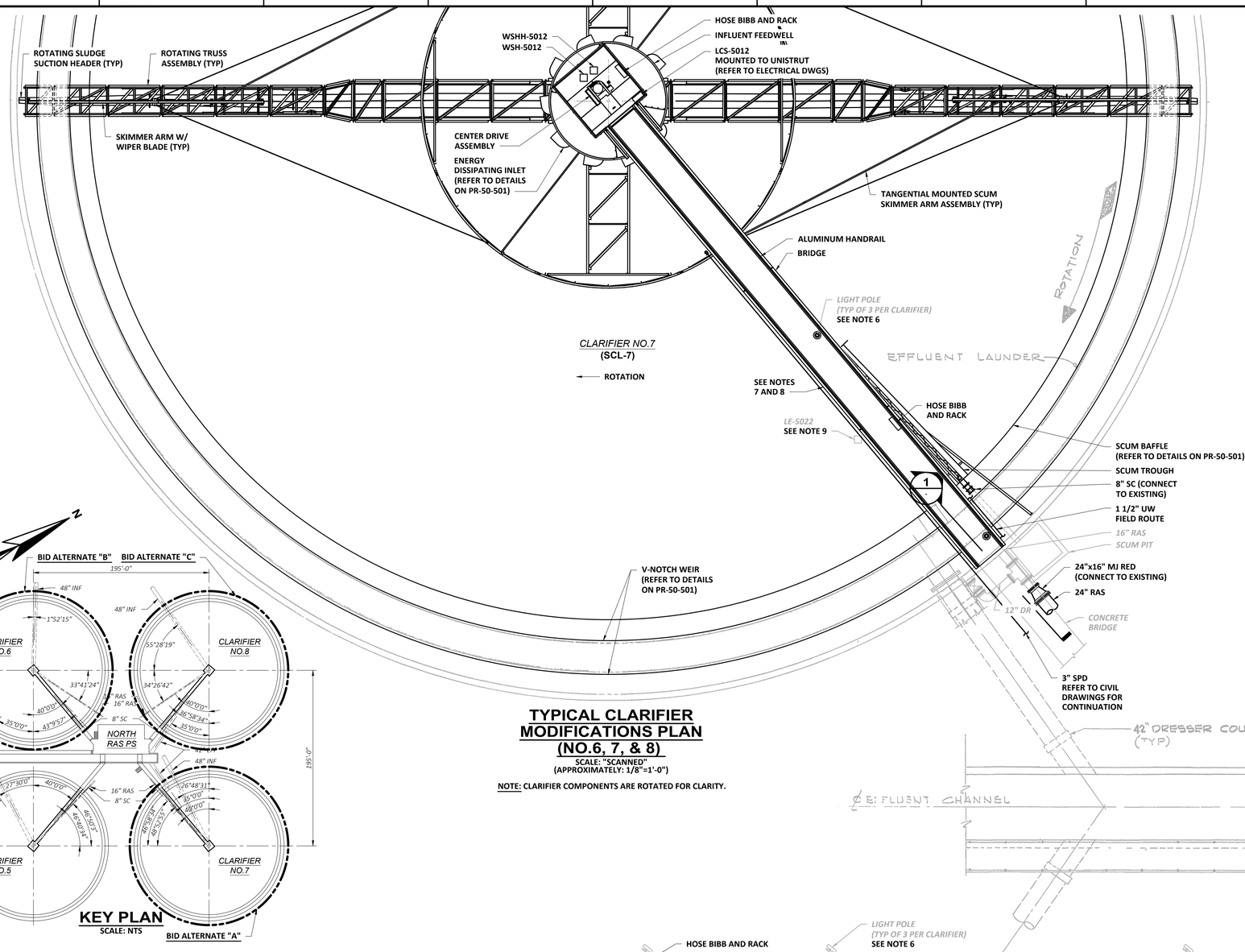
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DWG. No. 12221-W-33

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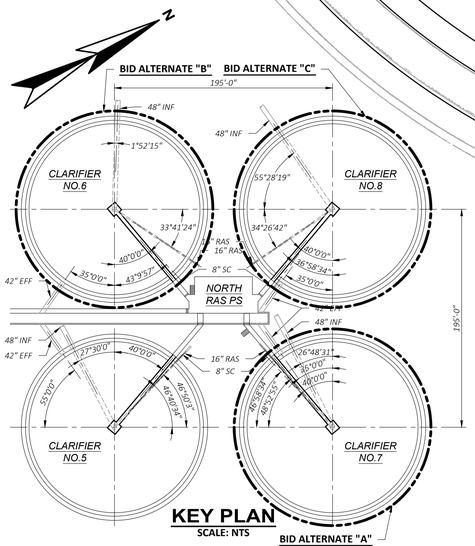
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TYPICAL CLARIFIER MODIFICATIONS PLAN (NO.6, 7, & 8)

SCALE: "SCANNED" (APPROXIMATELY: 1/8"=1'-0")

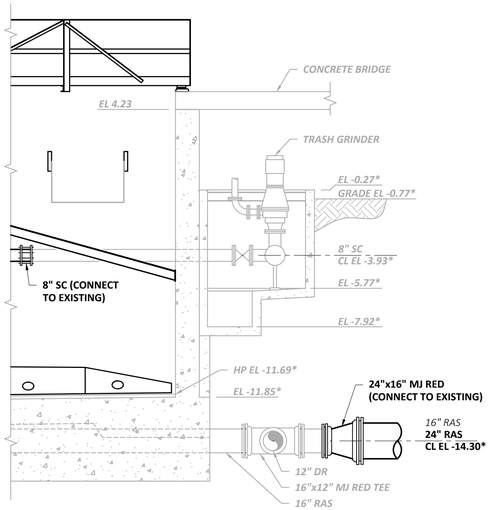
NOTE: CLARIFIER COMPONENTS ARE ROTATED FOR CLARITY.



KEY PLAN

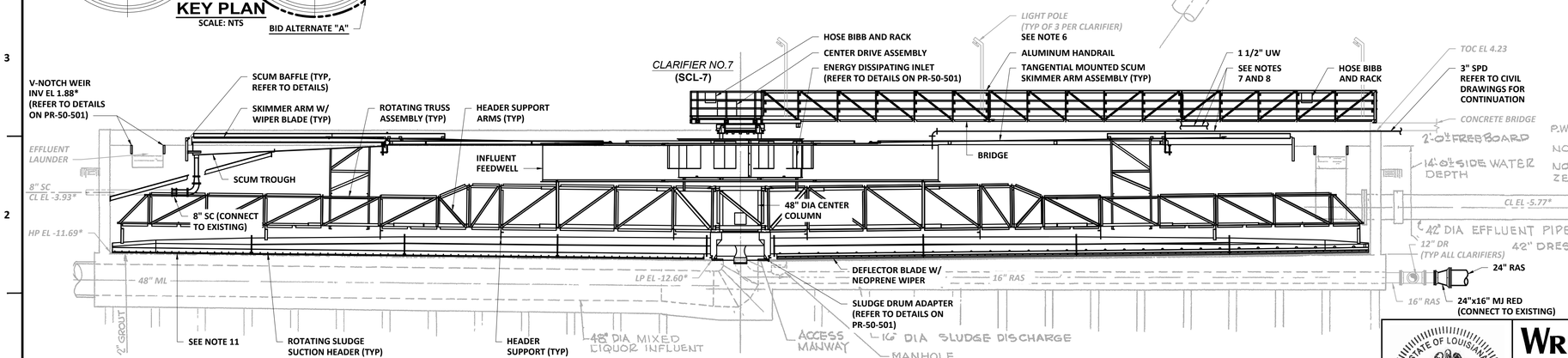
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BID ALTERNATE "A"



SECTION

SCALE: 1/4"=1'-0"



TYPICAL CLARIFIER MODIFICATIONS SECTION (NO.6, 7, & 8)

SCALE: "SCANNED" (APPROXIMATELY: 1/8"=1'-0")

NOTE: CLARIFIER COMPONENTS ARE ROTATED FOR CLARITY.

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR THE CLARIFIER MODIFICATIONS. EXISTING INFORMATION HAS BEEN FADED BACK FOR CLARITY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-00-001.
3. IN GENERAL, WORK DESCRIBED IN THESE NOTES AND ON THE DRAWINGS ARE TYPICAL FOR CLARIFIERS NO.6, 7, & 8.
4. CLARIFIER COMPONENTS MAY BE ROTATED FOR CLARITY. REFER TO THE CLARIFIER OVERALL MODIFICATIONS PLAN FOR ADDITIONAL INFORMATION.
5. ONCE THE SECONDARY CLARIFIER HAS BE DRAINED, CLEANED AND ALL LIQUIDS AND SOLIDS HAVE BEEN REMOVED AND DISPOSED, THE ENGINEER SHALL PERFORM AN INSPECTION OF THE INTERIOR CONCRETE WALLS AND BASE SLAB AND MAKE RECOMMENDATIONS, OF STRUCTURAL REPAIRS (CRACK REPAIRS, CEMENTITIOUS OVERLAY) TO THE OWNER. CONCRETE REPAIRS ARE TO BE PERFORMED BY THE CONTRACTOR AT SAID UNIT BID PRICES.
6. REINSTALL THE EXISTING LIGHT POLE/FIXTURES. COORDINATE WITH THE OWNER ON THE LOCATIONS. CONTRACTOR TO PROVIDE NEW CONDUIT, WIRE, AND CONTROLS. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
7. CONTRACTOR SHALL INSTALL NEW UTILITY WATER LINES AND HOSE BIBB WITH RACK (2 PER CLARIFIER) AT THE CENTER WELL AND BEGINNING OF THE BRIDGE ASSEMBLY FOR EACH CLARIFIER. CONTRACTOR SHALL COORDINATE HOSE BIBB AND RACK LOCATION WITH OWNER.
8. FOR CLARIFIERS NO.5, NO.6, AND NO.7, THE CONTRACTOR SHALL INSTALL THE SUMP PUMP DISCHARGE PIPING FROM THE NORTH RAS PUMP STATION TO THE CENTER WELL. CONTRACTOR SHALL COORDINATE THE FINAL DISCHARGE LOCATION WITH THE OWNER.
9. CONTRACTOR SHALL REMOVE THE SLUDGE BLANKET LEVEL INSTRUMENT DURING MECHANISM DEMOLITION FOR SALVAGE, AND REINSTALL AND REFEED INSTRUMENT AFTER INSTALLATION OF NEW CLARIFIER MECHANISM BRIDGE.
10. CONTRACTOR SHALL FIELD SURVEY THE V-NOTCH WEIR INVERT ELEVATIONS, BOLT HOLE LOCATIONS, SPACING, AND SIZE PRIOR TO DEMOLITION, AND INSTALL THE NEW WEIRS TO MATCH THE EXISTING FIELD MEASURED ELEVATIONS.
11. IF DEEMED NECESSARY BY THE SELECTED EQUIPMENT MANUFACTURER, PREPARE EXISTING CONCRETE SURFACE AND PLACE 2" CONCRETE FILL ON CLARIFIER BASE. SPREAD CONCRETE FILL WITH NEW MECHANISM.
12. ALL WORK INCLUDED IN THIS SHEET FALLS UNDER BID ALTERNATES "A", "B", AND "C" AS DESCRIBED IN SPECIFICATION SECTION 01100 – ALTERNATES.

FULL SHEET BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — STEVEN CHARLES HALLOWELL — License No. Pe0046278 — PROFESSIONAL ENGINEER — 2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

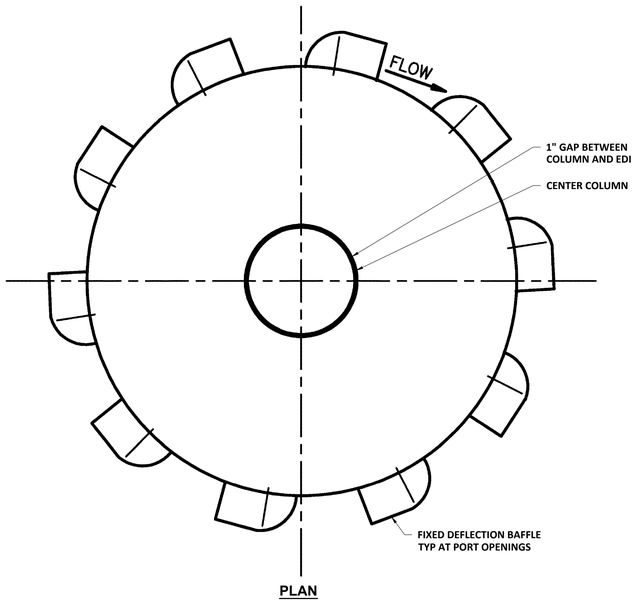
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

SECONDARY CLARIFIERS MODIFICATIONS PLAN AND SECTIONS

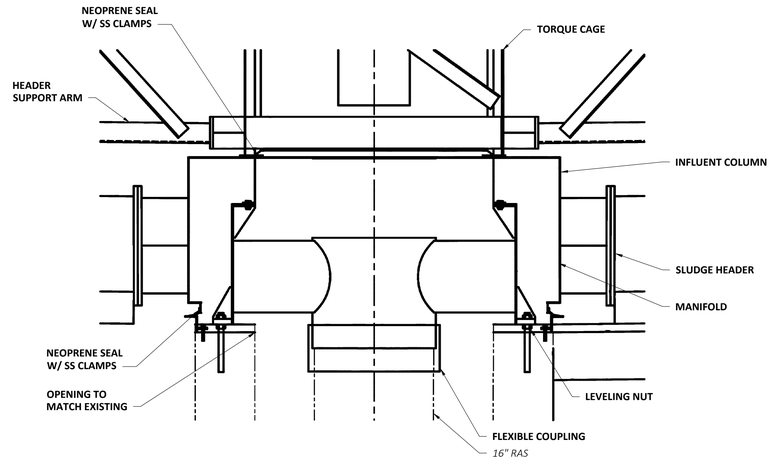
DR. A.COUTURE	PR-50-102
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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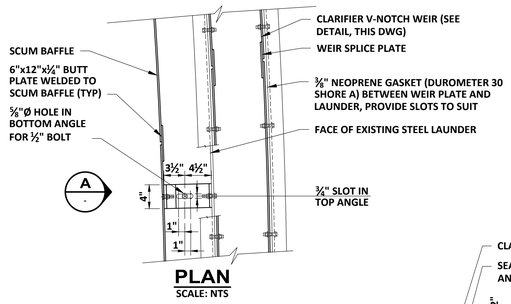
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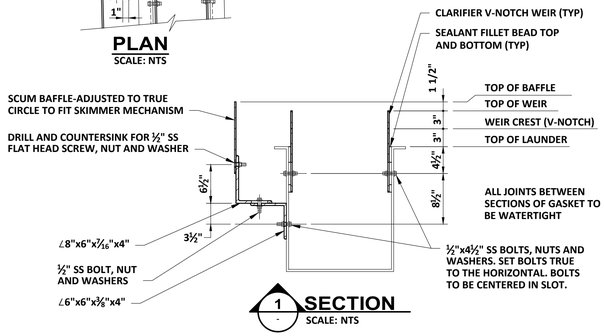
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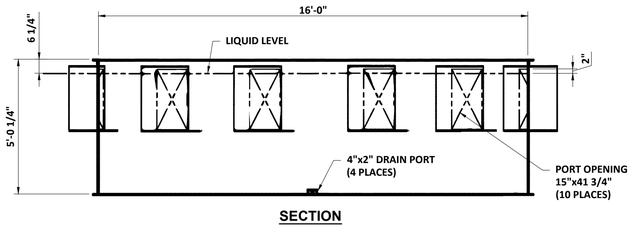
SLUDGE DRUM
SCALE: NTS



PLAN
SCALE: NTS

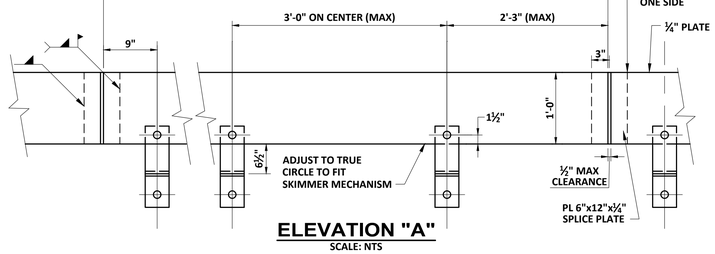


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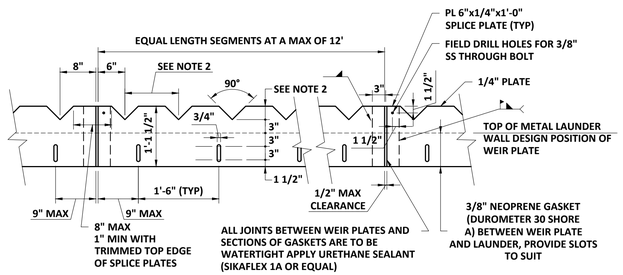


SECTION

ENERGY DISSIPATING INLET (EDI) DETAIL
SCALE: NTS



ELEVATION "A"
SCALE: NTS



CLARIFIER WEIR DETAIL
SCALE: NTS

NOTE:

1. TYPICAL SECONDARY CLARIFIER WEIR DETAIL IS INCLUDED TO PROVIDE GENERAL FIELD CONSTRUCTION AND MATERIAL THICKNESS REQUIREMENTS FOR FABRICATION AND INSTALLATION PURPOSES. THE CONTRACTOR SHALL FIELD VERIFY EXISTING WEIR V-NOTCH SPACING, BOLT HOLE OPENINGS AND LOCATIONS, DIMENSIONS, AND INVERT ELEVATIONS, AND INCORPORATE INTO THE SHOP DRAWING SUBMITTAL FOR THE ENGINEER'S REVIEW. CONTRACTOR TO PROVIDE SKETCH OF FIELD MEASUREMENTS TO ENGINEER FOR REFERENCE.
2. V-NOTCH SPACING, DEPTH AND ELEVATIONS TO MATCH EXISTING WEIRS. CONTRACTOR TO FIELD VERIFY EXISTING WEIR DETAILS AND ELEVATIONS PRIOR TO SUBMITTING SHOP DRAWING.
3. ALL HARDWARE FOR CLARIFIER WEIR TO BE 316 SS.

SCUM BAFFLE AND CLARIFIER WEIR DETAIL
SCALE: NTS

NOTES:

1. SCUM BAFFLE DEPTH SHALL EXTEND TO 18" BELOW WATER LEVEL AT THE SCUM TROUGH, AND EXTEND 5' ON EITHER SIDE OF THE SCUM TROUGH.
2. MATERIALS OF CONSTRUCTION PER SPEC SECTION 05500.
3. CONTRACTOR TO FIELD VERIFY THE EXISTING BOLT HOLE OPENINGS AND LOCATIONS AND INCORPORATE INTO THE SHOP DRAWINGS FOR THE ENGINEERS REVIEW.
4. ALL HARDWARE FOR SCUM BAFFLE SHALL BE 316 SS.

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. IN GENERAL, WORK DESCRIBED IN THESE NOTES AND ON THE DRAWINGS ARE TYPICAL FOR CLARIFIERS NO.6, 7, & 8.
3. CONTRACTOR TO PERFORM STRUCTURAL REPAIRS TO THE CLARIFIER CONCRETE SURFACE AS DETERMINED BY ENGINEER.
4. ALL WORK INCLUDED IN THIS SHEET FALLS UNDER BID ALTERNATES "A", "B", AND "C" AS DESCRIBED IN SPECIFICATION SECTION 01100 – ALTERNATES.

FULL SHEET BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

CLARIFIER DETAILS

DR. A.COUTURE	PR-50-501
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	DWG. No. 12221-W-33
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
SET NO.	SHEET NO. OF

J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\21163-PRS-CLARIFIER.DWG | Details | 1:10.12364677 | — | 2/12/2026 3:55:58 PM | ADAM.COUTURE

LAST SAVED BY: ADAM.COUTURE 6/6/2026 2:49 PM

J:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_1_WW_IMPROVEMENTS_DRAWINGS\PHASE 1A\PRO\21163-PRS-RAS-PS-NORTH-DEMO.DWG | Demo-Plans | 1:10.1236457 | — | 2/12/2026 3:56:09 PM | ADAM.COUTURE

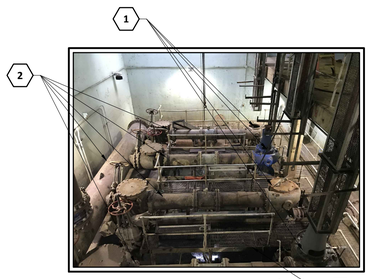


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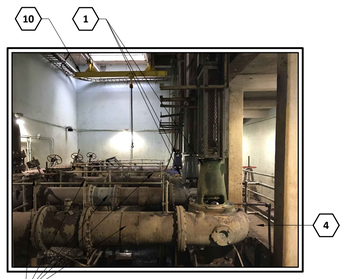


PHOTO 2



PHOTO 5



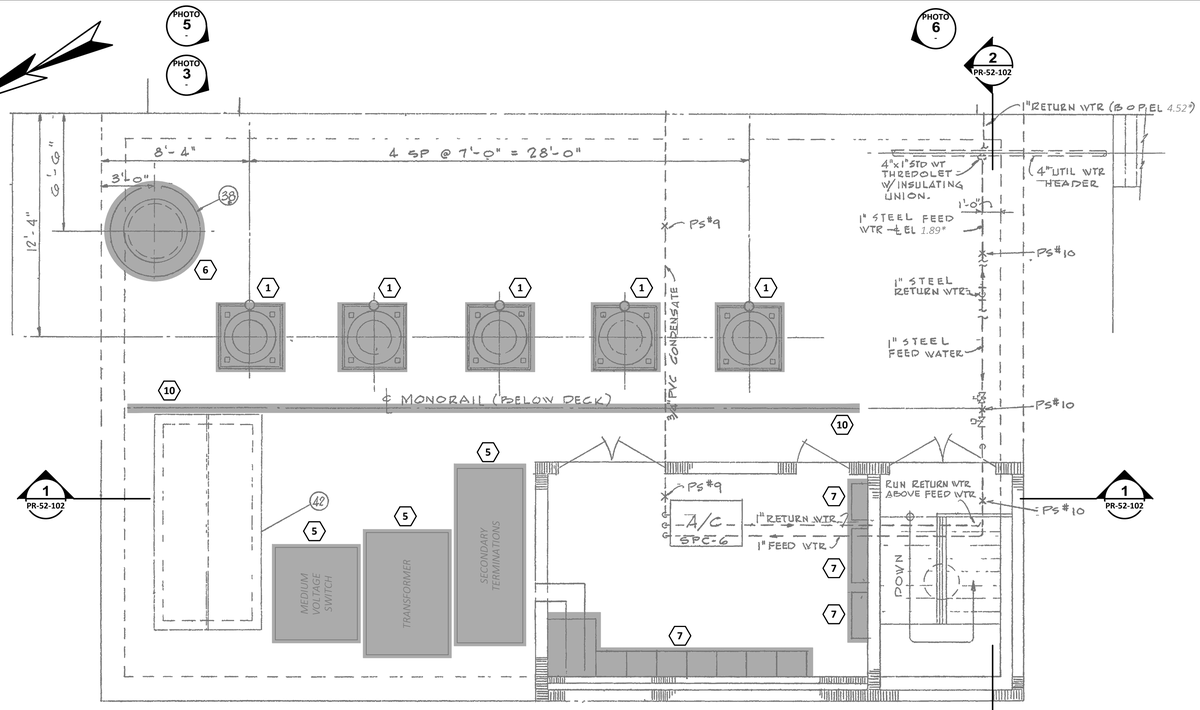
PHOTO 3



PHOTO 4

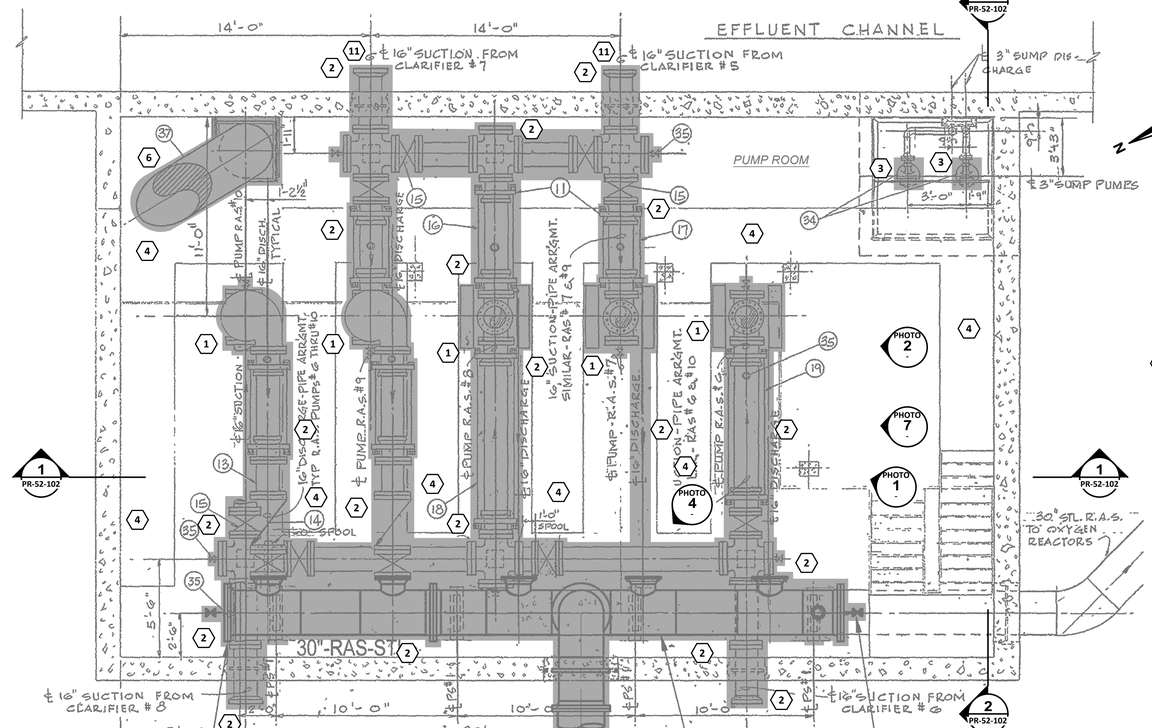


PHOTO 6



DEMOLITION PLAN @ EL 30.42

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")



DEMOLITION PLAN @ EL 17.00

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")

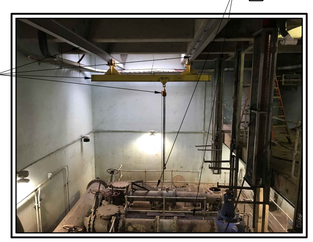


PHOTO 7

DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING RAS PUMPS IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; PUMPS, EQUIPMENT PADS, MOTORS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH THE EXISTING RAS PIPING IN ITS ENTIRETY, INCLUDING BUT NOT LIMTED TO; PIPING TO THE EXTENTS SHOWN, VALVES, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING SUMP PUMPS IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; PUMPS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
4. REMOVE/DEMOLISH EXISTING GRATING IN ITS ENTIRETY.
5. REMOVE/DEMOLISH THE EXISTING SECONDARY TERMINATIONS, TRANSFORMER, AND MEDIUM VOLTAGE SWITCH.
6. REMOVE/DEMOLISH THE EXISTING SUPPLY FAN IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; FAN, DUCT, CONCRETE CURB, SUPPORTS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
7. REMOVE/DEMOLISH THE EXISTING ELECTRICAL EQUIPMENT IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; CONTROL PANELS, MCC, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
8. REMOVE/DEMOLISH THE EXISTING ABANDONED PIPING AS NECESSARY TO FACILITATE INSTALLATION OF THE NEW ELECTRICAL BUILDING. CAP EXISTING.
9. REMOVE/RELOCATE THE EXISTING PIPING TO FACILITATE INSTALLATION OF THE NEW ELECTRICAL BUILDING.
10. REMOVE/DEMOLISH THE EXISTING BRIDGE CRANE SYSTEM IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; LIFTING HOOK, CHAIN OPERATOR, TROLLEY SYSTEM, WHEELS, SUPPORT BEAMS, AND ALL OTHER ASSOCIATED APPURTENANCES.
11. CONTRACTOR TO INFILL PIPE OPENINGS AS NECESSARY AND BASED ON ACTUAL RETURN SLUDGE PIPE PENETRATION FROM CLARIFIERS NO.5 AND NO.7. REFER TO STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR THE NORTH RAS PUMP STATION DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-00-001.

REV.	DATE	DESCRIPTION	BY
3			
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1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

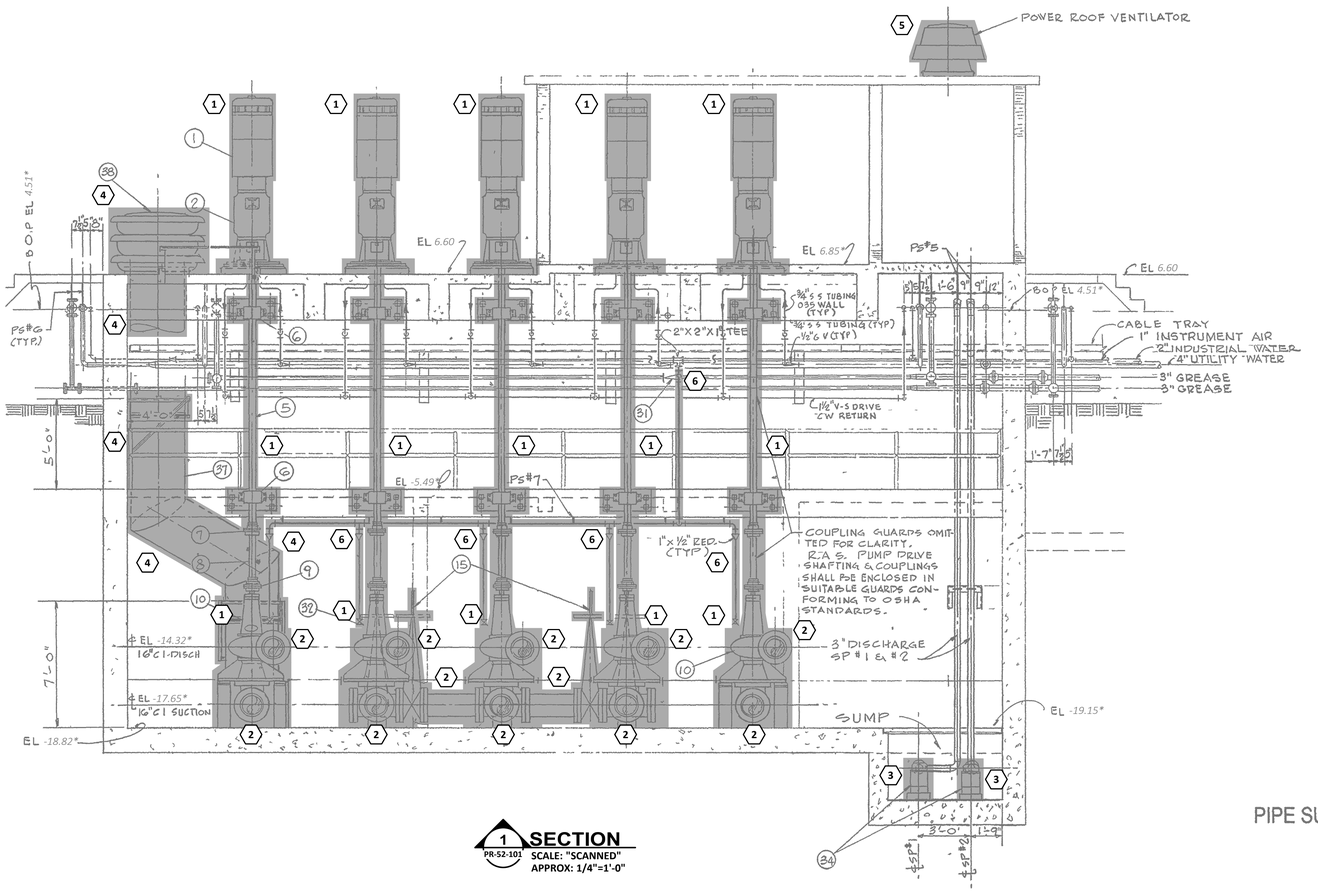
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

NORTH RAS PUMP STATION DEMOLITION PLANS

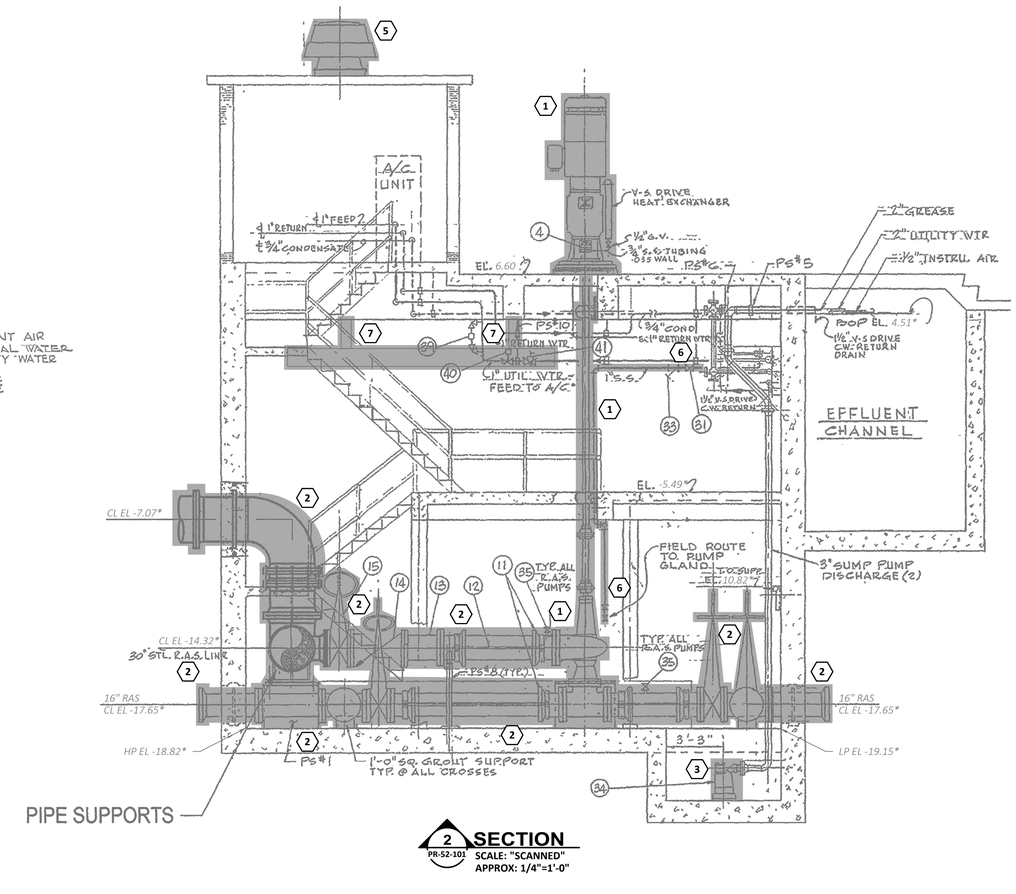
DR. A.COUTURE	
TRC. -	**PR-52-101**
CK. D.STILES	
AP. S.HALLOWELL	**DWG. No. 12221-W-33**
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

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1 SECTION
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SCALE: "SCANNED"
APPROX: 1/4"=1'-0"



2 SECTION
PR-52-101
SCALE: "SCANNED"
APPROX: 1/4"=1'-0"

DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING RAS PUMPS IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; PUMPS, EQUIPMENT PADS, MOTORS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH THE EXISTING RAS PIPING IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; PIPING TO THE EXTENTS SHOWN, VALVES, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING SUMP PUMPS IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; PUMPS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
4. REMOVE/DEMOLISH THE EXISTING SUPPLY FAN IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; FAN, DUCT, CONCRETE CURB, SUPPORTS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
5. REMOVE/DEMOLISH THE EXISTING EXHAUST FAN IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; FAN, DUCT, SUPPORTS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
6. REMOVE/DEMOLISH THE EXISTING PUMP SEAL WATER SYSTEMS IN THEIR ENTIRETY, INCLUDING BUT NOT LIMITED TO; PIPING, VALVES, FITTINGS, SUPPORTS, GAUGES, AND ALL OTHER ASSOCIATED APPURTENANCES. DEMOLISH SEAL WATER PIPING BACK TO THE UTILITY WATER HEADER AND CAP PIPING AT THE BRANCH.
7. REMOVE/DEMOLISH THE EXISTING BRIDGE CRANE SYSTEM IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO; LIFTING HOOK, CHAIN OPERATOR, TROLLEY SYSTEM, WHEELS, SUPPORT BEAMS, AND ALL OTHER ASSOCIATED APPURTENANCES.

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR THE NORTH RAS PUMP STATION DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-00-001.

REV.	DATE	DESCRIPTION	BY
3			
2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

NORTH RAS PUMP STATION DEMOLITION SECTIONS

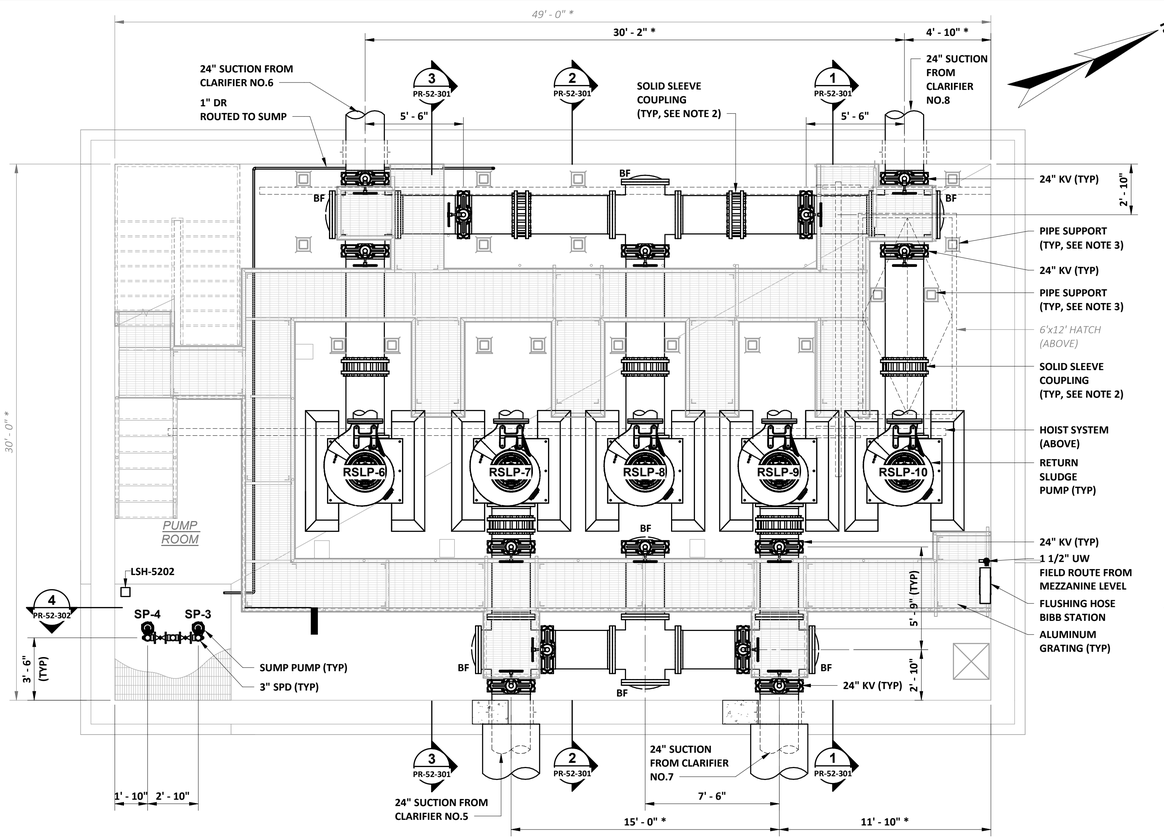
DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

PR-52-102

DWG. No. 12221-W-33

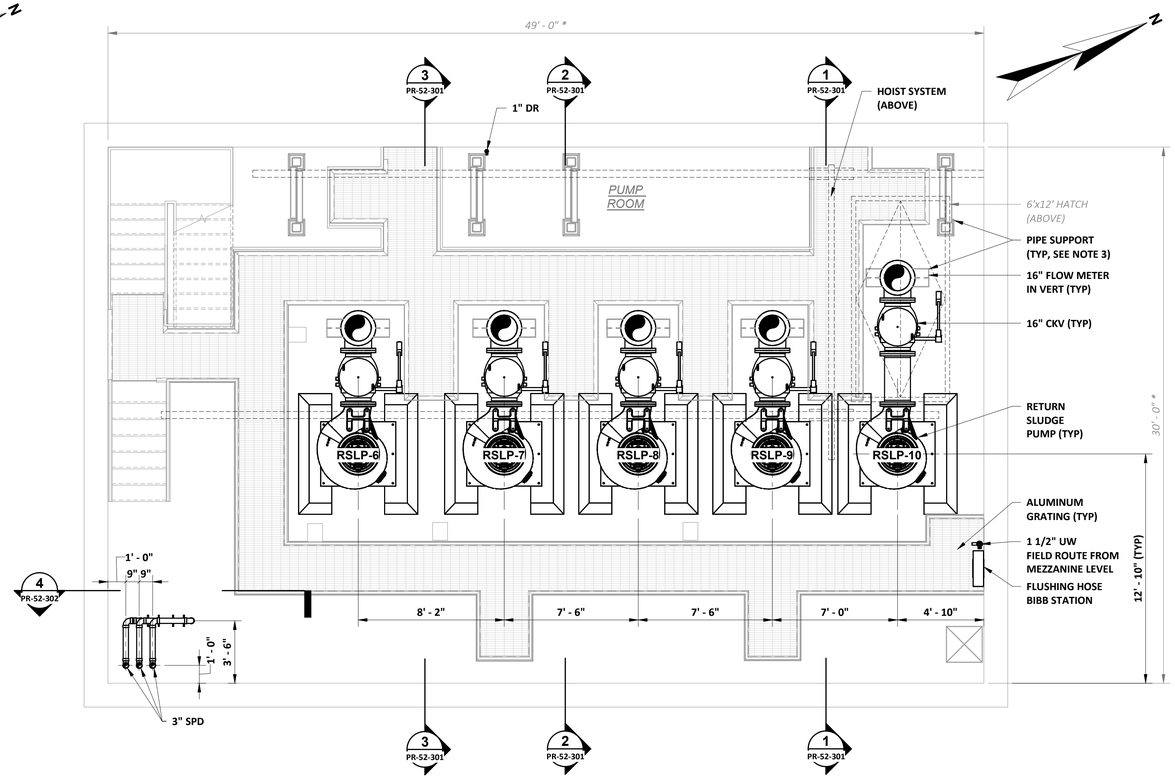
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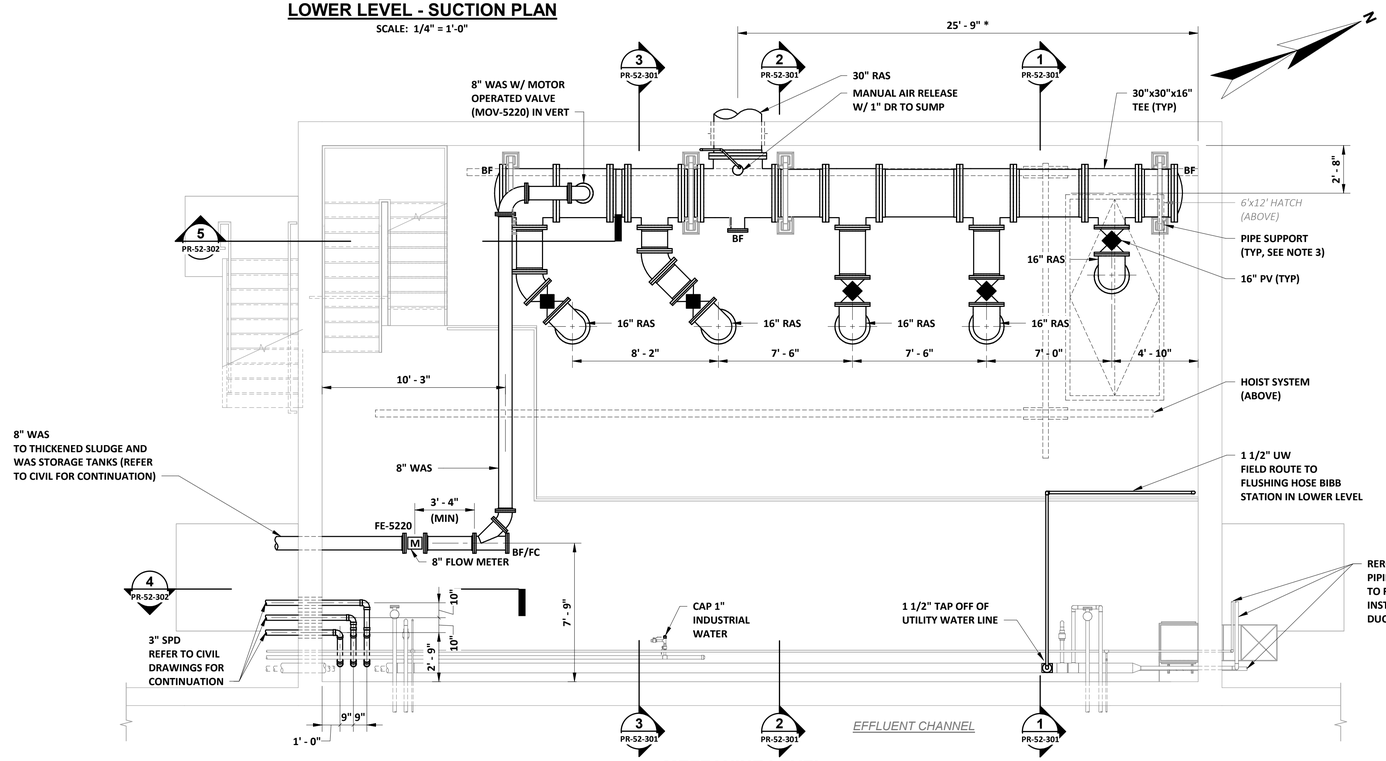
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SCALE: 1/4" = 1'-0"



LOWER LEVEL - DISCHARGE PLAN

SCALE: 1/4" = 1'-0"



MEZZANINE LEVEL

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. ALL COUPLINGS ARE TO BE RODDED BACK TO THE NEAREST FITTINGS W/ 316 SS THREADED RODS AND HARDWARE.
3. PIPING SUPPORTS AND RESTRAINTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PER SPECIFICATION SECTION 15094. CONCEPTUAL CRITICAL PIPE SUPPORT SYSTEMS HAVE BEEN ILLUSTRATED BY THE ENGINEER FOR GUIDANCE PURPOSES ONLY. HOWEVER, THIS DOES NOT RELIEVE THE CONTRACTOR FROM LOCATING/DESIGNING AND/OR PROVIDING ALL STATIC AND DYNAMIC SUPPORTS IN ACCORDANCE WITH 15094.
4. REFER TO THE STRUCTURAL DRAWINGS FOR INFORMATION ON THE ALUMINUM GRATING AROUND THE RETURN SLUDGE PUMPS, VALVES, AND PIPING.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. PeO046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

NORTH RAS PUMP STATION MODIFICATION PLANS

DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	
DATE: FEBRUARY 2026	SET NO.

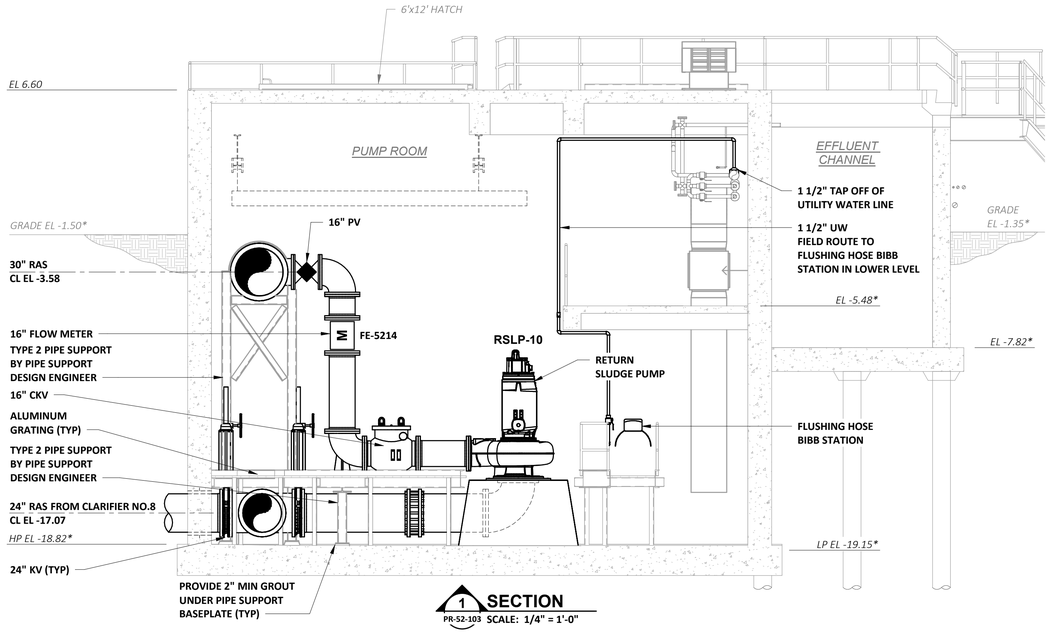
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DWG. No. 12221-W-33

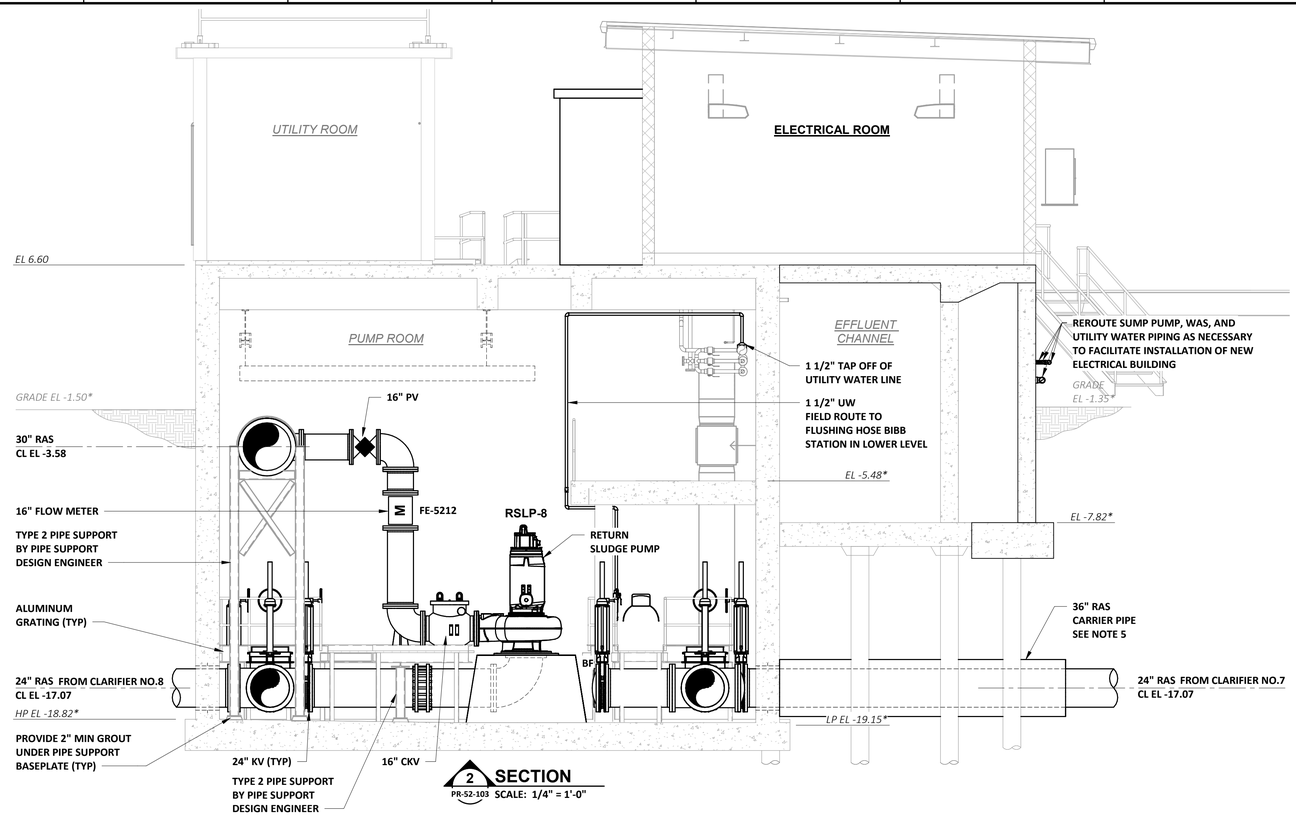
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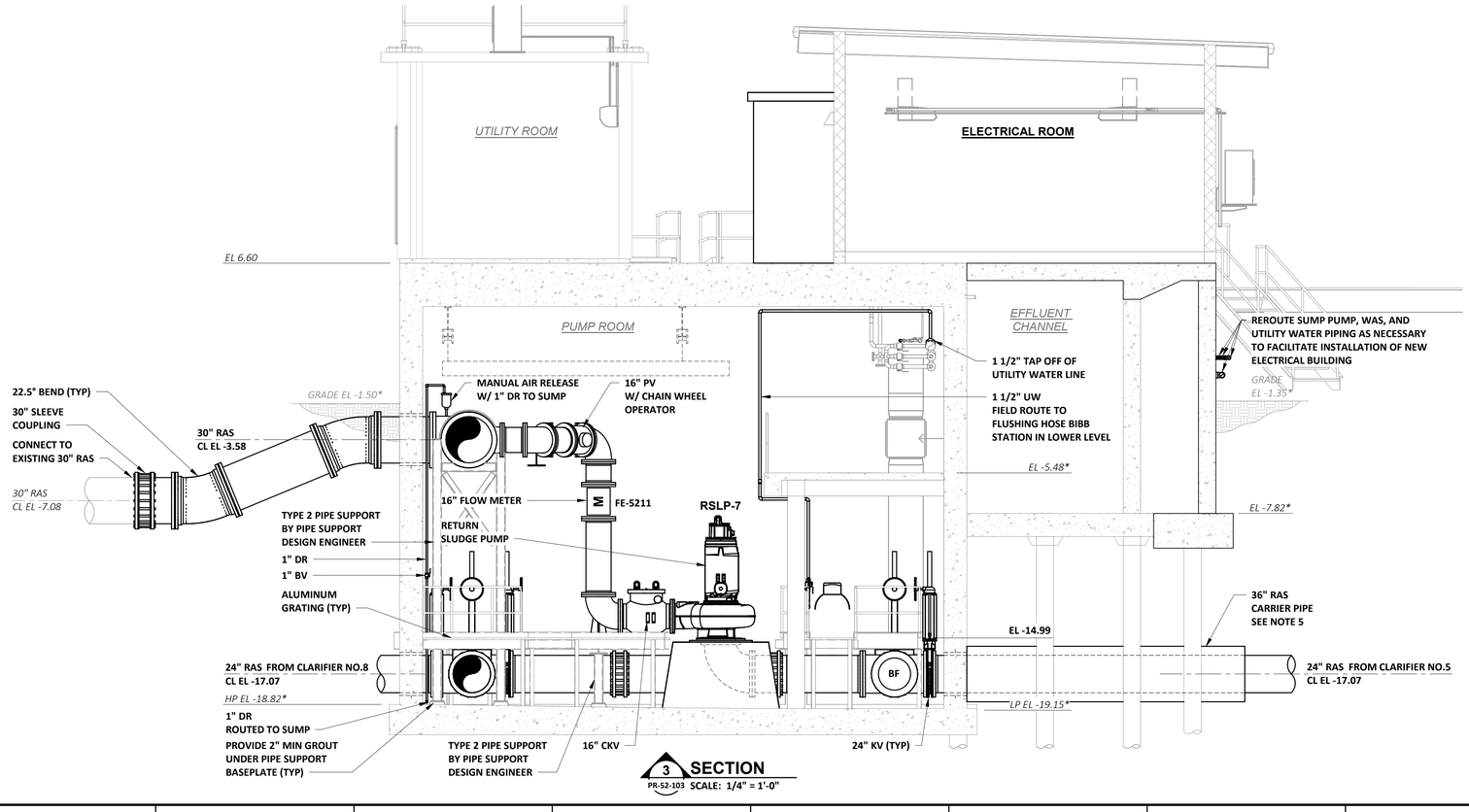
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1 SECTION
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2 SECTION
PR-52-103 SCALE: 1/4" = 1'-0"



3 SECTION
PR-52-103 SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. ALL COUPLINGS ARE TO BE RODDED BACK TO THE NEAREST FITTINGS W/ 316 SS THREADED RODS AND HARDWARE.
3. PIPING SUPPORTS AND RESTRAINTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PER SPECIFICATION SECTION 15094. CONCEPTUAL CRITICAL PIPE SUPPORT SYSTEMS HAVE BEEN ILLUSTRATED BY THE ENGINEER FOR GUIDANCE PURPOSES ONLY. HOWEVER, THIS DOES NOT RELIEVE THE CONTRACTOR FROM LOCATING/DESIGNING AND/OR PROVIDING ALL STATIC AND DYNAMIC SUPPORTS IN ACCORDANCE WITH 15094.
4. REFER TO THE STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION ON THE ALUMINUM GRATING.
5. REFER TO THE CIVIL DRAWINGS FOR ADDITIONAL INFORMATION ON THE RETURN SLUDGE CARRIER AND RETURN SLUDGE PIPING TO THE CLARIFIERS.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION MODIFICATION SECTIONS I

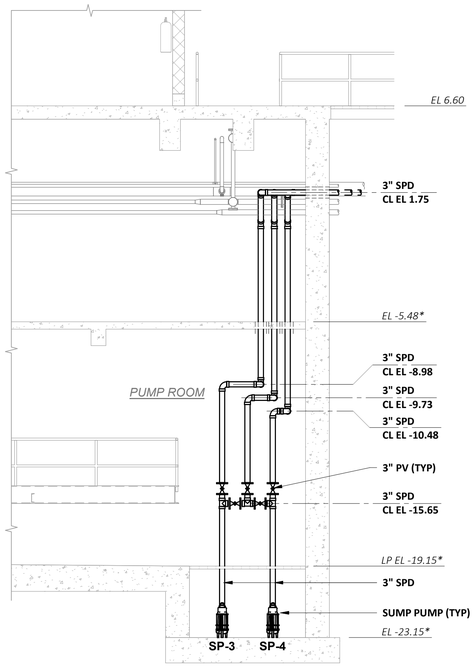
STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

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407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

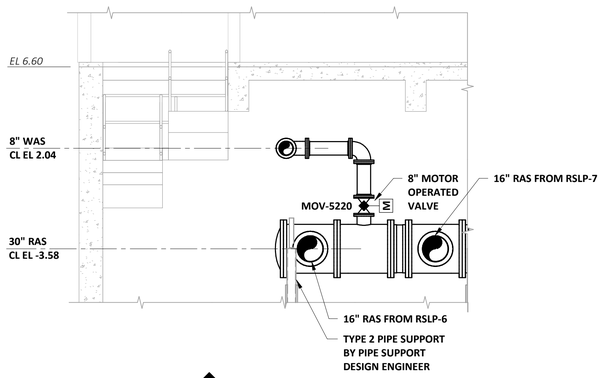
DR. A.COUTURE			PR-52-301
TRC. -			
CK. D.STILES			
AP. S.HALLOWELL			DWG. No. 12221-W-33
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON	SCALE: AS NOTED	
SUBMISSION: CONTRACT DRAWINGS		SET NO.	SHEET NO. OF
CAD COORD: A.COUTURE		DATE: FEBRUARY 2026	

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase/21163-PRM-RAS-PS-North.rvt

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4 SECTION
PR-52-103 SCALE: 1/4" = 1'-0"



5 SECTION
PR-52-103 SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.

2. PIPING SUPPORTS AND RESTRAINTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PER SPECIFICATION SECTION 15094. CONCEPTUAL CRITICAL PIPE SUPPORT SYSTEMS HAVE BEEN ILLUSTRATED BY THE ENGINEER FOR GUIDANCE PURPOSES ONLY. HOWEVER, THIS DOES NOT RELIEVE THE CONTRACTOR FROM LOCATING/DESIGNING AND/OR PROVIDING ALL STATIC AND DYNAMIC SUPPORTS IN ACCORDANCE WITH 15094.

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

NORTH RAS PUMP STATION MODIFICATION SECTIONS II

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe046278
PROFESSIONAL ENGINEER
3/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

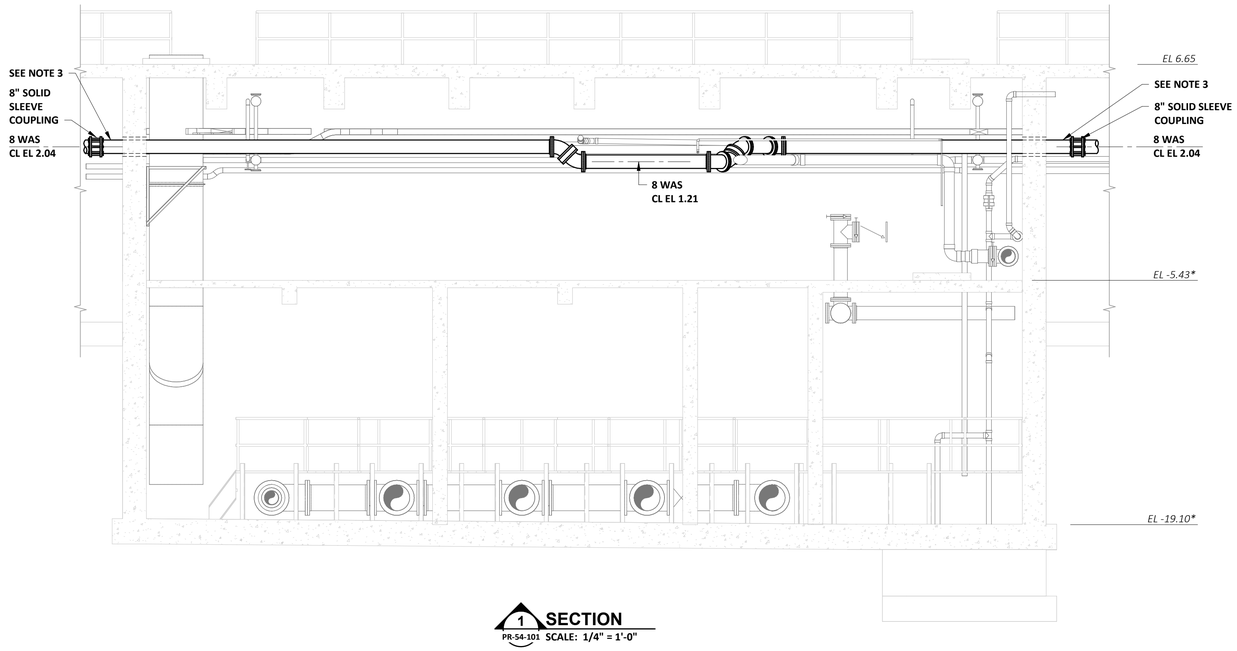
DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

PR-52-302

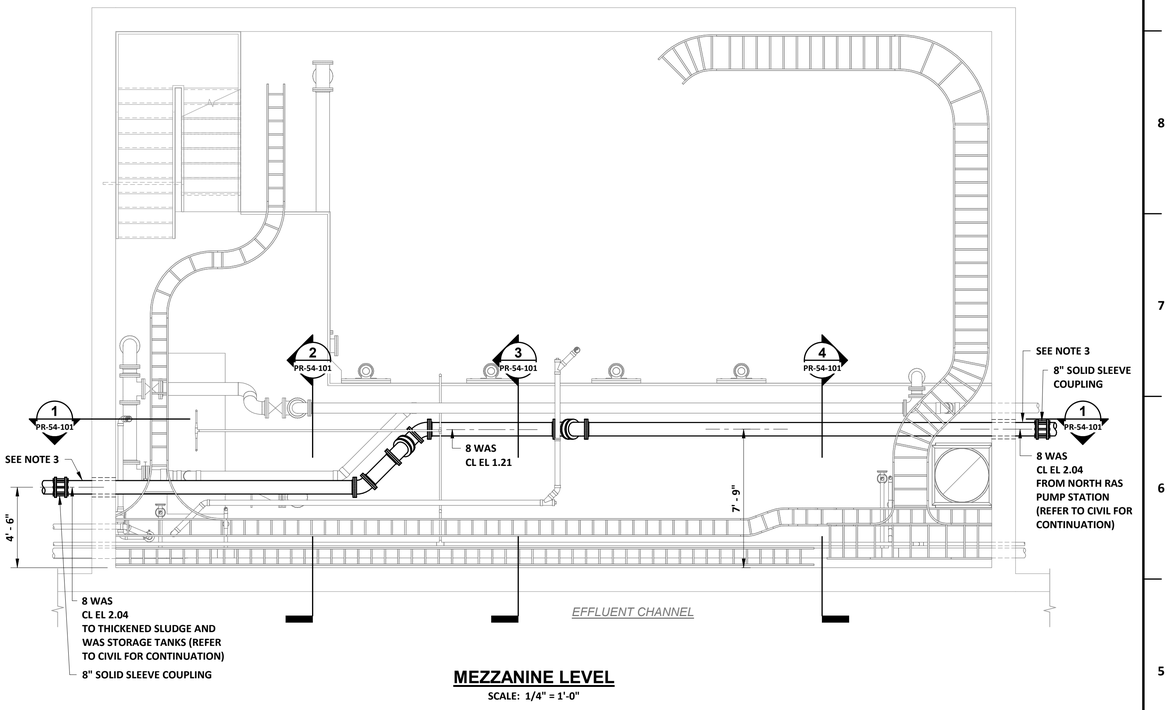
DWG. No. 12221-W-33

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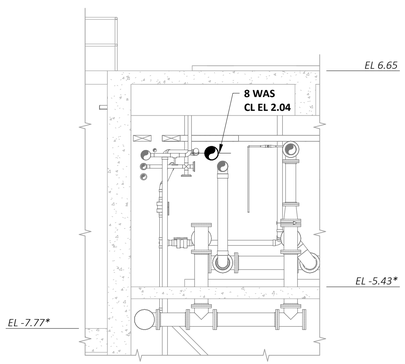
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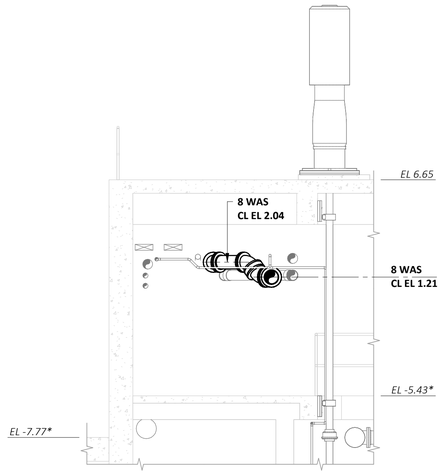
1 SECTION
PR-54-101 SCALE: 1/4" = 1'-0"



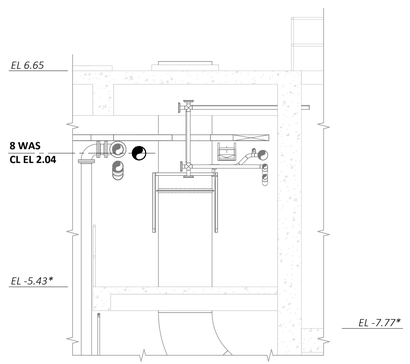
MEZZANINE LEVEL
SCALE: 1/4" = 1'-0"



2 SECTION
PR-54-101 SCALE: 1/4" = 1'-0"



3 SECTION
PR-54-101 SCALE: 1/4" = 1'-0"



4 SECTION
PR-54-101 SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. PIPING SUPPORTS AND RESTRAINTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PER SPECIFICATION SECTION 15094.
3. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS ON THE OUTSIDE AND INSIDE WALL PRIOR TO CORE DRILLING OPENINGS IN THE WALL. REFER TO THE PROCESS DRAWINGS FOR ADDITIONAL INFORMATION.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

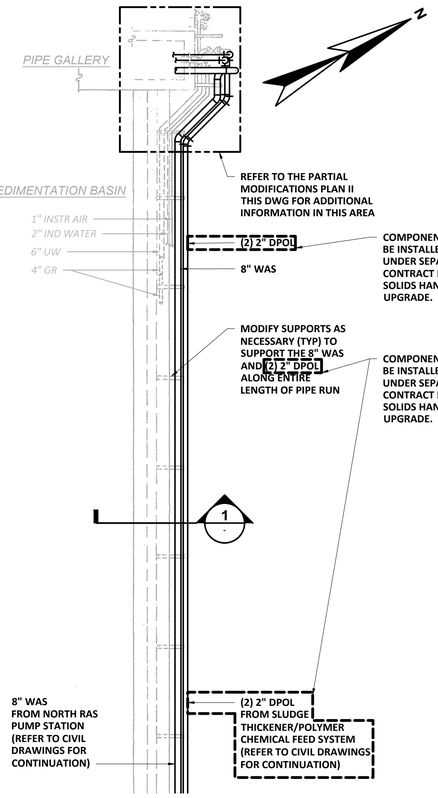
SOUTH RAS PUMP STATION MODIFICATIONS PLAN AND SECTIONS

DR.	A.COUTURE	**PR-54-101**	
TRC.	-		
CK.	D.STILES		
AP.	S.HALLOWELL	**DWG. No. 12221-W-33**	
PROJECT NO:	21163	DESIGNED BY: W.EDGERTON	
SUBMISSION:	CONTRACT DRAWINGS	SCALE: AS NOTED	
CAD COORD:	A.COUTURE	DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

Autodesk Docs://LA-NewOrleans-21163-EastBank-STP-Phase2/21163-PRM-RAS-PS-South.rvt

LAST SAVED BY: ADAM.COUTURE 2/4/2026 12:55 PM

J:\ENG\LAVNEWORLEANS\21163-EASTBANKSTP PHASE_1_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PROJ\21163-PRS-EFFLUENTCHANNEL.DWG | Mod Sections | 1:10.12364677 | — | 2/12/2026 3:56:21 PM | ADAM.COUTURE



PARTIAL MODIFICATIONS PLAN I

SCALE: "SCANNED"
(APPROXIMATELY: 1/8"=1'-0")



REMOVE/DEMOLISH EXISTING PIPE IN ITS ENTIRETY

REMOVE/DEMOLISH EXISTING HOPPER AND CHUTE

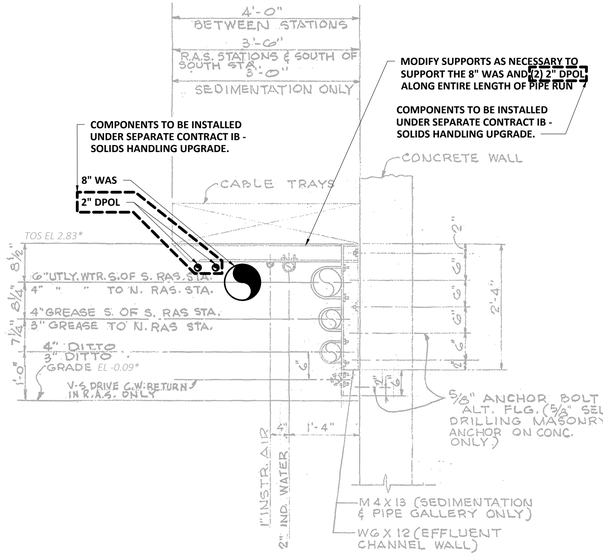
PHOTO 1



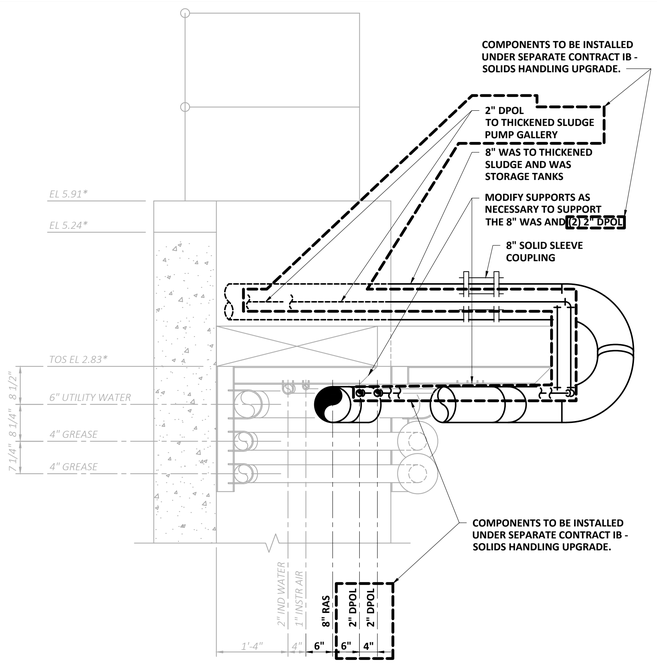
COMPONENTS TO BE DEMOLISHED UNDER SEPARATE CONTRACT IB - SOLIDS HANDLING UPGRADE.

REMOVE/DEMOLISH EXISTING GREASE PIPES TO THE EXTENTS SHOWN REFER TO PR-66-103 FOR ADDITIONAL INFORMATION CAP AND ABANDON GREASE LINES

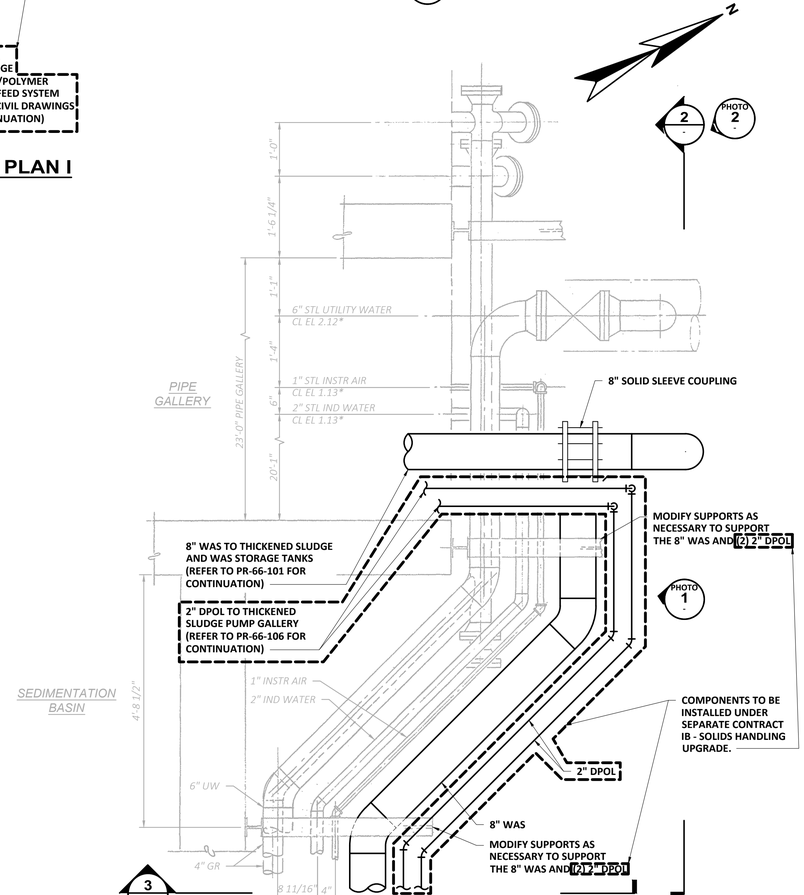
PHOTO 2



1 SECTION
SCALE: "SCANNED"
APPROX: 3/4"=1'-0"

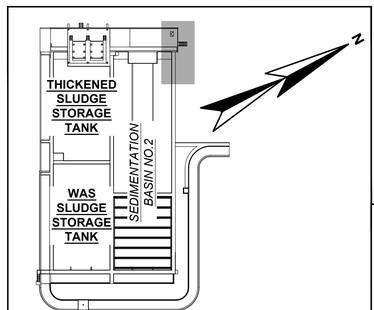


3 SECTION
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APPROX: 3/4"=1'-0"

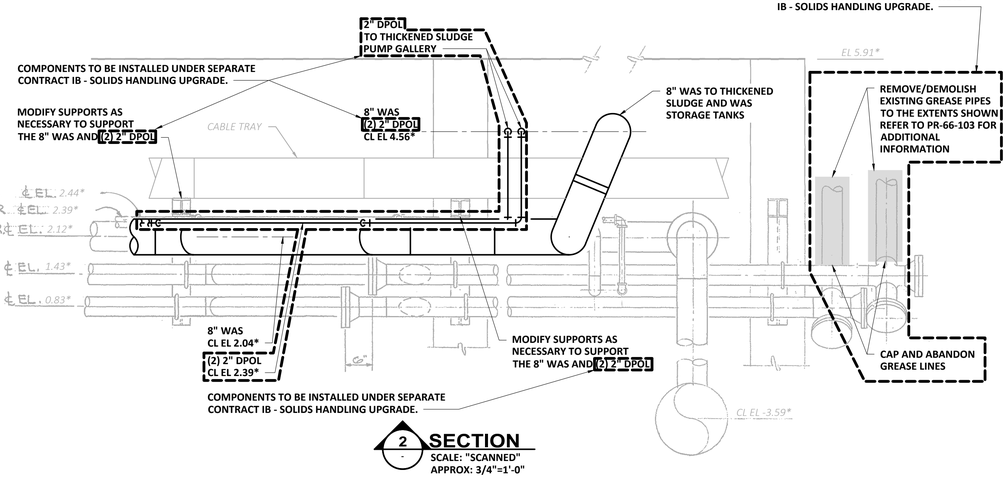


PARTIAL MODIFICATIONS PLAN II

SCALE: "SCANNED"
(APPROXIMATELY: 3/4"=1'-0")



KEY PLAN



2 SECTION
SCALE: "SCANNED"
APPROX: 3/4"=1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR THE EFFLUENT CHANNEL MODIFICATIONS. EXISTING INFORMATION HAS BEEN FADED BACK FOR CLARITY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-00-001.
3. FOR PIPING SYSTEMS THAT REQUIRE DELEGATED PIPE SUPPORT DESIGN, THE CONTRACTOR SHALL SHALL FOLLOW THE REQUIREMENTS OF SPECIFICATION SECTION 15094 TO VERIFY EXISTING PIPE SUPPORTS CAN ADEQUATELY SUPPORT NEW PIPING (WHERE APPLICABLE).

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

EFFLUENT CHANNEL MODIFICATION PLANS AND SECTIONS

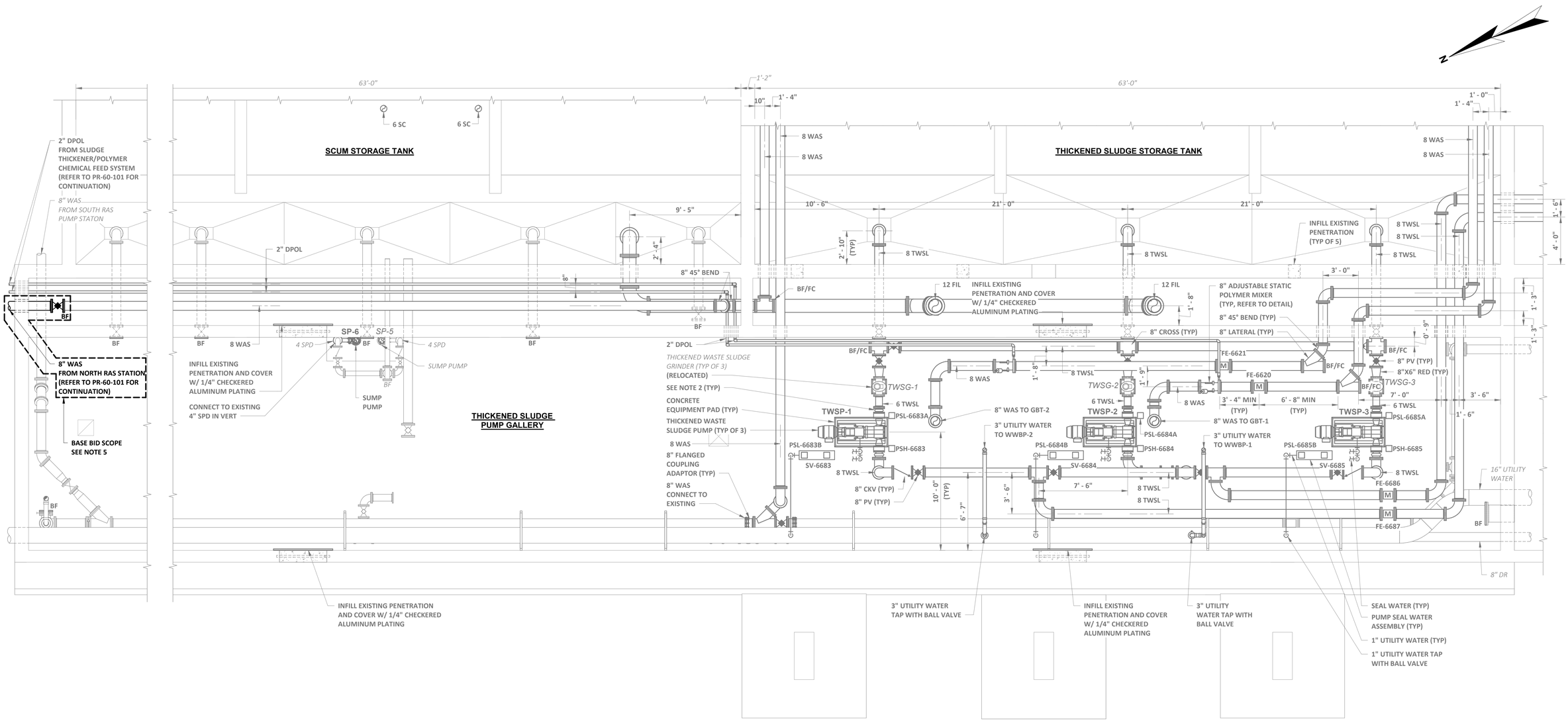
PROJECT NO: 21163	DESIGNED BY: W.EDGERTON
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. A.COUTURE	
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

PR-60-101

DWG. No. 12221-W-33

SET NO. | SHEET NO. | OF



LOWER LEVEL MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWINGS PR-00-001. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWINGS PR-00-002.
2. CONTRACTOR SHALL VERIFY THICKENED WASTE SLUDGE PUMP PIPING CONNECTION FITTING TYPE WITH THE ACCEPTED PUMP MANUFACTURER. FLEXIBLE TYPE COUPLINGS ARE CURRENTLY SHOWN, HOWEVER RIGID SOLID SLEEVE COUPLINGS MAY BE REQUIRED.
3. REFER TO INSTRUMENTATION AND ELECTRICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS AND DETAILS.
4. PIPING SUPPORTS AND RESTRAINTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PER SPECIFICATION SECTION 15094. PIPE FITTINGS FOR DYNAMIC FORCES HAVE BEEN SHOWN IN KEY AREAS, HOWEVER, THIS DOES NOT RELIEVE THE CONTRACTOR FROM LOCATING/DESIGNING AND/OR PROVIDING ALL STATIC AND DYNAMIC SUPPORTS.
5. BASE BID SCOPE TO INCLUDE EXTENDING 8-INCH WAS FROM NORTH RAS PUMP STATION INTO THE SEDIMENTATION BASIN INFLUENT CHANNEL WITH ISOLATION PLUG VALVE AND BLIND FLANGE AS ILLUSTRATED. THE REMAINING WORK ILLUSTRATED ON THIS SHEET, INCLUDING EXTENSION OF THE 8" WAS FROM THE BLIND FLANGE CONNECTION WILL BE PERFORMED UNDER A SEPARATE CONTRACT 1B - SOLIDS HANDLING UPGRADE.

REV.	DATE	DESCRIPTION	BY
3			
2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

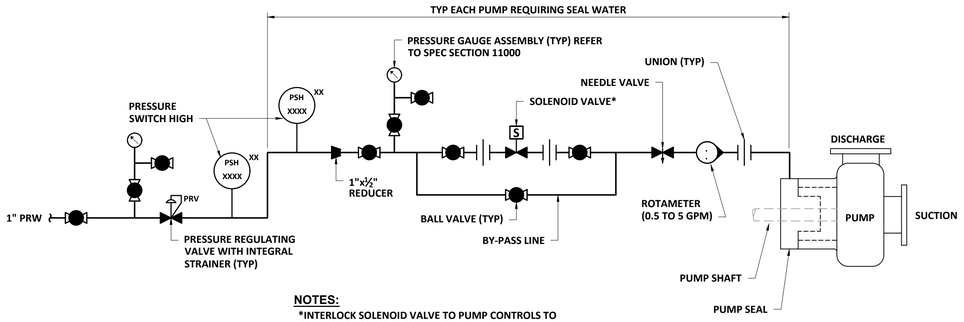
WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SEDIMENTATION BASINS PIPE GALLERY MODIFICATIONS PLAN

DR. A.COUTURE	PR-66-101
TRC. -	
CK. D.STILES	
AP. S.HALLOWELL	DWG. No. 12221-W-33
PROJECT NO: 21163 / DESIGNED BY: W.EDGERTON	SCALE: AS NOTED
SUBMISSION: CONTRACT DRAWINGS	SET NO. / SHEET NO. OF
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

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Autodesk Docs://1A-NewOrleans 21163-EastBank-STP-Phase/21163-PRIM SedimentationBasins-1A.rvt

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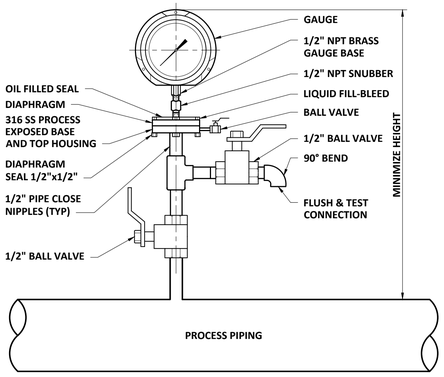
NOTES:

*INTERLOCK SOLENOID VALVE TO PUMP CONTROLS TO OPEN WHEN PUMP IS RUNNING.

1. EACH SEAL SHALL BE CAPABLE OF BEING FED WITH NPW OR EW. REFER TO PROCESS AND DRAWINGS FOR TIE-IN LOCATIONS.

PUMP SEAL WATER SYSTEM SCHEMATIC HORIZONTAL SINGLE MECHANICAL SEAL

SCALE: NTS

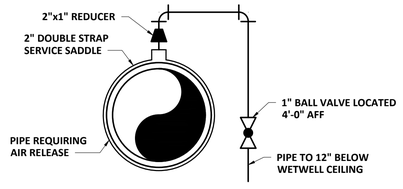


NOTE:

1. PROVIDE ONE SUCTION GAUGE ASSEMBLY AND ONE DISCHARGE GAUGE ASSEMBLY PER PROCESS PUMP UNLESS OTHERWISE SPECIFIED. GAUGES SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 11000 AND 11310.

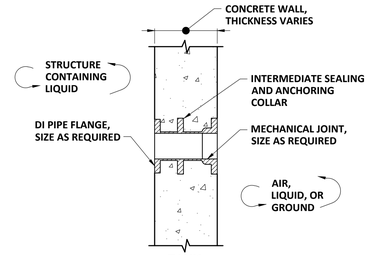
PIPE MOUNTED GAUGE ASSEMBLY

NTS



MANUAL AIR RELEASE DETAIL

SCALE: NTS

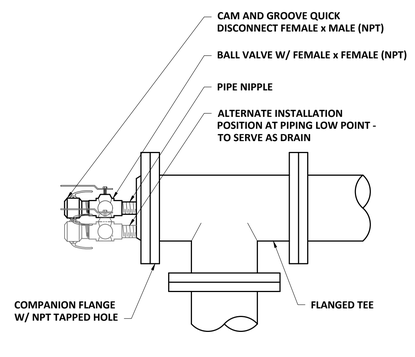


NOTES:

1. REFER TO SPECIFICATION SECTION 15092 FOR REQUIREMENTS AND INFORMATION.
2. WALL CASTING CONNECTION SHOWN IS FLG TO MJ. PROVIDE TYPE OF WALL CASTING AS REQUIRED.
3. SET TOP OF LINK TYPE SEAL APPROXIMATE ½" TO ¼" BELOW FINISH FLOOR.
4. LINK SEAL SHALL NOT BE USED TO SUPPORT PIPE. THREADED ROD SHALL BE SIZED AS REQUIRED TO SUPPORT PIPE BOTH VERTICALLY AND HORIZONTALLY.

CONSTRUCTION PIPING PENETRATION DETAILS

SCALE: NTS

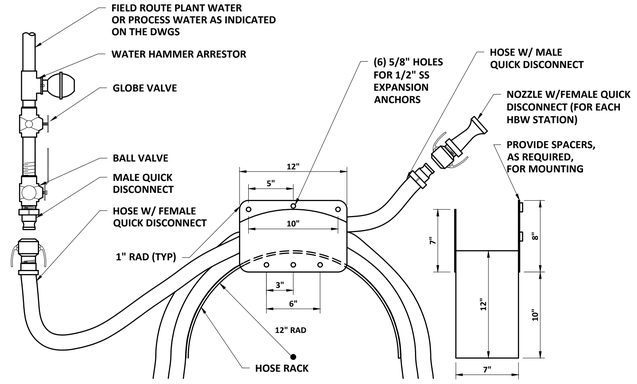


NOTE:

1. SEE PROCESS DRAWINGS AND SPECIFICATION SECTION 15200.

FLUSHING CONNECTION

SCALE: NTS



NOTES:

1. DETAIL IS FOR NON-POTABLE WATER APPLICATIONS IN ACCORDANCE WITH SPECIFICATION SECTION 15200. FOR POTABLE WATER HOSE BIBB AND APPURTENANCES, REFER TO SPECIFICATION SECTION 15401.
2. COORDINATE LOCATIONS WITH ENGINEER AND OWNER.
3. TO BE PROVIDED AT SECONDARY CLARIFIERS 6, 7, 8, AND INSIDE THE NORTH RAS PUMP STATION.

WASHDOWN (HBW) / FLUSHING (HBF) HOSE BIBB STATIONS

SCALE: NTS

REV.	DATE	DESCRIPTION	BY
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2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
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STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

DETAILS I

PROJECT NO: 21163	DESIGNED BY: W.EDGERTON	DR. A.COUTURE	PR-99-501
SUBMISSION: CONTRACT DRAWINGS		TRC. -	
CAD COORD: A.COUTURE		CK. D.STILES	
		AP. S.HALLOWELL	DWG. No. 12221-W-33
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

J:\ENGV\AV\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\PRO\21163-PRS-DETAILS.DWG | Details I | 1:10.12364677 | — | 2/12/2026 3:56:25 PM | ADAM.COUTURE

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DESIGN CRITERIA

OUTSIDE DESIGN TEMPERATURE

WINTER (ASHRAE MEAN ANUAL EXTREME)	30°F
SUMMER (ASHRAE 0.4%)	93°F DB/79°F WB
INSIDE DESIGN TEMPERATURE WINTER/SUMMER	
PROCESS AREAS	55°F/AMBIENT
ELECTRICAL AREAS	AMBIENT/80°F

VENTILATION RATES - REFER TO DRAWINGS

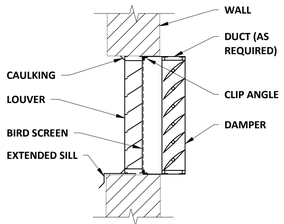
SCHEMATIC / LEGEND

- PIPE TURNING DOWN
- PIPE TURNING UP
- PIPE TEE DOWN
- PIPE CAP
- DRAIN / FILL STATION
- THERMOSTAT
- TS — TEMPERATURE SENSOR
- PS — PRESSURE SENSOR
- S — SENSOR
- CG — COMBUSTIBLE GAS DETECTOR
- FS — PROOF-OF-AIRFLOW SWITCH
- THERMOMETER
- ATC-# — AUTOMATIC TEMPERATURE CONTROL PANEL
- HORN/STROBE

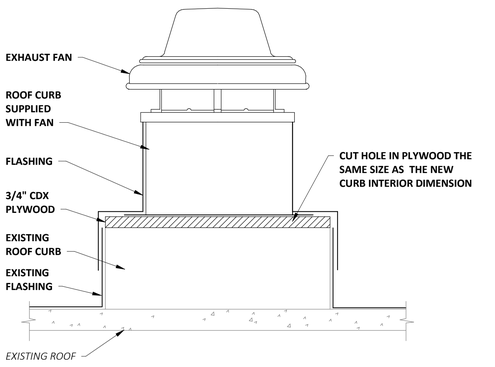
- RECTANGULAR SUPPLY AIR DUCT UP
- RECTANGULAR SUPPLY AIR DUCT DOWN
- RECTANGULAR RETURN OR EXHAUST AIR DUCT UP
- RECTANGULAR RETURN OR EXHAUST AIR DUCT DOWN
- SUPPLY DIFFUSER, REGISTER OR GRILLE
- RETURN REGISTER OR GRILLE
- SIDEWALL REGISTER
- KEYNOTE
- DIRECTION OF AIR FLOW (S/OA)
- DIRECTION OF AIR FLOW (R/E)
- VD — VOLUME DAMPER
- MITERED ELBOW WITH TURNING VANES
- DIFFUSER DESIGNATION PER SCHEDULE / AIRFLOW IN CFM (DIFF / CFM)
- EQ-# — EQUIPMENT DESIGNATION & SEQUENCE NUMBER
- POINT OF CONNECTION BETWEEN EXISTING AND NEW
- APPROX. EXTENTS OF DEMOLITION
- DEMOLITION NOTE TAG
- MODIFICATIONS NOTE TAG

MECHANICAL GENERAL NOTES

1. ALL EQUIPMENT AND PIPING LAYOUT DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED WITH EQUIPMENT SUPPLIED, AND/OR EXISTING CONDITIONS. SOME INFORMATION ASSOCIATED WITH EXISTING STRUCTURES, PIPING AND EQUIPMENT LOCATIONS, ELEVATIONS AND SIZES, WERE TAKEN FROM THE RECORD DRAWINGS FOR THE EAST BANK WASTEWATER TREATMENT FACILITY, NEW ORLEANS, LOUISIANA, EAST BANK WWTF IMPROVEMENT (RICE, DORNBLATT & ERNST, 1988), WHICH ARE AVAILABLE FOR REVIEW AT THE ENGINEER'S OFFICE. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES, EQUIPMENT OR PIPING THAT MAY BE AFFECTED.
2. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY DIMENSIONS, LAYOUT OR ELEVATION CHANGES REQUIRED TO SUIT THE SPECIFIC EQUIPMENT BEING PROVIDED UNDER THIS CONTRACT. WHEN SUCH EQUIPMENT REQUIRES PADS, PIERS, CURBING, ETC., THAT DIFFERS FROM THAT SHOWN ON THE CONSTRUCTION DRAWINGS, THE CONTRACTOR SHALL COORDINATE THE STEEL REINFORCING SHOP DRAWINGS ACCORDINGLY.
3. CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. THE EXCEPTION IS WHEN SCANNED IMAGES ARE UTILIZED FROM THE PREVIOUS CONSTRUCTION PROJECTS NOTED IN GENERAL NOTE No.1 ABOVE. WHEN REVIEWING DRAWINGS NOTED AS "SCANNED" UNDER DRAWING TITLE, THE CONTRACTOR SHALL IGNORE ANY REFERENCE TO PREVIOUS CONTRACT WORK. SCANNED IMAGES ARE NOT TO SCALE, HOWEVER AN APPROXIMATE SCALE MAY BE GIVEN FOR CONVENIENCE.
4. ALL COMPONENTS OF THE AUTOMATIC TEMPERATURE CONTROL SYSTEM SHALL MEET THE ELECTRICAL CLASSIFICATION OF THE SPACE IN WHICH THEY ARE INSTALLED UNLESS NOTED OTHERWISE IN THE SPECIFICATIONS.
5. ALL DUCTWORK AND DEVICES SHALL BE FABRICATED, REINFORCED AND INSTALLED IN ACCORDANCE WITH SMACNA (SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION) DOCUMENT "HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE". SEAL ALL DUCT JOINTS TO SEAL CLASS "B".
6. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH THE 2021 INTERNATIONAL MECHANICAL CODE.
7. ALL PIPING SYSTEMS SHALL BE PRESSURE TESTED FOR TIGHTNESS IN ACCORDANCE WITH SPECIFICATION SECTION 15601. ALL LEAKS SHALL BE CORRECTED AND RETESTED UNTIL PRESSURE TEST IS SATISFACTORY PRIOR TO THE INSTALLATION OF PIPE INSULATION.
8. TEST REFRIGERANT PIPING IN ACCORDANCE WITH 2021 IMC, CHAPTER 11.
9. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
10. ALL MITERED ELBOWS, AND RADIUS ELBOWS HAVING RAD<1.0xDUCT WIDTH SHALL HAVE TURNING VANES INSTALLED.
11. INDICATES EXISTING PIPING/EQUIPMENT TO REMAIN FOR RE-USE.
    INDICATES EXISTING PIPING/EQUIPMENT TO BE DEMOLISHED.
    INDICATES EXISTING PIPING/EQUIPMENT TO BE SAVED FOR REUSE.

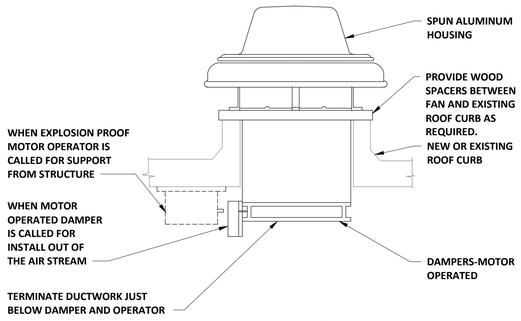


LOUVER & DAMPER DETAIL
SCALE: 12" = 1'-0"

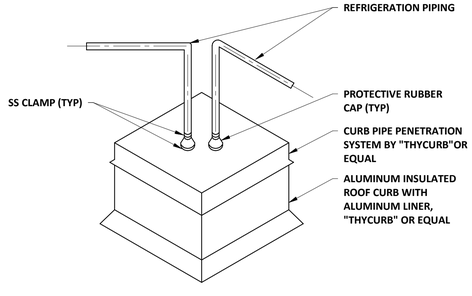


NOTE: FLASHING SHALL BE IN ACCORDANCE WITH THE ROOF SYSTEMMANUFACTURER'S REQUIREMENT

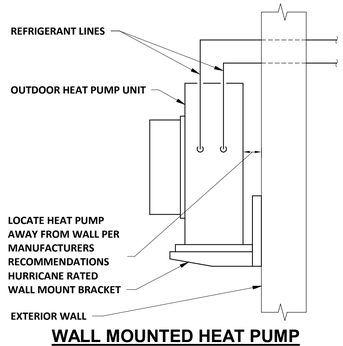
EXHAUST FAN INSTALLATION DETAIL
SCALE: NTS



GRAVITY VENTILATOR DETAIL
SCALE: NTS



ROOF PIPE PENETRATION DETAIL (PRE-FAB CURB)
SCALE: NTS



WALL MOUNTED HEAT PUMP
SCALE: NTS

ABBREVIATIONS

A	AMPERE	HP	HEAT PUMP (DRAWINGS)	RL	REFRIGERANT LIQUID
ABV	ABOVE	HP	HORSEPOWER (SCHEDULES)	RLA	RUNNING LOAD AMPS
ACH	AIR CHANGES PER HOUR	HR	HOUR	RPM	REVOLUTIONS PER MINUTE
AFF	ABOVE FINISH FLOOR	IN	INCHES	RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
AFG	ABOVE FINISH GRADE	kW	KILOWATT		
ATC	AUTOMATIC TEMPERATURE CONTROL	L	LOUVER	RS	REFRIGERANT SUCTION
BOD	BOTTOM OF DUCT	LAT	LEAVING AIR TEMPERATURE	SA	SUPPLY AIR
BOE	BOTTOM OF EQUIPMENT	LF	LINEAR FOOT	SC	SENSIBLE COOLING
BTU	BRITISH THERMAL UNIT	LRA	LOCKED ROTOR AMPS	SCH	SCHEDULE
BTUH	BRITISH THERMAL UNITS PER HOUR	MAX	MAXIMUM	SEER	SEASONAL ENERGY EFFICIENCY RATIO
CD	CONDENSATE DRAIN	MBH	BTUH x 1000	SF	SUPPLY FAN
CFM	CUBIC FEET PER MINUTE	MCA	MINIMUM CIRCUIT AMPS	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
D	DAMPER	MFR	MANUFACTURER		
DB	DRY BULB	MIN	MINIMUM	SP	STATIC PRESSURE
DIA, Ø	DIAMETER	MOCP	MAXIMUM OVERCURRENT PROTECTION	TC	TOTAL COOLING
DN	DOWN	MOD	MOTOR OPERATED DAMPER	TG	TRANSFER GRILLE
DS	DUCTLESS SPLIT AIR CONDITIONER	MNT	MOUNT	TOD	TOP OF DUCT
EA	EXHAUST AIR	N/A	NOT APPLICABLE	TOE	TOP OF EQUIPMENT
EAT	ENTERING AIR TEMPERATURE	NC	NOISE CRITERION	TRANS	TRANSITION
EER	ENERGY EFFICIENCY RATIO	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	TS	TEMPERATURE SENSOR
EF	EXHAUST FAN			TSP	TOTAL STATIC PRESSURE
EFF	EFFICIENCY	NO.	NUMBER	TSTAT	THERMOSTAT
EL	ELEVATION	NTS	NOT TO SCALE	TYP	TYPICAL
ESP	EXTERNAL STATIC PRESSURE	OA	OUTSIDE AIR	UH	UNIT HEATER
ET	EXPANSION TANK	OAT	OUTSIDE AIR TEMPERATURE	V	VOLTS
EUH	ELECTRIC UNIT HEATER	OED	OPEN END DRAIN, OPEN END DUCT	VD	VOLUME DAMPER
°F	DEGREES FAHRENHEIT	PD	PRESSURE DROP	VFD	VARIABLE FREQUENCY DRIVE
FLA	FULL-LOAD AMPS	PS	PRESSURE SENSOR	W/	WITH
GEV	GRAVITY EXHAUST VENTILATOR	QTY	QUANTITY	W	WIDTH
GIV	GRAVITY INTAKE VENTILATOR	RA	RETURN AIR	WB	WET BULB
GPM	GALLONS PER MINUTE	RAD	RADIUS	WC	WATER COLUMN
H	HEIGHT	RG	RETURN GRILLE	WG	WATER GAUGE

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

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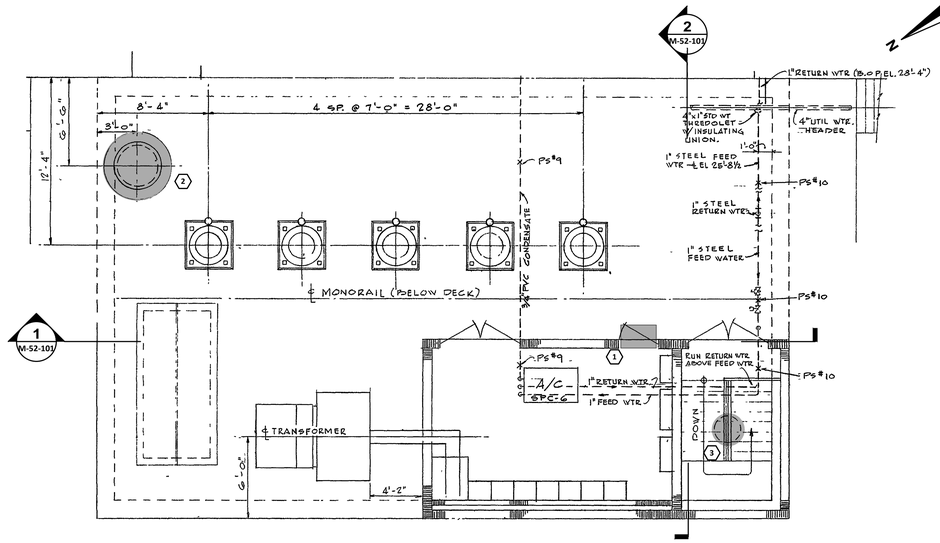
MECHANICAL GENERAL NOTES, LEGEND, DESIGN CRITERIA, AND DETAILS

DR. H. CINI	M-00-001
TRC. -	
CK. R.GREENE	
AP. R.GREENE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF
PROJECT NO: 21163 DESIGNED BY: T. CARLMAN	
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A. COUTURE	

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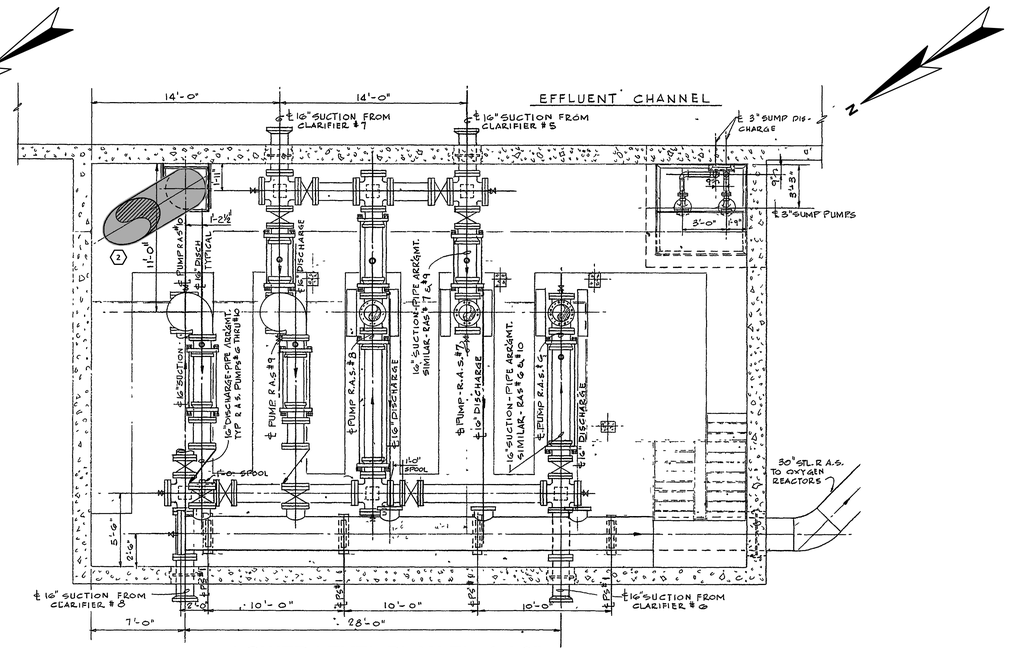
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J:\ENGV\LA\NEWORLEANS\21163-EASTBANKSTP PHASE 1_VW_IMPROVEMENTS_DRAWINGS\PHASE 1A\MEC\21163-M5-RAS-PS-NORTH.DWG | M-8 - North RAS Pump Station | 11/10/2025 4:46:06 PM | ADAM.COUTURE



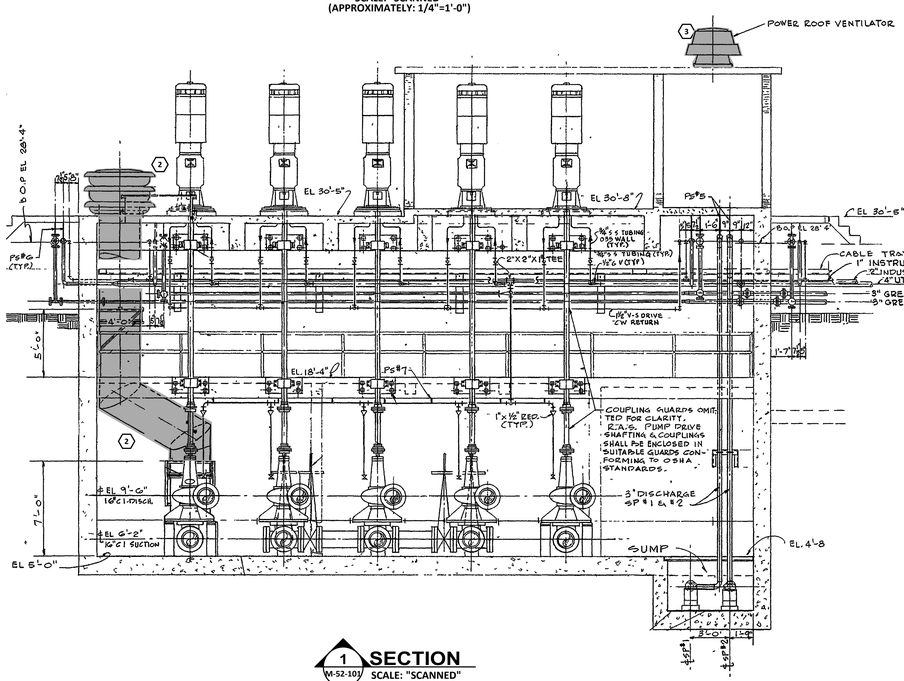
UPPER LEVEL PLAN EL. 30'-5"

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")

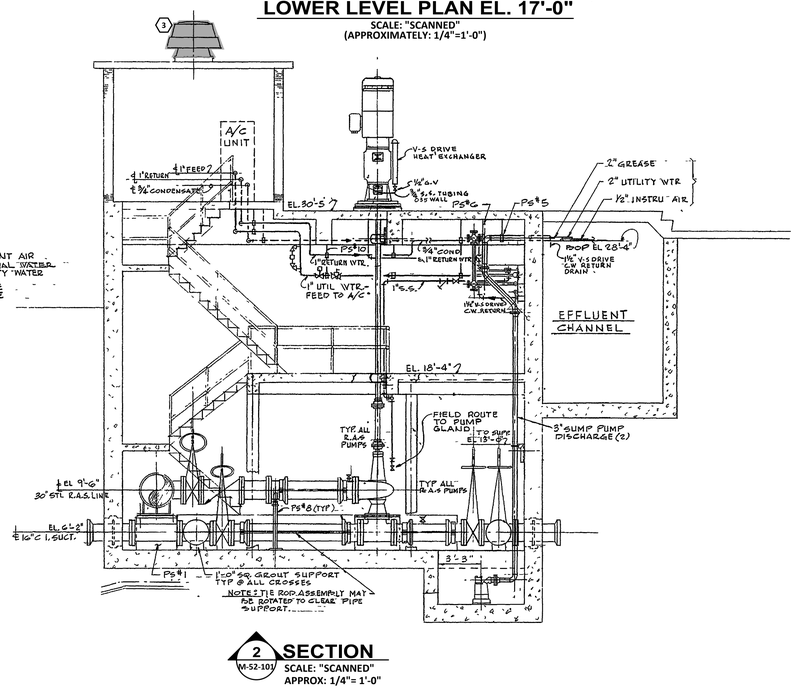


LOWER LEVEL PLAN EL. 17'-0"

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")



1 M-52-101 **SECTION**
SCALE: "SCANNED"
APPROX: 1/4"=1'-0"



2 M-52-101 **SECTION**
SCALE: "SCANNED"
APPROX: 1/4"= 1'-0"

DEMOLITION NOTES:

1. REMOVE/DEMOLISH EXISTING AIR CONDITIONING UNIT IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: UNIT, PIPING, FITTINGS, WIRING AND CONDUIT, AND ALL OTHER ASSOCIATED APPURTENANCES. COORDINATE INFILL OF PENETRATION WITH ARCHITECTURAL.
2. REMOVE/DEMOLISH EXISTING SUPPLY FAN IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: FAN, DUCTWORK, FITTINGS, WIRING AND CONDUIT, CONTROLS AND ALL ASSOCIATED APPURTENANCES. CLEAN AND PREPARE PENETRATION FOR INSTALLATION OF NEW.
3. REMOVE/DEMOLISH EXISTING EXHAUST FAN IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO; ALL DUCTWORK, FITTINGS, SUPPORTS, AND OTHER ASSOCIATED APPURTENANCES TO REMAIN. CLEAN AND PREPARE PENETRATION AND CORRESPONDING EQUIPMENT FOR INSTALLATION OF NEW.

NOTES:

1. FOR MECHANICAL NOTES, LEGEND, AND ABBREVIATIONS REFER TO DRAWING M-001-1

REV.	DATE	DESCRIPTION	BY
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2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
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2/12/2026

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NORTH RAS PUMP STATION DEMOLITION PLANS AND SECTIONS

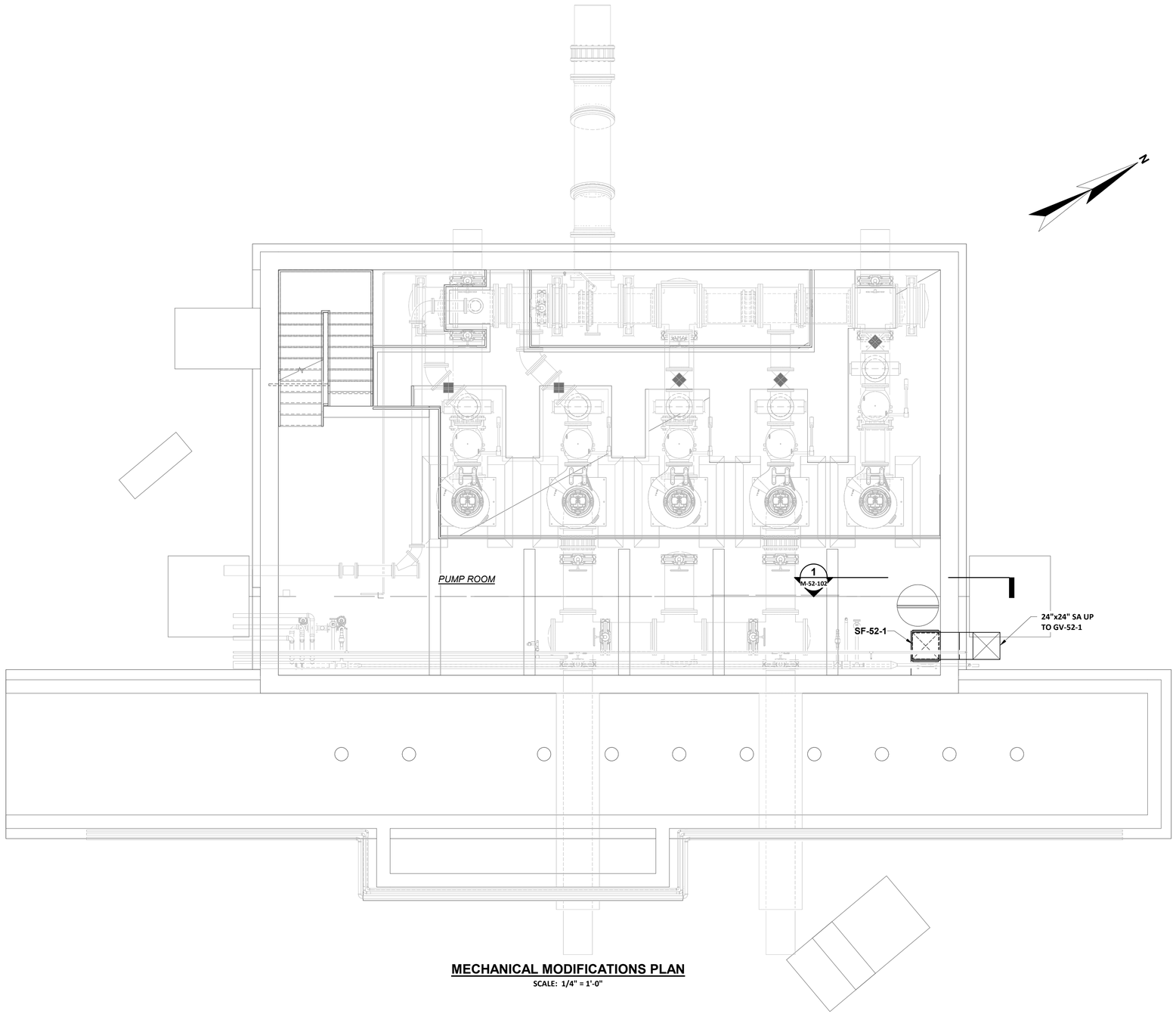
DR. H.CINI	
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CK. R.GREENE	
AP. R.GREENE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	
SET NO.	SHEET NO. OF

M-52-101

DWG. No. 12221-W-33

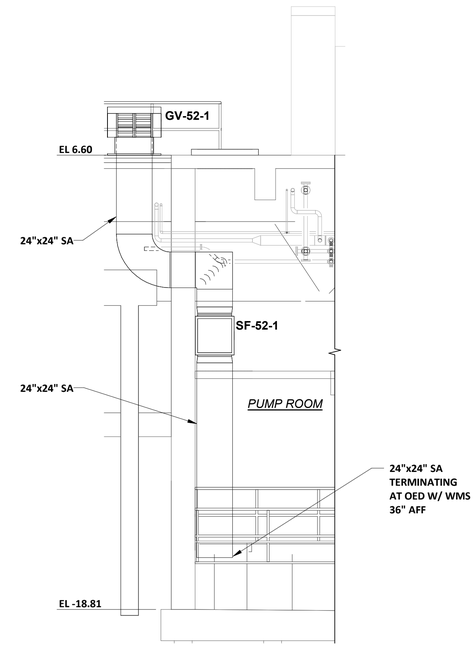
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SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

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MECHANICAL MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"



1 M-52-102 SECTION

SCALE: 1/4" = 1'-0"

NOTES:

1. FOR MECHANICAL NOTES, LEGEND, AND ABBREVIATIONS REFER TO DRAWING M-00-1.

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2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA

SECONDARY TREATMENT AND SOLIDS UPGRADE

NORTH RAS PUMP STATION BASEMENT MECHANICAL MODIFICATIONS PLAN

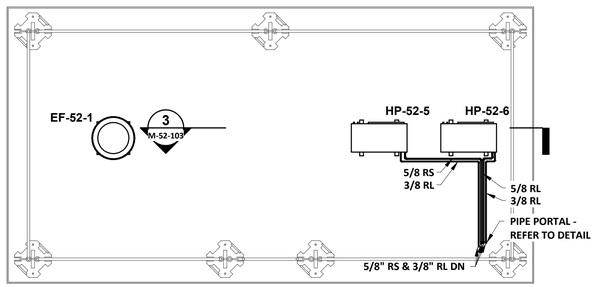
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SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A. COUTURE	

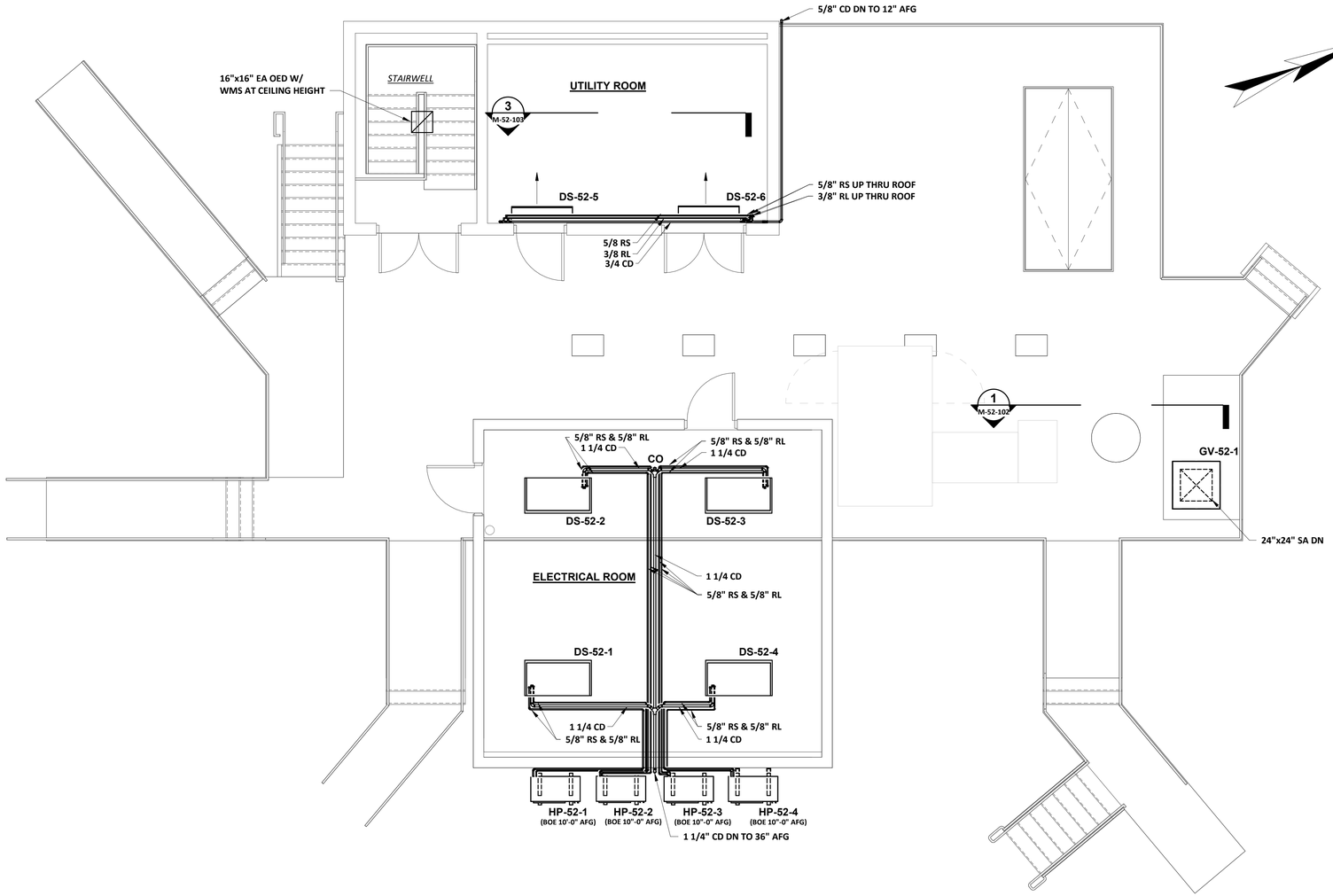
DR. H.CINI	**M-52-102**
TRC. -	
CK. R.GREENE	
AP. R.GREENE	**DWG. No. 12221-W-33**
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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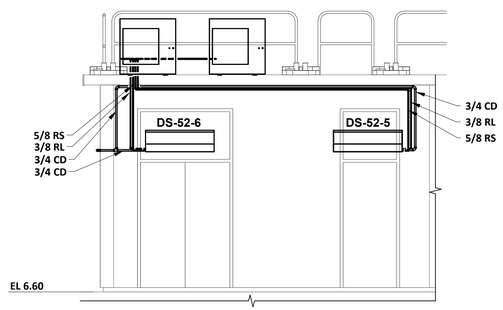
MECHANICAL MODIFICATIONS UTILITY ROOM ROOF PLAN

SCALE: 1/4" = 1'-0"



MECHANICAL MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"



3 M-52-103 SECTION

SCALE: 1/4" = 1'-0"

NOTES:

1. FOR MECHANICAL NOTES, LEGEND, AND ABBREVIATIONS REFER TO DRAWING M-00-001.

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SEWERAGE AND WATER BOARD OF NEW ORLEANS

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SECONDARY TREATMENT AND SOLIDS UPGRADE

STATE OF LOUISIANA
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SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A. COUTURE	

NORTH RAS PUMP STATION FIRST FLOOR MECHANICAL MODIFICATIONS PLAN

DR. H.CINI	**M-52-103**
TRC. -	
CK. R.GREENE	
AP. R.GREENE	**DWG. No. 12221-W-33**
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AIR COOLED DX HEAT PUMP SCHEDULE

UNIT NO.	LOCATION SERVED	REFRIGERANT	TOTAL MBH		SEER	COMPRESSOR		CONDENSER					REMARKS	NOTES
			COOL	HEAT		RLA	LRA	CFM	VOLTS	PHASE	MCA	MOCP		
HP-52-1	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	40	18.8	8	13	3880	208/230	1	25	30	MITSUBISHI PUZ-A36NKA7 OR EQUIVALENT	1,2,4
HP-52-2	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	40	18.8	8	13	3880	208/230	1	25	30	MITSUBISHI PUZ-A36NKA7 OR EQUIVALENT	1,2,4
HP-52-3	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	40	18.8	8	13	3880	208/230	1	25	30	MITSUBISHI PUZ-A36NKA7 OR EQUIVALENT	1,2,4
HP-52-4	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	40	18.8	8	13	3880	208/230	1	25	30	MITSUBISHI PUZ-A36NKA7 OR EQUIVALENT	1,2,4
HP-52-5	NORTH PUMP HOUSE BUILDING - UTILITY ROOM	R410a	24	28	21.4	7	11	1940	208/230	1	19	25	MITSUBISHI PUZ-A24NKA7 OR EQUIVALENT	1,3,4
HP-52-6	NORTH PUMP HOUSE BUILDING - UTILITY ROOM	R410a	24	28	21.4	7	11	1940	208/230	1	19	25	MITSUBISHI PUZ-A24NKA7 OR EQUIVALENT	1,3,4

NOTES:
1. PROVIDE ALL OPTIONS AND ACCESSORIES FOR LOW AMBIENT OPERATION
2. PROVIDE HURRICANE RATED STAINLESS STEEL BRACKETS FOR WALL MOUNTING. COORDINATE EXACT LOCATION WITH GENERAL CONTRACTOR
3. PROVIDE THYBAR CURBS FOR ROOF MOUNTING. COORDIANTE EXACT LOCATION WITH GENERAL CONTRACTOR
4. PROVIDE WITH SEACOAST COIL PROTECTION

DUCTLESS SPLIT HEAT PUMP SCHEDULE

UNIT NO.	LOCATION	REFRIGERANT	DX COOLING						DX HEATING			MOUNTING TYPE	CFM	VOLTS	PHASE	FLA	MCA	REMARKS	NOTES
			TC MBH	SC MBH	EAT DB	EAT WB	LAT DB	LAT WB	MBH	EAT	LAT								
DS-52-1	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	26.3	80	67	58	57	40	68	111	CEILING SUSPENDED	850	208/230	1	0.97	1	MITSUBISHI MODEL PCA-A36KA8 OR EQUIVALENT	1
DS-52-2	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	26.3	80	67	58	57	40	68	111	CEILING SUSPENDED	850	208/230	1	0.97	1	MITSUBISHI MODEL PCA-A36KA8 OR EQUIVALENT	1
DS-52-3	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	26.3	80	67	58	57	40	68	111	CEILING SUSPENDED	850	208/230	1	0.97	1	MITSUBISHI MODEL PCA-A36KA8 OR EQUIVALENT	1
DS-52-4	NORTH PUMP HOUSE BUILDING - ELECTRICAL ROOM	R410a	36	26.3	80	67	58	57	40	68	111	CEILING SUSPENDED	850	208/230	1	0.97	1	MITSUBISHI MODEL PCA-A36KA8 OR EQUIVALENT	1
DS-52-5	NORTH PUMP HOUSE BUILDING - UTILITY ROOM	R410a	24	18.5	80	67	58	57	28	68	109	WALL MOUNTED	705	208/230	1	0.265	1	MITSUBISHI MODEL PKA-A24KA8 OR EQUIVALENT	1
DS-52-6	NORTH PUMP HOUSE BUILDING - UTILITY ROOM	R410a	24	18.5	80	67	58	57	28	68	109	WALL MOUNTED	705	208/230	1	0.265	1	MITSUBISHI MODEL PKA-A24KA8 OR EQUIVALENT	1

NOTES:
1. USE MANUFACTURER RECOMMENDED REFRIGERANT TUBING. INSULATE SUCTION & LIQUID LINES. PROVIDE PVC JACKETS.

FAN SCHEDULE

UNIT NO.	LOCATION SERVED	CFM	E.S.P IN WC	FAN RPM	SONES	DRIVE TYPE	TYPE	MOTOR DATA				NEMA	REMARKS	NOTES
								HP	RPM	VOLTS	PHASE			
EF-52-1	NORTH PUMP HOUSE BUILDING - PUMP ROOM	3500	0.375	1328	18.5	DIRECT	CENTRIFUGAL UPBLAST	2	1725	208	1	4X	GREENHECK MODEL CUE-160-VG OR EQUIVALENT	1,2,3,4,5,6
SF-52-1	NORTH PUMP HOUSE BUILDING - PUMP ROOM	3500	0.5	1318	15.6	DIRECT	INLINE CENTRIFUGAL	1	1725	208	1	4X	GREENHECK MODEL SQ-160-VG OR EQUIVALENT	1,2,3,4,6

NOTES:
1. HIGH PERFORMANCE POLYESTER POWDER COAT FINISH (HI-PRO POLY OR EQUIVALENT)
2. ELECTRONICALLY COMMUTATED MOTOR
3. FACTORY MOUNTED AND WIRED DISCONNECT SWITCH
4. FACTORY MOUNTED AND WIRED 0-10 VDC INPUT
5. 24" HIGH ROOF CURB
6. ALUMINUM CONSTRUCTION

GRAVITY VENTILATOR SCHEDULE

UNIT NO.	SERVES	CFM	MAX PRESS DROP IN H20	THROAT DIM	CURB CAP DIM	REMARKS	NOTES
GV-52-1	NORTH PUMP HOUSE BUILDING - PUMP ROOM	3500	0.102	28"x28"	28"x28"	GREENHECK MODEL ESD-635PD OR EQUIVALENT	1,2,3

NOTES:
1. PROVIDE WITH MOTOR OPERATED DAMPER
2. ALUMINUM BIRD SCREEN
3. CORROSION RESISTANT FINISH

REV.	DATE	DESCRIPTION	BY
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MECHANICAL SCHEDULES

PROJECT NO: 21163	DESIGNED BY: T.CARLMAN
SUBMISSION: CONTRACT DRAWINGS	AP. R.GREENE
CAD COORD: A. COUTURE	SCALE: AS NOTED
DR. H.CINI	DATE: FEBRUARY 2026
TRC. -	SET NO.
CK. R.GREENE	SHEET NO. OF

M-99-601

DWG. No. 12221-W-33

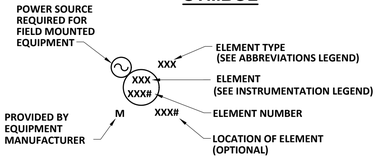
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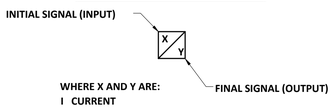
INSTRUMENTATION SYMBOL LEGEND

DESCRIPTION	EXISTING	NEW	FUTURE
PROCESS FLOW			
ELECTRICAL POWER OR PROCESS CONNECTION			
ELECTRICAL SIGNAL			
DATA LINK			
PLC INPUT/OUTPUT	I/O	I/O	I/O
PNEUMATIC SIGNAL			
HYDRAULIC SIGNAL			
DISCRETE OUTPUT SIGNAL	I/O	I/O	I/O
ANALOG OUTPUT SIGNAL	I/O	I/O	I/O
DISCRETE INPUT SIGNAL	I/O	I/O	I/O
ANALOG INPUT SIGNAL	I/O	I/O	I/O
HARDWIRE INTERLOCK	XX# XX# (INTERLOCK I.D. NUMBER / LOCATION OF INTERLOCK)	XX# XX# (INTERLOCK I.D. NUMBER / LOCATION OF INTERLOCK)	XX# XX# (INTERLOCK I.D. NUMBER / LOCATION OF INTERLOCK)
PROGRAMMABLE LOGIC CONTROLLER			
OPERATOR TERMINAL INTERFACE			
LOCAL (FIELD MOUNTED)			
FRONT PANEL MOUNTED			
REAR PANEL MOUNTED			
INTEGRAL EQUIPMENT			
SIGNAL SPLITTER CONVERTER/ BOOSTER (SEE BELOW)	X Y	X Y	X Y
MOTOR	M	M	M
ALARM/ STATUS LIGHT			
STROBE LIGHT			

TYPICAL INSTRUMENTATION SYMBOL



TYPICAL SIGNAL CONVERTER SYMBOL



WHERE X AND Y ARE:
- I CURRENT
- E VOLTAGE
- P PRESSURE
- H HYDRAULIC

* ALSO USED AS A MODIFIER AFTER FIRST LETTER (i.e. PDIT: PRESSURE DIFFERENTIAL INDICATING TRANSMITTER)

** ALSO USED AS A MODIFIER AFTER LAST LETTER (i.e. LSHH: LEVEL SWITCH HIGH HIGH)

INSTRUMENTATION LEGEND

FIRST LETTER		SUCCEEDING LETTER	
1		2	3
A	ANALYSIS	ALARM	-
B	-	-	-
C	CONTROL	CONTROL	CONTROL
D	DIFFERENTIAL*	DETECT	-
E	-	ELEMENT	-
F	FLOW	--	-
G	GAS	GLASS	GLASS
H	HAND (MANUAL)	-	HIGH**
I	CURRENT	INDICATE	INDICATE
J	POWER	--	-
K	TIME*	--	-
L	LEVEL	LIGHT	LOW**
M	MOTOR	-	INTERMEDIATE
P	PRESSURE	-	-
Q	QUANTITY OR TOTALIZE*	QUANTITY	-
R	RADIATION	RECORD	RECORD
S	SPEED OR FREQUENCY	SWITCH	SIGNAL
T	TEMPERATURE	TRANSMIT	TRANSMIT
V	VIBRATION	VALVE	VALVE
W	TORQUE, WEIGHT, FORCE	-	-
X	-	-	-
Y	STATUS	RELAY, COMPUTE,OR CONVERT	RELAY, COMPUTE OR CONVERT
Z	POSITION	--	-

VALVES AND FITTINGS

DESCRIPTION	EXISTING	NEW	FUTURE
GATE VALVE			
BALL VALVE			
PLUG VALVE			
GLOBE VALVE			
BUTTERFLY VALVE			
CHECK VALVE			
DOUBLE DISC CHECK VALVE			
DIAPHRAGM VALVE			
MUD VALVE			
TIDE CHECK VALVE			
NEEDLE VALVE			
PINCH VALVE			
3-WAY VALVE			
KNIFE GATE			
TELESCOPING VALVE	T	T	T
CONCENTRIC REDUCER			
ECCENTRIC REDUCER			
FLOW ARROW			
UNION			
PRESSURE SAFETY VALVE	PSV PSV	PSV PSV	PSV PSV
VACUUM RELIEF	V V	V V	V V
BACKPRESSURE VALVE	BPV	BPV	BPV
PRESSURE REDUCING VALVE	PRV	PRV	PRV
BACKFLOW PREVENTER			
DUPLEX STRAINER			
SIMPLEX STRAINER			
WYE STRAINER			
IN-LINE MIXER			
EXPANSION JOINT			
ROTAMETER			
PULSTATION DAMPENER			
DIAPHRAGM SEAL			

ACTUATORS

CONTROL ACTUATOR	M	M	M
SOLENOID ACTUATOR	S	S	S
PNEUMATIC DIAPHRAGM ACTUATOR			
PNEUMATIC/HYDRALUIC CYLINDER			

ELECTRICAL EQUIPMENT

INTRINSICALLY SAFE BARRIER	ISB	ISB	ISB
INTRINSICALLY SAFE RELAY	ISR	ISR	ISR

ABBREVIATIONS LEGEND

AMD	ADMITTANCE
CAP	CAPACITANCE
CL	CHLORINE
CP	CONTROL PANEL
CR	CONTROL RELAY
DO	DISSOLVED OXYGEN
ESTOP	EMERGENCY STOP
FOR	FORWARD-OFF-REVERSE
FSR	FORWARD-STOP-REVERSE
FRSA	FORWARD-STOP-REVERSE-AUTO
GBT	GRAVITY BELT THICKENER
HOA	HAND-OFF-AUTO
I	CURRENT
INF	INFLUENT
ISB	INTRINSICALLY SAFE BARRIER
ISR	INTRINSICALLY SAFE RELAY
LOE	LOSS OF ECHO
LOR	LOCAL-OFF-REMOTE
LT	PILOT LIGHT
MBS	MAINTENANCE BY-PASS SWITCH
MCC	MOTOR CONTROL CENTER
MES	MANAGED ETHERNET SWITCH
OCR	OPEN-CLOSE-REMOTE
OPT	OPERATOR TERMINAL
PB	PUSH BUTTON
PLC	PROGRAMMABLE LOGIC CONTROLLER
POT	POTENTIOMETER
RESET	ALARM RESET
ROL	RAISE OFF LOWER
ROR	RUN-OFF-REMOTE
SCR	SPEED CONTROL RECTIFIER
SCSP	SECONDARY CLARIFIER GREASE/SCUM PUMP
SS	SELECTOR SWITCH
TR	TIMER RELAY
TURB	TURBIDITY
ULT	ULTRASONIC
UPS	UNINTERRUPTIBLE POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE

PUMPS

DESCRIPTION	EXISTING	NEW	FUTURE
POSITIVE DISPLACEMENT			
PROGRESSIVE CAVITY			
SCREW PUMP			
CENTRIFUGAL			
SUBMERSIBLE PUMP			
HOSE			
CHEMICAL METERING			
CHEMICAL TRANSFER			

BLOWERS

CENTRIFUGAL			
POSITIVE DISPLACEMENT			
COMPRESSOR/TURBO			
AIR INTAKE FILTER			

MISCELLANEOUS SYMBOLS

MIXER			
IN-LINE STATIC MIXER			
GRINDER			
WEIR			
STOP GATE			
SLIDE GATE			
SHEAR GATE			
CHEMICAL INJECTION NOZZLE			

FIELD INSTRUMENTS

DESCRIPTION	EXISTING	NEW	FUTURE
FIELD PIPE MOUNTED DEVICE			
PADDLE OR LEVER TYPE PROBE			
SUBMERSIBLE PRESSURE TRANSDUCER			
FLOAT SWITCH			
CAPACITANCE OR ADMITTANCE TYPE PROBE			
BUBBLE LIQUID LEVEL ELEMENT			
ULTRASONIC LEVEL TRANSDUCER			
RADAR LEVEL TRANSDUCER			
GUIDED WAVE RADAR			

FLOW METERS

MAGNETIC FLOW METER	M	M	M
VENTURI FLOW METER			
PARSHALL FLUME			
ULTRASONIC FLOW METER			
PITOT FLOW METER			
AVERAGING PITOT FLOW METER			
THERMAL MASS FLOW METER			
TURBINE FLOW METER	M	M	M
ORIFICE PLATE			

INDICATOR LIGHT COLOR LEGEND

RUN	GREEN
STOP	RED
WARNING	AMBER
ALARM	RED
POWER	WHITE

NOTES:

1. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE SIGNAL REPEATERS/CONVERTERS/BOOSTERS AS REQUIRED BASED UPON EQUIPMENT SELECTED BY INSTRUMENTATION SUPPLIER, DISTANCE AND LOCATION.
3. PROVIDE DRIP SHIELDS TO PROTECT ALL PANELS LOCATED UNDERNEATH PIPES OR OTHER LIQUID-CONTAINING STRUCTURES.
4. REFERENCE PROCESS AND ELECTRICAL DRAWINGS FOR LOCATION OF PANELS AND FIELD INSTRUMENTATION.
5. CONTRACTOR TO COORDINATE NEEDED VOLTAGE BASED UPON EQUIPMENT SUPPLIED.
6. ALL FLOOR MOUNTED CONTROL PANELS SHALL BE INSTALLED ON 4" HIGH CONCRETE EQUIPMENT PADS.
7. WHERE INPUT AND OUTPUT SIGNALS TO A PLC IS REQUIRED, PROVIDE PROPER TYPE AND QUANTITY OF INPUT/OUTPUT MODULES (I/O).
8. CONTRACTOR SHALL COORDINATE THE TYPE OF ANALOG SIGNAL PROVIDED BY THE EQUIPMENT OR FIELD DEVICES WITH THE PROPER TYPE PLC I/O.
9. ALL ANALOG SIGNALS WILL BE 4-20mA, UNLESS OTHERWISE INDICATED OR REQUIRED.

REV.	DATE	DESCRIPTION	BY
3			
2			
1			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
PROFESSIONAL ENGINEER
2/12/2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
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PROJECT NO: 21163	DESIGNED BY: R.MECHAM
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

LEGEND

DR. R.MECHAM	I-00-001
TRC. -	
CK. R.MECHAM	
AP. R.MECHAM	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. / OF

J:\ENG\LAN\NEWORLEANS\21163-EASTBANKSTP PHASE_I_MVV_IMPROVEMENTS_DRAWINGS\PHASE-1A\INS\21663-15-LOOPS-P1A.DWG | Legend | 1:10.12364677 | — | 2/12/2026 3:23:44 PM | ADAM.COUTURE

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CAT6 PATCH PANEL
NETWORK SWITCH
FIREWALL
KVM MONITOR
RACK KVM SWITCH
SCADA 1
SCADA 2
DOMAIN CONTROLLER AND HISTORIAN (SRV-3)
NETWORK ATTACHED STORAGE (NAS-1)
FIBER OPTIC PATCH PANEL (FPP)
UPS POWER DISTRIBUTION
UPS-SERVER
NON-UPS POWER
120VAC
120VAC

SCADA CLIENT (DEWATERING CONTROL ROOM)

DEWATERING CONTROL PANEL DW-CP (DIV. 13)
FPP-DW
OIT-DW
MES-DW
PLC-DW
MBS-DW
UPS-DW

GRAVITY BELT THICKENER CONTROL PANEL GBTCP-1 (DIV. 11)
480VAC
OIT-GBT-1
MES-GBT-1
PLC-GBT-1
MBS-GBT-1
UPS-GBT-1

POLYMER BLEND CONTROL PANEL PBUCP-1 (DIV. 11)
480VAC
OIT-PBU-1
MES-PBU-1
PLC-PBU-1
MBS-PBU-1
UPS-PBU-1

SEE NOTE 1

SEPTAGE BAR SCREEN CONTROL PANEL SBS-CP (DIV. 11)
120VAC
OIT-SBS
ES-SBS
PLC-SBS
MBS-SBS
UPS-SBS

NORTH RAS PUMP STATION CONTROL PANEL NR-CP (DIV. 13)
120 VAC
FPP-NR
OIT-NR
MES-NR
PLC-NR
MBS-NR
UPS-NR

GRAVITY BELT THICKENER CONTROL PANEL GBTCP-2 (DIV. 11)
480VAC
OIT-GBT-2
MES-GBT-2
PLC-GBT-2
MBS-GBT-2
UPS-GBT-2

POLYMER BLEND CONTROL PANEL PBUCP-2 (DIV. 11)
480VAC
OIT-PBU-2
MES-PBU-2
PLC-PBU-2
MBS-PBU-2
UPS-PBU-2

SEPTAGE SCREENING WASH PRESS CONTROL PANEL SSWP-CP (DIV. 11)
120VAC
OIT-SSWP
ES-SSWP
PLC-SSWP
MBS-SSWP
UPS-SSWP

SEPTAGE CONTROL PANEL SEP-CP (DIV. 13)
120VAC
FPP-SEP
OIT-SEP
MES-SEP
PLC-SEP
MBS-SEP
UPS-SEP

DEWATERED SLUDGE TRANSFER PUMP CONTROL PANEL DSFPCP-1 (DIV. 11)
OIT-DSFP-1
MES-DSFP-1
PLC-DSFP-1

DEWATERED SLUDGE TRANSFER PUMP CONTROL PANEL DSFPCP-2 (DIV. 11)
OIT-DSFP-2
MES-DSFP-2
PLC-DSFP-2

POLYMER BLEND CONTROL PANEL PBUCP-3 (DIV. 11)
480VAC
OIT-PBU-3
MES-PBU-3
PLC-PBU-3
MBS-PBU-3
UPS-PBU-3

LEGEND:

- CAT-PLC — ETHERNET PLC COMMUNICATION
- CAT-SC — ETHERNET SCADA COMMUNICAITON
- FO-SC — FIBER OPTIC SCADA COMM
- DP — DP — PROFIBUS DP

OPERATOR TERMINAL INTERFACE OR HMI
RACK STYLE PROGRAMMABLE LOGIC CONTROLER (PLC)
FIBER PATCH PANEL
SCADA SERVER — DIN RAIL MOUNTED INTERIM SCADA SERVER
12-PORT MANAGED MODULAR INDUSTRIAL ETHERNET SWITCH
UPS — UNINTERRUPTABLE POWER SUPPLY
MAINTENANCE BYPASS SWITCH
DATA PORT
SCADA CLIENT

NOTES:
1. TO BE INSTALLED UNDER SEPARATE CONTRACT.
2. FOR ALL EQUIPMENT SHOWN AS "NOT IN THIS CONTRACT", THE CONTRACTOR SHALL PROVIDE SUFFICIENT NETWORK CONNECTIONS ON PROVIDED NETWORK SWITCHES AND PATCH PANELS TO SUPPORT THE WORK SHOW AS "NOT IN THIS CONTRACT"

STATE OF LOUISIANA — STEVEN CHARLES HALLOWELL License No. Pe0046278 — PROFESSIONAL ENGINEER — 2/12/2026

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

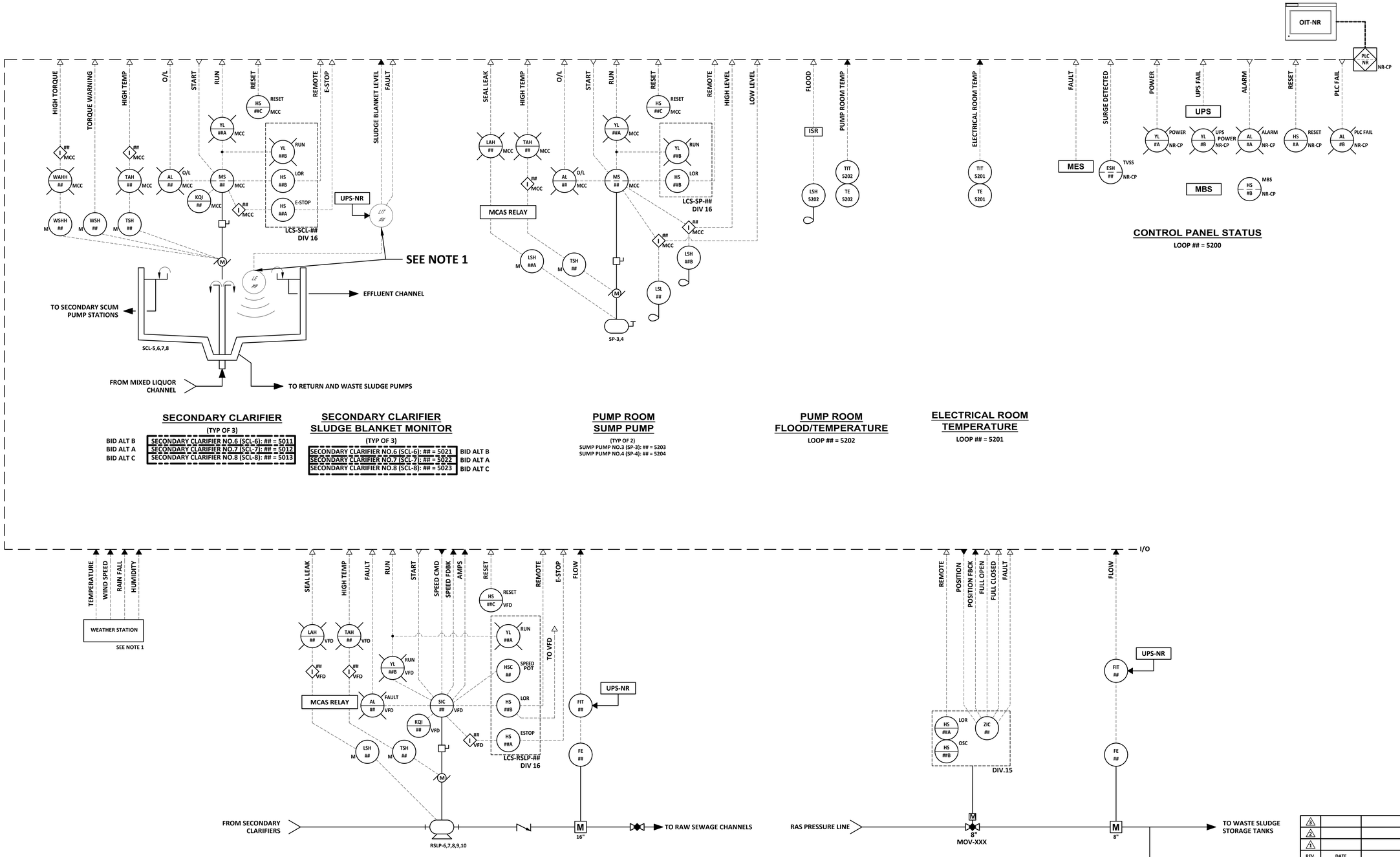
CONTROL SYSTEM ARCHITECTURE

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DR. R.MECHAM	
TRC. -	
CK. R.MECHAM	
AP. R.MECHAM	
PROJECT NO: 21163	DESIGNED BY: R.MECHAM
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

I-00-002
DWG. No. 12221-W-33
SET NO. — SHEET NO. — OF

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SECONDARY CLARIFIER

(TYP OF 3)

BID ALT B — SECONDARY CLARIFIER NO.6 (SCL-6): ## = 5011
BID ALT A — SECONDARY CLARIFIER NO.7 (SCL-7): ## = 5012
BID ALT C — SECONDARY CLARIFIER NO.8 (SCL-8): ## = 5013

SECONDARY CLARIFIER SLUDGE BLANKET MONITOR

(TYP OF 3)

SECONDARY CLARIFIER NO.6 (SCL-6): ## = 5021 — BID ALT B
SECONDARY CLARIFIER NO.7 (SCL-7): ## = 5022 — BID ALT A
SECONDARY CLARIFIER NO.8 (SCL-8): ## = 5023 — BID ALT C

PUMP ROOM SUMP PUMP

(TYP OF 2)

SUMP PUMP NO.3 (SP-3): ## = 5203
SUMP PUMP NO.4 (SP-4): ## = 5204

PUMP ROOM FLOOD/TEMPERATURE

LOOP ## = 5202

ELECTRICAL ROOM TEMPERATURE

LOOP ## = 5201

WEATHER STATION

LOOP 5205

RETURN SLUDGE PUMPS

(TYP OF 5)

RETURN SLUDGE PUMPS NO. 6 (RSLP-6): ## = 5210
RETURN SLUDGE PUMPS NO. 7 (RSLP-7): ## = 5211
RETURN SLUDGE PUMPS NO. 8 (RSLP-8): ## = 5212
RETURN SLUDGE PUMPS NO. 9 (RSLP-9): ## = 5213
RETURN SLUDGE PUMPS NO.10 (RSLP-10): ## = 5214

RETURN SLUDGE FLOW

(TYP OF 5)

FE NO. 6: ## = 5210
FE NO. 7: ## = 5211
FE NO. 8: ## = 5212
FE NO. 9: ## = 5213
FE NO. 10: ## = 5214

MOTOR OPERATED VALVE

LOOP ## = 5220

WASTE ACTIVATED SLUDGE FLOW

LOOP ## = 5220

NOTES:
1. THE WEATHER STATION PROVIDED MAY BE CONNECTED USING ANALOG SIGNALING OR NETWORK COMMUNICATIONS. SEE 13440-2.1, B, 10.
2. THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100-ALTERNATES
3. EXISTING LEVEL ELEMENT TO BE REMOVED AND REINSTALLED ON THE NEW BRIDGE WAY.

SHEET CONTAINS BID ALTERNATE "A", "B", "C"

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

LOOPS I

STEVEN CHARLES HALLOWELL — License No. Pe0046278 — PROFESSIONAL ENGINEER — STATE OF LOUISIANA — 9/12/2026

WRIGHT-PIERCE
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DR.	R.MECHAM
TRC.	-
CK.	R.MECHAM
AP.	R.MECHAM
SCALE:	AS NOTED
DATE:	FEBRUARY 2026

PROJECT NO: 21163 | DESIGNED BY: R.MECHAM
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

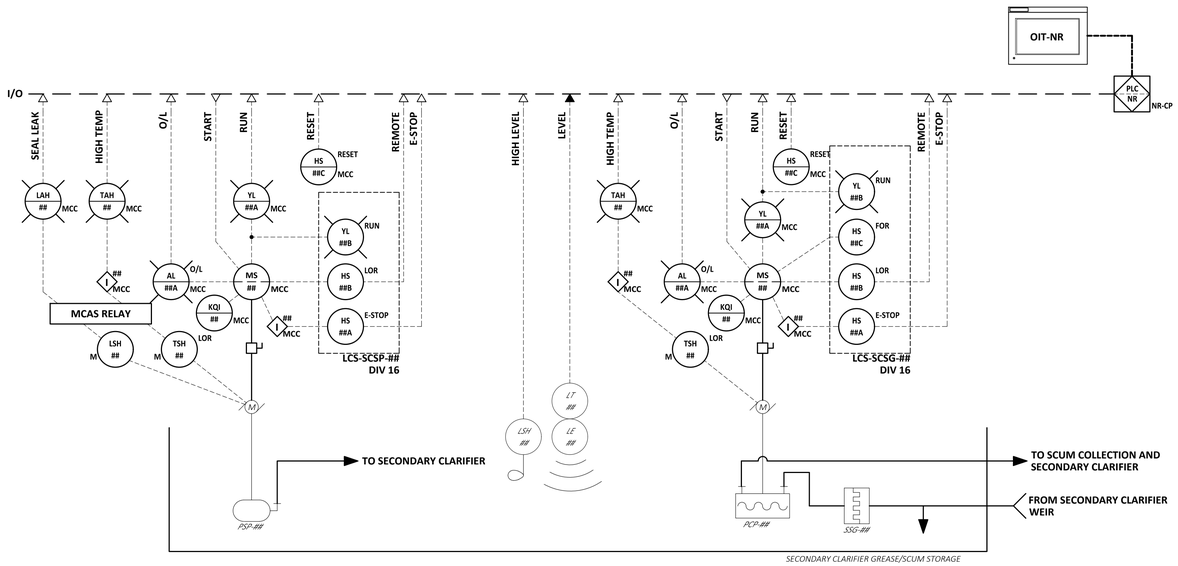
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DWG. No. 12221-W-33

SET NO. | SHEET NO. | OF

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	SECONDARY CLARIFIER GREASE/SCUM PUMP (TYPE OF 3)	SECONDARY CLARIFIER GREASE/SCUM STORAGE LEVEL (TYPE OF 3)	SECONDARY CLARIFIER GREASE/SCUM GRINDER AND PUMP (TYPE OF 3)
BID ALT B	SCSP NO.6 = 5231	SCSP NO.6 = 5239	SCSP NO.6 = 5235
BID ALT A	SCSP NO.7 = 5232	SCSP NO.7 = 5240	SCSP NO.7 = 5236
BID ALT C	SCSP NO.8 = 5233	SCSP NO.8 = 5241	SCSP NO.8 = 5237

NOTES:
1. **THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100-ALTERNATES**

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3/12/2026

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SHEET CONTAINS BID ALTERNATE "A", "B", "C"

REV.	DATE	DESCRIPTION	BY
3			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

LOOPS II

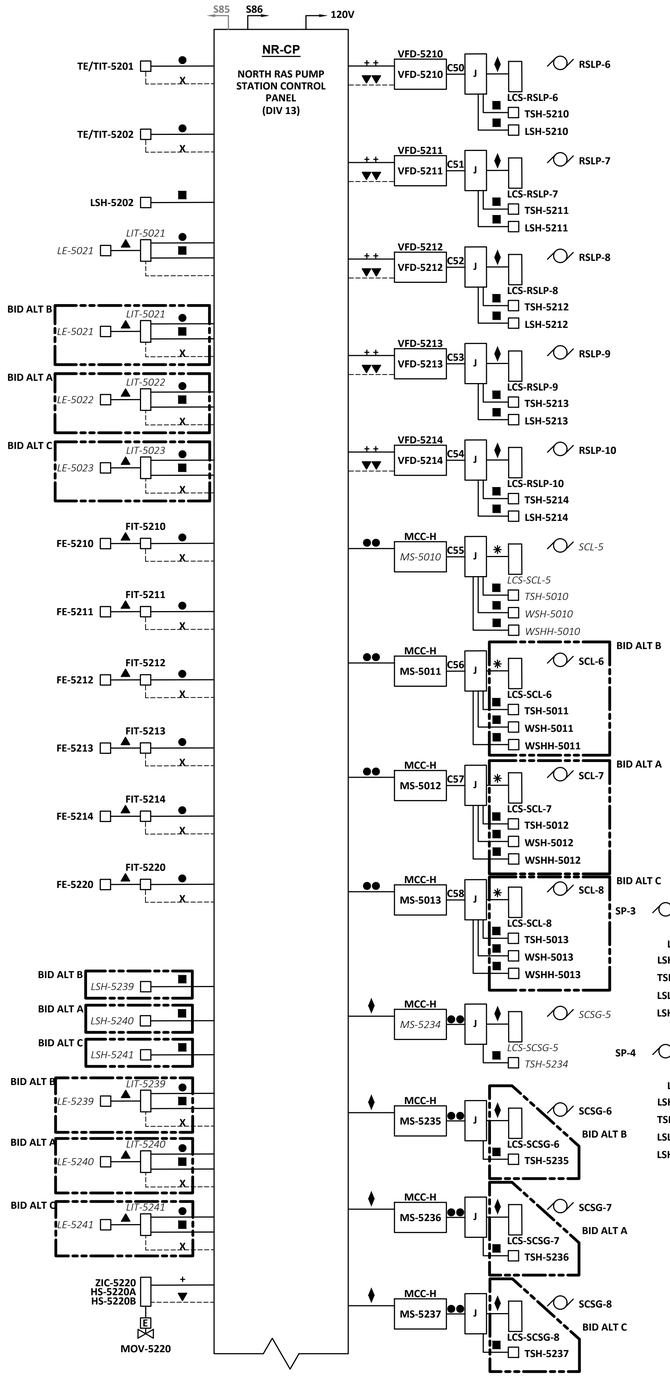
PROJECT NO: 21163	DESIGNED BY: R.MECHAM
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. R.MECHAM	**I-00-004**
TRC. -	
CK. R.MECHAM	
AP. R.MECHAM	**DWG. No. 12221-W-33**
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

I:\ENG\LA\NEWORLEANS\21163-EASTBANKSTP PHASE_I_WW_IMPROVEMENTS_DRAWINGS\PHASE-1A\WS\21663-IS-LOOPS-P1A.DWG | loopsII | 1:10.12364677 | — | 2/12/2026 3:23:52 PM | ADAM.COUTURE

LAST SAVED BY: MORGAN.FELICE 4/21/2025 8:54 AM

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INSTRUMENTATION AND CONTROL DIAGRAM

NTS

Instruments Connection					
Conduit No	Conduit Size	Wire Type	Wire Count	From	To
C40	1"	#14	20	MS-5230	Secondary Clarifier Grease/Scum Pump No.5
C41	1"	#14	20	MS-5231	Secondary Clarifier Grease/Scum Pump No.6
C42	1"	#14	20	MS-5232	Secondary Clarifier Grease/Scum Pump No.7
C43	1"	#14	20	MS-5233	Secondary Clarifier Grease/Scum Pump No.8
C44	1"	#14	24	MS-5203	Pump Room Sump Pump No.1
C45	1"	#14	24	MS-5204	Pump Room Sump Pump No.2
C50	1"	#14	22	VFD-5210	Return Sludge Pump No.6
C51	1"	#14	22	VFD-5211	Return Sludge Pump No.7
C52	1"	#14	22	VFD-5212	Return Sludge Pump No.8
C53	1"	#14	22	VFD-5213	Return Sludge Pump No.9
C54	1"	#14	22	VFD-5214	Return Sludge Pump No.10
C55	1"	#14	24	MS-5010	Grease Scum/Grinder and Pump No.5
C56	1"	#14	24	MS-5011	Grease Scum/Grinder and Pump No.6
C57	1"	#14	24	MS-5012	Grease Scum/Grinder and Pump No.7
C58	1"	#14	24	MS-5013	Grease Scum/Grinder and Pump No.8

Control Panel Connection					
Conduit No	Conduit Size	Wire Type	Wire Count	From	To
S86	2"	12 fiber OM3	1	CP-NR	Future SCADA

LEGEND:

1. THE FOLLOWING SYMBOLS SHOWN ON THE CONTROL AND INSTRUMENTATION DIAGRAMS SHALL BE NOTED AS FOLLOWS:
   - ▲ MANUFACTURER SUPPLIED CABLE, PROVIDE CONDUIT SIZED AS REQUIRED
   - ■ PROVIDE 3/4"C, 4#14
   - ▬ PROVIDE 3/4"C, 6#14
   - ◤ PROVIDE 3/4"C, 8#14
   - + PROVIDE 3/4"C, 10#14
   - ✳ PROVIDE 3/4"C, 12#14
   - ⧫ PROVIDE 3/4"C, 14#14
   - + + PROVIDE 1"C, 16#14
   - ●● PROVIDE 1"C, 18#14
   - ●●● PROVIDE 1"C, 26#14
   - ● PROVIDE 3/4"C, 2#12 & 1#12 GND (POWER SUPPLY)
   - ◆ PROVIDE 3/4"C, (1)-2C #16 TWS
   - X PROVIDE 3/4"C, (2)-2C #16 TWS
   - ▼ PROVIDE 1"C, (3)-2C #16 TWS
   - ▼▼ PROVIDE 1"C, (4)-2C #16 TWS
   - ▼▼▼ PROVIDE 1"C, (5)-2C #16 TWS
   - ⬡ PROVIDE 1"C, (2)-3/C #16 TWS
   - ▟ PROVIDE 3/4"C, CAT 6 ETHERNET CABLE
   - ** PROVIDE FINAL CONNECTIONS TO ALL CHEMICAL METERING PUMPS USING HEAVY-DUTY, EXTRA-FLEXIBLE, WATER AND CHEMICAL RESISTANT CABLES. CONDUCTORS SHALL BE NO.18 AWG. ALL CONNECTIONS SHALL BE MADE WATERTIGHT. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION.

SEE NOTE 1

NOTES:
1. NOT FINAL, FOR COORDINATION PURPOSES

SHEET CONTAINS BID ALTERNATE "A", "B", "C"

REV.	DATE	DESCRIPTION	BY
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2			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE IA
SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA
STEVEN CHARLES HALLOWELL
License No. Pe0046278
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2/12/2026

WRIGHT-PIERCE
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SCHEMATICS I

PROJECT NO: 21163	DESIGNED BY: R.MECHAM
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. M.FELICE	
TRC. -	
CK. R.MECHAM	
AP. R.MECHAM	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

I-00-005

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

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POWER

	DESCRIPTION
200/3	UNFUSED SAFETY SWITCH, RATING AS NOTED POLES AMPERES
30/15/3	FUSED SAFETY SWITCH, RATING AS NOTED POLES FUSE AMPERE RATING SWITCH AMPERE RATING
1	MAGNETIC MOTOR STARTER, RATING AS NOTED NEMA SIZE
	COMBINATION TYPE MAGNETIC MOTOR STARTER, RATING AS NOTED
	PUSHBUTTON OR SELECTOR SWITCH STATION
	MAINTAINED RED MUSHROOM-HEAD EMERGENCY STOP P.B.
	SOLENOID
R	RELAY
MOD	MOTOR OPERATED DAMPER
C	LIGHTING OR POWER CONTACTOR
CB	ENCLOSED CIRCUIT BREAKER
T	THERMOSTAT C — COOLING ONLY F — FREEZESTAT D — DUCT-MOUNTED
	UTILITY METER
	PANELBOARD, SURFACE MTD.
	PANELBOARD, FLUSH MTD.
	EQUIPMENT, TERMINAL, OR CONTROL CABINET
	MOTOR
T	TRANSFORMER
	PAD MOUNTED TRANSFORMER
EWH	ELECTRIC WATER HEATER
H	ELECTRICAL HANDHOLE
J J	JUNCTION BOX
PS	PRESSURE SWITCH
M	MOTOR OPERATED VALVE
P	PHOTOELECTRIC CELL
MS	MANUAL MOTOR STARTER
FI	FIROMATIC SWITCH

GROUNDING

	DESCRIPTION
	GROUND ROD
	EXOTHERMIC WELD CONNECTION
	BOLTED CONNECTION
G	BARE COPPER CONDUCTOR RUN EXPOSED
G	BARE COPPER CONDUCTOR EMBEDDED IN CONCRETE OR BURIED

NOTE:

1. ALL SYMBOL LISTS SHALL BE CONSIDERED AS APPLICABLE TO ALL ELECTRICAL DRAWINGS FOR THIS PROJECT. SYMBOLS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY AND DO NOT INDICATE THEIR INCORPORATION IN THE DESIGN.

SINGLE LINE DIAGRAM

	DESCRIPTION
	SAFETY DISCONNECT SWITCH
	TRANSFORMER
CT	CURRENT TRANSFORMER
PT	POTENTIAL TRANSFORMER
100AF 70AT	FRAME SIZE CIRCUIT BREAKER TRIP AMPS
	SURGE CAPACITOR
	LIGHTNING ARRESTER
	COMBINATION MOTOR STARTER AND BREAKER
	AUTOTRANSFORMER-TYPE MOTOR STARTER
	REVERSING MOTOR STARTER
	TWO-SPEED TWO-WINDING MOTOR STARTER
	REDUCED VOLTAGE SOLID-STATE MOTOR STARTER
	DELTA CONNECTION
	WYE CONNECTION
	GROUND CONNECTION
S	MOTOR (HP AS SHOWN)
	GENERATOR
N E	TRANSFER SWITCH
ES	EMERGENCY STOP MUSHROOM SWITCH (RED)
SPD	SURGE PROTECTION DEVICE
A	METER A - AMMETER V - VOLTMETER W - WATTMETER WH - WATT HOURMETER KWH - KILOWATT HOUR VAR - VAR METER HZ - FREQUENCY METER PF - POWER FACTOR METER

LIGHTING FIXTURES

	DESCRIPTION
	FLUORESCENT FIXTURE, 2x4 SURFACE TROFFER TYPE
Ma,#3	FIXTURE (M) SWITCH (a) CIRCUIT (3)
	FLUORESCENT FIXTURE, STRIP, OPEN REFLECTOR, ENCLOSED OR WRAPAROUND TYPE
	INCANDESCENT WALL MOUNTED FIXTURE
	INCANDESCENT CEILING FIXTURE
	INCANDESCENT LIGHT WITH GLOBE AND GUARD
	H.I.D. WALL MOUNTED FIXTURE
	H.I.D. CEILING FIXTURE
	EXIT SIGN, CEILING MOUNTED ARROW INDICATES EGRESS DIRECTION SHADING INDICATES SIGN FACE
	EXIT SIGN, WALL MOUNTED SHADING INDICATES SIGN FACE
	EMERGENCY LIGHTING BATTERY UNIT WITH 2 LAMP HEADS
	REMOTE EMERGENCY LIGHTING 1 OR 2 LAMP HEADS
	POLE MOUNTED SITE LIGHT

SCHEMATIC DIAGRAM

	DESCRIPTION
MS	MANUAL MOTOR STARTER, O/L, RIL FRACTIONAL H.P.
CR	CONTROL RELAY
M	MOTOR CONTACTOR
	CONTACT NORMALLY OPEN
	CONTACT NORMALLY CLOSED
	OVERLOAD HEATER ELEMENT
	SINGLE POLE SINGLE THROW SWITCH
	SELECTOR SWITCH
	START PUSHBUTTON, MOMENTARY CONTACT
	STOP PUSHBUTTON, MOMENTARY CONTACT
	RED MUSHROOM-HEAD MAINTAINED-TYPE EMERGENCY STOP PUSHBUTTON
	LIMIT SWITCH
	TEMPERATURE SWITCH
	FLOAT SWITCH
	PRESSURE SWITCH
	TORQUE SWITCH
	TIMED CONTACT
R	PILOT LIGHT, LETTER INDICATES COLOR G — GREEN R — RED A — AMBER
	FUSE
	CONNECTION POINT FOR EXTERNAL DEVICE
	INTERNAL CONNECTION POINT
	COOLING FAN

FIRE ALARM SYSTEM

	DESCRIPTION
F	MANUAL PULL STATION
F	AUDIO/VISUAL ALARM STATION (ADA COMPLIANT)
L	VISUAL ALARM (ADA COMPLIANT)
S	SMOKE DETECTOR
H 135°	HEAT DETECTOR TEMP RATING
SD	DUCT-MOUNTED SMOKE DETECTOR, REMOTE ALARM & TEST
FACP	FIRE ALARM SYSTEM CONTROL PANEL
TS	SPRINKLER SYSTEM TAMPER SWITCH
FAA	FIRE ALARM ANNUNCIATOR
FS	SPRINKLER SYSTEM FLOW SWITCH
FRPS	FIRE ALARM REMOTE POWER SUPPLY
MM	FIRE ALARM SYSTEM "MONITOR MODULE"
FIM	FAULT ISOLATING MODULE
TS	REMOTE TEST STATION
ILCP	INTEGRAL LIGHTNING CIRCUIT PROTECTOR

TELEPHONE/PAGING/INTERCOM SYSTEM

	DESCRIPTION
S	PAGING SPEAKER, CEILING MTD.
S	PAGING HORN, WALL MTD.
	TELEPHONE OUTLET RJ11
TD	TELEPHONE RJ11/DATA RJ45
W	WALL MOUNTED
HS	PAGING HANDSET, WALL MOUNTED

WIRING DEVICES

	DESCRIPTION
	20 AMPERE, 120 VOLT DUPLEX RECEPTACLE
	GFI 20 AMPERE, 120 VOLT DUPLEX RECEPTACLE
+48"	INDICATES INCHES AFF MOUNTING HEIGHT
WP	WEATHERPROOF
IG	ISOLATED GROUND
CTR	COUNTER TOP
	20 AMPERE, 120 VOLT QUAD RECEPTACLE
	20 AMPERE, 120 VOLT SINGLE RECEPTACLE
	CLOCK OUTLET
30	SINGLE SPECIAL PURPOSE RECEPTACLE INDICATES AMPERE SIZE
	PLUGMOLD
S	SINGLE POLE WALL SWITCH
DP	DOUBLE POLE SWITCH
3	THREE WAY SWITCH
4	FOUR WAY SWITCH
P	NEON PILOT LIGHT
WP	WEATHERPROOF
K	KEY OPERATED
EP	EXPLOSION PROOF
D	DIMMER SWITCH
T	MOTOR RATED
EM	EMERGENCY SHUT-OFF

WIRING

	DESCRIPTION
	WIRING, CONCEALED IN FINISHED AREAS, EXPOSED WHERE PERMITTED BY SPECIFICATIONS
	WIRING INSTALLED IN OR BELOW FLOOR SLAB
EBU-XX	HOME RUN TO DEVICE (EBU, ATC, ETC.)
P101	HOME RUN (NO. REFERS TO CONDUIT AND WIRE SCHEDULE)
DC	DC WIRING
3C#12 W/GND, .75"C	CONDUIT AND WIRE
	CONDUIT DOWN
	CONDUIT UP
#XX	INDICATES THE CIRCUIT # OF THE RESPECTIVE PANELBOARD REFERENCED. SEE GENERAL NOTES 6 AND 26 FOR CONDUIT AND WIRING REQUIREMENTS

SECURITY SYSTEM

	DESCRIPTION
SACP	SECURITY ALARM CONTROL PANEL
K WP	SECURITY SYSTEM FUNCTION KEYPAD WEATHERPROOF
D OH	DOOR CONTACT OVERHEAD DOOR TYPE
W	GLASS BREAK CONTACT, GLASS MOUNTED TYPE
IR A	INFRARED INTRUDER SENSOR
G A	AREA GLASS BREAK DETECTOR

NEMA CLASSIFICATIONS FOR ELECTRICAL EQUIPMENT AND ENCLOSURES

(UNLESS OTHERWISE NOTED - SEE NOTE BELOW)

ROOM NAME	NEMA RATING
NORTH RAS PUMP STATION	
PUMP ROOM	4X
ELECTRICAL ROOM	12
UTILITY ROOM	12
THICKENED SLUDGE	
PUMP GALLERY	4X
THICKENED SLUDGE CANOPY (OUTDOORS)	
GRAVITY BELT THICKENERS - WITHIN 3'	7(CL 1, DIV 1)
- BEYOND 3'	4X
THICKENED/WAS STORAGE TANKS	
WITHIN TANKS	7(CL 1, DIV 1)
OUTDOORS	4X
SOLIDS HANDLING BLDG.	
EFFLUENT PUMP MOTOR ROOM	4X
ELECTRICAL ROOM	12
CONTROL ROOM	12
GARAGE ROOM	12
DEWATERING AREA	4X
POLYMER AND SLUDGE DISPOSAL ROOM	4X
SEDIMENTATIONS BASINS	
PIPE GALLERY	7(CL 1, DIV 1, GR D)
LIQUID SLUDGE/SEPTAGE RECEIVING FACILITIES	
WITHIN TANKS	7(CL 1, DIV 1, GR D)
OUTDOORS	4X
OUTDOORS	
GENERAL OUTDOORS	4X
POLYMER SHELTER	
WITH SHELTER	4X
OUTDOORS	4X

NOTES:

1. THE AREAS NOTED SHALL BE RATED AS INDICATED, EXCEPT THAT EQUIPMENT SUCH AS MOTOR CONTROL CENTERS, SWITCHBOARDS, AND TRANSFORMERS SHALL BE RATED AS SPECIFIED. PANELBOARDS AND TRANSFORMERS SHALL BE, AT A MINIMUM, RATED NEMA 12 IF NOT SPECIFIED.
2. AREAS WITHIN 3' OF VENTS ARE RATED NEMA 7(CLASS 1, DIV. 1) AND BETWEEN 3' AND 5' ARE RATED NEMA 7(CLASS 1, DIV. 2). AREAS 18" ABOVE AND WITHIN 3' FROM HATCH OPENINGS ARE RATED NEMA 7(CLASS 1, DIV. 2). AREAS WITHIN A 3' ENVELOPE FROM DOORS ARE RATED NEMA 7(CLASS 1, DIV. 2).
3. WATER SURFACE TO 18" ABOVE TANK AND 10 FEET FROM WALL 18" ABOVE GRADE IS RATED NEMA 7 (CLASS 1, DIV. 2) AREAS 18" ABOVE TANK WALL AND ABOVE GRADE ARE RATED UNCLASSIFIED NEMA 4X.

** CONDUIT INSTALLATION SCHEDULE

AREA NEMA RATING PER E-1	CONDUIT REQUIRED IN EXPOSED AREAS	CONDUIT REQUIRED IN NON EXPOSED AREAS	CONDUITS EMERGING FROM GRADE OR SLAB 12" AFF
1/12	* ALUMINUM	EMT	RGS PVC COATED
3R	* ALUMINUM	RGS	RGS PVC COATED
4	* ALUMINUM	RGS	RGS PVC COATED
4X	* ALUMINUM	RGS	RGS PVC COATED
4X CORROSIVE	RGS PVC COATED	RGS	RGS PVC COATED
4X CORROSIVE ABOVE 8'	PVC SCHEDULE 80	RGS	N/A
7	RGS PVC COATED	RGS	RGS PVC COATED
* IN CONCRETE SLAB	N/A	PVC SCHEDULE 40	RGS PVC COATED
* BELOW GRADE DUCT ENCASED IN CONCRETE	N/A	PVC SCHEDULE 40	RGS PVC COATED
* BELOW GRADE DUCT NON ENCASED	N/A	PVC SCHEDULE 80	RGS PVC COATED

** SEE SPECIFICATIONS FOR FURTHER INFORMATION
* SIGNAL CONDUITS SHALL BE RGS

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil Structural Mechanical Electrical Marine Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA — JOHN C. LAWRENCE — REG. NO. 27941 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING — 02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

ELECTRICAL LEGEND, NEMA AND CONDUIT INSTALLATION SCHEDULES

E-00-001

DWG. No. 12221-W-33

SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 4:11 PM

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ABBREVIATIONS

A	AMPERE
AC	ALTERNATING CURRENT
ACR	CONTROL RELAY "A" (TYP)
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AI	ANALOG INPUT (PLC)
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
AO	ANALOG OUTPUT (PLC)
ASYM	ASYMMETRICAL
ATC	AUTOMATIC TEMPERATURE CONTROL
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BFG	BELOW FINISHED GRADE
BKR	BREAKER
BOS	BOTTOM OF STEEL
C	CONDUIT
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CCF	CARBON CANISTER FILTER
CI	CONTROL INTERLOCK
CKT	CIRCUIT
CP	CONTROL PANEL
CR	CONTROL RELAY
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DACT	DIGITAL ALARM COMMUNICATOR TRANSMITTER
DB	DIRECT BURIED
DBH	DIESEL BLOCK HEATER
DC	DIRECT CURRENT
DI	DIGITAL INPUT (PLC)
DISC	DISCONNECT
DN	DOWN
DO	DIGITAL OUTPUT (PLC)
EBU	EMERGENCY BATTERY UNIT
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
EH	ELECTRICALLY HELD
EHH	ELECTRICAL HANDHOLE
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
EP	EXPLOSION PROOF CL I DIV 1 GR D
EPR	ETHYLENE PROPYLENE RUBBER
EQUIP	EQUIPMENT
ES	EMERGENCY STOP
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EX	EXTERIOR
EXIT	EXISTING
F	FIELD
FA	FIRE ALARM
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
FBO	FURNISHED BY OTHERS
FC	FOOTCANDLE
FE	FLOW ELEMENT
FIT	FLOW INDICATOR TRANSMITTER
FLUOR	FLUORESCENT
FNR	FORWARD NEUTRAL REVERSE
FS	FLOW SWITCH
FTR	FIN TUBE RADIATOR
FU	FUSE
FWE	FURNISHED WITH EQUIPMENT
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
GCP	GENERATOR CONTROL PANEL
GEN	GENERATOR
GF	GROUND FAULT
GFI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HIT	HIGH INTENSITY TUNGSTEN
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HTR	HEATER
HV	HIGH VOLTAGE
HVAC	HEATING VENTILATING AIR CONDITIONING
HWV	HOT WATER VALVE
HZ	HERTZ
IG	ISOLATED GROUND
IMC	INTERMEDIATE METAL CONDUIT
INCAND	INCANDESCENT
ISR	INTRINSICALLY SAFE RELAY
JB	JUNCTION BOX
JU	JUMPER WIRE
K	KILO
KCMIL	THOUSAND CIRCULAR MILS
KV	KILOVOLT
KVA	KILOVOLT-AMPERE
KVAR	KILOVOLT-AMPERE REACTIVE
KW	KILOWATT
KWH	KILOWATT-HOUR
L	LOCAL
LA	LIGHTNING ARRESTER
LCP	LOCAL CONTROL PANEL
LCS	LOCAL CONTROL STATION
LE	LEVEL ELEMENT
LI	LEVEL INDICATOR
LIT	LEVEL INDICATOR TRANSMITTER
LP	LIGHTING PANEL
LPS	LOW PRESSURE SODIUM
LSW	LIGHT SWITCH
LS	LEVEL SWITCH L=LOW, H=HIGH, LL=LOW LOW, HH=HIGH HIGH
LT	LEVEL TRANSMITTER
LTG	LIGHTING
LV	LOW VOLTAGE
MC	METAL CLAD
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR	MANUFACTURER
MI	MINERAL INSULATED
MH	MANHOLE
MLO	MAIN LUG ONLY
MO	MECHANICALLY OPERATED
MOD	MOTOR OPERATED DAMPER
MOV	MOTOR OPERATED VALVE
MS	MOTOR STARTER
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
MVA	MEGAVOLT-AMPERE
MV	MEDIUM VOLTAGE
NC	NORMALLY CLOSED
NEG	NEGATIVE
NEU	NEUTRAL
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OEM	FURNISHED BY MANUFACTURER
OH	OVERHEAD
OL	OVERLOAD
OOA	ON-OFF-AUTOMATIC
OSY	OUTSIDE STEM AND YOKE VALVE (FA SYSTEM)
P	POLE
PB	PUSHBUTTON
PC	PERSONAL COMPUTER
PE	PRESSURE ELEMENT
PF	POWER FACTOR
PH	PHASE
PIT	PRESSURE INDICATOR TRANSMITTER
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PT	PRESSURE TRANSMITTER
PVC	POLYVINYL CHLORIDE
QI	LOAD KW INDICATOR
R	REMOTE
RGS	RIGID GALVANIZED STEEL CONDUIT
RIL	RED INDICATING LIGHT (TYP) B=BLUE, G=GREEN, A=AMBER
RSC	RIGID STEEL CONDUIT
RTD	RESISTANCE TEMPERATURE DETECTOR
RVSS	REDUCED VOLTAGE SOLID STATE
S	SURFACE
SEC	SECONDARY
SF	SUPPLY FAN
SHLD	SHIELDED CABLE
SI	SPEED INDICATOR
SN	SOLID NEUTRAL
SP	SPARE
SPD	SURGE PROTECTIVE DEVICE
SS	SURGE SUPPRESSOR
STP	SHIELDED TWISTED PAIR
STT	SHIELDED TWISTED TRIPLET
SV3	3 WAY VALVE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
T	TRANSFORMER
TB	TERMINAL BLOCKS
TOS	TOP OF STEEL
TS	THERMOSTAT
TC	COOLING THERMOSTAT
TD	TEL DIALER
TDR	TIME DELAY RELAY
TE	TEMPERATURE ELEMENT
TEL	TELEPHONE
TF	FREEZE STAT
TH	HUMIDISTAT
TIT	TEMPERATURE INDICATING TRANSMITTER
TL	TEMPERATURE LOW
TOA	THERMOSTAT OUTSIDE AIR
TRANSF	TRANSFORMER
TS	THERMOSTAT
TS	TEMPERATURE SWITCH
TWS	TWISTED SHIELDED CABLE
UG	UNDERGROUND
UH	UNIT HEATER
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT-AMPERE
VAR	VOLT-AMPERE REACTIVE
VFD	VARIABLE FREQUENCY DRIVE
VPS	VACUUM PRESSURE SWITCH
W	WIRE
WH	WATT HOUR
WM	WATT METER
WP	WEATHERPROOF
XLP	CROSS LINKED POLYETHYLENE
XFMR	TRANSFORMER
ZSC	LIMIT SWITCH CLOSED
ZSO	LIMIT SWITCH OPEN

NOTE:

1. ALL GENERAL NOTES, AND ABBREVIATIONS SHALL BE CONSIDERED AS APPLICABLE TO ALL ELECTRICAL DRAWINGS FOR THIS PROJECT. ABBREVIATIONS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY AND DO NOT INDICATE THEIR INCORPORATION IN THE DESIGN.

GENERAL DEMOLITION NOTES:

1. THE EXISTING ELECTRICAL DRAWINGS FOR THIS PROJECT ARE BASED ON INFORMATION PRESENTED IN THE AS-BUILT CONTRACT DRAWINGS PROVIDED FOR THIS PROJECT. GENERAL CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND ELEVATIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
2. FIELD VERIFY ALL CONDITIONS AFFECTING THE WORK PRIOR TO CONSTRUCTION AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
3. PROTECT ALL EXISTING ITEMS AND EQUIPMENT ADJACENT TO THE WORK AREA. ALL EXISTING ITEMS, EQUIPMENT AND MATERIALS DAMAGED OR AFFECTED BY THE WORK SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE OWNER.
4. THE FACILITY WILL REMAIN IN OPERATION DURING THE CONSTRUCTION OF THE PROJECT. THE CONTRACTOR WILL COORDINATE THE DEMOLITION AND CONSTRUCTION WITH THE OWNER'S REQUIREMENTS TO MAINTAIN PLANT OPERATION.
5. PROVIDE ALL TEMPORARY BRACING REQUIRED AND SUPPORT ALL ITEMS AND EQUIPMENT MOUNTED TO THE WALLS WHICH ARE DESIGNATED TO BE REMOVED. REINSTALL ALL ITEMS AFTER THE NEW WALLS ARE COMPLETED.
6. PATCH, REPAIR AND REFINISH ALL EXISTING SURFACES AFFECTED BY THE WORK, TO THE SATISFACTION OF THE ENGINEER.
7. REMOVE, REINSTALL OR REPLACE ALL MISCELLANEOUS ITEMS MOUNTED TO THE WALLS DESIGNATED TO BE REMOVED OR RENOVATED.
8. ALL ITEMS SHOWN ON THE PLANS WITH SHADING ARE TO BE REMOVED AND DISPOSED OF, UNLESS OTHERWISE INDICATED. THIS SHALL INCLUDE ALL ASSOCIATED CONDUIT, WIRING, BOXES, DEVICES, CONTROLS, ETC. UNLESS OTHERWISE NOTED. THE OWNER RESERVES THE RIGHT TO RETAIN ANY EQUIPMENT OR MATERIALS. THE CONTRACTOR WILL STORE ON SITE AND PROTECT SUCH ITEMS IN A MANNER ACCEPTABLE TO THE OWNER AND ENGINEER. ALSO REFER TO THE STRUCTURAL, MECHANICAL, PROCESS AND ELECTRICAL DRAWINGS FOR A COMPLETE REQUIREMENT OF DEMOLITION WORK FOR THIS PROJECT.
9. ALL 120/208V ELECTRICAL EQUIPMENT TO REMAIN WHICH IS FED FROM PANELBOARDS OR EQUIPMENT DESIGNATED AS BEING REMOVED OR RELOCATED, SHALL REMAIN AND BE REWIRED FROM NEW OR RELOCATED PANELBOARDS OR EQUIPMENT AS NOTED ON THE MODIFIED DRAWINGS OR AS REQUIRED BY THE INTENDED OVERALL DEMOLITION OF THIS WORK. REMOVE EXISTING CONDUIT AND WIRING FROM THE APPLICABLE EXISTING PANELBOARD OR EQUIPMENT BACK TO THE CIRCUITS NEAREST PULLBOX, CONTROLLING DEVICE OR FIXTURE LOCATED OUTSIDE THE AREA BEING DEMOLISHED AND RE-FEED AS NOTED ON THE MODIFIED DRAWINGS. RE-FEED THE EXISTING EQUIPMENT WITH NEW CONDUIT AND WIRING FOR A COMPLETE INSTALLATION. SPLICING OF WIRING SHALL NOT BE ALLOWED.
10. THE EXISTING PANELBOARD CIRCUIT DESCRIPTIONS SHOWN WERE TAKEN FROM EXISTING PANELBOARD DIRECTORIES OBTAINED IN THE FIELD AND/OR BY EXISTING RECORD DRAWING PANELBOARD SCHEDULES. THE ACCURACY OF THESE DESCRIPTIONS HAS NOT BEEN FIELD VERIFIED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING ALL CIRCUITRY, AS APPLICABLE FOR THIS PROJECT, ASSOCIATED WITH THE PANEL, AND REPORT ANY DISCREPANCIES TO THE ENGINEER.

GENERAL NOTES

1. ALL CONDUIT AND EQUIPMENT SHALL BE INSTALLED AND GROUNDED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE CURRENT NATIONAL ELECTRICAL CODE.
2. CONDUIT RUNS ARE SHOWN DIAGRAMMATICALLY ONLY AND SHALL BE INSTALLED IN A MANNER TO PREVENT CONFLICTS WITH EQUIPMENT AND STRUCTURES. CONDUITS SHALL BE CONCEALED IN WALLS, AND ABOVE ANY SUSPENDED CEILINGS WHERE APPLICABLE. EXPOSED CEILING CONDUITS SHALL BE PERMITTED WHERE SUSPENDED CEILINGS ARE NOT USED. EXPOSED CONDUITS SHALL BE INSTALLED PARALLEL TO BEAMS AND WALLS.
3. CONDUITS SHALL BE PROPERLY TERMINATED WITH NEAT CONNECTIONS TO ALL ASSOCIATED EQUIPMENT.
4. CONTROL AND INSTRUMENTATION CONDUIT SIZES AND NUMBER OF CONDUCTORS ARE TO BE DETERMINED FROM SCHEMATIC DIAGRAMS, INSTRUMENTATION DIAGRAMS, AND/OR SPECIFICATIONS, IF NOT DIRECTLY SHOWN ON POWER PLANS. THE WIRING DIAGRAMS, QUANTITY AND SIZE OF WIRES AND CONDUIT REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL AND INSTRUMENTATION EQUIPMENT. MODIFICATIONS REVIEWED BY THE ENGINEER WITH NO EXCEPTIONS TAKEN, MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS. EACH CONTROL AND INSTRUMENTATION CONDUIT SHALL ALSO CONTAIN 10 PERCENT SPARE CONDUCTORS, WITH A MINIMUM OF TWO SPARES, UP TO THE LIMIT OF CONDUIT FILL AS SPECIFIED BY THE NATIONAL ELECTRICAL CODE. INSTRUMENTATION SHIELDED CABLES SHALL BE INSTALLED IN RGS CONDUIT. SEPARATE FROM OTHER POWER WIRING.
5. EACH CONDUIT TO CARRY GROUND WIRE(S) ACCORDING TO SPECIFICATION SECTION 16450, IN ADDITION TO NUMBER OF CONDUCTORS SHOWN ON DRAWINGS OR PER NOTE 4 ABOVE. ALL GROUNDING MUST CONFORM TO ARTICLE 250 OF CURRENT NATIONAL ELECTRICAL CODE.
6. MINIMUM CONDUIT SIZE SHALL BE 3/4" TRADE SIZE, UNLESS OTHERWISE NOTED ON THE ELECTRICAL DRAWINGS. GENERAL LIGHTING, RECEPTACLE AND HVAC POWER CIRCUITS MAY BE 1/2" TRADE SIZE CONDUIT INSTALLED PER NEC. MINIMUM POWER WIRING SHALL BE 2C#12 AWG WITH GROUND AND 2C#14 AWG FOR CONTROL. MINIMUM INSTRUMENTATION CABLE SHALL BE 2/C#16 AWG TWS AND 3C#16 AWG TWS FOR SPEED POTENTIOMETERS AND RTD'S. PROVIDE CONDUIT AND WIRING AS INDICATED.
7. ALL PANELBOARDS SHALL BE MOUNTED SO THAT THE DISTANCE FROM THE TOP CIRCUIT BREAKER OPERATING HANDLE TO FINISHED FLOOR SHALL NOT EXCEED 6'-6".
8. ALL SURFACE MOUNTED PANELS AND PANELBOARDS ON THE INSIDE OF EXTERIOR WALLS ABOVE GRADE, OR IN OTHER LOCATIONS CONSIDERED AS DAMP, SHALL BE MOUNTED TO MAINTAIN A 1/4" AIR SPACE BETWEEN THE ENCLOSURE AND THE WALL.
9. ELECTRICAL EQUIPMENT LOCATIONS ARE APPROXIMATE ONLY. COORDINATE LOCATIONS WITH PROCESS PIPING, STRUCTURAL, AND MECHANICAL DRAWINGS. CONTRACTOR SHALL COORDINATE MANUFACTURERS EQUIPMENT REQUIREMENTS WITH SPACE AVAILABLE. FINAL CONTROL PANEL LOCATIONS SHALL BE FIELD COORDINATED.
10. ALL FIELD CONTROL CONDUCTORS WILL TERMINATE AT INDIVIDUAL TERMINAL BLOCKS WITHIN THE CONTROL ENCLOSURE. SERIES AND PARALLEL CONNECTION OF FIELD CONTROL CONDUCTORS WILL BE MADE ONLY AT CONTROL PANEL OR MOTOR CONTROL CENTER TERMINAL BLOCKS.
11. GROUND ALL CONDUCTOR SHIELDS AT PANEL ONLY - DO NOT GROUND SHIELDS AT BOTH ENDS.
12. AT THE FOLLOWING LOCATIONS, UNLESS OTHERWISE NOTED, PULL, JUNCTION, TERMINAL, SWITCH, AND OUTLET BOXES SHALL BE CAST IRON WHERE STEEL CONDUIT IS TERMINATED; OR SHALL BE CAST ALUMINUM WHERE ALUMINUM CONDUIT IS TERMINATED:

    A - AT LOCATIONS WHERE VAPORTIGHT LIGHTING FIXTURES AND/OR WATERTIGHT RECEPTACLES ARE INDICATED.
    B - AT LOCATIONS ON OR IN ALL OUTSIDE WALLS.
    C - OUTDOORS
13. NAMEPLATES SHALL CONFORM STRICTLY TO INSTRUCTIONS IN THE ELECTRICAL SPECIFICATIONS AND ON THE DRAWINGS. THE FOLLOWING SHALL HAVE NAMEPLATES:

    A - ALL MAIN BREAKERS AND TIE BREAKERS.
    B - ALL COMPARTMENTS OF MOTOR CONTROL CENTERS EXCLUDING UNUSED COMPARTMENTS.
    C - ALL LOCAL CONTROL STATIONS AT OR NEAR EQUIPMENT.
    D - ALL PANELBOARDS.
    E - GANGED LIGHT SWITCHES.
14. PIPE SLEEVES FOR CONDUITS PASSING FROM NON-HAZARDOUS AREAS TO HAZARDOUS AREAS SHALL HAVE CAULKING APPLIED TO MAKE THE INSTALLATION GASTIGHT.
15. COORDINATE ELECTRICAL DEVICES WITH LAB EQUIPMENT AND FURNITURE ARRANGEMENT, WHERE APPLICABLE.
16. CONTRACTOR SHALL PROVIDE ALL DISCONNECTS AND SERVICE RECEPTACLES FOR HVAC AS REQUIRED BY NEC.
17. CONTRACTOR SHALL PROVIDE ALL CONDUIT, WIRING, EQUIPMENT, AND CONTROL DEVICES AS INDICATED BY SCHEMATICS, SINGLE LINE DIAGRAMS, SCHEDULES, PLANS, SPECIFICATIONS, AND VENDOR DOCUMENTATION TO PROVIDE A COMPLETE WORKING SYSTEM. SINCE NOT ALL HOME RUNS ARE SHOWN ON PLANS, THE CONTRACTOR SHALL REFERENCE ALL SINGLE LINE AND SCHEMATIC DIAGRAMS, SCHEDULES, AND VENDOR DOCUMENTATION TO DETERMINE CONDUIT AND WIRING REQUIREMENTS.
18. PROVIDE CONDUIT EXPANSION FITTINGS FOR ALL EXTERIOR CONDUIT SYSTEMS.
19. EXACT NUMBER, LOCATION, HORSEPOWER, VOLTAGE, AND PHASE OF ALL MOTORS AND DEVICES ASSOCIATED WITH THE CHEMICAL FEED SYSTEM, GRIT, SCREENING AND PLANT WATER, AND OTHER EQUIPMENT SYSTEMS AS APPLICABLE, PROVIDED UNDER THIS CONTRACT SHALL BE COORDINATED WITH THE ACTUAL EQUIPMENT SUPPLIER. CONDUIT AND WIRING TO BE PROVIDED SHALL BE ADJUSTED ACCORDINGLY AT NO ADDITIONAL COST TO THE OWNER.
20. PROVIDE CONCRETE HOUSEKEEPING PADS (4" HIGH) UNDER FLOOR MOUNTED ELECTRICAL AND INSTRUMENTATION EQUIPMENT. PROVIDE SUBMITTAL SKETCH FOR ENGINEER REVIEW.
21. COORDINATE ELECTRICAL EMBEDMENTS WITH STRUCTURAL.
22. CONTRACTOR SHALL PROVIDE A COMPLETE WORKING OPERATING SYSTEM IN ACCORDANCE WITH ALL DRAWINGS, SPECIFICATIONS, CODES AND STANDARDS.
23. HANDHOLES SHALL BE PREMANUFACTURED ASSEMBLIES SEPARATED FOR 480V AND 120V POWER. POWER CONDUIT UNDERGROUND SHALL BE SCHEDULE 80 PVC WITH RGS FITTINGS ABOVE GROUND. RGS FITTINGS SHALL EXTEND 2'-6" BELOW GROUND. INSTRUMENTATION AND CONTROL HANDHOLES SHALL BE SEGREGATED FOR INSTRUMENTATION AND 120 VOLT CONTROL.
24. THE ELECTRICAL SUBCONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING ALL OF THE ELECTRICAL DRAWINGS AND CONDUIT AND WIRE SCHEDULES RELATIVE TO THE CONDUIT AND WIRE TO BE PROVIDED ON THIS PROJECT. THE INTENT OF THE CONTRACT DOCUMENTS IS TO PROVIDE DETAILED INFORMATION OF SPECIFIC INDIVIDUAL RUNS OF CONDUIT AND WIRE TO SPECIFIC EQUIPMENT. THE ELECTRICAL SUBCONTRACTOR IS DIRECTED TO COMBINE CONDUIT AND WIRE RUNS AS MUCH AS POSSIBLE, AS DEFINED IN SPECIFICATIONS. THE LIMITING FACTOR FOR COMBINING CONDUIT AND WIRE SHALL BE BASED ON THE DERATING FACTORS ALLOWED PER THE NATIONAL ELECTRICAL CODE (NEC) BASED ON EQUIPMENT RATINGS AND REQUIRED AMPACITY RATINGS. ALL MEDIUM VOLTAGE FEEDER CONDUIT AND WIRE SHALL NOT BE ALLOWED TO BE COMBINED AND SHALL BE INSTALLED AS INDICATED IN THE CONTRACT DOCUMENTS. ELECTRICAL SUBCONTRACTOR IS DIRECTED TO USE THE MOST COST-EFFECTIVE CONDUIT AND WIRE RUNS CONSISTENT WITH THESE REQUIREMENTS.
25. 120V CIRCUITS EXCEEDING 100 FEET IN LENGTH SHALL BE NO 10 AWG WIRING, MINIMUM.
26. POWER CONDUITS FOR THREE PHASE AND SINGLE PHASE CIRCUITS (DESIGNATED WITH "P" NUMBERS) ARE SHOWN ON POWER PLANS, WITH CONDUIT SIZES AND WIRING INFORMATION INDICATED IN THE CONDUIT AND WIRE SCHEDULES.
27. CONTROL AND INSTRUMENTATION SIGNAL CONDUITS (DESIGNATED WITH "C" AND "S" NUMBERS OR, ALTERNATIVELY, INDICATED BY WAY OF A LEGEND) ARE SHOWN ON CONTROL AND INSTRUMENTATION WIRING DIAGRAMS, WITH CONDUIT SIZES AND WIRING INFORMATION INDICATED EITHER IN THE LEGEND OR IN CONDUIT AND WIRE SCHEDULES. THE CONTRACTOR SHALL NOTE THAT THE MAJORITY OF CONTROL AND INSTRUMENTATION SIGNAL CONDUITS AND WIRING REQUIRED FOR THIS CONTRACT IS INDICATED IN THE AFOREMENTIONED LEGEND AND DOES NOT APPEAR IN THE CONDUIT AND WIRE SCHEDULES. FOR INSTRUMENTS REQUIRING 120V POWER SUPPLIES, THIS INFORMATION IS ALSO SHOWN ON THE CONTROL AND INSTRUMENTATION WIRING DIAGRAMS.
28. CONTRACTOR SHALL LABEL EACH RESPECTIVE DISTRIBUTION PANEL, SWITCHBOARD OR MCC WITH THE FEEDER POWER CIRCUIT NAME AND LOCATION PER NEC REQUIREMENTS.
29. ALL PRIMARY FEEDER DISCONNECTS SERVING REMOTELY LOCATED TRANSFORMERS SHALL BE LOCKABLE. CONTRACTOR SHALL LABEL PRIMARY DISCONNECT LOCATION AT THE TRANSFORMER SERVED PER NEC REQUIREMENTS.
30. FOR ALL OUTDOOR ELECTRICAL EQUIPMENT AND INSTRUMENTATION, CONTRACTOR SHALL USE CONDUIT INSTALLATION MEANS AND METHODS NECESSARY TO MITIGATE MOISTURE AND CONDENSATION PER NEC AND INSTALLATION METHODS LISTED IN SPECIFICATIONS. MITIGATION METHODS INCLUDE DRIP LOOPS, AVOIDING TOP ENTRY, USE OF BREATHERS, DRAINS, AND DUCT SEALANT AS NECESSARY.
31. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES TO THE ENGINEER.

REV.	DATE	DESCRIPTION	BY
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△			

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil Structural Mechanical Electrical Marine Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163 | DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

ELECTRICAL NOTES AND ABBREVIATIONS

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

E-00-002

DWG. No. 12221-W-33

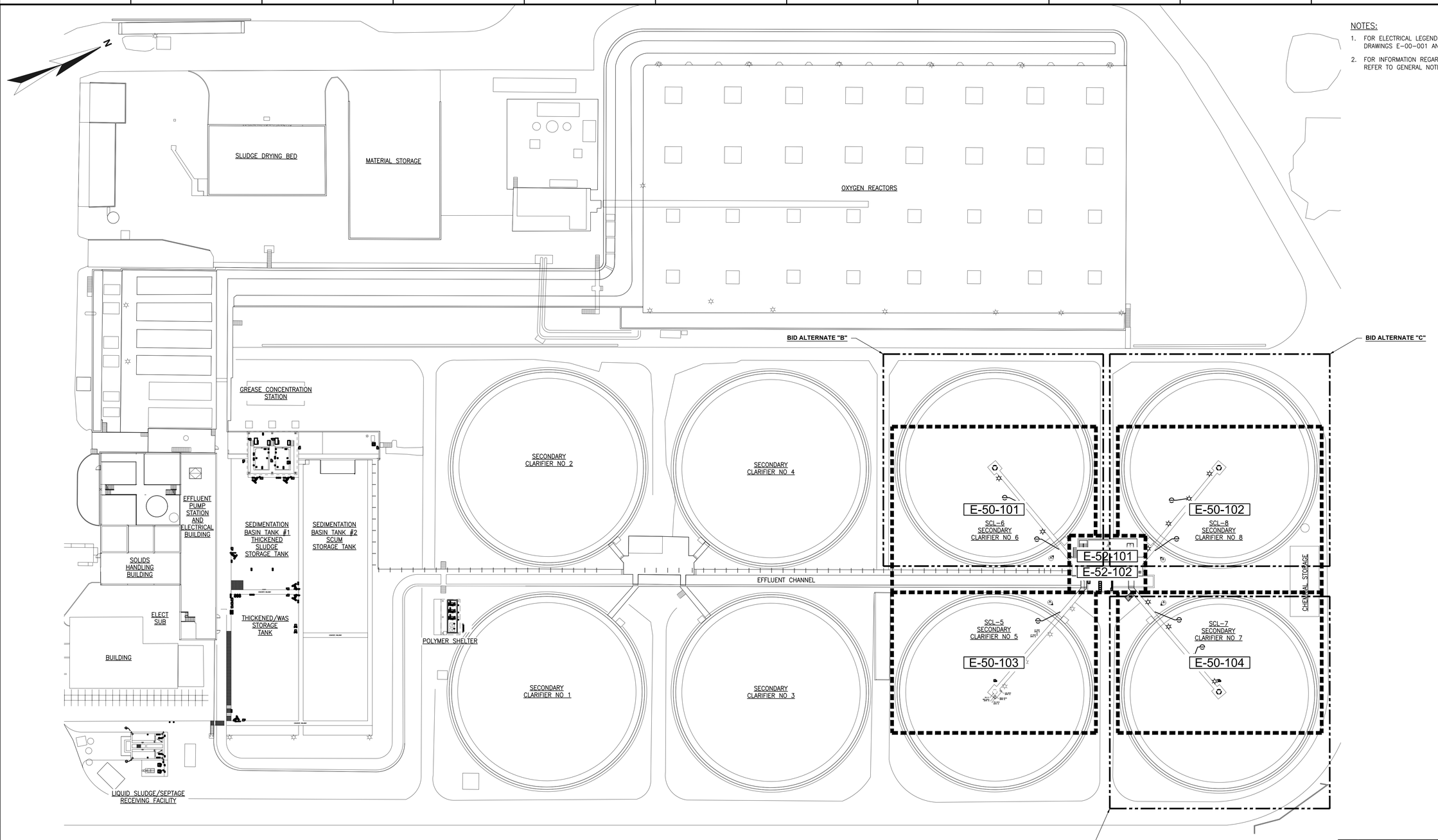
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NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.



KEY ELECTRICAL PLAN

SCALE: 1" = 40'

GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN THE SPECIFICATION SECTION 01100-ALTERNATES.

FULL SHEET BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

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PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

KEY ELECTRICAL PLAN

DR. G. LALA	E-01-001
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

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P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\21163-ES-SINGLELINES.DWG | SINGLE LINE DIAGRAM SWITCHGEAR - DEMOLITION PLAN | — | 2/18/2026 7:32:15 AM | DBABINEAUX

UTILITY ENTERGY WEST FEEDER NO. 612

ENTERGY METERING BAY (M) — UTILITY PRIMARY METERING

KA U-11

SWITCHGEAR NO. 1 BUS A SOUTH

STANDGY GENERATOR 4MW, 0.8PFM 13.8KV

U-31

KA/KB — KB/KC

SWITCHGEAR NO. 2 BUS B NORTH

UTILITY ENTERGY EAST FEEDER NO. 2344

ENTERGY METERING BAY (M) — UTILITY PRIMARY METERING

KC U-21

13.8KV, 1200A, 3Ø, 4W, 60HZ - BUS A

13.8KV, 1200A, 3Ø, 4W, 60HZ - BUS B

U-18 U-12 SPARE U-13 U-14 U-17 U-15 U-16 U-24 U-27 SPARE U-25 U-26 U-23 U-22

T13 13.8KV 1000 KVA 480 V

T12 13.8KV 1000 KVA 480 V

T11 13.8KV 1500 KVA 480 V, 8%

T10 13.8KV 1500 KVA 480 V, 8%

T9 13.8KV 2000 KVA 2.4 KV

T8 13.8KV 2000 KVA 2.4 KV

NO LOAD

T3 13.8KV 1000 KVA 2.4 KV

T15 13.8KV 1500 KVA 2.4 KV

T4 13.8KV 1500 KVA 2.4 KV

SWITCHGEAR SWGR-H

1600AF 1600AF 1600AF

SWITCHGEAR SWGR-I

1600AF 1600AF

3000AF 3000AF 3000AF

480V 2600A MCC-J

480V 2600A MCC-J

1250 COMPRESSOR VSA

1200A

VFD-1 VFD-3 VFD-5 VFD-2 VFD-4

450 450 450 450 450 300

EFFLUENT PUMP NO. 1 — EFFLUENT PUMP NO. 3 — EFFLUENT PUMP NO. 5 — EFFLUENT PUMP NO. 2 — EFFLUENT PUMP NO. 4 — INCINERATOR BLOWER

480V 1600A MCC-H — NORTH RAS PUMP STATION

480V 1600A MCC-I — SOUTH RAS PUMP STATION

480V MCC-L — TRAIN NO. 1

480V MCC-L — TRAIN NO. 1

T2 13.8KV 1000/480 V

T1 13.8KV 1000/480 V

T7 13.8KV 1000/480 V

T6 13.8KV 1000/480 V

480V SWITCHGEAR

2000AF 2000AF

SG480-1, 480V, 2000A, 3Ø, 4W, 60HZ, 65,000 AIC

2000AF

SG480-1, 480V, 2000A, 3Ø, 4W, 60HZ, 65,000 AIC

PER SPD MFR — 800AF — FUTURE SLUDGE DRYER — SPD

800AF — SPARE

800AF 800AF — FUTURE SLUDGE DRYER

800AF — SPARE

PER SPD MFR — 800AF — SPD

800AF

480V SWITCHGEAR

1600AF 1600AF

480V 600AF — MCC-B

SPACE — SPACE — 600AF — MCC-C

1200A

SPACE — 600AF — MCC-D — 125 PROCESS AIR BLOWER NO. 1 — 150 WELL PUMP NO. 1

480V 600AF — EMPLOYEE AND SHOP BUILDING

480V 1600AF — MCC-D — 150 PROCESS AIR BLOWER NO. 2

800AF — MCC-A — ADMIN BUILDING

600AF — GEN MAIN BREAKER — ATS 3P, 480V, 400A — 80KW EMERGENCY GENERATOR

13.8KV 13800/ 480 V/277

ATS 3P, 480V, 400A

MAIN BREAKER

FUTURE 300 KW EMERGENCY GENERATOR BY OTHERS

MCC1 - GENERATOR BUILDING, 400A, 3Ø, 3W, 480V, 65,000 AIC

50A 100A 30A SIZE 1 15A SIZE 1 30A SIZE 1 30A SIZE 4 150A 50A

60A 100A 30A 30A 30A 30A LL 75KV 480 V/277/120V

AIR COMPRESSOR CONTROL PANEL — 10 AIR COMPRESSOR

CRANE 30 TON

IMMERSION HEATER 15KW

ALTERNATE SPACE HEATER 3KW

7.5 EXHAUST FAN NO. 1

75 ACR RADIATOR FAN

LTF LCR

BATTERY CHARGER

MCC-FBI MCC-STORM

480V 800A 800A 480V 800A 300A 300A MCC-GA

480V 800A 800A 480V 800A MCC-GB

480V 800A 800A 480V 800A MCC-FA

480V 800A 800A 480V 800A MCC-FB

SINGLE LINE DIAGRAM
SWITCHGEAR DEMOLITION PLAN

NTS

REV.	DATE	DESCRIPTION	BY
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△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
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407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SINGLE LINE DIAGRAM
SWITCHGEAR - DEMOLITION PLAN

DR. G. LALA	E-09-001
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

PROJECT NO: 21163 | DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

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UTILITY ENTERGY WEST FEEDER NO. 612

ENTERGY METERING BAY — UTILITY PRIMARY METERING

KA U-11

SWITCHGEAR NO. 1 BUS A SOUTH

13.8KV, 1200A, 3Ø, 4W, 60HZ - BUS A

U-18 — U-12 — SPARE — U-13

STANDGY GENERATOR 4MW, 0.8PFM 13.8KV

U-31

KA/KB — KB/KC

SWITCHGEAR NO. 2 BUS B NORTH

13.8KV, 1200A, 3Ø, 4W, 60HZ - BUS B

U-14 — U-17 — U-15 — U-16 — U-24 — U-27 — SPARE — U-25 — U-26 — U-23 — U-22

UTILITY ENTERGY EAST FEEDER NO. 2344

ENTERGY METERING BAY — UTILITY PRIMARY METERING

KC U-21

T12 13.8KV 1000 KVA 480 V

T12 13.8KV 1000 KVA 480 V

T11 13.8KV 1500 KVA 480 V, 8%

T10 13.8KV 1500 KVA 480 V, 8%

T9 13.8KV 2000 KVA 2.4 KV

T8 13.8KV 2000 KVA 2.4 KV

NO LOAD

T3 13.8KV 1000 KVA 480 V

T15 13.8KV 1500 KVA 2.4 KV

T4 13.8KV 1500 KVA 2.4 KV

SWITCHGEAR SWGR-H

1600AF

1600AF

SWITCHGEAR SWGR-I

1600AF

1600AF

3000AF — 3000AF — 3000AF

480V 2600A — MCC-J

480V 2600A — MCC-J

1250 — COMPRESSOR VSA

1200A

VFD-1 — VFD-3 — VFD-5 — VFD-2 — VFD-4

450 — 450 — 450 — 450 — 450 — 300

EFFLUENT PUMP NO. 1 — EFFLUENT PUMP NO. 3 — EFFLUENT PUMP NO. 5 — EFFLUENT PUMP NO. 2 — EFFLUENT PUMP NO. 4 — INCINERATOR BLOWER

SWITCHBOARD SWBD-H

480V 1600A

600AF

480V 600A MCC-H

NORTH RAS PUMP STATION

480V 1600A MCC-I

SOUTH RAS PUMP STATION

480V MCC-L

TRAIN NO. 1

480V MCC-L

TRAIN NO. 1

T2 13.8KV 1000/480 V

T1 13.8KV 1000/480 V

13.8KV 13800/ 480 V/277

ATS 3P, 480V, 400A

MAIN BREAKER

FUTURE 300 KW EMERGENCY GENERATOR BY OTHERS

MCC1 - GENERATOR BUILDING, 400A, 3Ø, 3W, 480V, 65,000 AIC

50A — 100A — 30A SIZE 1 — 15A SIZE 1 — 30A SIZE 1 — 30A SIZE 4 — 150A — 50A

60A — 100A — 30A — 30A — 30A — 30A

LL

75KV 480 V/277/120V

AIR COMPRESSOR CONTROL PANEL

10 — AIR COMPRESSOR

CRANE 30 TON

IMMERSION HEATER 15KW

ALTERNATE SPACE HEATER 3KW

7.5 — EXHAUST FAN NO. 1

75 — ACR RADIATOR FAN

LTF — LCR

BATTERY CHARGER

T7 13.8KV 1000/480 V

T6 13.8KV 1000/480 V

480V SWITCHGEAR

2000AF — 2000AF

SG480-1, 480V, 2000A, 3Ø, 4W, 60HZ, 65,000 AIC

SG480-1, 480V, 2000A, 3Ø, 4W, 60HZ, 65,000 AIC

PER SPD MFR — 800AF — 800AF — 800AF — 800AF — 800AF — 800AF — 800AF — PER SPD MFR — 800AF — 800AF

SPD — FUTURE SLUDGE DRYER

FUTURE SLUDGE DRYER — SPD

480V SWITCHGEAR

1600AF — 1600AF

480V — 1200A — 480V

600AF — SPACE — SPACE — 600AF — SPACE — 600AF — 600AF — 1600AF — 800AF — 600AF

MCC-B — MCC-C — MCC-D — EMPLOYEE AND SHOP BUILDING — MCC-D — MCC-A

125 — PROCESS AIR BLOWER NO. 1

150 — WELL PUMP NO. 1

150 — PROCESS AIR BLOWER NO. 2

E N — ATS 3P, 480V, 400A — GEN MAIN BREAKER — 80KW EMERGENCY GENERATOR

ADMIN BUILDING

MCC-FBI — MCC-STORM

480V 800A 800A — 480V 800A — 300A 300A — MCC-GA

480V 800A 800A — 480V 800A — MCC-GB

480V 800A 800A — 480V 800A — MCC-FA

480V 800A 800A — 480V 800A — MCC-FB

SINGLE LINE DIAGRAM SWITCHGEAR MODIFICATION PLAN

NTS

REV.	DATE	DESCRIPTION	BY
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△			
△			

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Metairie, LA — www.infinityec.com — 504-304-0548

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A

SECONDARY TREATMENT UPGRADE

STATE OF LOUISIANA — JOHN C. LAWRENCE REG. NO. 27941 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING — 02-18-2026

WRIGHT-PIERCE

407.906.1776 | www.wright-pierce.com

601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

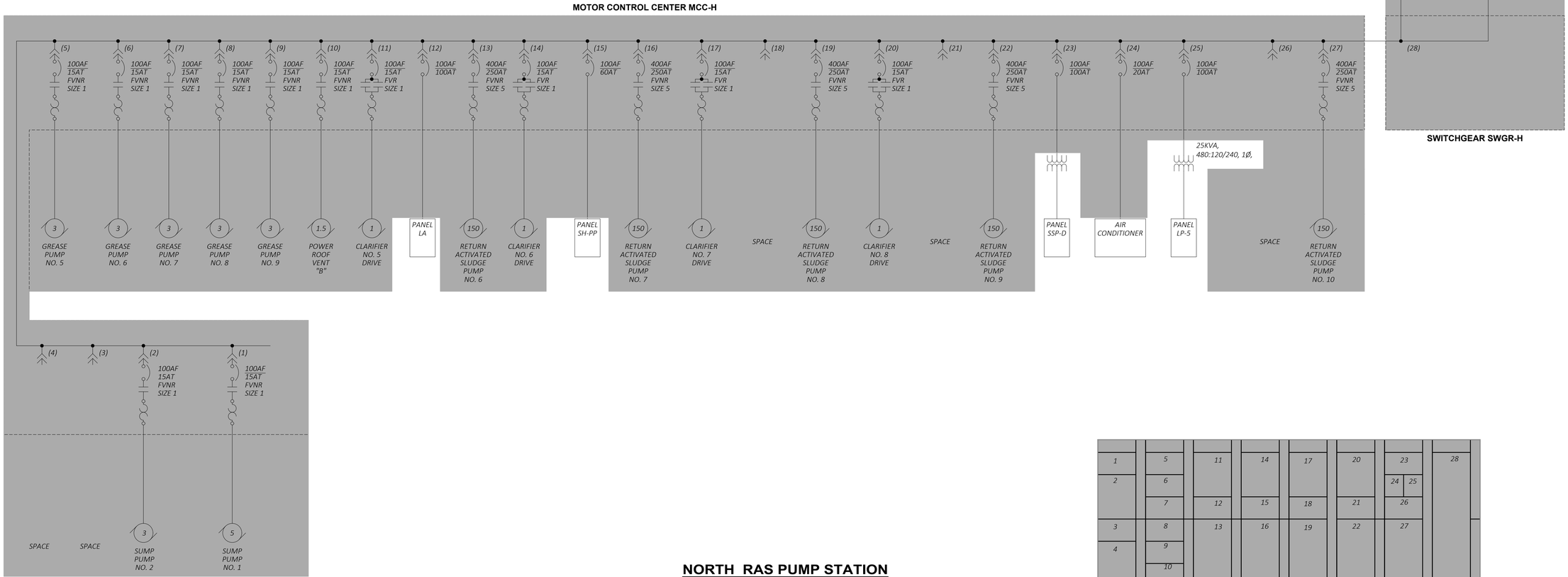
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026

SINGLE LINE DIAGRAM SWITCHGEAR MODIFICATION PLAN

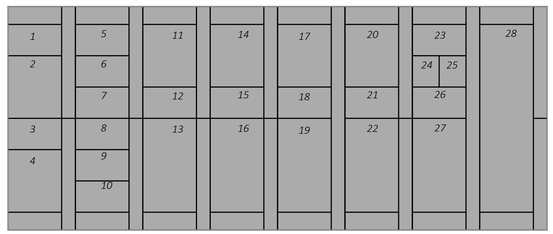
DR. G. LALA	E-09-002
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SET NO.	SHEET NO. OF

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NORTH RAS PUMP STATION
SINGLE LINE DEMOLITION - MCC-H
NTS



NORTH RAS PUMP STATION
MCC-H ELEVATION
NTS

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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
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SINGLE LINE DIAGRAM MOTOR CONTROL CENTER MCC-H - DEMOLITION

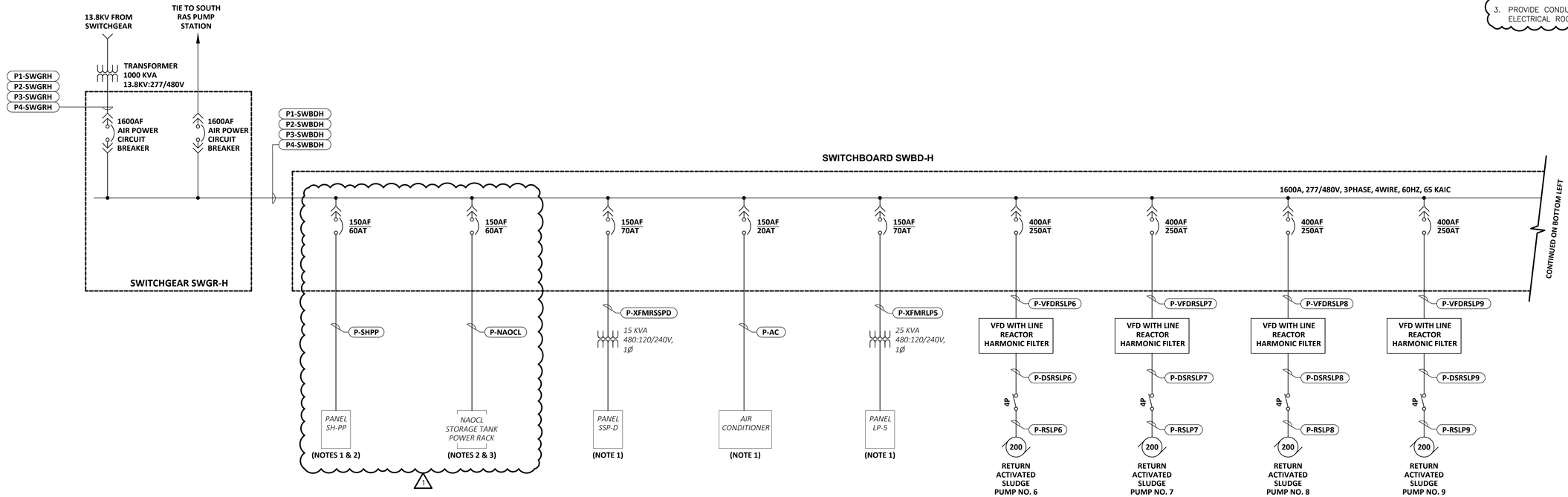
DR. G. LALA	E-09-003
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

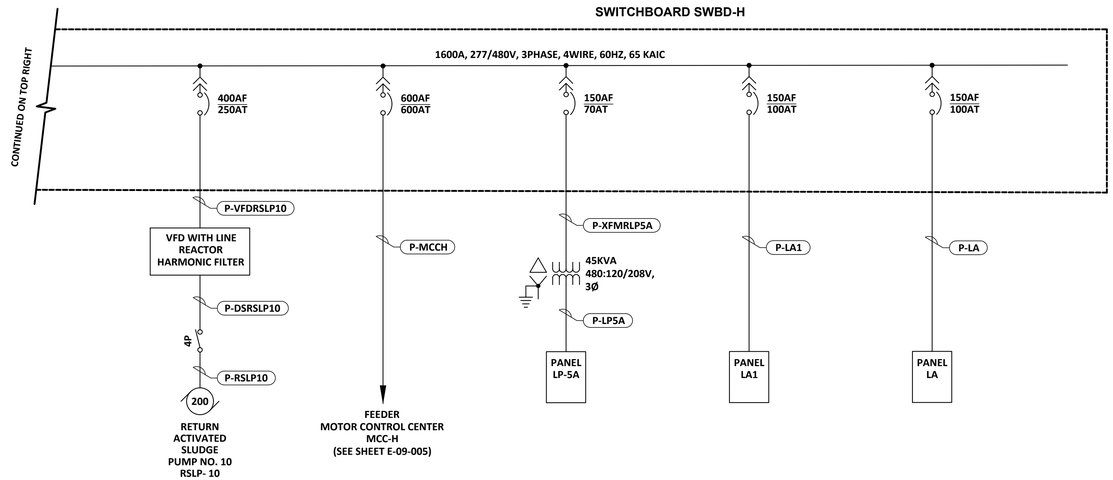
PROJECT NO: 21163 | DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

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NOTES:

1. EXISTING EQUIPMENT TO BE FED FROM SWITCHBOARD "H".
2. PROVIDE AUX CONTACT ON BREAKER FOR PLC MONITORING.
3. PROVIDE CONDUIT AND WIRE FROM MCC TO I/O RACK IN ELECTRICAL ROOM.





SINGLE LINE DIAGRAM SWITCHBOARD SWBD-H

NTS

REV.	DATE	DESCRIPTION	BY
1	02/26/2026	ADDENDUM NO 2	GML/JCL

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

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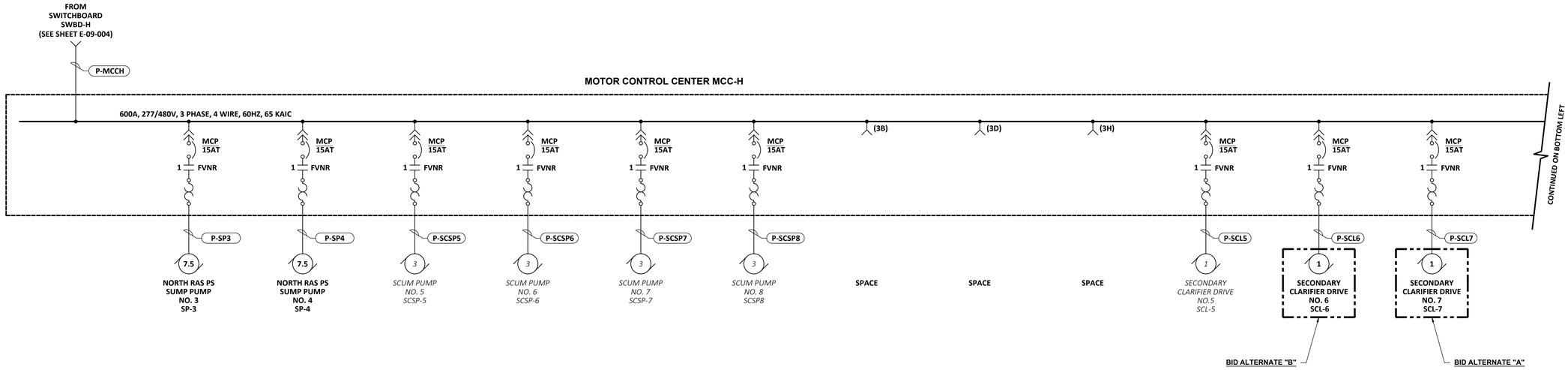
SINGLE LINE DIAGRAM SWITCHBOARD SWBD-H

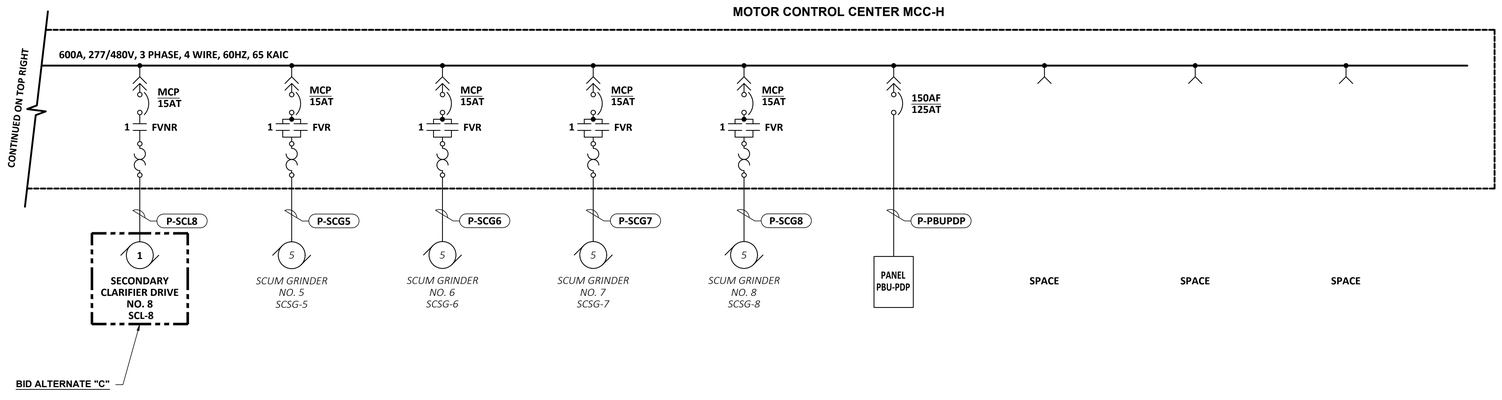
DR. G. LALA	E-09-004
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
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	SET NO. / SHEET NO. / OF

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SINGLE LINE DIAGRAM
MOTOR CONTROL CENTER MCC-H
NTS

GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "A", "B", AND "C" ITEMS AS DESCRIBED IN THE SPECIFICATION SECTION 01100-ALTERNATES.

SHEET CONTAINS BID ALTERNATES

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA — JOHN C. LAWRENCE — REG. NO. 27941 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SINGLE LINE DIAGRAM MOTOR CONTROL CENTER MCC-H

DR. G. LALA	E-09-005
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
SET NO.	SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 4:52 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\21163-ES-SINGLELINES.DWG | MCC-H ELEVATION | 1:10.12364677 | — | 2/18/2026 7:32:18 AM | DBABINEAUX

NOTES:

1. FOR ELECTRICAL GENERAL NOTES, LEGENDS AND SYMBOLS, SEE SHEETS E-09-00X AND E-09-00X.
2. FOR ONE-LINES SEE SHEETS E-09-00X AND E-09-00X.

	1		2		3		4		5	
A	INCOMING SECTION	WIREWAY	SUMP PUMP NO. 3 SP-3	WIREWAY	SPACE	WIREWAY	SECONDARY CLARIFIER DRIVE NO. 8 SCL-8	WIREWAY	SCUM GRINDER NO. 8 SCG-8	WIREWAY
B										
C			SUMP PUMP NO. 4 SP-4		SPACE		SCUM GRINDER NO. 5 SCG-5		PANEL PBU-PDP	
D										
E			SCUM PUMP NO. 5 SCSP-5		SPACE					
F									SPACE	
G	SPACE	WIREWAY	SCUM PUMP NO. 6 SCSP-6	WIREWAY	SECONDARY CLARIFIER DRIVE NO. 5 SCL-5	WIREWAY	SCUM GRINDER NO. 6 SCG-6	WIREWAY		WIREWAY
H									SPACE	
J			SCUM PUMP NO. 7 SCSP-7		SECONDARY CLARIFIER DRIVE NO. 6 SCL-6		SCUM GRINDER NO. 7 SCG-7			
K									SPACE	
L			SCUM PUMP NO. 8 SCSP-8		SECONDARY CLARIFIER DRIVE NO. 7 SCL-7					
M							SPACE			
	WIREWAY		WIREWAY		WIREWAY		WIREWAY		WIREWAY	

MCC-H ELEVATION

SCALE: 1" = 1'

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil · Structural · Mechanical · Electrical · Marine · Transportation
Metairie, LA | www.infinityec.com | 504-304-0548

STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
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02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

MCC-H ELEVATION

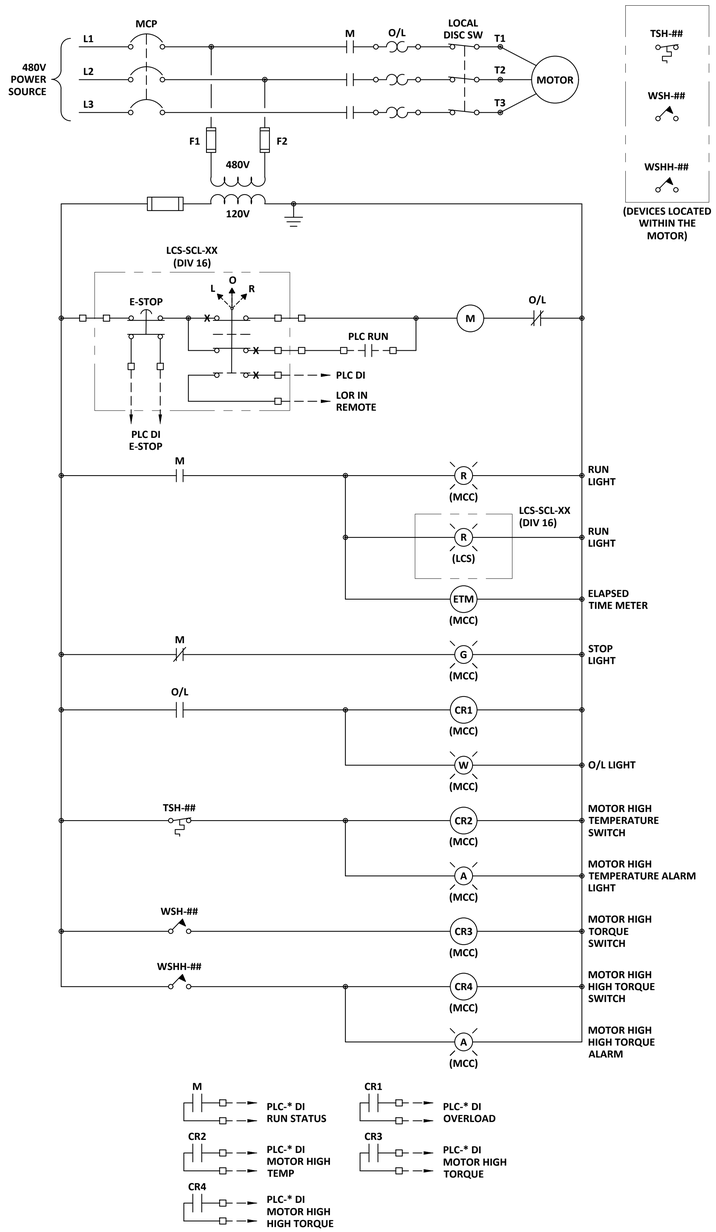
DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

E-09-006

DWG. No. 12221-W-33

LAST SAVED BY: GLALA 4/29/2025 7:59 AM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\SCHEMATICS.DWG | E-09-012 MOTOR SCHEMATICS (1 OF 2) | 1:10.1236477 | — | 2/18/2026 7:32:23 AM | DBABINEAUX

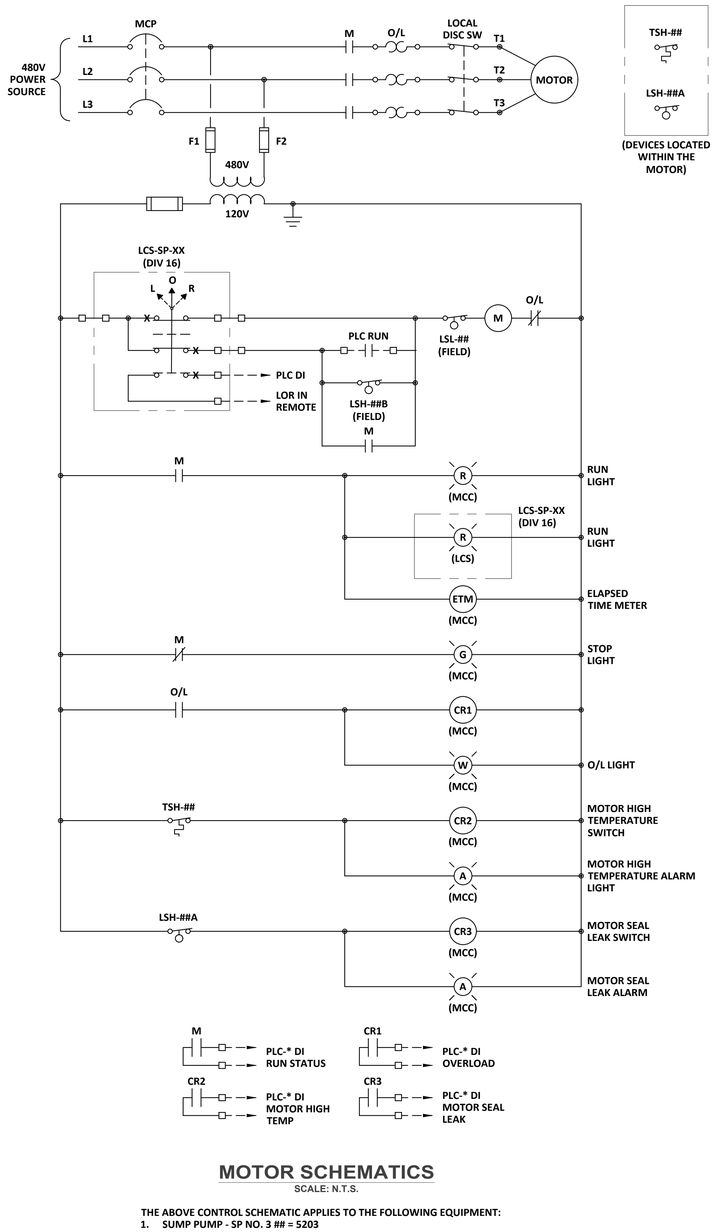


MOTOR SCHEMATICS

SCALE: N.T.S.

THE ABOVE CONTROL SCHEMATIC APPLIES TO THE FOLLOWING EQUIPMENT:

1. SECONDARY CLARIFIER - SCL NO. 5; LOOP(S) 5010 = PLC - * = CP-NR
2. SECONDARY CLARIFIER - SCL NO. 6; LOOP(S) 5011 = PLC - * = CP-NR
3. SECONDARY CLARIFIER - SCL NO. 7; LOOP(S) 5012 = PLC - * = CP-NR
4. SECONDARY CLARIFIER - SCL NO. 8; LOOP(S) 5013 = PLC - * = CP-NR

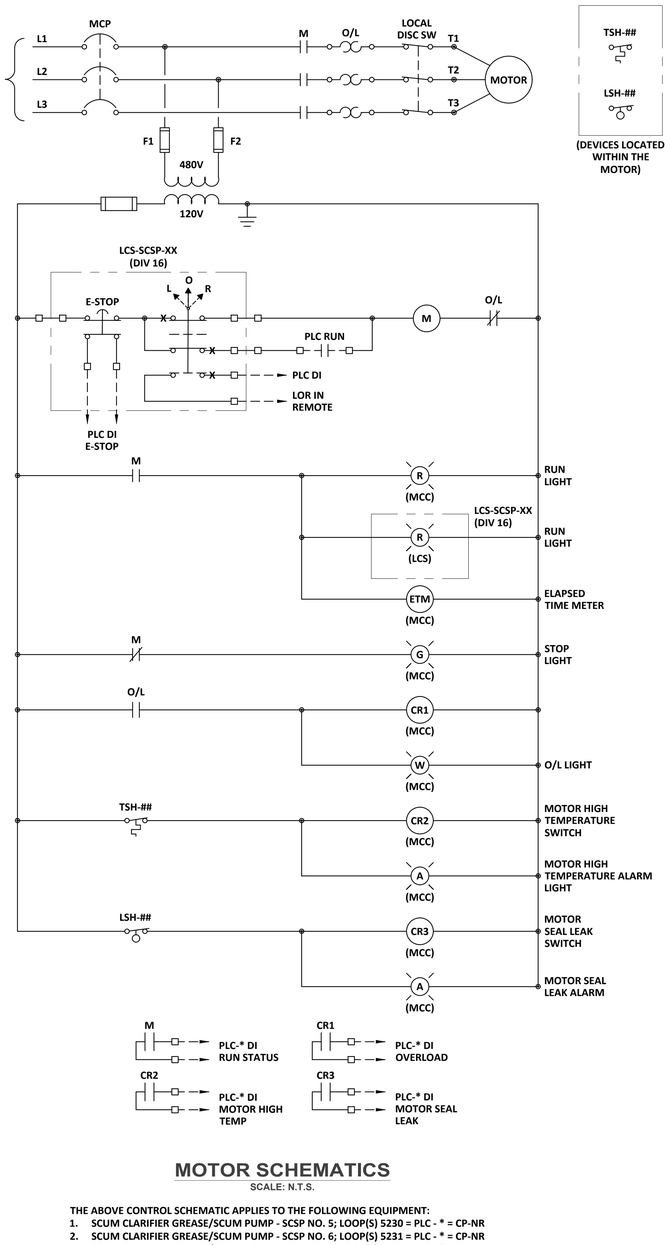


MOTOR SCHEMATICS

SCALE: N.T.S.

THE ABOVE CONTROL SCHEMATIC APPLIES TO THE FOLLOWING EQUIPMENT:

1. SUMP PUMP - SP NO. 3 ## = 5203
2. SUMP PUMP - SP NO. 4 ## = 5204



MOTOR SCHEMATICS

SCALE: N.T.S.

THE ABOVE CONTROL SCHEMATIC APPLIES TO THE FOLLOWING EQUIPMENT:

1. SCUM CLARIFIER GREASE/SCUM PUMP - SCSP NO. 5; LOOP(S) 5230 = PLC - * = CP-NR
2. SCUM CLARIFIER GREASE/SCUM PUMP - SCSP NO. 6; LOOP(S) 5231 = PLC - * = CP-NR
3. SCUM CLARIFIER GREASE/SCUM PUMP - SCSP NO. 7; LOOP(S) 5232 = PLC - * = CP-NR
4. SCUM CLARIFIER GREASE/SCUM PUMP - SCSP NO. 8; LOOP(S) 5233 = PLC - * = CP-NR

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil ∞ Structural ∞ Mechanical ∞ Electrical ∞ Marine ∞ Transportation
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STATE OF LOUISIANA — JOHN C. LAWRENCE — REG. NO. 27941 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
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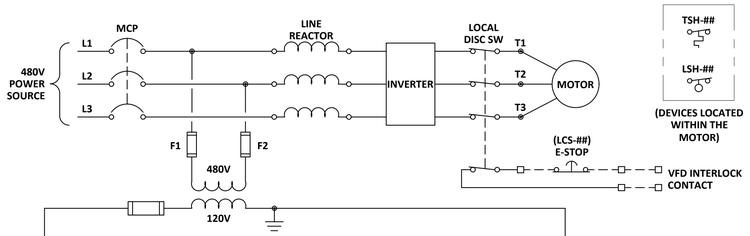
MOTOR SCHEMATICS (1 OF 2)

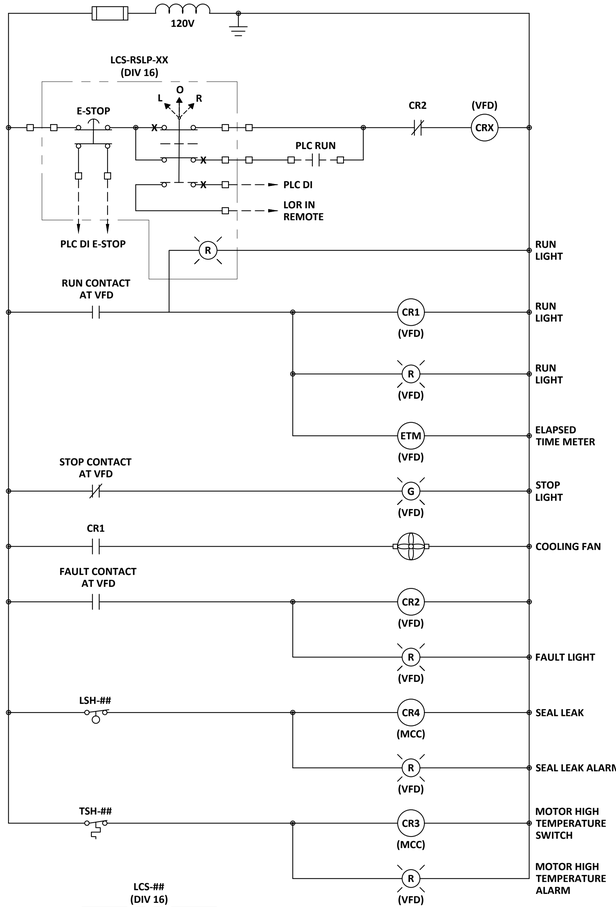
DR. G. LALA	E-09-012
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

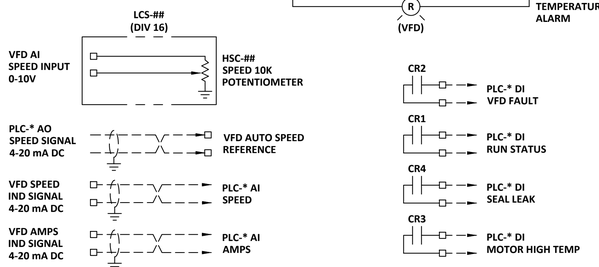
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

LAST SAVED BY: GLALA 4/29/2025 7:59 AM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\SCHEMATICS.DWG | E-09-013 MOTOR SCHEMATICS (2 OF 2) | 1:10.12364677 | ---- | 2/18/2026 7:32:24 AM | DBABINEAUX





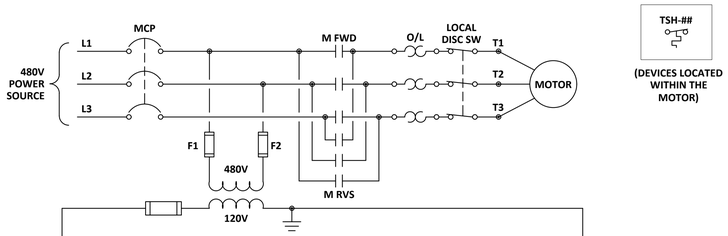


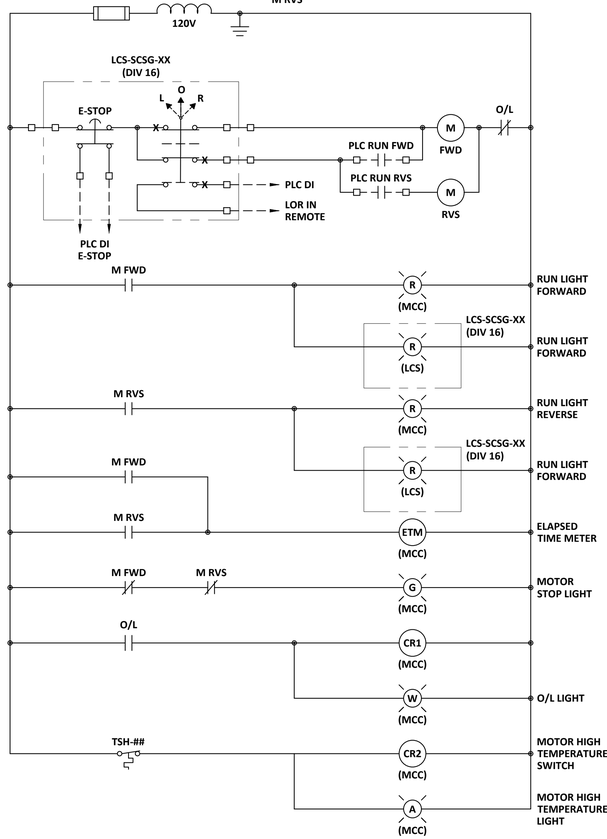
MOTOR SCHEMATICS

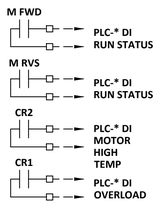
SCALE: N.T.S.

THE ABOVE CONTROL SCHEMATIC APPLIES TO THE FOLLOWING EQUIPMENT:

1. RETURN SLUDGE PUMP - RSLP NO. 6; LOOP(S) 5210 = PLC - * = CP-NR
2. RETURN SLUDGE PUMP - RSLP NO. 7; LOOP(S) 5211 = PLC - * = CP-NR
3. RETURN SLUDGE PUMP - RSLP NO. 8; LOOP(S) 5212 = PLC - * = CP-NR
4. RETURN SLUDGE PUMP - RSLP NO. 9; LOOP(S) 5213 = PLC - * CP-NR
5. RETURN SLUDGE PUMP - RSLP NO. 10; LOOP(S) 5214 = PLC - * CP-NR







MOTOR SCHEMATICS

SCALE: N.T.S.

THE ABOVE CONTROL SCHEMATIC APPLIES TO THE FOLLOWING EQUIPMENT:

1. GREASE/SCUM GRINDER - SCG NO. 5; LOOP(S) 5234 = PLC - * CP-NR
2. GREASE/SCUM GRINDER - SCG NO. 6; LOOP(S) 5235 = PLC - * CP-NR
3. GREASE/SCUM GRINDER - SCG NO. 7; LOOP(S) 5236 = PLC - * CP-NR
4. GREASE/SCUM GRINDER - SCG NO. 8; LOOP(S) 5237 = PLC - * CP-NR

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
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STATE OF LOUISIANA — JOHN C. LAWRENCE — REG. NO. 27941 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

MOTOR SCHEMATICS (2 OF 2)

DR. G. LALA	E-09-013
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DESIGNED BY: M. TORRES	
PROJECT NO: 21163	
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026
SET NO.	SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\WIES\21163-CM-SRVMOD.DWG | SECONDARY CLARIFIER NO 6 ELECTRICAL MODIFICATION PLAN | 1:10.12364677 | — | 2/18/2026 7:32:29 AM | DBABINEAUX



BID ALTERNATE "B"

TSH-5011
WSH-5011
SCL-6
WSHH-5011
LCS-5011
P-SCL6
P-DSSCL6

BID ALTERNATE "B"

1
E-99-501
(TYP)

BID ALTERNATE "B"

LE-5021
LIT-5021

SCL-6
SECONDARY CLARIFIER NO 6

2
E-99-501
(TYP)

SCUM PIT
P-SCSP6
P-SCG6

TO CLARIFIER No.6
LCS-5235
LCS-5231

A

BID ALTERNATE "B"

EFFLUENT CHANNEL

MATCHLINE
SEE SHT E-52-101

SECONDARY CLARIFIER NO 6
ELECTRICAL MODIFICATION PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. BID ALTERNATE "B": REMOVE AND REINSTALL EXISTING LIGHT FIXTURES AND POLES ON CLARIFIER BRIDGE ASSEMBLY. PROVIDE NEW CONDUIT AND WIRE AND RECONNECT TO EXISTING LIGHTING CIRCUIT.

1

EXIST SCUM GRINDER AND SCUM PUMP CONTROL PANELS TO BE DEMOED AND REPLACED WITH LOCAL CONTROL STATIONS. MOTOR STARTERS SHALL BE IN MCC-H



PHOTO A

GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "B" ITEMS AS DESCRIBED IN THE SPECIFICATION SECTION 01100-ALTERNATES.
2. IF ALTERNATE "B" IS NOT AWARDED, CONTRACTOR SHALL BE RESPONSIBLE FOR CONNECTING EXISTING INSTRUMENTS TO NEW CONTROL PANELS AND REFEEDING POWER CIRCUITS AS INDICATED ON ONE-LINES.

SHEET CONTAINS BID ALTERNATE "B"

REV.	DATE	DESCRIPTION	BY
△			
△			
1	02/26/2026	ADDENDUM NO 2	GML/JCL

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
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STATE OF LOUISIANA
JOHN C. LAWRENCE
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REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

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601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

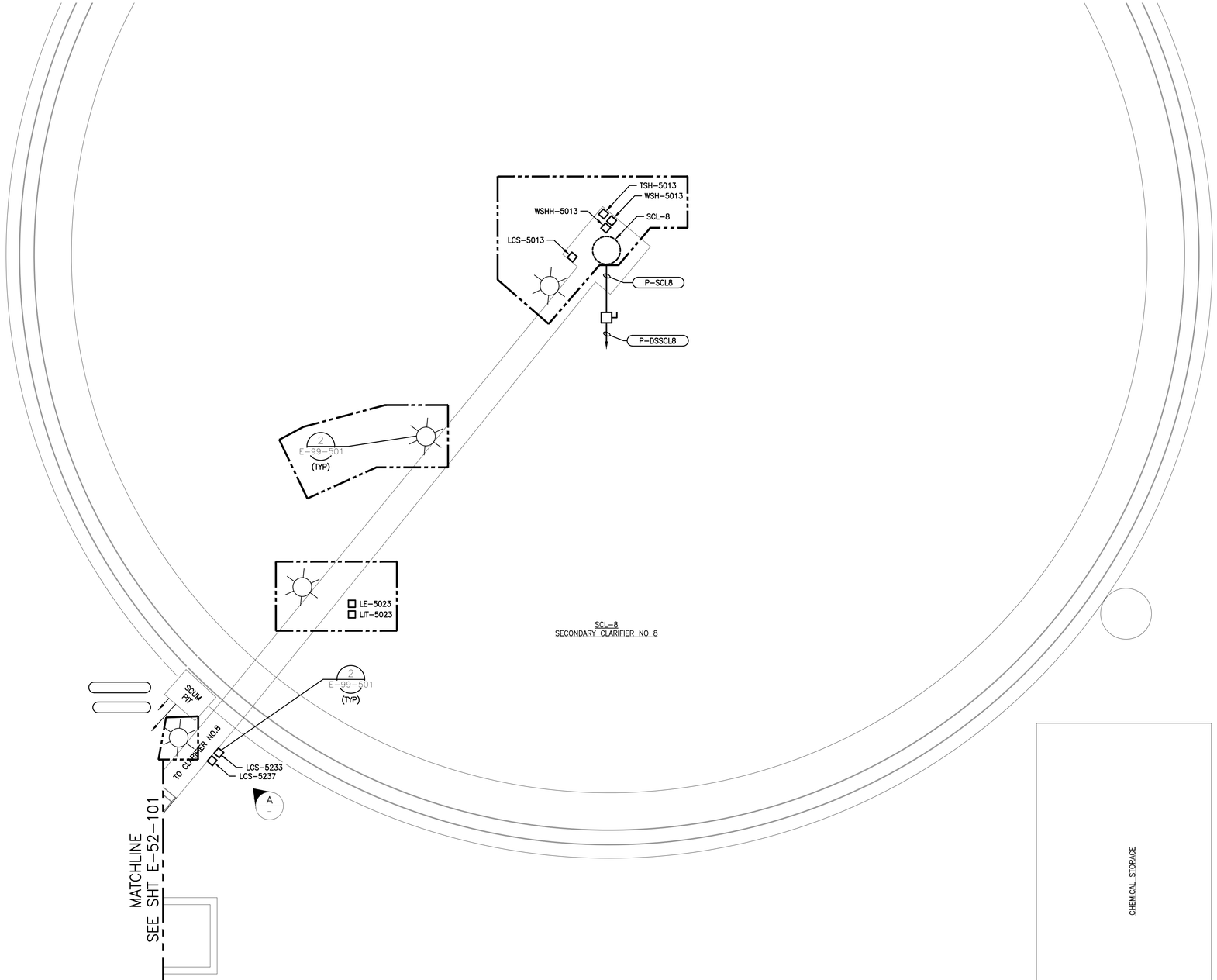
SECONDARY CLARIFIER NO 6
ELECTRICAL MODIFICATION PLAN

PROJECT NO: 21163	DESIGNED BY: M. TORRES	DR. G. LALA	E-50-101
SUBMISSION: CONTRACT DRAWINGS		TRC.	
CAD COORD: A.COUTURE		CK. J. LAWRENCE	
		AP. J. LAWRENCE	DWG. No. 12221-W-33
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\WIREFS\21163-CM-SRVMOD.DWG | SECONDARY CLARIFIER NO 8 ELECTRICAL MODIFICATION PLAN | 1:10.1236427 | --- | 2/18/2026 7:32:30 AM | DBABINEAUX





NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. BID ALTERNATE "C": REMOVE AND REINSTALL EXISTING LIGHT FIXTURES AND POLES ON CLARIFIER BRIDGE ASSEMBLY. PROVIDE NEW CONDUIT AND WIRE AND RECONNECT TO EXISTING LIGHTING CIRCUIT. (1)

EXIST SCUM GRINDER AND SCUM PUMP CONTROL PANELS TO BE DEMOED AND REPLACED WITH LOCAL CONTROL STATIONS. MOTOR STARTERS SHALL BE IN MCC-H



GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "C" ITEMS AS DESCRIBED IN THE SPECIFICATION SECTION 01100-ALTERNATES.
2. IF ALTERNATE "C" IS NOT AWARDED, CONTRACTOR SHALL BE RESPONSIBLE FOR CONNECTING EXISTING INSTRUMENTS TO NEW CONTROL PANELS AND REFEEDING POWER CIRCUITS AS INDICATED ON ONE-LINES.

SHEET CONTAINS BID ALTERNATE "C"

SECONDARY CLARIFIER NO 8 ELECTRICAL MODIFICATION PLAN

SCALE: 1/8" = 1'-0"

REV.	DATE	DESCRIPTION	BY
1	02/26/2026	ADDENDUM NO 2	GML/JCL

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC
IEC Project No 23-023
Civil Structural Mechanical Electrical Marine Transportation
Metairie, LA www.infinityec.com 504-304-0548

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STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

SECONDARY CLARIFIER NO 8 ELECTRICAL MODIFICATION PLAN

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

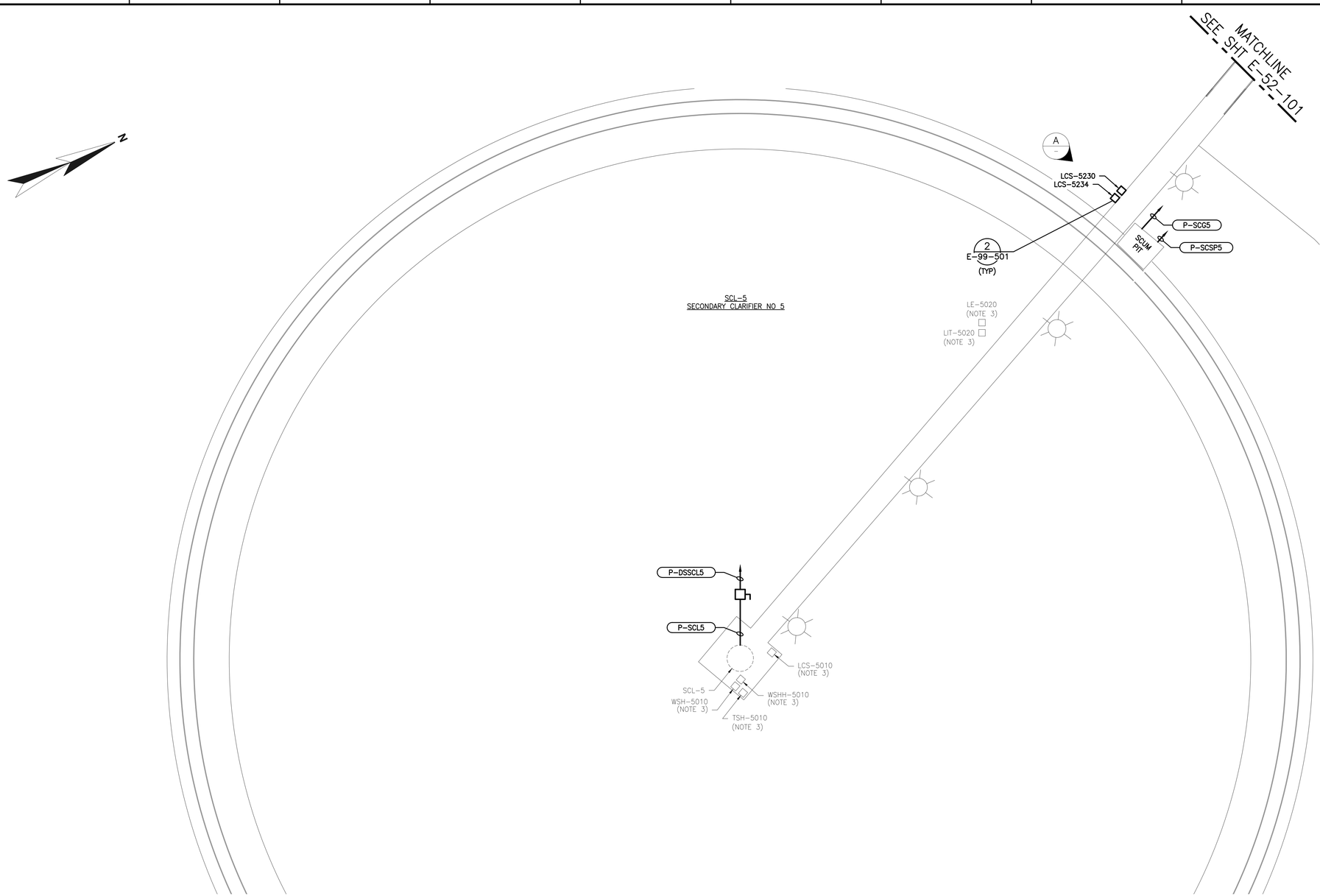
E-50-102

DWG. No. 12221-W-33

SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\XREFS\21163-CM-SRVMOD.DWG | SECONDARY CLARIFIER NO 5 ELECTRICAL MODIFICATION PLAN | 1:10.12364677 | — | 2/18/2026 7:32:32 AM | DRABINEAUX



NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. EXISTING INSTRUMENTS ARE TO BE RECONNECTED TO NEW CONTROLS SYSTEM.
4. CLARIFIER 5, MECHANICAL AND LIGHTING ARE NOT IN SCOPE OF PROJECT. ONLY POWER AND CONTROLS.

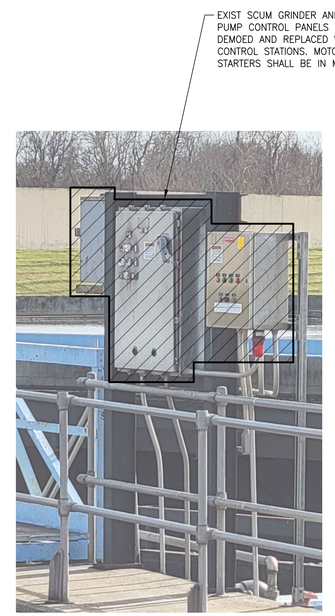


PHOTO A

SECONDARY CLARIFIER NO 5
ELECTRICAL MODIFICATION PLAN

SCALE: 1/8" = 1'-0"

(NOTE 4)

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

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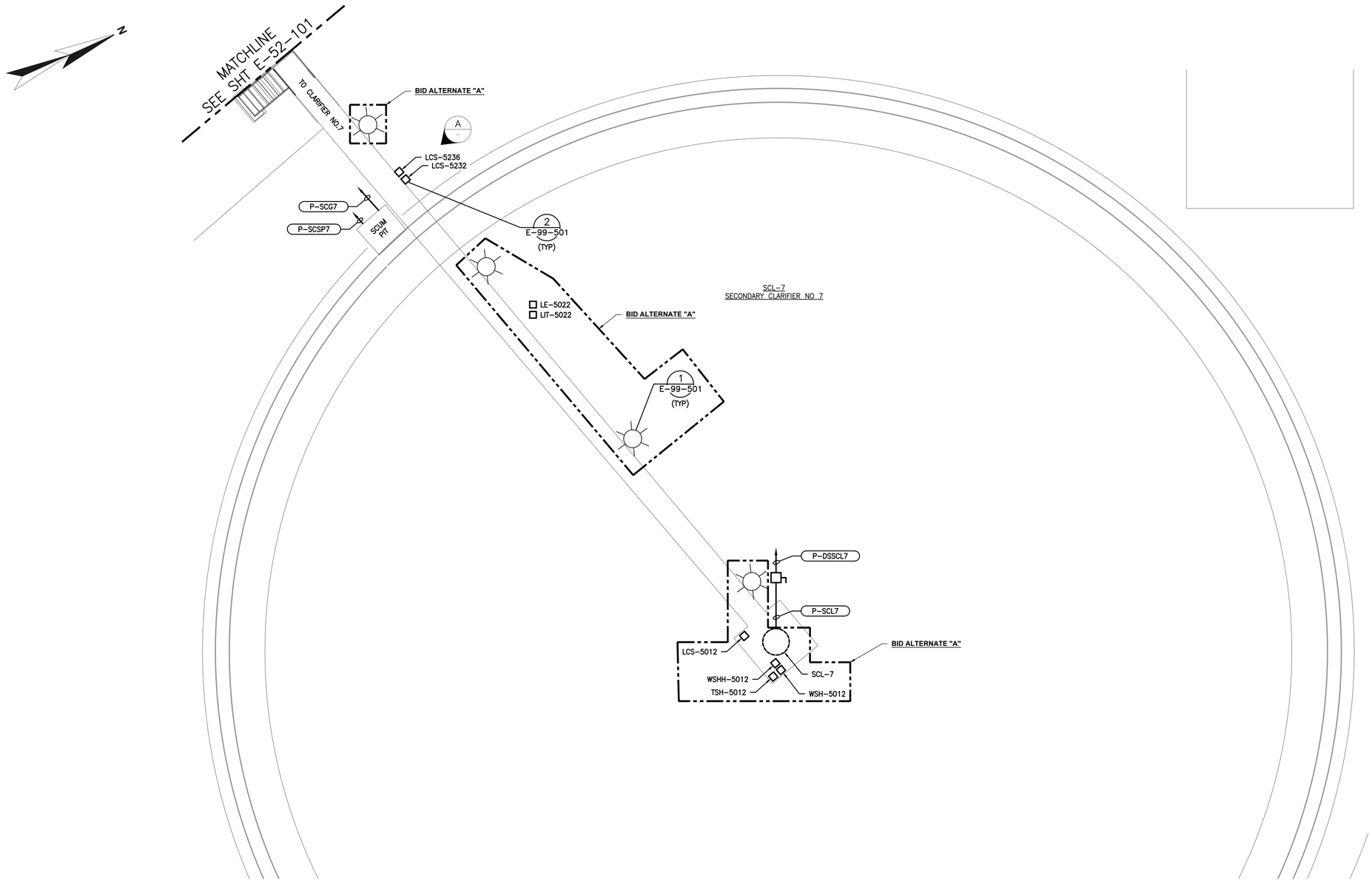
PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

SECONDARY CLARIFIER NO 5
ELECTRICAL MODIFICATION PLAN

DR. G. LALA	E-50-103
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\XREFS\21163-CM-SRVMOD.DWG | SECONDARY CLARIFIER NO 7 ELECTRICAL MODIFICATION PLAN | 1:10.12364677 | — | 2/18/2026 7:32:33 AM | DRABINEAUX



SECONDARY CLARIFIER NO 7
ELECTRICAL MODIFICATION PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. BID ALTERNATE "A": REMOVE AND REINSTALL EXISTING LIGHT FIXTURES AND POLES ON CLARIFIER BRIDGE ASSEMBLY. PROVIDE NEW CONDUIT AND WIRE AND RECONNECT TO EXISTING LIGHTING CIRCUIT. (1)



PHOTO A

GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "A" ITEMS AS DESCRIBED IN THE SPECIFICATION SECTION 01100-ALTERNATES.
2. IF ALTERNATE "A" IS NOT AWARDED, CONTRACTOR SHALL BE RESPONSIBLE FOR CONNECTING EXISTING INSTRUMENTS TO NEW CONTROL PANELS AND REFEEDING POWER CIRCUITS AS INDICATED ON ONE-LINES.

SHEET CONTAINS BID ALTERNATE "A"

REV.	DATE	DESCRIPTION	BY
△			
△			
1	02/26/2026	ADDENDUM NO 2	GML/JCL

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC
IEC Project No 23-023
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

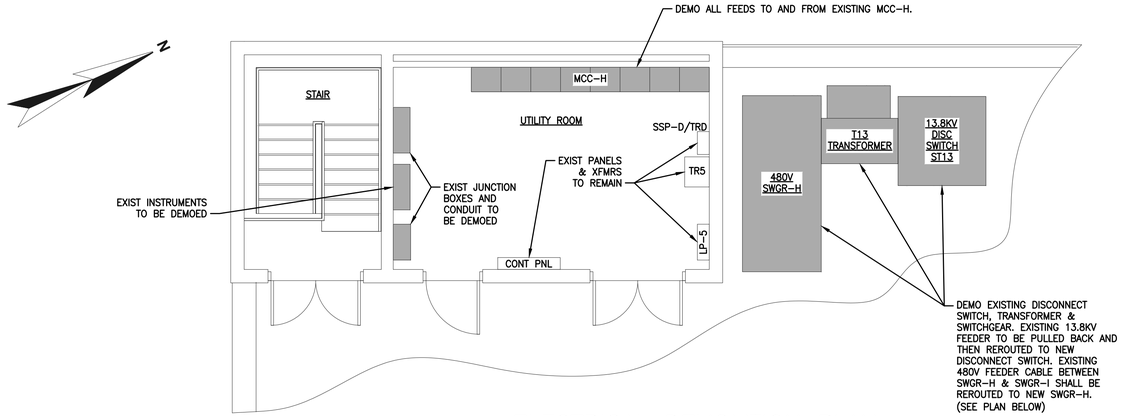
WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

SECONDARY CLARIFIER NO 7
ELECTRICAL MODIFICATION PLAN

DR. G. LALA	E-50-104
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
PROJECT NO: 21163 / DESIGNED BY: M. TORRES	
SUBMISSION: CONTRACT DRAWINGS	SCALE: AS NOTED
CAD COORD: A.COUTURE	DATE: FEBRUARY 2026 / SET NO. / SHEET NO. / OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\XREFS\21163-CM-SRVMOD.DWG | ELECTRICAL PLAN NORTH RAS PUMP STATION | 1:10.12364677 | --- | 2/18/2026 7:32:35 AM | DBABINEAUX

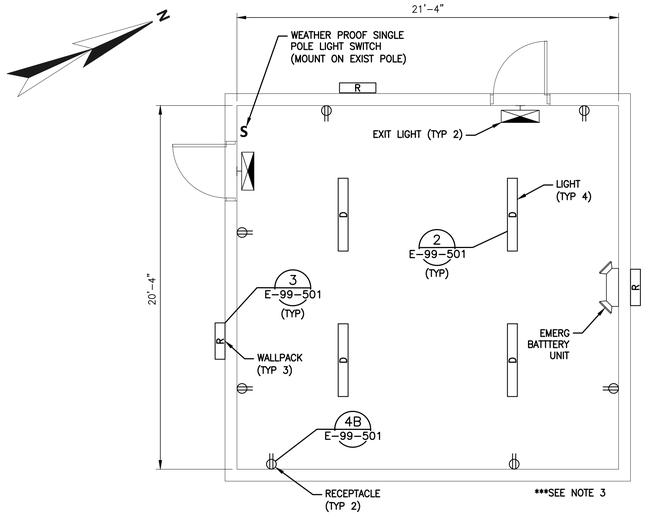


ELECTRICAL DEMOLITION PLAN
NORTH RAS PUMP STATION UTILITY ROOM

SCALE: 1/4" = 1'-0"

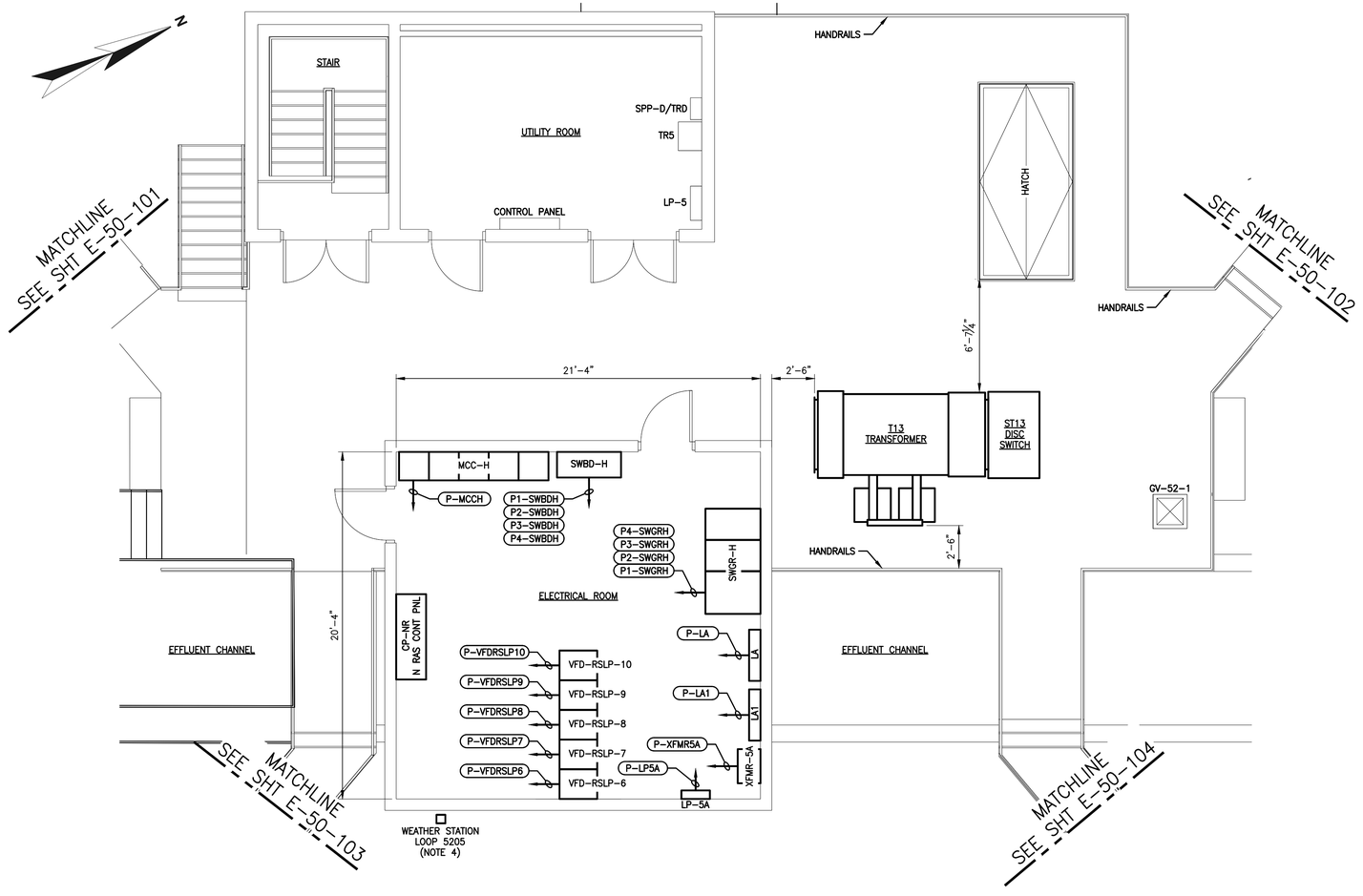
NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. FOR LIGHTING FIXTURE & RECEPTACLE SCHEDULES, REFER TO DRAWING E-99-501.
4. CONTRACTOR SHALL COORDINATE WITH ENGINEER/OWNER TO FIELD LOCATE THE WEATHER STATION ON THE EXTERIOR OF THE NEW ELECTRICAL ROOM.



NORTH RAS ELECTRICAL ROOM
LIGHTING AND RECEPTACLE PLAN

SCALE: 1/4" = 1'-0"



ELECTRICAL PLAN NORTH RAS PUMP STATION

SCALE: 1/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil Structural Mechanical Electrical Marine Transportation
Metairie, LA www.infinityec.com 504-304-0548

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ELECTRICAL PLAN NORTH RAS PUMP STATION

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

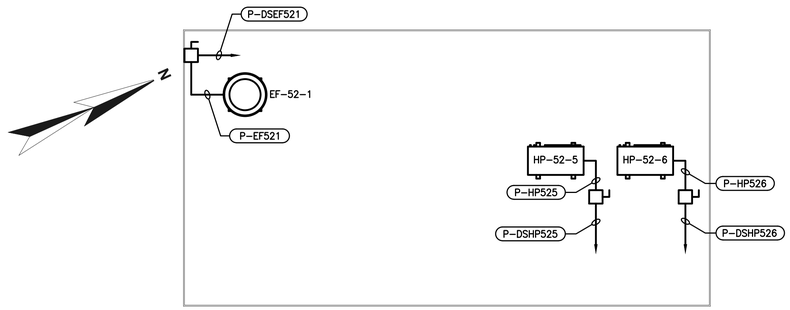
E-52-101

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 5:12 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\XREFS\21163-CM-SRVMOD.DWG | E-52-102 PLAN NORTH RAS PUMP STATION | 1:0.12364677 | --- | 2/18/2026 7:32:42 AM | DBABINEAUX

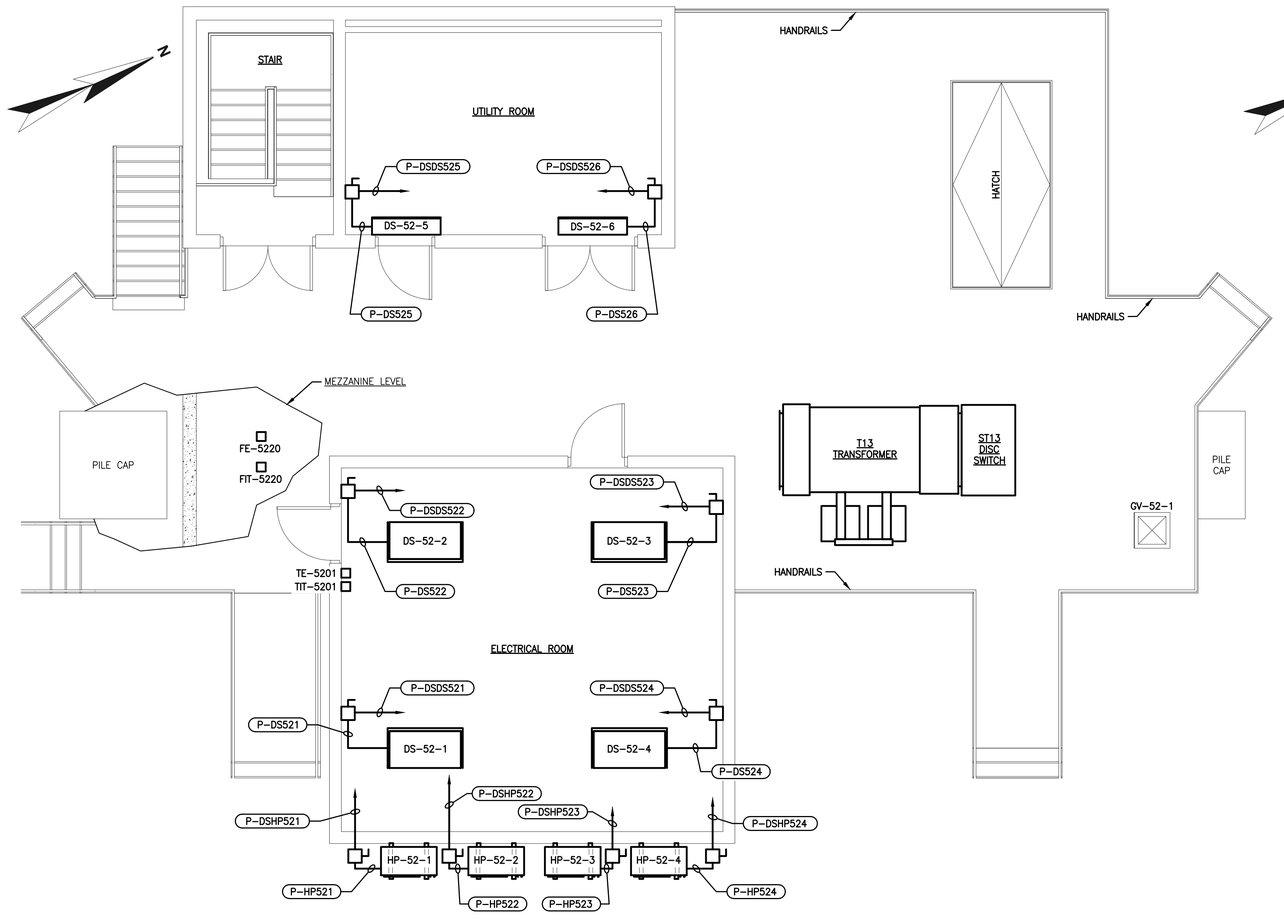


POWER MODIFICATION PLAN
UTILITY ROOM ROOF

SCALE: 1/4" = 1'-0"

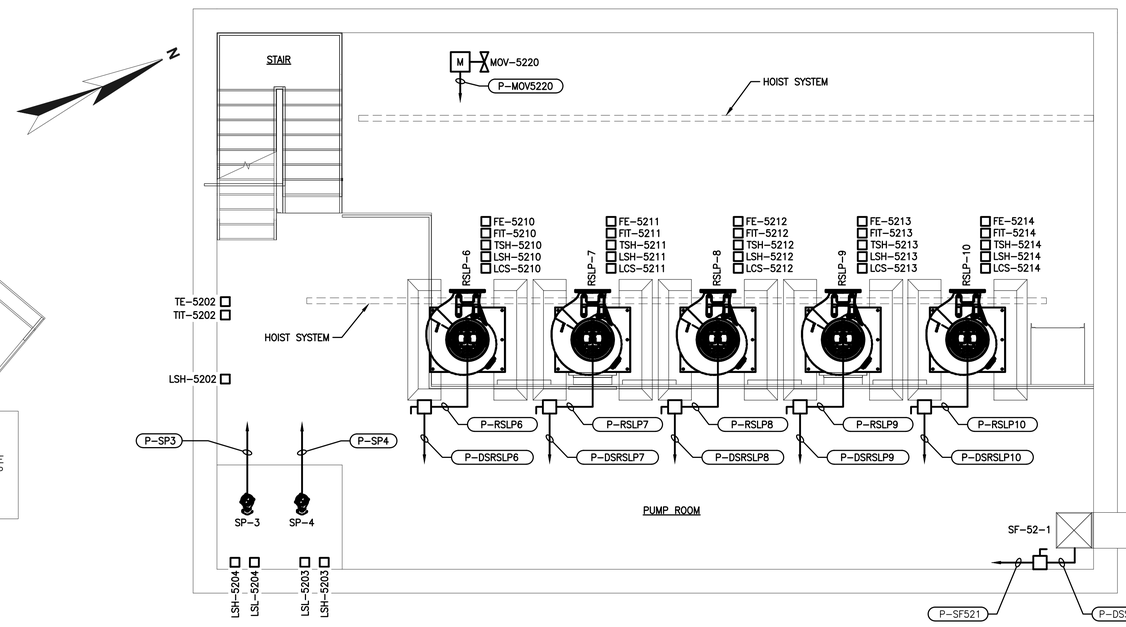
NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS, AND NOTES, REFER TO DRAWINGS E-00-001 AND E-00-002.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 26 AND 27, ON DRAWING E-00-002.
3. REFER TO MECHANICAL PACKAGE FOR EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT.



POWER MODIFICATION PLAN – FIRST FLOOR

SCALE: 1/4" = 1'-0"



POWER MODIFICATION PLAN – LOWER LEVEL

SCALE: 1/4" = 1'-0"

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
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ELECTRICAL PLAN NORTH RAS PUMP STATION

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

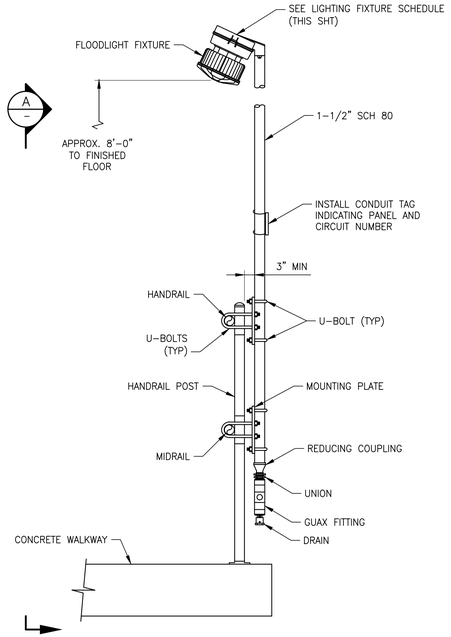
E-52-102

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

LAST SAVED BY: GLALA 4/24/2025 8:59 AM

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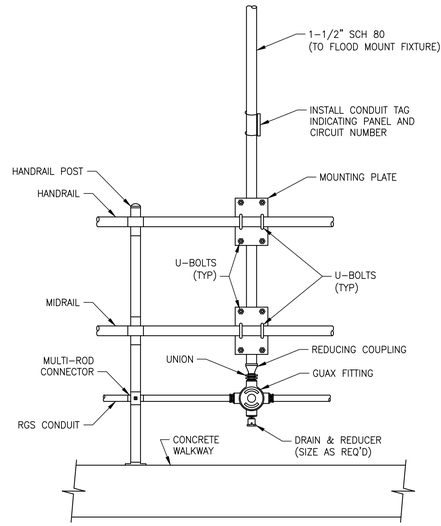


FLOODLIGHT MOUNTING DETAIL 1

SCALE: NTS

E-50-101

E-50-102
E-50-103
E-50-104



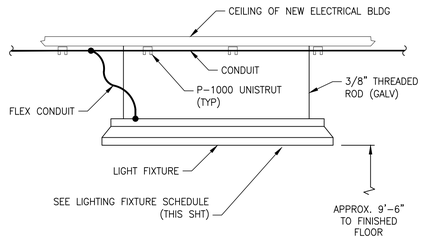
SECTION A

SCALE: NTS

LIGHTING FIXTURE SCHEDULE

CODE	LIGHT SOURCE TYPE	LIGHT SOURCE LAMPING	MOUNTING	MANUFACTURER	CATALOG NUMBER	VOLTS	DESCRIPTION
	LED	56W	STANCHION	EATON*	VMVL-5-J-G-UNV1/VMVL-JM5*	120	LED TYPE FIXTURE, NEMA TYPE 4X, SUITABLE FOR WET LOCATIONS w/ PHOTOCELL & MOUNTING MODULE
D	LED	58W	CEILING OR PENMDANT	COOPER-METALUX*	4VT2-LD4-6-DR-UNV-L835-CD1-U*	120	4 FT ENCL & POLYURETHANE GASKETED, LET, DRY LOCATION, ACRYLIC LENS, 6000 LUMENS
R	LED	20W	WALL	COOPER-MCGRAW-EDISON*	IST-AF-350-LED-E1-T2-BZ*	120	LED COMPACT WALLPACK, IST, UL WET LOCATION, BRONZE FINISH, T2 LIGHT DISTRIBUTION
	LED	1.5W, 3.6VDC	WALL	LITHONIA*	ELM2-LED-HO*	3.6VDC OR 9.6VDC	LED EMERGENCY BATTERY UNIT w/2 LAMPS, NI-CAD BTY, DRY LOCATIONS, 6W REMOTE OUTPUT CAPABILITY
	LED	42W	SURFACE OR SUSPENDED	LITHONIA*	CSVT-L48-ALO3-MVOLT-SWW3-80CRI	120	4 FT ENCL POLYCARBONATE HOUSING, VAPOR TIGHT LED STRIP LIGHT, FROSTED POLYCARBONATE LENS, 5000 LUMENS
	LED	1.1W	WALL, 7 FT AFF	COOPER-SURE-LITES*	LPX7SD*	120	SELF-POWERED EXIT, NI-CAD BATTERY FOR DRY LOCATIONS w/ SELF DIAGNOSTIC SYSTEM
	LED	50W	POLE MOUNTED	LITHONIA*	ESX1-LED-P2-40K-R3-MVOLT-UPA-BLS-DDBXD-M2	120	HIGH-EFFICACY ROUND OR SQUARE POLE MOUNTED LED WITH COLOR TEMPERATURE OF 4000K WITH MINIMUM CRI OF 70

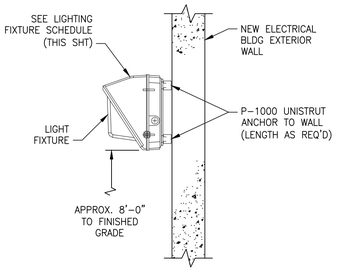
* OR EQUALS



LIGHT FIXTURE CEILING MOUNT DETAIL 2

SCALE: NTS

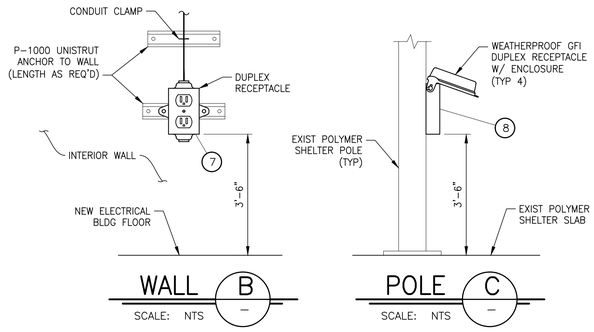
E-52-101



LIGHT FIXTURE WALL MOUNT DETAIL 3

SCALE: NTS

E-52-101

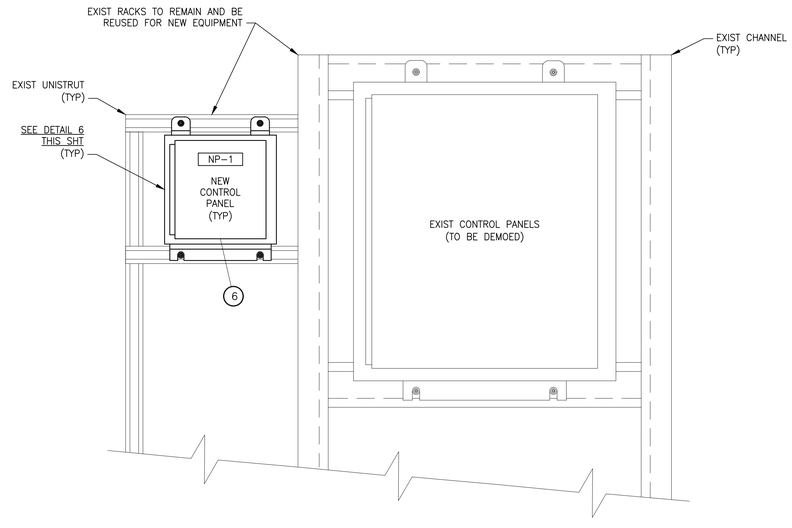


RECEPTACLE MOUNT DETAILS 4

SCALE: NTS

E-52-101

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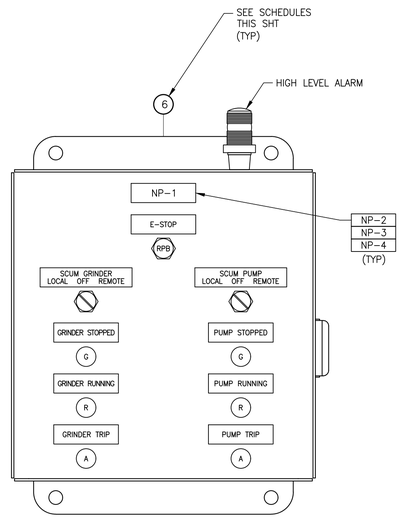


TYPICAL RACK DETAIL 5

SCALE: NTS

E-50-101

E-50-102
E-50-103
E-50-104



TYP CONTROL PANEL DETAILS 6

SCALE: NTS

NAMEPLATE SCHEDULE

ITEM	SIZE	COLOR (Background/text)	TEXT SIZE	LINE 1	LINE 2	LINE 3
NP-1	2" X 4"	WHITE/BLACK	3/8"	SCL-5	CONTROL PANEL	100A
NP-2	2" X 4"	WHITE/BLACK	3/8"	SCL-6	CONTROL PANEL	100A
NP-3	2" X 4"	WHITE/BLACK	3/8"	SCL-7	CONTROL PANEL	100V
NP-4	2" X 4"	WHITE/BLACK	3/8"	SCL-8	CONTROL PANEL	100A

CONTROL PANEL SCHEDULE

ITEM NO.	QUANTITY	DESCRIPTION
6	4	CONTROL PANEL, MOYNO ANNIHILATOR CONTROLLER*

* OR EQUALS

RECEPTACLE SCHEDULE

ITEM NO.	QUANTITY	DESCRIPTION
7	2	CONVIENIENCE RECEPTACLE, 120V, 20A, 1-PH, DUPLEX RECEPTACLE (WALL MOUNT)
8	4	WEATHERPROOF GFI RECEPTACLE W/ENCLOSURE, 120V, 20A, 1-PH, DUPLEX RECEPTACLE (POLE MOUNT)

* OR EQUALS

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

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ELECTRICAL DETAILS AND SCHEDULE

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

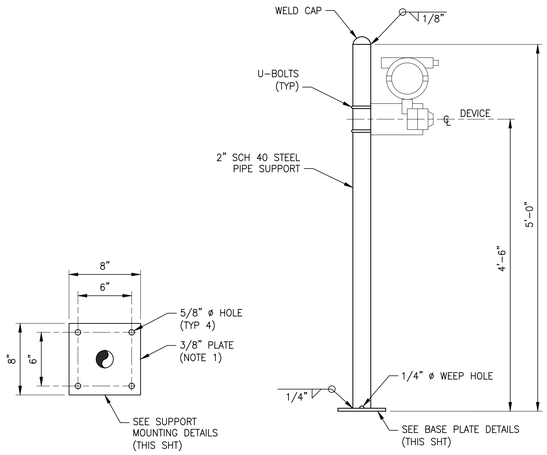
E-99-501

DWG. No. 12221-W-33

SET NO. SHEET NO. OF

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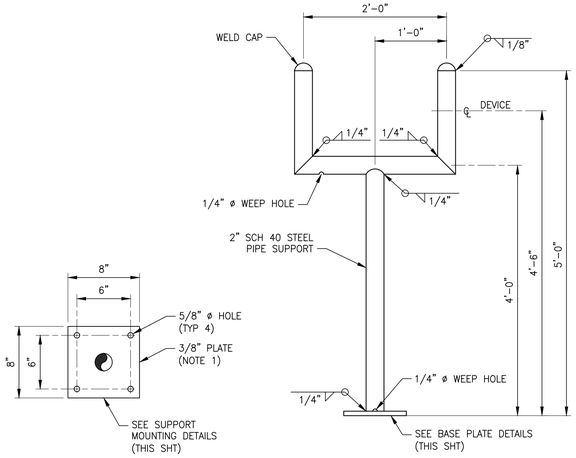
P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\LIGHTING DETAILS AND SCHEDULE.DWG | TYPICAL INSTALLATION DETAILS | 1:10.12364677 | — | 2/18/2026 7:32:50 AM | DBABINEAUX



BASE PLATE DETAIL ELEVATION

SINGLE STAND SUPPORT DETAILS

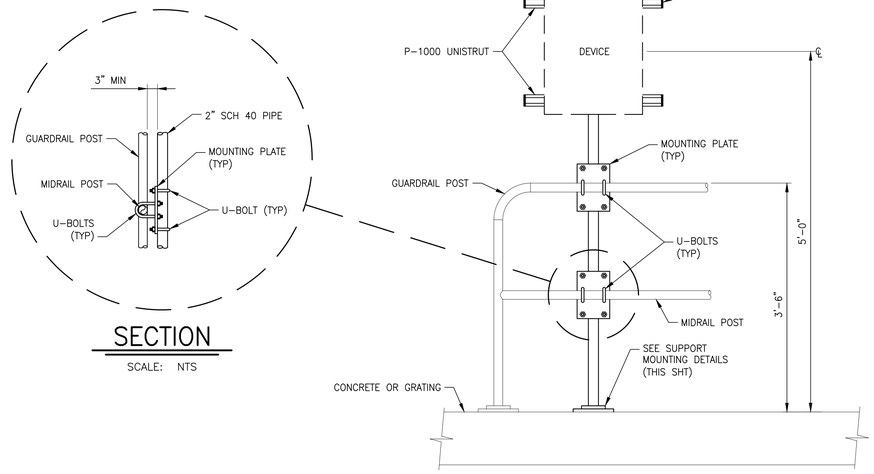
SCALE: NTS



BASE PLATE DETAIL ELEVATION

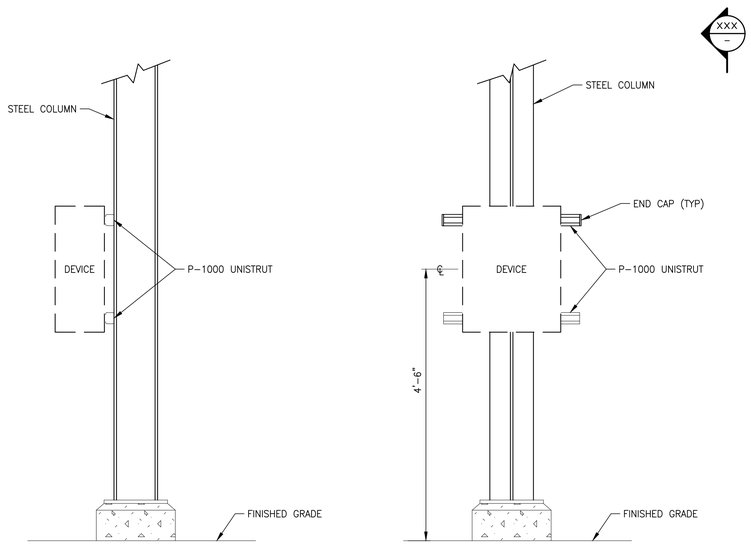
DOUBLE STAND SUPPORT DETAILS

SCALE: NTS



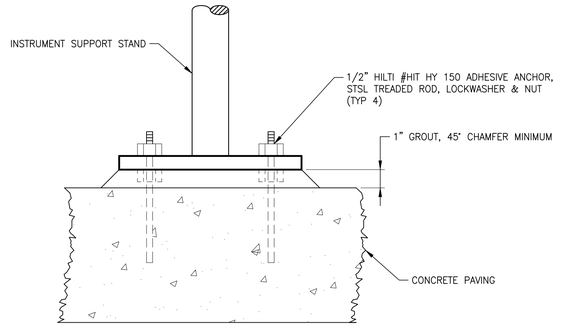
GUARDRAIL MOUNTING DETAILS

SCALE: NTS



COLUMN MOUNTING DETAILS

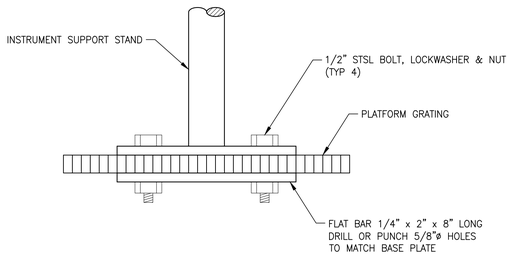
SCALE: NTS



CONCRETE MOUNTING

SUPPORT MOUNTING DETAILS

SCALE: NTS



PLATFORM MOUNTING

SUPPORT MOUNTING DETAILS

SCALE: NTS

REV.	DATE	DESCRIPTION	BY
△			
△			
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SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

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TYPICAL INSTALLATION DETAILS

PROJECT NO: 21163	DESIGNED BY: M. TORRES	DR. G. LALA	E-99-502
SUBMISSION: CONTRACT DRAWINGS		TRC.	
CAD COORD: A.COUTURE		CK. J. LAWRENCE	
		AP. J. LAWRENCE	DWG. No. 12221-W-33
		SCALE: AS NOTED	
		DATE: FEBRUARY 2026	SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 4/29/2025 12:30 PM

P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\PANEL SCHEDULES.DWG | NORTH RAS PANEL SCHEDULES | 11:0.12364677 | --- | 2/18/2026 7:33:00 AM | DBABINEAUX

PANEL	LP-5A			NTRL.	X	100%			AIC	RATED	10,000	CALC	7,272								
LOCATION	NORTH RAS PUMP STATION					200%		X	FULLY RATED												
AMPERES	200A	*RATED*		MOUNT.	X	SURFACE			SERIES RATED												
VOLTS		120/240V, 3PH,3W, DELTA W/3PH "STINGER"				FLUSH			PANEL HAS FRONT ACCESS ONLY												
	X	120/208V, 3PH,4W, WYE		ENCL.	X	NEMA1			ALL COPPER BUSSING												
		277/480V, 3PH,4W, WYE				NEMA3R			FURNISH GROUND BAR KIT												
	X	FACTORY MAIN CIRCUIT BREAKER				LOCKABLE COVER			FURNISH ADDITIONAL ISOLATED GROUND BAR KIT												
		SHUNT TRIP MAIN CB		FEED	X	TOP			SERVICE ENTRANCE LABEL												
		MAIN LUGS ONLY				BOTTOM		X	NAMEPLATE, 2"X4" ENGRAVED LAMINATED PLASTIC												
		UL LISTED FEED-THRU LUGS		BRNCH.		BOLT-ON			USE 1/4" LETTERING FOR PANEL NAME, 1 LINE												
		MAIN FUSIBLE SWITCH, FURNISH FUSES			X	STAB-IN			USE 1/8" LETTERING FOR VOLTS, AMPS, FED FROM												
						FUSIBLE SWITCHES			MONTH/YR. INSTALLED, 4 LINES												
MFG.:	SQUARE D							X	BLACK FIELD, WHITE LETTERS												
									RED FIELD, WHITE LETTERS												

CKT #	# OF POLES	TRIP AMPS	LOAD DESCRIPTION	KILOVOLT-AMPS A	B	C	LCL		KILOVOLT-AMPS A	B	C	LCL	LOAD DESCRIPTION	# OF POLES	TRIP AMPS	CKT #
1	2	30	HP-52-1 NORTH PUMP HOUSE BLDG	0.92			0.23	^_	0.92			0.23	HP-52-2 NORTH PUMP HOUSE BLDG	2	30	2
3			ELECTRICAL ROOM DISC SW (NEW)		0.92		0.23	-^-		0.92		0.23	ELECTRICAL ROOM DISC SW (NEW)			4
5	2	30	HP-52-3 NORTH PUMP HOUSE BLDG			0.92	0.23	_^			0.92	0.23	HP-52-4 NORTH PUMP HOUSE BLDG	2	30	6
7			ELECTRICAL ROOM DISC SW (NEW)	0.92			0.23	^_	0.92			0.23	ELECTRICAL ROOM DISC SW (NEW)			8
9	2	25	HP-52-5 NORTH PUMP HOUSE BLDG		0.81		0.20	-^-		0.81		0.20	HP-52-6 NORTH PUMP HOUSE BLDG	2	25	10
11			ELECTRICAL ROOM DISC SW (NEW)			0.81	0.20	_^			0.81	0.20	ELECTRICAL ROOM DISC SW (OLD)			12
13	2	20	DS-52-1 NORTH PUMP HOUSE BLDG	0.11			0.03	^_	0.11			0.03	DS-52-2 NORTH PUMP HOUSE BLDG	2	20	14
15			ELECTRICAL ROOM DISC SW (NEW)		0.11		0.03	-^-		0.11		0.03	ELECTRICAL ROOM DISC SW (NEW)			16
17	2	20	DS-52-3 NORTH PUMP HOUSE BLDG			0.11	0.03	_^			0.11	0.03	DS-52-4 NORTH PUMP HOUSE BLDG	2	20	18
19			ELECTRICAL ROOM DISC SW (NEW)	0.11			0.03	^_	0.11			0.03	ELECTRICAL ROOM DISC SW (NEW)			20
21	2	20	DS-52-5 NORTH PUMP HOUSE BLDG		0.04		0.01	-^-		0.04		0.01	DS-52-6 NORTH PUMP HOUSE BLDG	2	20	22
23			ELECTRICAL ROOM DISC SW (OLD)			0.04	0.01	_^			0.04	0.01	ELECTRICAL ROOM DISC SW (OLD)			24
25	2	20	EF-52-1 NORTH PUMP HOUSE BLDG	0.34			0.08	^_	0.25			0.06	SF-52-1 NORTH PUMP HOUSE BLDG	2	20	26
27			PUMP ROOM DISC SW		0.34		0.08	-^-		0.25		0.06	PUMP ROOM DISC SW			28
29	1	20	SP-52-1 N PUMP HOUSE BLDG PUMP RM			0.37	0.09	_^			0.37	0.09	SP-52-2 N PUMP HOUSE BLDG PUMP RM	1	20	30
31	1	20	N RAS PUMP STATION CONTROL PANEL	1.80			0.45	^_	0.29			0.07	ELECTRICAL ROOM LIGHTS	1	20	32
33	1	20	ELECTRICAL ROOM RECEP		1.26		0.32	-^-					SPARE	1	20	34
35	1	20	SPARE					_^					SPARE	1	20	36
37	1	20	SPARE					^_					SPARE	1	20	38
39	1	20	SPARE					-^-					SPARE	1	20	40
41	1	20	SPARE					_^					SPARE	1	20	42
				4.20	3.48	2.25	2.48		2.60	2.13	2.25	1.74	TOTAL BY PHASE			
									6.80	5.60	4.50	4.23	TOTAL BY PHASE BOTH SIDES			
RECEP	RECEPTACLE												FEED-THRU LUG LOAD			
DC	DIRECT CONNECT								6.80	5.60	4.50	4.23	TOTAL CONNECTED LOAD			
									56.64	46.69	37.54	35.22	AMPERES 120 VOLTS (SINGLE PHASE)			
													21 KVA TOTAL			
													59 AMPS AT 208 VOLTS (PHASE AS NOTED)			
DLB													02/18/26			

PANEL SCHEDULE

PANEL	LA			NTRL.	X	100%			AIC	RATED	35,000	CALC	24,056								
LOCATION	NORTH RAS PUMP STATION					200%		X	FULLY RATED												
AMPERES	200A	*RATED*		MOUNT.	X	SURFACE			SERIES RATED												
VOLTS		120/240V, 3PH,3W, DELTA W/3PH "STINGER"				FLUSH			PANEL HAS FRONT ACCESS ONLY												
		120/208V, 3PH,4W, WYE		ENCL.	X	NEMA1			ALL COPPER BUSSING												
	X	277/480V, 3PH,4W, WYE				NEMA3R			FURNISH GROUND BAR KIT												
	X	FACTORY MAIN CIRCUIT BREAKER				LOCKABLE COVER			FURNISH ADDITIONAL ISOLATED GROUND BAR KIT												
		SHUNT TRIP MAIN CB		FEED	X	TOP			SERVICE ENTRANCE LABEL												
		MAIN LUGS ONLY				BOTTOM		X	NAMEPLATE, 2"X4" ENGRAVED LAMINATED PLASTIC												
		UL LISTED FEED-THRU LUGS		BRNCH.		BOLT-ON			USE 1/4" LETTERING FOR PANEL NAME, 1 LINE												
		MAIN FUSIBLE SWITCH, FURNISH FUSES			X	STAB-IN			USE 1/8" LETTERING FOR VOLTS, AMPS, FED FROM												
						FUSIBLE SWITCHES			MONTH/YR. INSTALLED, 4 LINES												
MFG.:	SQUARE D							X	BLACK FIELD, WHITE LETTERS												
									RED FIELD, WHITE LETTERS												

CKT #	# OF POLES	TRIP AMPS	LOAD DESCRIPTION	KILOVOLT-AMPS A	B	C	LCL		KILOVOLT-AMPS A	B	C	LCL	LOAD DESCRIPTION	# OF POLES	TRIP AMPS	CKT #
1		20		0.06			0.02	^_					SPARE	1	20	2
3	3	20	MOV-5220		0.06		0.02	-^-					SPARE	1	20	4
5		20				0.06	0.02	_^					SPARE	1	20	6
7	1	20	SPARE					^_					SPARE	1	20	8
9	1	20	SPARE					-^-					SPARE	1	20	10
11	1	20	SPARE					_^					SPARE	1	20	12
13	1	20	SPARE					^_					SPARE	1	20	14
15	1	20	SPARE					-^-					SPARE	1	20	16
17	1	20	SPARE					_^					SPARE	1	20	18
19	1	20	SPARE					^_					SPARE	1	20	20
21	1	20	SPARE					-^-					SPARE	1	20	22
23	1	20	SPARE					_^					SPARE	1	20	24
25	1	20	SPARE					^_					SPARE	1	20	26
27	1	20	SPARE					-^-					SPARE	1	20	28
29	1	20	SPARE					_^					SPARE	1	20	30
31	1	20	SPARE					^_					SPARE	1	20	32
33	1	20	SPARE					-^-					SPARE	1	20	34
35	1	20	SPARE					_^					SPARE	1	20	36
37	1	20	SPARE					^_					SPARE	1	20	38
39	1	20	SPARE					-^-					SPARE	1	20	40
41	1	20	SPARE					_^					SPARE	1	20	42
				0.06	0.06	0.06	0.05		0.00	0.00	0.00	0.00	TOTAL BY PHASE			
									0.06	0.06	0.06	0.05	TOTAL BY PHASE BOTH SIDES			
RECEP	RECEPTACLE												FEED-THRU LUG LOAD			
DC	DIRECT CONNECT								0.06	0.06	0.06	0.05	TOTAL CONNECTED LOAD			
									0.22	0.22	0.22	0.16	AMPERES 277 VOLTS (SINGLE PHASE)			
													0.23 KVA TOTAL			
													0.27 AMPS AT 480 VOLTS (PHASE AS NOTED)			
DLB													02/18/26			

PANEL SCHEDULE

PANEL	LA			NTRL.	X	100%			AIC	RATED	35,000	CALC	24,056								
LOCATION	NORTH RAS PUMP STATION					200%		X	FULLY RATED												
AMPERES	200A	*RATED*		MOUNT.	X	SURFACE			SERIES RATED												
VOLTS		120/240V, 3PH,3W, DELTA W/3PH "STINGER"				FLUSH			PANEL HAS FRONT ACCESS ONLY												
		120/208V, 3PH,4W, WYE		ENCL.	X	NEMA1			ALL COPPER BUSSING												
	X	277/480V, 3PH,4W, WYE				NEMA3R			FURNISH GROUND BAR KIT												
	X	FACTORY MAIN CIRCUIT BREAKER				LOCKABLE COVER			FURNISH ADDITIONAL ISOLATED GROUND BAR KIT												
		SHUNT TRIP MAIN CB		FEED	X	TOP			SERVICE ENTRANCE LABEL												
		MAIN LUGS ONLY				BOTTOM		X	NAMEPLATE, 2"X4" ENGRAVED LAMINATED PLASTIC												
		UL LISTED FEED-THRU LUGS		BRNCH.		BOLT-ON			USE 1/4" LETTERING FOR PANEL NAME, 1 LINE												
		MAIN FUSIBLE SWITCH, FURNISH FUSES			X	STAB-IN			USE 1/8" LETTERING FOR VOLTS, AMPS, FED FROM												
						FUSIBLE SWITCHES			MONTH/YR. INSTALLED, 4 LINES												
MFG.:	SQUARE D							X	BLACK FIELD, WHITE LETTERS												
									RED FIELD, WHITE LETTERS												

CKT #	# OF POLES	TRIP AMPS	LOAD DESCRIPTION	KILOVOLT-AMPS A	B	C	LCL		KILOVOLT-AMPS A	B	C	LCL	LOAD DESCRIPTION	# OF POLES	TRIP AMPS	CKT #
1	1	20	SPARE					^_					SPARE	1	20	2
3	1	20	SPARE					-^-					SPARE	1	20	4
5	1	20	SPARE					_^					SPARE	1	20	6
7	1	20	SPARE					^_					SPARE	1	20	8
9	1	20	SPARE					-^-					SPARE	1	20	10
11	1	20	SPARE					_^					SPARE	1	20	12
13	1	20	SPARE					^_					SPARE	1	20	14
15	1	20	SPARE					-^-					SPARE	1	20	16
17	1	20	SPARE					_^					SPARE	1	20	18
19	1	20	SPARE					^_					SPARE	1	20	20
21	1	20	SPARE					-^-					SPARE	1	20	22
23	1	20	SPARE					_^					SPARE	1	20	24
25	1	20	SPARE					^_					SPARE	1	20	26
27	1	20	SPARE					-^-					SPARE	1	20	28
29	1	20	SPARE					_^					SPARE	1	20	30
31	1	20	SPARE					^_					SPARE	1	20	32
33	1	20	SPARE					-^-					SPARE	1	20	34
35	1	20	SPARE					_^					SPARE	1	20	36
37	1	20	SPARE					^_					SPARE	1	20	38
39	1	20	SPARE					-^-					SPARE	1	20	40
41	1	20	SPARE					_^					SPARE	1	20	42
				0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	TOTAL BY PHASE			
									0.00	0.00	0.00	0.00	TOTAL BY PHASE BOTH SIDES			
RECEP	RECEPTACLE												FEED-THRU LUG LOAD			
DC	DIRECT CONNECT								0.00	0.00	0.00	0.00	TOTAL CONNECTED LOAD			
PS	PUMP STATION								0.00	0.00	0.00	0.00	AMPERES 277 VOLTS (SINGLE PHASE)			
													0 KVA TOTAL			
													0 AMPS AT 480 VOLTS (PHASE AS NOTED)			
DLB													02/18/26			

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270

EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA — JOHN C. LAWRENCE — REG. NO. 27947 — REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

NORTH RAS PANEL SCHEDULES

DR.	G. LALA		
TRC.			
CK.	J. LAWRENCE		
AP.	J. LAWRENCE		
PROJECT NO: 21163	DESIGNED BY: M. TORRES		
SUBMISSION: CONTRACT DRAWINGS		SCALE: AS NOTED	
CAD COORD: A.COUTURE		DATE: FEBRUARY 2026	

E-99-601

DWG. No. 12221-W-33

SET NO. | SHEET NO. OF

CONDUIT NO	SIZE		DESTINATION	
	CONDUIT	CONDUCTOR	FROM	TO
P1-MCCH	2-1/2"	1#350, 1#1/0GND	SWITCHBOARD SWBD-H	MOTOR CONTROL CENTER MCC-H
P2-MCCH	2-1/2"	1#350, 1#1/0GND	SWITCHBOARD SWBD-H	MOTOR CONTROL CENTER MCC-H
P1-SWGRH	4"	4#600, 1#4/0GND	SWITCHGEAR TRANSFORMER XFRM-SWGR-H	SWITCHGEAR SWGR-H
P2-SWGRH	4"	4#600, 1#4/0GND	SWITCHGEAR TRANSFORMER XFRM-SWGR-H	SWITCHGEAR SWGR-H
P3-SWGRH	4"	4#600, 1#4/0GND	SWITCHGEAR TRANSFORMER XFRM-SWGR-H	SWITCHGEAR SWGR-H
P4-SWGRH	4"	4#600, 1#4/0GND	SWITCHGEAR TRANSFORMER XFRM-SWGR-H	SWITCHGEAR SWGR-H
P1-SWBDH	4"	4#600, 1#4/0GND	SWITCHGEAR SWGR-H	SWITCHBOARD SWBD-H
P2-SWBDH	4"	4#600, 1#4/0GND	SWITCHGEAR SWGR-H	SWITCHBOARD SWBD-H
P3-SWBDH	4"	4#600, 1#4/0GND	SWITCHGEAR SWGR-H	SWITCHBOARD SWBD-H
P4-SWBDH	4"	4#600, 1#4/0GND	SWITCHGEAR SWGR-H	SWITCHBOARD SWBD-H
P-AC	1"	3#12, 1#12GND	SWITCHBOARD SWBD-H	AIR CONDITIONER AC
P-CPNR	1"	2#12, 1#12GND	LP-5A	NORTH RAS PUMP STATION CONTROL PANEL
P-DSS22	1"	2#12, 1#12GND	DUCTLESS SPLIT HEAT PUMP NO.2 DISCONNECT SWITCH	DUCTLESS SPLIT HEAT PUMP NO. 2 DS-52-2
P-DSS23	1"	2#12, 1#12GND	DUCTLESS SPLIT HEAT PUMP NO.3 DISCONNECT SWITCH	DUCTLESS SPLIT HEAT PUMP NO. 3 DS-52-3
P-DSS24	1"	2#12, 1#12GND	DUCTLESS SPLIT HEAT PUMP NO.4 DISCONNECT SWITCH	DUCTLESS SPLIT HEAT PUMP NO. 4 DS-52-4
P-DSS25	1"	2#12, 1#12GND	DUCTLESS SPLIT HEAT PUMP NO.5 DISCONNECT SWITCH	DUCTLESS SPLIT HEAT PUMP NO. 5 DS-52-5
P-DSS26	1"	2#12, 1#12GND	DUCTLESS SPLIT HEAT PUMP NO.6 DISCONNECT SWITCH	DUCTLESS SPLIT HEAT PUMP NO. 6 DS-52-6
P-DSDS521	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 1 DISCONNECT SWITCH
P-DSDS522	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 2 DISCONNECT SWITCH
P-DSDS523	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 3 DISCONNECT SWITCH
P-DSDS524	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 4 DISCONNECT SWITCH
P-DSDS525	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 5 DISCONNECT SWITCH
P-DSDS526	1"	2#12, 1#12GND	LP-5A	DUCTLESS SPLIT AIR CONDITIONER NO. 6 DISCONNECT SWITCH
P-DSEF521	1"	2#12, 1#12GND	LA1	EXHAUST FAN EF-52-1 DISCONNECT SWITCH
P-DSFP1	1"	2#12, 1#12GND	LP-6A	DEWATERING SLUDGE TRANSFER PUMP NO. 1 CONTROL PANEL
P-DSFP2	1"	2#12, 1#12GND	LP-6A	DEWATERING SLUDGE TRANSFER PUMP NO. 2 CONTROL PANEL
P-DSHP521	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 1
P-DSHP522	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 2
P-DSHP523	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 3
P-DSHP524	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 4
P-DSHP525	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 5
P-DSHP526	1"	2#10, 1#10GND	LP-5A	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 6
P-DSRSLP10	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 10 VFD	RETURN ACTIVATED SLUDGE PUMP NO. 10 DISCONNECT SWITCH
P-DSRSLP6	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 6 VFD	RETURN ACTIVATED SLUDGE PUMP NO. 6 DISCONNECT SWITCH
P-DSRSLP7	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 7 VFD	RETURN ACTIVATED SLUDGE PUMP NO. 7 DISCONNECT SWITCH
P-DSRSLP8	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 8 VFD	RETURN ACTIVATED SLUDGE PUMP NO. 8 DISCONNECT SWITCH
P-DSRSLP9	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 9 VFD	RETURN ACTIVATED SLUDGE PUMP NO. 9 DISCONNECT SWITCH
P-DSSF521	1"	2#12, 1#12GND	LA1	SUPPLY FAN SF-52-1 DISCONNECT SWITCH
P-DSSTDP1	1"	3#8, 1#10GND	MOTOR CONTROL CENTER MCC-C	SEDIMENTATION BASIN DRAIN PUMPS NO. 1 DISCONNECT SWITCH
P-DSSTDP2	1"	3#8, 1#10GND	MOTOR CONTROL CENTER MCC-C	SEDIMENTATION BASIN DRAIN PUMPS NO. 2 DISCONNECT SWITCH
P-EF521	1"	2#12, 1#12GND	EXHAUST FAN EF-52-1 DISCONNECT SWITCH	EXHAUST FAN EF-52-1
P-HP521	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 1	AIR COOLED HEAT PUMP NO. 1 HP-52-1
P-HP522	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 2	AIR COOLED HEAT PUMP NO. 2 HP-52-2
P-HP523	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 3	AIR COOLED HEAT PUMP NO. 3 HP-52-3
P-HP524	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 4	AIR COOLED HEAT PUMP NO. 4 HP-52-4
P-HP525	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 5	AIR COOLED HEAT PUMP NO. 5 HP-52-5
P-HP526	1"	2#10, 1#10GND	AIR COOLED HEAT PUMP DISCONNECT SWITCH NO. 6	AIR COOLED HEAT PUMP NO. 6 HP-52-6
P-LA	2"	4#2/0, 1#8GND	SWITCHBOARD SWBD-H	PANEL LA
P-LA1	2"	4#2/0, 1#8GND	SWITCHBOARD SWBD-H	PANEL LA-1
P-LP5A	2"	4#2/0, 1#8GND	PANEL LP-5A TRANSFORMER	PANEL LP-5A
P-MOV5220	1"	3#12, 1#12GND	LA1	MOV-5220
P-RSLP10	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 10 DISCONNECT SWITCH	RETURN ACTIVATED SLUDGE PUMP NO. 10 RSLP-10
P-RSLP6	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 6 DISCONNECT SWITCH	RETURN ACTIVATED SLUDGE PUMP NO. 6 RSLP-6
P-RSLP7	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 7 DISCONNECT SWITCH	RETURN ACTIVATED SLUDGE PUMP NO. 7 RSLP-7
P-RSLP8	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 8 DISCONNECT SWITCH	RETURN ACTIVATED SLUDGE PUMP NO. 8 RSLP-8
P-RSLP9	2"	3#250, 1#4GND	RETURN ACTIVATED SLUDGE PUMP NO. 9 DISCONNECT SWITCH	RETURN ACTIVATED SLUDGE PUMP NO. 9 RSLP-9
P-SCL5	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	CLAFIFIER DRIVE NO. 5 SCL-5
P-SCL6	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	CLAFIFIER DRIVE NO. 6 SCL-6
P-SCL7	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	CLAFIFIER DRIVE NO. 7 SCL-7
P-SCL8	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	CLAFIFIER DRIVE NO. 7 SCL-8
P-SCSG5	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM GRINDER NO. 5 SCSG-5
P-SCSG6	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM GRINDER NO. 6 SCSG-6
P-SCSG7	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM GRINDER NO. 7 SCSG-7
P-SCSG8	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM GRINDER NO. 8 SCSG-8
P-SCSP5	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM PUMP NO. 5 SCSP-5
P-SCSP6	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM PUMP NO. 6 SCSP-6
P-SCSP7	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM PUMP NO. 7 SCSP-7
P-SCSP8	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SCUM PUMP NO. 8 SCSP-8
P-SF521	1"	2#12, 1#12GND	SUPPLY FAN SF-52-1 DISCONNECT SWITCH	SUPPLY FAN SF-52-1
P-SHPP	1"	3#4, 1#8GND	SWITCHBOARD SWBD-H	PANEL SH-PP
P-SP4	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	SUMP PUMP NO. 3 SP-4
P-SP5	1"	3#12, 1#12GND	MOTOR CONTROL CENTER MCC-H	THICKENED SLUDGE PUMP GALLERY SUMP PUMP NO. 5 SP-5
P-STDP2	1"	3#8, 1#10GND	SEDIMENTATION BASIN DRAIN PUMPS NO. 2 DISCONNECT SWITCH	SEDIMENTATION BASIN DRAIN PUMPS NO. 2 STDP-2
P-VFDRSLP10	2"	3#250, 1#4GND	SWITCHBOARD SWBD-H	RETURN ACTIVATED SLUDGE PUMP NO. 10 VFD
P-VFDRSLP6	2"	3#250, 1#4GND	SWITCHBOARD SWBD-H	RETURN ACTIVATED SLUDGE PUMP NO. 6 VFD
P-VFDRSLP7	2"	3#250, 1#4GND	SWITCHBOARD SWBD-H	RETURN ACTIVATED SLUDGE PUMP NO. 7 VFD
P-VFDRSLP8	2"	3#250, 1#4GND	SWITCHBOARD SWBD-H	RETURN ACTIVATED SLUDGE PUMP NO. 8 VFD
P-VFDRSLP9	2"	3#250, 1#4GND	SWITCHBOARD SWBD-H	RETURN ACTIVATED SLUDGE PUMP NO. 9 VFD
P-XFRMLP5	1"	3#4, 1#8GND	SWITCHBOARD SWBD-H	PANEL LP-5 TRANSFORMER
P-XFRMLP5A	1"	3#4, 1#8GND	SWITCHBOARD SWBD-H	PANEL LP-5A TRANSFORMER
P-NAOCL	1"	3#4, 1#8GND	SWITCHBOARD SWBD-H	PNAOCL STORAGE TANKS POWER RACK

REV.	DATE	DESCRIPTION	BY
1	02/26/2026	ADDENDUM NO 2	GML/JCL

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil Structural Mechanical Electrical Marine Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163	DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS	
CAD COORD: A.COUTURE	

ELECTRICAL CABLE SCHEDULE

DR. G. LALA	
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	
SCALE: AS NOTED	
DATE: FEBRUARY 2026	

E-99-901

DWG. No. 12221-W-33

SET NO. SHEET NO. OF

LAST SAVED BY: GLALA 2/10/2026 4:51 PM
P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\ELEC CABLE SCH.DWG | E-99-901 ELECTRICAL CABLE SCHEDULE | 1:1 | 2/18/2026 7:33:14 AM | DBABINEAUX

CONDUIT NO	SIZE		DESTINATION	
	CONDUIT	CONDUCTOR	FROM	TO
	3/4"	4#14	CP-NR	TIT-5201
	3/4"	1#16TC-POS	CP-NR	TIT-5201
	3/4"	4#14	CP-NR	TIT-5202
	3/4"	1#16TC-POS	CP-NR	TIT-5202
	3/4"	4#14	CP-NR	LSH-5202
	3/4"	4#14	CP-NR	FIT-5210
	3/4"	2#16TC-POS	CP-NR	FIT-5210
	3/4"	4#14	CP-NR	FIT-5211
	3/4"	2#16TC-POS	CP-NR	FIT-5211
	3/4"	4#14	CP-NR	FIT-5212
	3/4"	2#16TC-POS	CP-NR	FIT-5212
	3/4"	4#14	CP-NR	FIT-5213
	3/4"	2#16TC-POS	CP-NR	FIT-5213
	3/4"	4#14	CP-NR	FIT-5214
	3/4"	2#16TC-POS	CP-NR	FIT-5214
	3/4"	4#14	CP-NR	LIT-5021
	3/4"	2#16TC-POS	CP-NR	LIT-5021
	3/4"	4#14	CP-NR	LIT-5022
	3/4"	2#16TC-POS	CP-NR	LIT-5022
	3/4"	4#14	CP-NR	LIT-5023
	3/4"	2#16TC-POS	CP-NR	LIT-5023
	3/4"	4#14	CP-NR	FIT-5220
	3/4"	2#16TC-POS	CP-NR	FIT-5220
	3/4"	10#14	CP-NR	MOV-5220
	1"	3#16TC-POS	CP-NR	MOV-5220
	3/4"	14#14	CP-NR	VFD-5210
	1"	4#16TC-POS	CP-NR	VFD-5210
	3/4"	14#14	RSLP-6 JB	LCS-RSLP-6
	3/4"	4#14	RSLP-6 JB	TSH-5210
	3/4"	4#14	RSLP-6 JB	LSH-5210
	3/4"	14#14	CP-NR	VFD-5211
	1"	4#16TC-POS	CP-NR	VFD-5211
	3/4"	14#14	RSLP-7 JB	LCS-RSLP-7
	3/4"	4#14	RSLP-7 JB	TSH-5211
	3/4"	4#14	RSLP-7 JB	LSH-5211
	3/4"	14#14	CP-NR	VFD-5212
	1"	4#16TC-POS	CP-NR	VFD-5212
	3/4"	14#14	RSLP-8 JB	LCS-RSLP-8
	3/4"	4#14	RSLP-8 JB	TSH-5212
	3/4"	4#14	RSLP-8 JB	LSH-5212
	3/4"	14#14	CP-NR	VFD-5213
	1"	4#16TC-POS	CP-NR	VFD-5213
	3/4"	14#14	RSLP-9 JB	LCS-RSLP-9
	3/4"	4#14	RSLP-9 JB	TSH-5213
	3/4"	4#14	RSLP-9 JB	LSH-5213
	3/4"	14#14	CP-NR	VFD-5214

CONDUIT NO	SIZE		DESTINATION	
	CONDUIT	CONDUCTOR	FROM	TO
	1"	4#16TC-POS	CP-NR	VFD-5214
	3/4"	14#14	RSLP-10 JB	LCS-RSLP-10
	3/4"	4#14	RSLP-10 JB	TSH-5214
	3/4"	4#14	RSLP-10 JB	LSH-5214
	1"	18#14	CP-NR	MS-5011
	3/4"	12#14	SCL-6 JB	LCS-SCL-6
	3/4"	4#14	SCL-6 JB	TSH-5011
	3/4"	4#14	SCL-6 JB	WSH-5011
	3/4"	4#14	SCL-6 JB	WSHH-5011
	1"	18#14	CP-NR	MS-5012
	3/4"	12#14	SCL-7 JB	LCS-SCL-7
	3/4"	4#14	SCL-7 JB	TSH-5012
	3/4"	4#14	SCL-7 JB	WSH-5012
	3/4"	4#14	SCL-7 JB	WSHH-5012
	1"	18#14	CP-NR	MS-5013
	3/4"	12#14	SCL-8 JB	LCS-SCL-8
	3/4"	4#14	SCL-8 JB	TSH-5013
	3/4"	4#14	SCL-8 JB	WSH-5013
	3/4"	4#14	SCL-8 JB	WSHH-5013
	3/4"	14#14	CP-NR	MS-5235
	1"	16#14	MS-5235	SCSG-6 JB
	3/4"	12#14	SCSG-6 JB	LCS-SCSG-6
	3/4"	4#14	SCSG-6 JB	TSH-5235
	3/4"	14#14	CP-NR	MS-5236
	1"	16#14	MS-5236	SCSG-7 JB
	3/4"	12#14	SCSG-7 JB	LCS-SCSG-7
	3/4"	4#14	SCSG-7 JB	TSH-5236
	3/4"	14#14	CP-NR	MS-5237
	1"	16#14	MS-5237	SCSG-8 JB
	3/4"	12#14	SCSG-8 JB	LCS-SCSG-8
	3/4"	4#14	SCSG-8 JB	TSH-5237
	1"	16#14	CP-NR	MS-5231
	3/4"	12#14	SCSP-6 JB	LCS-SCSP-6
	3/4"	4#14	SCSP-6 JB	TSH-5231
	3/4"	4#14	SCSP-6 JB	LSH-5231
	1"	16#14	CP-NR	MS-5232
	3/4"	12#14	SCSP-7 JB	LCS-SCSP-7
	3/4"	4#14	SCSP-7 JB	TSH-5232
	3/4"	4#14	SCSP-7 JB	LSH-5232
	1"	16#14	CP-NR	MS-5233
	3/4"	12#14	SCSP-8 JB	LCS-SCSP-8
	3/4"	4#14	SCSP-8 JB	TSH-5233
	3/4"	4#14	SCSP-8 JB	LSH-5233
	1"	5#16TC-POS	CP_NR	WEATHER STATION
C41	1"	20#14	MS-5231	Secondary Clarifier Grease/Scum Pump No.6
C42	1"	20#14	MS-5232	Secondary Clarifier Grease/Scum Pump No.7

CONDUIT NO	SIZE		DESTINATION	
	CONDUIT	CONDUCTOR	FROM	TO
C43	1"	20#14	MS-5233	Secondary Clarifier Grease/Scum Pump No.8
C44	1"	24#14	MS-5203	Pump Room Sump Pump No.1
C45	1"	24#14	MS-5204	Pump Room Sump Pump No.2
C50	1"	22#14	VFD-5210	Return Sludge Pump No.6
C51	1"	22#14	VFD-5211	Return Sludge Pump No.7
C52	1"	22#14	VFD-5212	Return Sludge Pump No.8
C53	1"	22#14	VFD-5213	Return Sludge Pump No.9
C54	1"	22#14	VFD-5214	Return Sludge Pump No.10
C56	1"	24#14	MS-5011	Grease Scum/Grinder and Pump No.6
C57	1"	24#14	MS-5012	Grease Scum/Grinder and Pump No.7
C58	1"	24#14	MS-5013	Grease Scum/Grinder and Pump No.8
S86	2"	12 fiber OM3	CP-NR	Future SCADA

REV.	DATE	DESCRIPTION	BY
△			
△			
△			

Infinity Engineering Consultants, LLC — IEC Project No 23-023
Civil∞Structural∞Mechanical∞Electrical∞Marine∞Transportation
Metairie, LA www.infinityec.com 504-304-0548

STATE OF LOUISIANA
JOHN C. LAWRENCE
REG. NO. 27941
REGISTERED PROFESSIONAL ENGINEER IN ELECTRICAL ENGINEERING
02-18-2026

WRIGHT-PIERCE
407.906.1776 | www.wright-pierce.com
601 S LAKE DESTINY ROAD, SUITE 290, MAITLAND, FL 32751

PROJECT NO: 21163 | DESIGNED BY: M. TORRES
SUBMISSION: CONTRACT DRAWINGS
CAD COORD: A.COUTURE

SEWERAGE AND WATER BOARD OF NEW ORLEANS

CONTRACT No. 30270
EAST BANK STP - PHASE 1A
SECONDARY TREATMENT UPGRADE

INSTRUMENT CABLE SCHEDULE

DR. G. LALA	E-99-903
TRC.	
CK. J. LAWRENCE	
AP. J. LAWRENCE	DWG. No. 12221-W-33
SCALE: AS NOTED	
DATE: FEBRUARY 2026	SET NO. / SHEET NO. OF

LAST SAVED BY: GLALA 4/24/2025 3:28 PM
P:\PROJECTS\23-023 WRIGHT-PIERCE - SWB EBWWTP ELECTRICAL MODIFICATIONS\DRAWINGS\PHASE 1A\PRODUCTION DRAWINGS\ELECTRICAL\INSTR CABLE SCH.DWG | E-99-903 INSTRUMENT CABLE SCHEDULE | 1:10.1236477 | --- | 2/18/2026 7:33:22 AM | DRABINEAUX

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Owner – The Sewerage and Water Board of New Orleans (SWBNO).

B. Designer – The entity or individual who is to act as the Engineer-of Record under the oversight and administration of the Owner. The term Designer may refer to a third-party Engineering Firm or a (SWBNO) department or individual.

C. Change Order Request (COR) – A formal proposal written by the Contractor that requests changes to the Contract Price and/or Contract Times. Document will include reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and as may be required for Contractor to accurately estimate cost and time impact on Project. Change to Contract Times must prove impact to the critical path of the project.

D. Work Change Directive (WCD) – A written statement to Contractor signed by the Owner, recommended by the Designer, and acknowledged by the Contractor ordering an addition, deletion, or revision in the Work, or responding to emergencies or differing or unforeseen conditions under which the Work is to be performed. A Work Change Directive will not change the Contract Price or Contract Times but is evidence that the parties expect that the change ordered will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Times.

E. Instruction to Contractor (ITC) – A document or written communication issued by the Owner or Designer directing the Contractor to prepare a proposal for a Change Order. An ITC may or may not influence the Contract Price or Times. An ITC may also be issued to clarify the drawings, specifications, or procedures.

F. Field Change Order (FCO) – A document formalizing the approval of a Change Order. This document will include all paperwork submitted by the Contractor and Designer to initiate the change, including the WCD or ITC, the COR, all supporting documentation submitted by the Contractor, and an analysis of the changes requested by the Designer justifying the increase/decrease to the Contract Prices/Times. Multiple FCOs may be combined into a single Change Order as defined below.

G. Change Order – A document authorizing an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times. Approval of a Change Order is determined by SWBNO Policy and may be modified. Table 12-1 is included at the end of this document for reference on the Signature

authority for Change Orders. This Table was approved by Board Resolution R-063-2021. This approval may be either a Board of Directors Resolution or an Executive Director's Change Authority document. A Change Order may consist of multiple changes to Contract Price and/or Times that would be memorialized in multiple Field Change Orders (FCOs) if necessary.

H. Request for Information (RFI) – A written request, from the Contractor to the Designer and/or Owners that asks for additional information or to clarify some aspect of the project, such as procedures, equipment, materials, specification details or drawing details.

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

1.02 INSTRUCTION TO CONTRACTOR (ITC)

A. Owner may, in anticipation of ordering an addition, deletion, or revision to the Work, request Contractor to prepare a detailed proposal of cost and times to perform contemplated change via an ITC.

B. The ITC will include a reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and as may be required for Contractor to accurately estimate cost and time impact on Project.

C. Proposal requests via ITCs are for information only. Contractor is neither authorized to execute a proposed change nor to stop Work in progress as result of such request.

D. Contractor's written proposal shall be transmitted to Designer for their review no later than 10 business days after Contractor's receipt of ITC.

E. Owner's request for proposal or Contractor's failure to submit such proposal within the required time period will not justify a Claim for an adjustment in Contract Price or Times.

1.03 CHANGE ORDER REQUEST (COR)

A. Include, at a minimum as part of the Contractor's Change Order Request (COR),

a. Specific references including Drawing numbers, Specification section and article/paragraph number, and Submittal type, Submittal number, date reviewed, Designer's comment, as applicable, with appropriate attachments.

b. Stipulated facts and pertinent documents, including photographs and statements.
c. Interpretations relied upon
d. Description of nature and extent of Claim, who or what caused the situation, impact to the Work and work of others, and discussion of claimant's justification for requesting a change to Contract Price or Times or both.
e. Estimated adjustment in price claimant believes it is entitled to with full documentation and justification. Estimate is to be detailed in nature, addressing all elements, materials, parts, equipment, labor, components, and the like affected by and/or incorporated into the Work as a result of the claimed adjustment.
f. Requested Change in Contract Times: include at least progress schedule documentation showing logic diagram for request, documentation that float times available for Work have been used, and revised activity logic with durations including sub-network logic revisions, duration changes, and other interrelated schedule impacts, as appropriate.
g. Documentation and/or information as may be necessary as set forth below for Work Change Directive, and as Designer may otherwise require.

B. For Work that will be performed by subcontract, Contractor is to submit three independent quotes that clearly reflect the scope of the respective modification. Additional supporting information as requested by the Designer shall be provided within 5 business days of request.

C. For Work that is to be self-performed, the Contractor is to provide a detailed breakdown of the Work by labor, materials, and equipment, detailing the labor force, equipment requirements, and providing three independent quotes for the required materials. Labor rates are to be consistent with the wage rate schedule included within these Documents, and equipment rates are to be consistent with those terms established in the General and Supplementary Conditions, and expanded on herein below, as applicable. Again, additional supporting information as requested by the Designer shall be provided within 5 business days of request.

1.04 WORK CHANGE DIRECTIVES

A. Designer will:
   a. Initiate, including a description of the Work involved and any attachments
   b. Sign and transmit electronic file to Owner for authorization.
   c. Provide any additional documentation as requested per RFI.

B. Owner will:
   a. Sign, demonstrating approval of the changes involved.
   b. Transmit electronic copies to Designer and Contractor

C. Contractor will:

a. Upon completion of Work covered by the WCD, submit COR documentation for inclusion in a Change Order
b. Provide documentation including, but not limited to:

i. Detailed records of Work performed
ii. Information required to substantiate resulting change in Contract Times and Contract Price for Work
iii. Support Data such as: dates Work was performed and by whom; time records, wage rates paid, equipment rental rates; invoices and receipts for materials, equipment, and subcontracts
1. Subcontracted Work: supply three independent quotes or documentation of cost reasonableness
2. Self-performed Work: supply three independent pricing quotes for materials or documentation of cost reasonableness

1.05 CHANGE ORDERS

A. Designer will prepare one electronic copy of proposed Change Order and transmit such with Designer's written recommendation based on one or multiple Field Change Orders.
B. Upon receipt of recommended Change Order, Owner will either:
a. Execute Change Order, or
b. Return to Designer unsigned copies with written justification for not executing Change Order.
C. Upon receipt of Owner-executed Change Order, Designer will transmit electronic packages to the Contractor, the Resident Project Representative or other field representative, and retain the package as part of the project file, or if Owner fails to execute the Change Order, Designer will promptly so notify Contractor and transmit Owner's justification to Contractor.
D. Upon receipt of documentation of the Owner-executed Change Order, Contractor shall:
a. Perform Work covered by Change Order.
b. Revise Schedule of Values to adjust Contract Price and submit with next Application for Payment.
c. Revise Progress Schedule to reflect changes in Contract Times, if any, and to adjust times for other items of Work affected by change.
d. Enter changes in Project record documents after completion of change related Work.
E. In signing a Change Order, Owner and Contractor acknowledge and agree that:
a. Stipulated compensation (Contract Price or Contract Times, or both) set forth includes payment for (i) the Cost of the Work covered by the Change Order, (ii) Contractor's fee for overhead and profit, (iii) interruption of Progress Schedule, (iv) delay and impact, including

cumulative impact, on other Work under the Contract Documents, and (v) extended overheads.

b. Change Order constitutes full mutual accord and satisfaction for the change to the Work.
c. Unless otherwise stated in the Change Order, all requirements of the original Contract Documents apply to the Work covered by the Change Order.

1.06 CHANGE ORDER PROCESS SUMMARY

This Section is to be used in conjunction with the *Change Order Flowchart* included.

A. Change Condition is identified by the Contractor.
B. Contractor initiates and submits an RFI
C. Designer responds to RFI indicating a Change Order is necessary.
D. If the Change Condition could delay the overall project schedule by waiting for approval at the next SWBNO Board of Directors meeting, then a WCD is issued by the Designer/Owner. Otherwise, skip to step (E).
    a. The Contractor begins Work as indicated in RFI Response/WCD.
    b. Contractor submits costs incurred as COR.
    c. If COR costs are justifiable, Designer/Owner creates FCO for Contractor signature.
    d. Owner submits Change Order to Executive Director (ED Change Authority) or Board of Directors based on Table 12-1 copied at the end of this document.
    e. After Approval of ED Change Authority or Board of Directors Resolution, Designer and/or Owner sign and return fully executed FCO(s) to Contractor.
    f. Contractor may include costs in the next Pay Application.
E. If the Change Condition does not impact the critical path of the project schedule, then the Designer/Owner submits an ITC to Contractor.
    a. The Contractor takes instructions from ITC and creates a proposal to complete the Work and submits as an COR.
    b. If COR costs are justifiable, Designer/Owner creates FCO for Contractor signature.
    c. Owner submits Change Order to Executive Director (ED Change Authority) or Board of Directors based on Table 12-1 copied at the end of this document.
    d. After Approval of ED Change Authority or Board of Directors Resolution, Designer and/or Owner sign and return fully executed FCO(s) to Contractor. Owner may concurrently issue a Notice to Proceed to Contractor for this Work.
    e. Contractor may include costs as incurred in following Pay Application(s)

1.07 REFERENCE DOCUMENTS

A. Contract Change Order Tier Summary per Resolution R-063-2021 (Attachment “A”)
B. Change Order Flowchart (Attachment “B”)
C. Instruction to Contractor Template/Example (Attachment “C”)
D. Work Change Directive Template/Example (Attachment “D”)
E. Field Change Order Template/Example (Attachment “E”)
F. ED Change Authority Template/Example (Attachment “F”)

PART 2 PRODUCTS (NOT USED)

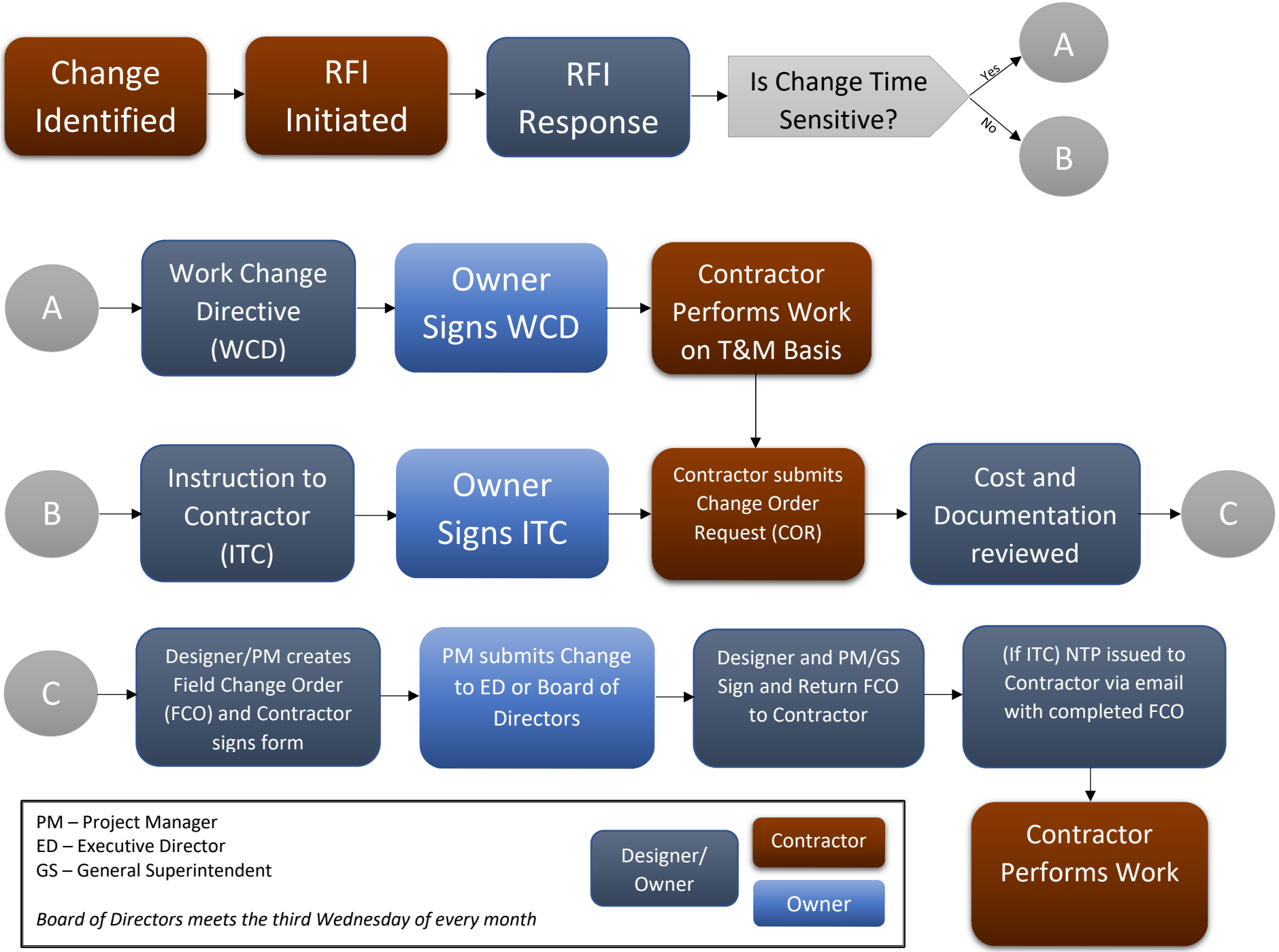
PART 3 EXECUTION (NOT USED)

END OF SECTION

Table 12-1. Contract Change Order Tier Summary

Contract Tier	Change Order Parameter	Signature Requirements
Tier One: Contract Aggregate <$1,000,000		
Change Order Scenario 1	If a change order is below 10% of the original contract value	Executive Director approves change order and SWBNO Board of Directors is notified during monthly meetings
Change Order Scenario 2	If a change order exceeds 10% of the original contract value, and total contract value remains below $1M	Executive Director approves change order and SWBNO Board of Directors is notified during monthly meetings
Tier Two: Contract Aggregate between $1,000,000 and $4,999,999.99		
Change Order Scenario 1	If a change order is less than $250,000 or 20% of the original contract value (whichever is less considering cumulative amount of change orders)	Executive Director approves change order and SWBNO Board of Directors is notified during monthly meetings
Change Order Scenario 2	If a change order or aggregate of change orders exceeds $249,999.99 or 20% of the original contract value (whichever is less considering cumulative amount of change orders)	SWBNO Board of Directors approves via F&A Committee. Executive Director signs resolution.
Tier Three: Contract Aggregate $5,000,000 and above		
Change Order Scenario 1	If a change order is less than $500,000 or 10% of the original contract value (whichever is less considering cumulative amount of change orders)	Executive Director approves change order and SWBNO Board of Directors is notified during monthly meetings
Change Order Scenario 2	If a change order or aggregate of change orders exceeds $499,999.99 or 10% of the original contract value (whichever is less considering cumulative amount of change orders)	SWBNO Board of Directors approves via F&A Committee. Executive Director signs resolution.

CHANGE ORDER FLOWCHART



INSTRUCTION TO CONTRACTOR

Contract Name	SWBNO Contract No.:
	Reference RFI No. (If applicable)
Contractor	Instruction No. 001
Contract Description/Specification Section	Date:

This instruction is issued to:

- ☐ Clarify drawings, specifications, or procedures.
- ☐ Request a proposal.
- ☐ Transmit drawings or documents for incorporation into the work.

The SWBNO is directing the Contractor to:

Recommended by Designer: _____

Authorized by Owner: _____

IF, IN THE CONTRACTOR'S OPINION, A CLARIFICATION INVOLVES WORK WHICH CHANGES THE CONTRACT PRICE OR TIME, YOU MUST SUBMIT A CHANGE ORDER REQUEST OR NOTICE AS REQUIRED IN THE CONTRACT DOCUMENTS.

WORK CHANGE DIRECTIVE NO.: 001

Owner: Sewerage & Water Board of New Orleans
Designer:
Contractor:
Owner's Project No.: Contract No.
Contract Name:

Date Issued: **Effective Date of Work Change Directive:**

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments:

Purpose for the Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

☐Non-agreement on pricing of proposed change. ☐Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: _____ ☐ increase ☐ decrease ☐ not yet estimated
Contract Time: _____ days ☐ increase ☐ decrease ☐ not yet estimated

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

	Recommended by Designer	Authorized by Owner	Received by Contractor
By:			
Title:			
Date:			

SWBNO FIELD CHANGE ORDER

FCO No.	Contract No.
Project Manager	Date
Project Name	**Contractor**
	Dated _____,_____ (Year)

**You are hereby requesting to make the following (In Scope) change(s) in acordance with the terms and conditions of the above contract

((Description of Change))

FOR THE (Additive/Deductive) Sum of	**$**	**-**
Original Contract Amount	$	1,000,000.00
Sum of Previous Changes	$	3,000.00
Present Contract Amount	$	1,003,000.00
This Change Add (Deduct)	$	2,000.00
Proposed Contract Amount	$	1,005,000.00

Commencement of Contract Times	1/1/2022
Contract Time (days)	365
Original Completion Date	1/1/2023
Previous Changes to Contract Times (days)	15
This Change to Times (days)	10
Revised Contract Completion Date	1/26/2023

Your acceptance of this Change Order shall constitue a modification to our Contract and will be performed subject to all the same terms and conditions in our Contract indicated above, as fully as if the same were repeated in this acceptance.

The adjustment, if any, to this Contract shall constitute a full and final settlement of any and all claims arising out of or related to the change set forth herein, including claims for impact and delay costs.

The Director of Procurement will direct the Contractor to increase the penal sum of the existing Performance, Payment Bonds and Insurance or to obtain additional bonds on the basis of a $100,000.00 or greater value change order. The Contractor Shall: Provide written confirmation within one (1) week of request: from their bonding company/agent (attorney-in-fact) that the amounts of the Performance, Payment Bonds and Insurance have been adjusted to 100% of the new contract amount. NOTE: No Invoices for change order work shall be paid without approved supporting documentation.

Contractor _____

Designer _____

Project Manager _____

General Superintedent _____

Executive Director's Approval of Change Order No. X **ED-00X-20XX**

Contract
Number/Name:

Contractor:

This Change Order, in the amount of XXXXXXX, represents additional construction costs (labor, material, and equipment) for_____. This change brings the accumulated contract change order total to $XXXX, or XXX% of the original contract. The cumulative contract total is now $XXXXXXXXX.

Provide Details

Attachments: Board of Directors Contractor Fact Sheet, S&WB Cost Estimate, and Contractor's Proposals

Recommended by: _____
M. Ron Spooner
Interim General Superintendent

Pursuant to the approval authority vested in the Executive Director by Resolution R-063-2021, I hereby approve Change Order X as indicated above.

_____
Ghassan Korban
EXECUTIVE DIRECTOR
SEWERAGE AND WATER BOARD OF NEW ORLEANS