



ST. TAMMANY PARISH

MICHAEL B. COOPER
PARISH PRESIDENT

NOTICE TO BIDDERS

ST. TAMMANY PARISH

Sealed bids will be received by the Department of Procurement, until 2:00 p.m., **Tuesday, November 26, 2024**, and then opened and read publicly at that time by the Procurement Staff for the following project:

Bid # 24-47-2– RIVER OAKS BUILDING & WELL IMPROVEMENTS

Each paper bid must be submitted in a sealed envelope. The outside of the envelope shall show the Name and Address of the Bidder, the State Contractor's License Number of the Bidder (if the work is estimated at \$50k or more), the Bid Name and the Bid Number.

The project classification is:

Municipal & Public Work Construction OR Building Construction

This bid package is available online at www.bidexpress.com or LaPAC <https://wwwcfprd.doa.louisiana.gov/osp/lapac/pubmain.cfm>. It is the Vendor's responsibility to check Bid Express, or LaPAC frequently for any possible addenda that may be issued. The Parish is not responsible for a Vendor's failure to download any addenda documents required to complete a submission.

Bids will be received at 21454 Koop Dr., Suite 2F, Mandeville, LA 70471 from each bidder or his agent and given a written receipt, by certified mail with return receipt requested, or electronically at www.bidexpress.com.

A Non-Mandatory pre-bid meeting will be held at the River Oaks Water Well Site, located at 1004 Sewell Street, Slidell, LA 70461 on Thursday, November 7, 2024, at 11:00 AM. Attendance is strongly encouraged.

Procurement Department

BID PROPOSAL

ST. TAMMANY PARISH
GOVERNMENT



BID PACKAGE FOR

**RIVER OAKS BUILDING & WELL
IMPROVEMENTS**

LDH/OPH Permit No. P 23-09-103-147

BID NO.: 24-47-2

July 2024

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Section 02

Instructions to Bidders

Bidders are urged to promptly review the requirements of this specification and submit questions for resolution as early as possible during the bid period. Questions or concerns must be submitted in writing to the Procurement Department no later than 2:00 CST seven (7) working days prior to the bid opening date. Otherwise, this will be construed as acceptance by the bidders that the intent of the specifications is clear and that competitive bids may be obtained as specified herein. Protests with regard to the specification documents will not be considered after bids are opened.

1. Bid security is required. Be sure that your bid includes such security as is necessary to meet Parish requirements and is properly signed. The bid must be fully completed. All applicable Louisiana license numbers must be affixed.
2. The Owner is the St. Tammany Parish Government (the "Parish").
3. The terms "he/his" and "it/its" may be used interchangeably.
4. The terms "Owner," the "Parish," and "St. Tammany Parish" may be used interchangeably.
5. The successful Bidder understands the limited contract time in the contract is **three hundred ninety (390) calendar days**, and shall submit any request for an extension of time in accordance with the General and Supplementary Conditions. Said request will reflect the days requested and the reason for same. No extension request is guaranteed or absolute.
6. Bidder specifically understands that acknowledgment of the General Conditions is required. Bidder specifically understands that signature of receipt of the General Conditions is mandated. **The Bidder's signature on the "Louisiana Uniform Public Work Bid Form" will serve as acknowledgment of the Bidder's receipt and understanding of the General Conditions as well as any Supplementary Conditions.**
7. ***If any additional work is performed by the contractor without written approval by owner, the cost of the work will be borne by the contractor and will not be reimbursed by the Parish.***
8. **Only** the Louisiana Uniform Public Bid Form, the Unit Price Form (if necessary), the bid security, and written evidence of authority of person signing the bid shall be submitted on or before the bid opening time and date provided for in the Bid Documents. Necessary copies of the Louisiana Uniform Public Work Forms and Unit Price Forms (if necessary) will be furnished for Bidding. Bound sets of the Contract Documents are for Bidder's information and should not be used in submitting Bids.
9. All other documents and information required are to be submitted by the low Bidder within ten (10) days after the opening of the bids, and at the same time of day and location as given for the opening of the bids in the Bid Documents.
10. Each Bid must be submitted in a sealed envelope, unless submitted electronically. The outside of the envelope shall show the name and address of the Bidder, the State Contractor's License Number of the Bidder (if work requires contractor's license), and the Project name and the Bid number. In the case of an electronic bid proposal, a contractor may submit an authentic digital signature on the electronic bid proposal accompanied by the contractor's license number, Project name and the Bid number.
11. The price quoted for the Work shall be stated in words and figures on the Bid Form, and in figures only on the Unit Price Form. The price in the Bid shall include all costs necessary

for the complete performance of the Work in full conformity with the conditions of the Contract Documents, and shall include all applicable Federal, State, Parish, Municipal or other taxes. The price bid for the items listed on the Unit Price Form will include the cost of all related items not listed, but which are normally required to do the type of Work bid.

12. The Bid shall be signed by the Bidder. The information required on the Louisiana Uniform Public Work Bid Form must be provided. Evidence of agency, corporate, or partnership authority is required and shall be provided in conformance with LSA-R.S. 38:2212(B).
13. Only a Contractor licensed by the State to do the type of Work as indicated on the Notice to Bidders can submit a Bid. The Bidder's signature on the Bid Form certifies that he holds an active license under the provisions of Chapter 24 of Louisiana Revised Statutes Title 37. Failure to be properly licensed constitutes authority for the Owner to reject the Bid.
14. Bidders shall not attach any conditions or provisions to the Bid. Any conditions or provisions so attached may, at the sole option of the Owner, cause rejection of the Bid.
15. A Bid Guarantee of five percent (5%) of the amount of the total Bid, including Alternates, must accompany the Proposal and, at the option of the Bidder, may be a cashier's check, certified check or a satisfactory Bid Bond. The Bid Guarantee must be attached to the Louisiana Uniform Public Work Bid Form. No Bid will be considered unless it is so guaranteed. Cashier's check or certified check must be made payable to the order of the Owner. Cash deposits will not be accepted. The Owner reserves the right to cash or deposit the cashier's check or certified check. Such guarantees shall be made payable to the Parish of St. Tammany. In accordance with LSA-R.S. 38:2218(C), if a bid bond is used, it shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide to write individual bonds up to ten percent of policyholders' surplus as shown in the A.M. Best's Key Rating Guide or by an insurance company in good standing licensed to write bid bonds which is either domiciled in Louisiana or owned by Louisiana residents. It is **not** required to be on any AIA form.
16. Bid securities of the three (3) lowest Bidders will be retained by the Owner until the Contract is executed or until final disposition is made of the Bids submitted. Bid securities of all other Bidders will be returned promptly after the canvas of Bids. Bids shall remain binding for forty-five (45) days after the date set for Bid Opening. The Parish shall act within the forty-five (45) days to award the contract to the lowest responsible bidder or reject all bids. However, the Parish and the lowest responsible bidder, by mutual written consent, may agree to extend the deadline for award by one or more extensions of thirty (30) calendar days. In the event the Owner issued the Letter of Award during this period, or any extension thereof, the Bid accepted shall continue to remain binding until the execution of the Contract.
17. A Proposal may be withdrawn at any time prior to the scheduled closing time for receipt of Bids, provided the request is in writing, executed by the Bidder or its duly authorized representative and is filed with the Owner prior to that time. When such a request is received, the Proposal will be returned to the Bidder unopened. A bid withdrawn under the provisions of LSA-R.S. 38:2214(C) cannot be resubmitted.
18. Written communications, over the signature of the Bidder, to modify Proposals will be accepted and the Proposal corrected in accordance therewith if received by the Owner prior to the scheduled closing time for receipt of Bids. Oral, telephonic or telegraphic Modifications will not be considered.
19. No oral interpretation obligating the Owner will be made to any Bidder as to the meaning of the Drawings, Specifications and Contract Documents. Every request for such an interpretation shall be made in writing and addressed and forwarded to the Owner. Inquiries received within seven (7) days prior to the day fixed for opening of the Bids may not be given consideration. Every interpretation made to the Bidder shall be in the form of an addendum to the Specifications. All such Addenda shall become part of the Contract Documents. Failure of the Owner to send or failure of Bidder to receive any such interpretation shall not relieve any Bidder from any obligation under this Bid as submitted without Modification. All Addenda shall be issued in accordance with the Public Bid Law, LSA-R.S. 38:2212(O).

20. The Owner reserves the right to reject any or all Bids for just cause in accordance with the Public Bid Law, LSA-R.S. 38:2214(B). Incomplete, informal, illegible, or unbalanced Bids may be rejected. Reasonable grounds for belief that any one Bidder is concerned directly or indirectly with more than one Bid will cause rejection of all Bids wherein such Bidder is concerned. If required, a Bidder shall furnish satisfactory evidence of its competence and ability to perform the Work stipulated in its Proposal. Incompetence will constitute cause for rejection. If the Parish determines that the bidder is not responsive or responsible for any reason whatsoever, the bid may be rejected in accordance with State law.
21. Contractor shall be liable without limitation to the Parish for any and all injury, death, damage, loss, destruction, damages, costs, fines, penalties, judgments, forfeitures, assessments, expenses (including attorney fees), obligations, and other liabilities of every name and description, which may occur or in any way arise out of any act or omission of Contractor, its owners, agents, employees, partners or subcontractors.
22. Upon notice of any claim, demand, suit, or cause of action against the Parish, alleged to arise out of or be related to this Contract, Contractor shall investigate, handle, respond to, provide defense for, and defend at its sole expense, even if the claim, demand, suit, or cause of action is groundless, false, or fraudulent. The Parish may, but is not required to, consult with or assist the Contractor, but this assistance shall not affect the Contractor's obligations, duties, and responsibilities under this section. Contractor shall obtain the Parish's written consent before entering into any settlement or dismissal.
23. It is understood and agreed that neither party can foresee the exigencies beyond the control of each party which arise by reason of an Act of God or force majeure; therefore, neither party shall be liable for any delay or failure in performance beyond its control resulting from an Act of God or force majeure. The Parish shall determine whether a delay or failure results from an Act of God or force majeure based on its review of all facts and circumstances. The parties shall use reasonable efforts, including but not limited to, use of continuation of operations plans (COOP), business continuity plans, and disaster recovery plans, to eliminate or minimize the effect of such events upon the performance of their respective duties under this Contract.
24. Contractor shall fully indemnify and hold harmless the Parish, without limitation, for any and all injury, death, damage, loss, destruction, damages, costs, fines, penalties, judgments, forfeitures, assessments, expenses (including attorney fees), obligations, and other liabilities of every name and description, which may occur or in any way arise out of any act or omission of Contractor, its owners, agents, employees, partners or subcontractors. The Contractor shall not indemnify for the portion of any loss or damage arising from the Parish's act or failure to act.
25. Contractor shall fully indemnify and hold harmless the Parish, without limitation, from and against damages, costs, fines, penalties, judgments, forfeitures, assessments, expenses (including attorney fees), obligations, and other liabilities in any action for infringement of any intellectual property right, including but not limited to, trademark, trade-secret, copyright, and patent rights.

When a dispute or claim arises relative to a real or anticipated infringement, the Contractor, at its sole expense, shall submit information and documentation, including formal patent attorney opinions, as required by the Parish.

If the use of the product, material, service, or any component thereof is enjoined for any reason or if the Contractor believes that it may be enjoined, Contractor, while ensuring appropriate migration and implementation, data integrity, and minimal delays of performance, shall at its sole expense and in the following order of precedence: (i) obtain for the Parish the right to continue using such product, material, service, or component thereof; (ii) modify the product, material, service, or component thereof so that it becomes a non-infringing product, material, or service of at least equal quality and performance; (iii) replace the product, material, service, or component thereof so that it becomes a non-infringing product, material, or service of at least equal quality and performance; or, (iv) provide the Parish monetary compensation for all payments made under the Contract related to the infringing product, material, service, or component, plus for all costs incurred to procure and implement a non-infringing product, material, or service of at least equal quality and performance. Until this obligation has been satisfied, the Contractor remains in default.

The Contractor shall not be obligated to indemnify that portion of a claim or dispute based upon the Parish's unauthorized: i) modification or alteration of the product, material or service; ii) use of the product, material or service in combination with other products not furnished by Contractor; or, iii) use of the product, material or service in other than the specified operating conditions and environment.

26. Bidders shall familiarize themselves with and shall comply with all applicable Federal and State Laws, municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the Project, which may directly or indirectly affect the Work or its prosecution. These laws and/or ordinances will be deemed to be included in the Contract, as though herein written in full.
27. Each Bidder shall visit the site of the proposed Work and fully acquaint itself with all surface and subsurface conditions as they may exist so that it may fully understand this Contract. Bidder shall also thoroughly examine and be familiar with drawings, Specifications and Contract Documents. The failure or omission of any Bidder to receive or examine any form, instrument, Drawing or document or to visit the site and acquaint itself with existing conditions shall in no way relieve any Bidder from any obligation with respect to its Bid and the responsibility in the premises.
28. The standard contract form enclosed with the Proposal documents is a prototype. It is enclosed with the Contract Documents for the guidance of the Owner and the Contractor. It has important legal consequences in all respects and consultation with an attorney is encouraged. Contractor shall be presumed to have consulted with its own independent legal counsel.
29. When one set of Contract plans show the Work to be performed by two or more prime Contractors, it is the responsibility of each Bidder to become knowledgeable of the Work to be performed by the other where the Work upon which this bid is submitted is shown to come into close proximity or in conflict with the Work of the other. In avoiding conflicts, pressure pipe lines must be installed to avoid conflict with gravity pipe lines and the Bidder of the smaller gravity pipe line in conflict with the larger gravity pipe line must include in his Bid the cost of a conflict box at these locations. The location of and a solution to the conflicts do not have to be specifically noted as such on the plans.
30. Bidder shall execute affidavit(s) attesting compliance with LSA-R.S. 38:2212.10, 38:2224, 38:2227, each as amended, and other affidavits as required by law, prior to execution of the contract.
31. In accordance with Louisiana Law, all Corporations (See LA R.S. 12:26.1) and Limited Liability Companies (See LA R.S. 12:1308.2) must be registered and in good standing with the Louisiana Secretary of State in order to hold a contract.
32. Sealed Bids shall be delivered to St. Tammany Parish Government at the office of **St. Tammany Parish Government, Department of Procurement, 21454 Koop Drive, Suite 2-F, Mandeville, LA 70471**, and a receipt given, until the time and date denoted in Notice to Bidders, at which time and place the Bids shall be publicly opened and read aloud to those present. In accordance with LSA-R.S. 38:2212(H), the designer's final estimated cost of construction shall be read aloud upon opening bids. Sealed Bids may also be mailed by certified mail to **St. Tammany Parish Government, Department of Procurement, 21454 Koop Drive, Suite 2-F, Mandeville, LA 70471**, and must be received before the bid opening. Bids may also be submitted electronically. Information concerning links for electronic bidding is contained in the Notice to Bidders. It is the responsibility of the Bidders to ensure that bids are delivered in a timely fashion. **Late bids, regardless of reason, will not be considered, and will be returned to bidder.**
33. Paper bids shall be placed in a sealed envelope, marked plainly and prominently as indicated in the Notice to Bidders, and these Instructions, and addressed:

**St. Tammany Parish Government
Department of Procurement
21454 Koop Drive, Suite 2-F
Mandeville, LA 70471**

34. See Notice to Bidders for availability of Drawings, Specifications and Contract Documents via electronic methods.
35. The successful Bidder shall be required to post in each direction a public information sign, 4' x 4' in size, at the location of the project containing information required by the Owner. The Owner shall supply this information.
36. The award of the Contract, if it is awarded, will be to the lowest responsible Bidder, in accordance with State Law. No award will be made until the Owner has concluded such investigations as it deems necessary to establish the responsibility and qualifications of the Bidder to do the Work in accordance with the Contract Documents to the satisfaction of the Owner within the time prescribed as established by the Department based upon the amount of work to be performed and the conditions of same. The written contract and bond shall be issued in conformance with LSA-R.S. 38:2216. If the Contract is awarded, the Owner shall give the successful Bidder written notice of the award within forty-five (45) calendar days after the opening of the Bids in conformance with LSA-R.S. 38:2215(A), or any extension as authorized thereunder.
37. At least three days prior to the execution of the Contract, the Contractor shall deliver to the Owner the required Bonds.
38. Failure of the successful Bidder to execute the Contract and deliver the required Bonds within ten (10) days of the Notice of the Award shall be just cause for the Owner to annul the award and declare the Bid and any guarantee thereof forfeited. Award may then be made to the next lowest responsible bidder.
39. In order to ensure the faithful performance of each and every condition, stipulation and requirement of the Contract and to indemnify and hold harmless the Owner from any and all damages, either directly or indirectly arising out of any failure to perform same, the successful Bidder to whom the Contract is awarded shall furnish a Performance and Payment Bond in an amount of at least equal to one hundred percent (100%) of the Contract Price. The Contract shall not be in force or binding upon the Owner until such satisfactory Bond has been provided to and approved by the Parish. The cost of the Bond shall be paid for by the Contractor unless otherwise stipulated in the Special Provisions.
40. No surety Company will be accepted as a bondsman which has no permanent agent or representative in the State upon whom notices referred to in the General Conditions of these Specifications may be served. Service of said notice on said agent or representative in the State shall be equal to service of notice on the President of the Surety Company, or such other officer as may be concerned.
41. In conformance with LSA-R.S. 38:2219(A)(1)(a), (b), and (c):

Any surety bond written for a public works project shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide, to write individual bonds up to ten percent of policyholders' surplus as shown in the A.M. Best's Key Rating Guide or by an insurance company that is either domiciled in Louisiana or owned by Louisiana residents and is licensed to write surety bonds.

For any public works project, no surety or insurance company shall write a bond which is in excess of the amount indicated as approved by the U.S. Department of the Treasury Financial Management Service list or by a Louisiana domiciled insurance company with an A- rating by A.M. Best up to a limit of ten percent of policyholders' surplus as shown by A.M. Best; companies authorized by this Paragraph who are not on the treasury list shall not write a bond when the penalty exceeds fifteen percent of its capital and surplus, such capital and surplus being the amount by which the company's assets exceed its liabilities as reflected by the most recent financial statements filed by the company with the Department of Insurance.

In addition, any surety bond written for a public works project shall be written by a surety or insurance company that is currently licensed to do business in the state of Louisiana. All contractors must comply with any other applicable provisions of LSA-R.S. 38:2219.

42. Should the Contractor's Surety, even though approved and accepted by the Owner, subsequently remove its agency or representative from the State or become insolvent, bankrupt, or otherwise fail, the Contractor shall immediately furnish a new Bond in another company approved by the Owner, at no cost to the Owner. The new Bond shall be executed under the same terms and conditions as the original Bond. The new bond shall be submitted within thirty (30) days of such time as the Owner notifies Contractor or from the time Contractor learns or has reason to know that the original surety is no longer financially viable or acceptable to the Parish, whichever occurs first. In the event that Contractor fails or refuses to timely secure additional surety, then the Owner may secure such surety and thereafter deduct such cost or expense from any sum due, or to become due to Contractor.
43. The Contractor's bondsman shall obligate itself to all the terms and covenants of these Specifications and of contracts covering the Work executed hereunder. The Owner reserves the right to do Extra Work or make changes by altering, adding to deducting from the Work under the conditions and in the manner herein before described without notice to the Contractor's surety and without in any manner affecting the liability of bondsman or releasing it from any of its obligations hereunder.
44. The Bond shall also secure for the Owner the faithful performance of the Contract in strict accordance with plans, specifications, and other Contract Documents. It shall protect the Owner against all lien laws of the State and shall provide for payment of reasonable attorney's fees for enforcement of Contract and institution or concursus proceedings, if such proceedings become necessary. Likewise, it shall provide for all additional expenses of the Owner occurring through failure of the Contractor to perform.
45. The surety of the Contractor shall be and does hereby declare and acknowledge itself by acceptance to be bound to the Owner as a guarantor, jointly and in solido, with the Contractor, for fulfillment of terms of the Contract.
46. The performance Bond and Labor and Material Bond forming part of this Contract shall be continued by Contractor and its Surety for a period of one (1) year from date of acceptance of the Work/Project by Owner to assure prompt removal and replacement of all defective material, equipment, components thereof, workmanship, etc., and to assure payment of any damage to property of Owner or others as a result of such defective materials, equipment, workmanship, etc.
47. Contractor authorizes Parish to deduct from any payment due herein costs and service fees for recordation of this Contract in full or an excerpt hereof, or any revisions or modifications thereof as required by law. Contractor agrees to execute an excerpt or extract of this agreement for recordation purposes. If Contractor fails to execute such an excerpt, then the Parish shall file and record the entire Contract and all attachments at the expense of Contractor and Parish is hereby authorized to deduct all related costs from any proceeds due to the Contractor.
48. Contractor shall secure and maintain at its expense such insurance that will protect it and the Parish from claims for injuries to persons or damages to property which may arise from or in connection with the performance of Services or Work hereunder by the Contractor, his agents, representatives, employees, and/or subcontractors. The cost of such insurance shall be included in Contractor's bid.
49. The Contractor shall not commence work until it has obtained all insurance as required for the Parish Project. If the Contractor fails to furnish the Parish with the insurance protection required and begins work without first furnishing Parish with a currently dated certificate of insurance, the Parish has the right to obtain the insurance protection required and deduct the cost of insurance from the first payment due the Contractor. Further deductions are permitted from future payments as are needed to protect the interests of the Parish including, but not limited to, renewals of all policies.
50. Payment of Premiums: The insurance companies issuing the policy or policies shall have no recourse against the Parish of St. Tammany for payment of any premiums or for assessments under any form of policy.
51. Deductibles: Any and all deductibles in the described insurance policies shall be assumed by and be at the sole risk of the Contractor.

52. Authorization of Insurance Company(ies) and Rating: All insurance companies must be authorized to do business in the State of Louisiana and shall have an A.M. Best rating of no less than A-, Category VII.
53. Policy coverages and limits must be evidenced by Certificates of Insurance issued by Contractor's carrier to the Parish and shall reflect:

Date of Issue: Certificate must have current date.

Named Insured: The legal name of Contractor under contract with the Parish and its principal place of business shall be shown as the named insured on all Certificates of Liability Insurance.

Name of Certificate Holder: St. Tammany Parish Government, Office of Risk Management, P. O. Box 628, Covington, LA 70434

Project Description: A brief project description, including Project Name, Project Number and/or Contract Number, and Location.

Endorsements and Certificate Reference: All policies must be endorsed to provide, and certificates of insurance must evidence the following:

Waiver of Subrogation: The Contractor's insurers will have no right of recovery or subrogation against the Parish of St. Tammany, it being the intention of the parties that all insurance policy(ies) so affected shall protect both parties and be the primary coverage for any and all losses covered by the below described insurance. *Policy endorsements required for all coverages.*

Additional Insured: The Parish of St. Tammany shall be named as additional named insured with respect to general liability, marine liability, pollution/environmental liability, automobile liability and excess liability coverages. *Policy endorsements required.*

Hold Harmless: Contractor's liability insurers shall evidence their cognizance of the Hold Harmless and Indemnification in favor of St. Tammany Parish Government by referencing same on the face of the Certificate(s) of Insurance.

Cancellation Notice: Producer shall provide thirty (30) days prior written notice to the Parish of policy cancellation or substantive policy change.

54. The types of insurance coverage the Contractor is required to obtain and maintain throughout the duration of the Contract shall be designated by a separate document issued by the Office of Risk Management.
55. It is the intent of these instructions that they are in conformance with State Bid Laws. Should there be any discrepancy or ambiguity in these provisions, the applicable State Bid Law shall apply.
56. The letting of any public contract in connection with funds that are granted or advanced by the United States of America shall be subject to the effect, if any, of related laws of said United States and valid rules and regulations of federal agencies in charge, or governing use and payment of such federal funds.
57. Protests based on alleged solicitation improprieties that are apparent before bid opening, or the time set for receipt of initial proposals must be filed with and received by the Procurement Department BEFORE two (2) working days of the bid opening. Any other protest shall be filed no later than ten (10) calendar days after: the opening of the bid; the basis of the protest is known; or the basis of the protest should have been known (whichever is earlier).
58. It is the Parish's policy to provide a method to protest exclusion from a competition or from the award of a contract, or to challenge an alleged solicitation irregularity. It is always better to seek a resolution within the Parish system before resorting to outside agencies

and/or litigation to resolve differences. All protests must be made in writing, and shall be concise and logically presented to facilitate review by the Parish. The written protest shall include:

The protester's name, address, and fax and telephone numbers and the solicitation, bid, or contract number;

A detailed statement of its legal and factual grounds, including a description of the resulting prejudice to the protester;

Copies of relevant documents;

All information establishing that the protester is an interested party and that the protest is timely; and

A request for a ruling by the agency; and a statement of the form of relief requested.

The protest shall be addressed to St. Tammany Parish Government Department of Procurement, P.O. Box 628, Covington, LA 70434

The protest review shall be conducted by the Parish Legal Department.

Only protests from interested parties will be allowed. Protests based on alleged solicitation improprieties that are apparent before bid opening, or the time set for receipt of initial proposals, must be filed with and received by the Department of Procurement BEFORE those deadlines.

Any other protest shall be filed no later than ten (10) calendar days after the basis of the protest is known, or should have been known (whichever is earlier).

The Parish will use its best efforts to resolve the protest within thirty (30) days of the date that it is received by the Parish. The written response will be sent to the protestor via mail and fax, if a fax number has been provided by the protestor. The protester can request additional methods of notification.

59. The last day to submit questions and/or verification on comparable products will be no later than 2:00 pm CST, fourteen (14) working days prior to the opening date of the bid/proposal due date. Further, any questions or inquires must be submitted via fax to 985-898-5227, or via email to Procurement@stpgov.org. Any questions or inquiries received after the required deadline to submit questions or inquiries will not be answered.

Schedule of Events

	<u>Date</u>	<u>Time (CT)</u>
Bid Due Date	November 26, 2024	2:00 PM
Inquiry Deadline	November 15, 2024	2:00 PM
Addendum Deadline	November 21, 2024	2:00 PM
Non-Mandatory Meeting	November 7, 2024	11:00 AM

NOTE: The Parish reserves the right to revise this schedule. Any such revision will be formalized by the issuance of an addendum to the Bid Request.

60. St. Tammany Parish Government contracts to be awarded are dependent on the available funding and/or approval by members designated and/or acknowledged by St. Tammany Parish Government. At any time, St. Tammany Parish Government reserves the right to cancel the award of a contract if either or both of these factors is deficient.
61. Any action by the Parish to disqualify any Bidder on the grounds that they are not a responsible Bidder shall be conducted in accordance with LSA-R.S. 38:2212(X).
62. Failure to complete or deliver within the time specified or to provide the services as specified in the bid or response will constitute a default and may cause cancellation of the contract. Where the Parish has determined the contractor to be in default. The Parish

reserves the right to purchase any or all products or services covered by the contract on the open market and to charge the contractor with the cost in excess of the contract price. Until such assessed charges have been paid, no subsequent bid or response from the defaulting contractor will be considered.

63. If any part of the provisions contained herein and/or in the Specifications and Contract for the Work shall for any reason be held invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this Agreement or attachment, but it shall be construed as if such invalid, illegal, or unenforceable provision or part of a provision had never been contained herein.

Section 03

Summary of Work

I. Work to Include:

New control building, controls, piping, site grading and drainage, equipment, utility lines and other related items at the River Oaks site.

II. Location of Work:

River Oaks – 1004 Sewell Street, Slidell, LA 70461

III. Documents: Bid Documents dated July 2024, and entitled:

RIVER OAKS BUILDING & WELL IMPROVEMENTS

BID NO. 24-47-2

IV. OTHER REQUIREMENTS (as applicable)

Contractor must comply and assures compliance with Section 12 Federal Clauses.

When not otherwise specified herein, all work and materials shall conform to the requirements of the Louisiana Department of Transportation and Development hereafter called LDOTD (2016 Edition of Louisiana Standard Specifications for Roads and Bridges).

This project is federally grant funded and therefore requires the Contractor to have a Unique Entity Identification number (UEI). The Contractor should submit with their response their UEI number. If the Contractor does not have a UEI already, then they must register at the below link before an award can be made.

<https://sam.gov/content/entity-registration>

V. SPECIAL PROVISIONS

• **SITE CONDITION**

- The location of the work of this contract is on the grounds of the River Oaks water well, located at 1004 Sewell Street, Slidell, LA 70461. The Contractor shall perform all his work in a way that minimizes interferences with the Parish's Department of Utility's (DU) operation of the facility and the public. All schedules and methods of work are subject to approval by the Engineer. It will be assumed that all prospective bidders have inspected the site(s) and have acquainted themselves with the local conditions.
- Because of the location of the job site on the grounds of the River Oaks water well, it is imperative that the Contractor schedule and conduct his work in such a manner so as not to interfere in any way with the operation of the facility. Trucking through the facility, delivering and storing materials and equipment, shall be done with the approval of the engineer. The Contractor's personnel will be allowed to enter the facility and park private vehicles on site; however, he will be allowed to bring equipment and company vehicles only into the facility as necessary in the execution of this contract but may be required to remove them if their presence interferes with the operations of

- the Department of Utilities, all at the discretion of the Engineer.
- All work of this contract **MUST** be coordinated with the Department of Utilities (DU) through the Engineer, with proper advanced notice.
 - The existing water well **MUST** remain operational throughout the length of this contract. Any outage of this facility and/or other damages due to the contractor's negligence shall be repaired immediately by the Contractor at no additional cost to the contract. Contractor shall inform the DU at least 72 hours in advance for any coordination required for tie-in the existing facility to the new facility, weather permitting. No work shall begin without express written approval of the DU. Waste water spillage, if any, shall be remediated immediately to the satisfaction of DU at no additional cost to the contract.
- **BIDDERS TO EXAMINE LOCATION & PLANS**
 - Each Bidder shall make a personal examination of the location of the proposed work and of the surrounding area. He/she shall thoroughly acquaint themselves with the details of the work to be done and all the conditions and obstacles likely to be encountered, including soil conditions, in the performance and completion of work. Bidders shall inform themselves as to the facilities for the transportation, handling, and storage of equipment and materials.
 - Each bidder shall carefully study the plans, specifications and other contract documents and thoroughly satisfy themselves as to the conditions under which the work is to be done, and as to the character, qualities and quantities of work to be performed, and materials to be furnished, and be prepared to execute a finished job in every particular.
 - **PARKING FACILITIES**
 - The work under this contract is to be executed in close proximity of the adjacent residential neighborhood and businesses. The Contractor will be allowed to bring construction equipment and construction vehicles onto the site as necessary in the execution of this contract but may be required to relocate them if their presence interferes with the operations of the Board or businesses. All roadways must remain open throughout the entire construction period.
 - **UTILITY LOCATION**
 - The locations of all utilities shown on the plans are approximate. Contractor shall field verify all utilities and their tie-in prior to any work commences.
 - Any damages to any utility line due to lack of the contractor's field verification shall be repaired immediately to the satisfaction of the Engineer, all at no cost to the contract.
 - **TIE-IN**
 - The location and condition of each tie-in is approximate. It is the contractor's responsibility, as the first order of business to field verify the location and the conditions of each tie-in prior to ordering any materials and inform the Engineer of the findings.
 - Additionally, once the tie-ins are exposed, the contractor **MUST** notify the DU to operate and exercise the isolation valves at either end to see if they are operable and lines are flushed and cleaned (**ALL existing valves shall be operated by operations personnel of DU only**). In the event that the existing valves are not operable as determined by the Engineer, new valves may be installed at the discretion of DU through the Engineer.
 - **ENVIRONMENTAL REQUIREMENTS**
 - The parties agree that the work and duties required to be performed in accordance with the Contract Documents shall meet and comply with all environmental requirements including the laws and regulations of the United States and the State of Louisiana.
 - For public areas that have come in contact with overflowed sewage, the Contractor will take reasonable action to implement disinfection procedures. Generally, these procedures will involve an application of an oxidizing agent such as a diluted chlorine solution on constructed surfaces (streets, driveways, walls, etc.) and a lime application on organic surfaces (lawns, soil areas, etc.). The level and extent of disinfection will be determined in the field. It is not the intent of this disinfection procedure to infer that total pathogen destruction has been achieved, nor that any other level of disinfection

has been achieved.

- The Contractor shall develop a plan to report, contain/by-pass and clean up all sewage spills or unanticipated hazards that would adversely affect the health of the community.
 - REPORT: A report shall be given immediately to the DU Compliance Office (985-893-1717). The information communicated in the report must include location, nature of problem, name of project, name of company performing work, name of the individual making the call, time of incident, volume of spill (gallons), method of remediation and clean up, and other pertinent data as necessary.
- **NOISE & SOUND ISSUE**
 - Contractor's attention shall be given specifically to St. Tammany Parish Ordinance, Article IV – Noise and Sound, which in part states that the sound measured by a performer taken at least 25 feet from the source of the noise cannot exceed 70 decibels between Noon and 9 p.m. Between 9 p.m. and Noon, the sound measurement taken at least 25 feet from the source of the noise cannot exceed 55 decibels.
- **NIGHT, WEEKEND OR HOLIDAY WORK**
 - Normal work hours are 7:00 a.m. to 6:00 p.m. Monday through Friday. Hours requested outside normal work hours should be requested in writing at least 72 hours in advance. Contractor shall be required to pay resident inspection fees for work outside normal working hours. Night, weekend or holiday work requiring the presence of an Engineer or inspector will be permitted only in cases of emergency, and then only to such an extent as is absolutely necessary and with the written permission of the DU through the Engineer. In the event such work becomes necessary, no extra payment will be made therefor.
- **LONG LEAD ITEMS**
 - Due to long delivery of certain items specified in this contract work, it is strongly recommended that the Contractor to order those long delivery items as soon as NTP has been issued. Contract substantial completion date shall not be extended due to contractor's negligence in ordering material and/or equipment in timely manner.
- **DELIVERY & UNLOADING**
 - Seventy-two (72) hours advanced notice of arrival must be rendered by notifying the Engineer (Tel: 985 893-1717) so that unloading may be arranged without inconvenience to either the Parish or the carrier. Arrangements shall be made for delivery before noon on a regular workday. Deliveries attempted without proper advance notice or on other than flatbed trucks will be refused and any additional storage or delivery charges shall be the responsibility of the Contractor. All freight and insurance charges shall be included in the Bid Price. Risk of loss due to damage of any kind shall be borne by the Contractor until receipt and unloading by the Parish.
 - All components shall be adequately secured and bolted or otherwise made fast to prevent movement and/or damages during shipment
 - Special notice is hereby given to all Contractors that the terms stipulated in this section will be strictly interpreted and rigidly enforced.
 - All openings shall be completely covered and protected for shipment.
- **AS-BUILT DRAWINGS**
 - The Contractor shall furnish one (1) neat and legibly marked blue line set of contract drawings to depict actual "as-built" conditions.
 - The "as-built" drawings shall show all construction, elevation, equipment, mechanical and electrical systems and connections as installed or built.
 - The work under this contract will not be considered "complete" until "as-built" drawings, prepared to the satisfaction of the Engineer, are received.
 - There will be no direct payment for furnishing the "as-built" drawings specified above.
 - Provide copies of operation and maintenance manuals for all equipment. Manuals shall include spare parts lists recommended by the manufacturer.
- **JOB SITE DRAWINGS & SPECIFICATIONS**
 - A complete and current set of contract drawings and specifications (including any addenda) shall be maintained on the job site by the Contractor.

- One copy of all approved shop drawings, equipment or material drawings, etc. shall be maintained on the job site by the Contractor.
- **EMERGENCY TELEPHONE**
 - The Contractor shall, before contract work begins, furnish to the Engineer Telephone Numbers at which company officers and/or responsible persons can be contacted at night, weekends and holidays in case of emergencies.
- **CONFLICT BETWEEN DRAWINGS & SPECIFICATIONS**
 - In case of the conflict between the drawings and the specifications, the Engineer shall be the sole authority in determining which of the two shall take precedence in the Contract Documents. Such conflict shall not be a basis for an extra expense to the Parish.
 - The Contractor is hereby cautioned to base his/her price and work upon the more costly item in event of conflict as no claim for extra expense will be entertained on this basis.
- **PERMITS**
 - Contractor shall be required to apply for, meet all requirements and obtain all required permits.
 - St. Tammany Parish Permit information is as follows:
 - Two permits are required, one sitework permit and one building permit. The Department of Utilities will prepare the permit application, and the Contractor will submit the permit application to the Parish. All fees shall be paid by the Contractor.
 - Contractor must register with St. Tammany Parish.
 - Traffic and Drainage Impact Fees shall not apply.
 - Permit fee schedule is available at:
 - <http://www.stpgov.org/departments/permits-and-inspections>
 - Other fees and costs shall be paid by Contractor
 - LDH authorization has been obtained by Owner.
 - St. Tammany Parish Dept. of Environmental Services Letter of No Objection will be obtained by Owner. (Includes Engineering and Planning Dept. reviews)

Table 3.1

Liquidated Damages	
Original Contract Amount	Daily Charge
Dollars	Dollars
0 - 250,000	500
250,000 – 1 Million	1,000
> 1 Million – 5 Million	1,500
> 5 Million – 10 Million	2,000
> 10 Million	3,000

- Parish reserves the right to increase the Daily charge rate due to additional provisions required in order to complete the project as described in the specifications

Section 04

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: St. Tammany Parish Government
21454 Koop Dr., Suite 2F
Mandeville, La 70471

BID FOR: River Oaks Building & Well Improvements
Bid No. 24-47-2

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: Principal Engineering, Inc. and dated: July 2024.

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 No. 1 (Owner to provide description of alternate and state whether add or deduct) for the lump sum of: N/A Dollars (\$)

Alternate No. 2 (Owner to provide description of alternate and state whether add or deduct) for the lump sum of: N/A Dollars (\$)

Alternate No. 3 (Owner to provide description of alternate and state whether add or deduct) for the lump sum of: N/A 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:

St. Tammany Parish Government
21454 Koop Drive, Suite 2F
Mandeville, LA., 70471

(Owner to provide name and address of owner)

BID FOR:

River Oaks Building &
Well Improvements
Bid. No. 24-47-2

(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:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ MOBILIZATION			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
1	1	LS		
DESCRIPTION:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ WELL REHABILITATION			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
2	1	LS		
DESCRIPTION:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ MECHANICAL, ELECTRICAL, & CONTROL BUILDING			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE:	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
3	1	LS		
DESCRIPTION:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ DISINFECTION			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE:	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
4	1	LS		

DESCRIPTION:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ EQUIPMENT STARTUP			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
5	1	LS		
DESCRIPTION:	<input checked="" type="checkbox"/> Base Bid or Alt.# _____ SITE IMPROVEMENTS			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION (<i>Quantity times Unit Price</i>)
6	1	LS		

All quantities are estimated. The contractor will be paid based upon actual quantities as verified by the Owner.

Section 05

**AFFIDAVIT PURSUANT TO LSA-R.S. 38:2224 and 38:2227
FOR BIDDERS FOR PUBLIC WORKS CONTRACTS**

STATE OF _____

PARISH/COUNTY OF _____

BEFORE ME, the undersigned authority, in and for the above stated State and Parish (or County), personally came and appeared:

Print Name

who, after first being duly sworn, did depose and state:

1. That affiant is appearing on behalf of _____, who is seeking a public contract with St. Tammany Parish Government.

2. That affiant employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for affiant; and

3. That no part of the contract price received by affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for affiant.

4. If affiant is a sole proprietor, that after July 2, 2010, he/she has not been convicted of, or has not entered a plea of guilty or nolo contendere to any of the crimes or equivalent federal crimes listed in LSA-R.S. 38:2227(B).

5. If affiant is executing this affidavit on behalf of a juridical entity such as a partnership, corporation, or LLC, etc., that no individual partner, incorporator, director, manager, officer, organizer, or member, who has a minimum of a ten percent ownership in the bidding entity, has been

convicted of, or has entered a plea of guilty or *nolo contendere* to any of the crimes or equivalent federal crimes listed in LSA-R.S. 38:2227(B).

6. If affiant is a sole proprietor, that neither affiant, nor his/her immediate family is a public servant of St. Tammany Parish Government or the Contract is not under the supervision or jurisdiction of the public servant's agency.

7. If affiant is executing this affidavit on behalf of a juridical entity such as a partnership, corporation, or LLC, etc., that no public servant of St. Tammany Parish Government, or his/her immediate family, either individually or collectively, has more than a 25% ownership interest in the entity seeking the Contract with St. Tammany Parish Government if the Contract will be under the supervision or jurisdiction of the public servant's agency.

Printed Name: _____

Title: _____

Entity name: _____

THUS SWORN TO AND SUBSCRIBED BEFORE ME,
THIS _____, DAY OF _____, 202__.

Notary Public

Print Name: _____

Notary I.D./Bar No.: _____

My commission expires: _____

**AFFIDAVIT PURSUANT TO LSA-R.S. 38:2212.10 CONFIRMING
REGISTRATION AND PARTICIPATION IN A STATUS VERIFICATION
SYSTEM**

STATE OF _____

PARISH/COUNTY OF _____

BEFORE ME, the undersigned authority, in and for the above stated State and Parish (or County), personally came and appeared:

Print Name

who, after first being duly sworn, did depose and state:

1. That affiant is appearing on behalf of _____, a private employer seeking a bid or a contract with St. Tammany Parish Government for the physical performance of services within the State of Louisiana.

2. That affiant is registered and participates in a status verification system to verify that all employees in the state of Louisiana are legal citizens of the United States or are legal aliens; and

3. That affiant shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

4. That affiant shall require all subcontractors to submit to the affiant a sworn affidavit verifying compliance with this law.

Printed Name: _____

Title: _____

Name of Entity: _____

**THUS SWORN TO AND SUBSCRIBED BEFORE ME,
THIS _____, DAY OF _____, 202__.**

Notary Public

Print Name: _____

Notary I.D./Bar No.: _____

My commission expires: _____

Section 06



INSURANCE REQUIREMENTS*

Construction Project: River Oaks Building & Well Improvements

Project/Quote/Bid#: 24-47-2

*****IMPORTANT – PLEASE READ*****

Prior to submitting your quote or bid, it is recommended that you review these insurance requirements with your insurance broker/agent.

These requirements modify portions of the insurance language found in the General Conditions and/or Supplementary General Conditions; however, there is no intention to remove all sections pertaining to insurance requirements and limits set forth in the General Conditions and/or Supplementary General Conditions, only to amend and specify those items particular for this Project.

- A. The Provider shall secure and maintain at its expense such insurance that will protect it and St. Tammany Parish Government (the "Parish") from claims for bodily injury, death or property damage as well as from claims under the Workers' Compensation Acts that may arise from the performance of services under this agreement. All certificates of insurance shall be furnished to the Parish and provide thirty (30) days prior notice of cancellation to the Parish, in writing, on all of the required coverage.
- B. All policies shall provide for and certificates of insurance shall indicate the following:
1. Waiver of Subrogation: The Provider's insurers will have no right of recovery or subrogation against the Parish of St. Tammany, it being the intention of the parties that all insurance policy(ies) so affected shall protect both parties and be the primary coverage for any and all losses covered by the below described insurance.
 2. Additional Insured: St. Tammany Parish Government shall be named as Additional Insured with respect to general liability, automobile liability and excess liability coverages, as well as marine liability and pollution/environmental liability, when those coverages are required or necessary.
 3. Payment of Premiums: The insurance companies issuing the policy or policies will have no recourse against St. Tammany Parish Government for payment of any premiums or for assessments under any form of policy.
 4. Project Reference: The project(s) and location(s) shall be referenced in the Comment or Description of Operations section of the Certificate of Insurance (Project ##-###, or Bid # if applicable, Type of Work, Location).
- C. Coverage must be issued by insurance companies authorized to do business in the State of Louisiana. Companies must have an A.M. Best rating of no less than A-, Category VII. St. Tammany Parish Risk Management Department may waive this requirement only for Workers Compensation coverage at their discretion.

Provider shall secure and present proof of insurance on forms acceptable to St. Tammany Parish Government, Office of Risk Management no later than the time of submission of the Contract to the Parish. However, should any work performed under this Contract by or on behalf of Provider include exposures that are not covered by those insurance coverages, Provider is not relieved of its obligation to maintain appropriate levels and types of insurance necessary to protect itself, its agents and employees, its subcontractors, St. Tammany Parish Government (Owner), and all other interested third parties, from any and all claims for damage or injury in connection with the services performed or provided throughout the duration of this Project, as well as for any subsequent periods required under this Contract.

The insurance coverages checked (✓) below are those required for this Contract.

- 1. **Commercial General Liability*** insurance – **Occurrence Form** - with a Combined Single Limit for bodily injury and property damage of at least \$2,000,000 per Occurrence / \$4,000,000 General Aggregate and \$4,000,000 Products-Completed Operations. Contracts over \$1,000,000 may require higher limits. The insurance shall provide for and the certificate(s) of insurance shall indicate the following coverages:
 - a) Premises - operations;
 - b) Broad form contractual liability;
 - c) Products and completed operations;
 - d) Personal/Advertising Injury;
 - e) Broad form property damage (for Projects involving work on Parish property);
 - f) Explosion, Collapse and Damage to underground property.
 - g) Additional Insured forms CG 2010 and CG 2037 in most current edition are required.

- 2. **Business Automobile Liability*** insurance with a Combined Single Limit of \$1,000,000 per Occurrence for bodily injury and property damage, and shall include coverage for the following:
 - a) Any auto;
 - or**
 - b) Owned autos; **and**
 - c) Hired autos; **and**
 - d) Non-owned autos.

- 3. **Workers' Compensation/Employers Liability insurance*** - Workers' Compensation coverage as required by State law. Employers' liability limits shall be a minimum of \$1,000,000 each accident, \$1,000,000 each disease, \$1,000,000 disease policy aggregate. When water activities are expected to be performed in connection with this project, coverage under the USL&H Act, Jones Act and/or Maritime Employers Liability (MEL) must be included. **Coverage for owners, officers and/or partners in any way engaged in the Project shall be included in the policy.** The names of any excluded individual must be shown in the Description of Operations/Comments section of the Certificate.

- 4. **Pollution Liability and Environmental Liability*** insurance in the minimum amount of \$1,000,000 per occurrence / \$2,000,000 aggregate including full contractual liability and third party claims for bodily injury and/or property damage, for all such hazardous waste, pollutants and/or environmental exposures that may be affected by this project stemming from pollution/environmental incidents as a result of Contractor's operations.

If coverage is provided on a claims-made basis, the following conditions apply:

- 1) the retroactive date must be prior to or coinciding with the effective date of the Contract, or prior to the commencement of any services provided by the Contractor on behalf of the Parish, whichever is earlier; AND
- 2) continuous coverage must be provided to the Parish with the same retro date for 24 months following acceptance or termination of the Project by the Parish either by
 - a) continued renewal certificates **OR**
 - b) a 24 month Extended Reporting Period

*The Certificate must indicate whether the policy is written on an occurrence or claims-made basis and, if claims-made, the applicable retro date must be stated.

5. **Contractor's Professional Liability/Errors and Omissions*** insurance in the sum of at least \$1,000,000 per claim / \$2,000,000 aggregate is required when work performed by Contractor or on behalf of Contractor includes professional or technical services including, but not limited to, construction administration and/or management, engineering services such as design, surveying, and/or inspection, technical services such as testing and laboratory analysis, and/or environmental assessments. An occurrence basis policy is preferred.

If coverage is provided on a claims-made basis, the following conditions apply:

- 1) the retroactive date must be prior to or coinciding with the effective date of the Contract, or prior to the commencement of any services provided by the Contractor on behalf of the Parish, whichever is earlier; AND
- 2) continuous coverage must be provided to the Parish with the same retro date for 24 months following acceptance or termination of the Project by the Parish either by
 - a) continued renewal certificates **OR**
 - b) a 24 month Extended Reporting Period

*The Certificate must indicate whether the policy is written on an occurrence or claims-made basis and, if claims-made, the applicable retro date must be stated.

6. **Marine Liability/Protection and Indemnity*** insurance is required for any and all vessel and/or marine operations in the minimum limits of \$1,000,000 per occurrence / \$2,000,000 per project general aggregate. The coverage shall include, but is not limited to, the basic coverages found in the Commercial General Liability insurance and coverage for third party liability

***Excess/Umbrella Liability** insurance may be provided to meet the limit requirements for any Liability coverage. For example: if the General Liability requirement is \$3,000,000 per occurrence, but the policy is only \$1,000,000 per occurrence, then the excess policy should be at least \$2,000,000 per occurrence thereby providing a combined per occurrence limit of \$3,000,000.)

7. **Owners Protective Liability (OPL)** shall be furnished by the Contractor and shall provide coverage in the minimum amount of \$1,000,000 CSL each occurrence / \$2,000,000 aggregate. **St. Tammany Parish Government, ATTN: Risk Management Department, P. O. Box 628, Covington, LA 70434 shall be the first named insured on the policy.**

8. **Builder's Risk Insurance** written as an "all-risk" policy providing coverage in an amount at or greater than one hundred percent (100%) of the completed value of the contracted project. Any contract modifications increasing the contract cost will require an increase in the limit of the Builder's Risk policy. Deductibles should not exceed \$5,000 and Contractor shall be responsible for all policy deductibles. This insurance shall cover materials at the site, stored off the site, and in transit. The Builder's Risk Insurance shall include the interests of the Owner, Contractor and Subcontractors and shall terminate only when the Project is accepted in writing. **St. Tammany Parish Government, ATTN: Risk Management Department, P. O. Box 628, Covington, LA 70434 shall be named as a Loss Payee on the policy.**

9. **Installation Floater Insurance**, on an "all-risk" form, shall be furnished by Contractor and carried for the full value of the materials, machinery, equipment and labor for each location. The Contractor shall be responsible for all policy deductibles. The Installation Floater Insurance shall provide coverage for property owned by others and include the interests of the Owner, Contractor and Subcontractors and shall terminate only when the Project is accepted in writing. **St. Tammany Parish Government, ATTN: Risk Management Department, P. O. Box 628, Covington, LA 70434 shall be named as a Loss Payee on the policy.**

- D. All policies of insurance shall meet the requirements of the Parish prior to the commencing of any work. The Parish has the right, but not the duty, to approve all insurance coverages prior to commencement of work. If any of the required policies are or become unsatisfactory to the Parish as to form or substance; or if a company issuing any policy is or becomes unsatisfactory to the Parish, the Provider shall promptly obtain a new policy, timely submit same to the Parish for approval, and submit a certificate thereof as provided above. The Parish agrees not to unreasonably withhold approval of any insurance carrier selected by Provider. In the event that Parish cannot agree or otherwise authorize a carrier, Provider shall have the option of selecting and submitting a new insurance carrier within 30 days of said notice by the Parish. In the event that the second submission is insufficient or is not approved, then the Parish shall have the unilateral opportunity to thereafter select a responsive and responsible insurance carrier all at the cost of Provider and thereafter deduct from Provider's fee the cost of such insurance.
- E. Upon failure of Provider to furnish, deliver and/or maintain such insurance as above provided, this contract, at the election of the Parish, may be declared suspended, discontinued or terminated. Failure of the Provider to maintain insurance shall not relieve the Provider from any liability under the contract, nor shall the insurance requirements be construed to conflict with the obligation of the Provider concerning indemnification.
- F. Provider shall maintain a current copy of all annual insurance policies and agrees to provide a certificate of insurance to the Parish on an annual basis or as may be reasonably requested for the term of the contract or any required Extended Reporting Period. Provider further shall ensure that all insurance policies are maintained in full force and effect throughout the duration of the Project and shall provide the Parish with annual renewal certificates of insurance evidencing continued coverage, without any prompting by the Parish.
- G. It shall be the responsibility of Provider to require that these insurance requirements are met by all contractors and sub-contractors performing work for and on behalf of Provider. Provider shall further ensure the Parish is named as an additional insured on all insurance policies provided by said contractor and/or sub-contractor throughout the duration of the project.
- H. Certificates of Insurance shall be issued as follows:

**St. Tammany Parish Government
Attn: Risk Management
P O Box 628
Covington, LA 70434**

To avoid contract processing delays, be certain the project name/number is included on all correspondence including Certificates of Insurance.

***NOTICE: St. Tammany Parish Government reserves the rights to remove, replace, make additions to and/or modify any and all of the insurance requirements at any time.**

Any inquiry regarding these insurance requirements should be addressed to:

**St. Tammany Parish Government
Office of Risk Management
P O Box 628
Covington, LA 70434
Telephone: 985-898-5226
Email: riskman@stpgov.org**

Section 07

Project Signs

1. General

- a. Work to include providing and installing project sign(s) at the beginning of the project. Some projects may require multiple signs. Should more than one sign be required, it will be reflected in the bidding documents.

2. Materials

- a. The printed project sign(s) shall be 3/8" primed Medium Density Overlay (MDO) **OR** 3-millimeter corrugated plastic secured to exterior plywood (4' x 4').
- b. Contractor shall not use previously provided templates and/or fonts.

3. Execution

- a. The sign(s) shall be printed on a project-by-project basis in black and white, using the template and font provided to the Contractor by the St. Tammany Parish Government Project Manager.
- b. All signage proofed and approved by State Tammany Parish Government before project sign(s) are to be produced by the Contractor.
- c. Exact placement of the project sign(s) must be coordinated with, and approved by, the St. Tammany Parish Government Project Manager prior to sign installation.
- d. The sign(s) is to be installed such that the bottom of the sign is a minimum of 5' above the existing ground elevation.
- e. Sign(s) is to be maintained throughout the period of construction. If sign(s) is damaged or destroyed, repair and/or replacement of sign(s) will be at Contractor's expense.
- f. Contractor is responsible for the removal of all project signs upon issuance of final acceptance by the St. Tammany Parish Government Project Manager at no direct pay.
- g. Cost to be included in "Mobilization" bid item, No. 1.

Blank Template of Parish Project Sign:

PROGRESS



MICHAEL B. COOPER
Parish President

Councilmember Name
Council District X

\$XXX,XXX.XX

Total Dollar \$
amount specified here

Project Name

Description of
Project Work

Name of Street, Bridge,
Subdivision, etc. stated here

Short Description of Project stated here
(if deemed applicable by the Parish)

Example of a Completed Parish Project Sign:

PROGRESS



MICHAEL B. COOPER
Parish President

RYKERT O. TOLEDANO, JR
Council District 5

\$514,444.40

**Dove Park
Subdivision Drainage**
Drainage Improvements along
Swallow St., Sparrow St.,
Partridge St. and Egret St.

Section 08

General Conditions for St. Tammany Parish Government

This index is for illustrative purposes only and is not intended to be complete nor exhaustive.

All bidders/contractors are presumed to have read and understood the entire document. Some information contained in these conditions may not be applicable to all projects.

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01.00 DEFINITIONS OF TERMS

Whenever used in these General Conditions or in other Contract Documents, the following terms shall have the meanings indicated, and these shall be applicable to both the singular and plural thereof.

- 01.01 A.A.S.H.T.O American Association of State Highway and Transportation Officials. When A.A.S.H.T.O. is referred to in these Specifications it takes the meaning of the specification for materials and methods of testing specified by this association and the specification stated is considered to be a part of the Specifications as if written herein in full.
- 01.02 A.C.I American Concrete Institute. When A.C.I. is referred to in these Specifications it takes the meaning of the specification for materials and methods of testing specified by this institute and the specification stated is considered to be a part of the Specifications as if written herein in full.
- 01.03 Addenda Written or graphic instruments issued prior to the opening of bids which clarify, correct, modify or change the bidding or Contract Documents.
- 01.04 Advertisement The written instrument issued by the Owner at the request of the Owner used to notify the prospective bidder of the nature of the Work. It becomes part of the Contract Documents.
- 01.05 Agreement The written agreement or contract between the Owner and the Contractor covering the Work to be performed and the price that the Owner will pay. Other documents, including the Proposal, Addenda, Specifications, plans, surety, insurance, etc., are made a part thereof.
- 01.06 Application for Payment The form furnished by the Owner which is to be used by the Contractor in requesting incremental (progress) payments and which is to include information required by Section 28.01 and an affidavit of the Contractor. The affidavit shall stipulate that progress payments theretofore received from the Owner on account of the Work have been applied by Contractor to discharge in full of all Contractor's obligations reflected in prior applications for payment.
- 01.07 A.S.T.M. American Society of Testing Materials. When A.S.T.M. is referred to in these Specifications it takes the meaning of the specification for materials and methods of testing specified by this society and the specification stated is considered to be a part of the Specifications as if written herein in full.
- 01.08 Bid The offer or Proposal of the Bidder submitted on the prescribed form setting forth all the prices for the Work to be performed.
- 01.09 Bidder Any person, partnership, firm or corporation submitting a Bid for the Work.
- 01.10 Bonds Bid, performance and payment bonds and other instruments of security, furnished by the Contractor and its surety in accordance with the Contract Documents and Louisiana law.
- 01.11 Change Order A written order to the Contractor signed by the Owner authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time after execution of the Agreement.
- 01.12 Contract Documents The Agreement, Addenda, Contractor's Bid and any documentation accompanying or post-bid documentation when attached as an exhibit, the Bonds, these General Conditions, the Advertisement for Bid, Notice to Contractor, all supplementary conditions, the Specifications, the Drawings, together with all Modifications issued after the execution of the Agreement.
- 01.13 Contract Price The total monies payable to the Contractor under the Contract Documents.

- 01.14 Contract Time The number of consecutive calendar days stated in the Agreement for the completion of the Work.
- 01.15 Contractor The person, firm, corporation or Contractor with whom the Owner has executed the Agreement.
- 01.16 Defective Work When work which is unsatisfactory, faulty or deficient for any reason whatsoever, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, test or approval referred to in the Contract Documents, or has been damaged prior to the Owner's recommendation or acceptance.
- 01.17 Drawings The Drawings and plans which show the character and scope of the Work to be performed and which have been prepared or approved by the Owner and are referred to in the Contract Documents.
- 01.18 Field Order A written order issued by the Owner or his agent which clarifies or interprets the Contract Documents.
- 01.19 Modification (a) A written amendment of the Contract Documents signed by both parties, (b) A Change Order, (c) A written clarification or interpretation issued by the Owner or his agent. Modification may only be issued after execution of the Agreement.
- 01.20 Notice of Award The written notice by Owner to the lowest responsible Bidder stating that upon compliance of the conditions enumerated in the Notice of Award, or enumerated in the Bid documents, the Owner will deliver the Contract Documents for signature. The time for the delivery of the Contract Documents can be extended in conformance with Louisiana Law.
- 01.21 Notice to Contractor Instructions, written or oral given by Owner to Contractor and deemed served if given to the Contractor's superintendent, foreman or mailed to Contractor at his last known place of business.
- 01.22 Notice to Proceed A written notice given by the Owner fixing the date on which the Contract Time will commence, and on which date the Contractor shall start to perform his obligation under the Contract Documents. Upon mutual consent by both parties, the Notice to Proceed may be extended.
- 01.23 Owner St. Tammany Parish Government, acting herein through its duly constituted and authorized representative, including but not limited to the Office of the Parish President or its designee, its Chief Administrative Officer, and/or Legal Counsel. St. Tammany Parish Government (hereinafter, the "Parish") and Owner may be used interchangeably.
- 01.24 Project The entire construction to be performed as provided in the Contract Documents.
- 01.25 Project Representative The authorized representative of the Owner who is assigned to the Project or any parts thereof.
- 01.26 Proposal The Bid submitted by the Bidder to the Owner on the Proposal form setting forth the Work to be done and the price for which the Bidder agrees to perform the Work.
- 01.27 Shop Drawings All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, Subcontractor, Manufacturer, Supplier or Distributor and which illustrate the equipment, material or some portion of the Work.
- 01.28 Specifications The Instructions to Bidders, these General Conditions, the Special Conditions and the Technical Provisions. All of the documents listed in the "Table of Contents."
- 01.29 Subcontractor An individual, firm or corporation having a direct Contract with the Contractor or with any other Subcontractor for the performance of a part of the Project Work.
- 01.30 Substantial Completion The date as certified by the Owner or its agent when the construction of the Project or a specified part thereof is sufficiently complete in accordance with the Contract Documents so that the Project or specified part can be utilized for the

purposes for which it was intended; or if there is no such certification, the date when final payment is due in accordance with Section 28.

- 01.31 Superintendent Contractor's site representative. The person on the site who is in full and complete charge of the Work.
- 01.32 Time Unless specifically stated otherwise, all time delays shall be calculated in calendar days.
- 01.33 Work Any and all obligations, duties and responsibilities necessary to the successful completion of the Project assigned to or undertaken by the Contractor under the Contract Documents, usually including the furnishing of all labor, materials, equipment and other incidentals.
- 01.34 The terms "he/himself" may be used interchangeably with "it/itself."

02.00 PROPOSAL

- 02.01 All papers bound with or attached to the Proposal Form are a necessary part thereof and must not be detached.
- 02.02 For submitting Bids, the only forms allowed shall be the "Louisiana Uniform Public Work Bid Form", "Louisiana Uniform Public Works Bid Form Unit Price Form" (if necessary), the Bid Bond, and written evidence of authority of person signing the bid. Necessary copies of the Louisiana Uniform Public Work Forms will be furnished for Bidding. Bound sets of the Contract Documents are for Bidder's information and should not be used in submitting Bids.
- 02.03 Proposal forms must be printed in ink or typed, unless submitted electronically. Illegibility or ambiguity therein may constitute justification for rejection of the Bid.
- 02.04 Each Bid must be submitted in a sealed envelope, unless submitted electronically. The outside of the envelope shall show the name and address of the Bidder, the State Contractor's License Number of the Bidder (if work requires contractor's license), and the Project name and number for which the Bid is submitted, along with the Bid number.
- 02.05 The price quoted for the Work shall be stated in words and figures on the Bid Form, and in numbers only on the Unit Price Form. The price in the Proposal shall include all costs necessary for the complete performance of the Work in full conformity with the conditions of the Contract Documents, and shall include all applicable Federal, State, Parish, Municipal or other taxes. The price bid for the items listed on the Unit Price Form will include the cost of all related items not listed, but which are normally required to do the type of Work bid.
- 02.06 The Bid shall be signed by the Bidder. The information required on the Louisiana Uniform Public Work Bid Form must be provided. Evidence of agency, corporate, or partnership authority is required and shall be provided in conformance with LSA-R.S. 38:2212(B).
- 02.07 Only the Contractors licensed by the State to do the type of Work involved can submit a Proposal for the Work. The envelope containing the Proposal shall have the Contractor's license number on it. Failure to be properly licensed constitutes authority by the Owner for rejection of Bid.
- 02.08 Bidders shall not attach any conditions or provisions to the Proposal. Any conditions or provisions so attached may, at the sole option of the Owner, cause rejection of the Bid or Proposal.
- 02.09 A Bid Guarantee of five percent (5%) of the amount of the total Bid, including Alternates, must accompany the Proposal and, at the option of the Bidder, may be a cashier's check, certified check or a satisfactory Bid Bond. The Bid Guarantee must be attached to the Louisiana Uniform Public Work Bid Form. No Bid will be considered unless it is so guaranteed. Cashier's check or certified check must be made payable to the order of the Owner. Cash deposits will not be accepted. The Owner reserves the right to cash or deposit the cashier's check or certified check. Such guarantees shall be made payable to the Parish of St. Tammany. In accordance with LSA-R.S. 38:2218(C), if a bid bond is used, it shall

be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide to write individual bonds up to ten percent of policyholders' surplus as shown in the A.M. Best's Key Rating Guide, or by an insurance company in good standing licensed to write bid bonds which is either domiciled in Louisiana or owned by Louisiana residents. It is **not** required to be on any AIA form.

- 02.10 Bid securities of the three (3) lowest Bidders will be retained by the Owner until the Contract is executed or until final disposition is made of the Bids submitted. Bid securities of all other Bidders will be returned promptly after the canvas of Bids. Bids shall remain binding for forty-five (45) days after the date set for Bid Opening. The Parish shall act within the forty-five (45) days to award the contract to the lowest responsible bidder or reject all bids as permitted by Public Bid Law. However, the Parish and the lowest responsible bidder, by mutual written consent, may agree to extend the deadline for award by one or more extensions of thirty (30) calendar days. In the event the Owner issued the Letter of Award during this period, or any extension thereof, the Bid accepted shall continue to remain binding until the Execution of the Contract.
- 02.11 A Proposal may be withdrawn at any time prior to the scheduled closing time for receipt of Bids, provided the request is in writing, executed by the Bidder or its duly authorized representative and is filed with the Owner prior to that time. When such a request is received, the Proposal will be returned to the Bidder unopened.
- 02.12 Written communications, over the signature of the Bidder, to modify Proposals will be accepted and the Proposal corrected in accordance therewith if received by the Owner prior to the scheduled closing time for receipt of Bids. Oral, telephonic or telegraphic Modifications will not be considered.
- 02.13 No oral interpretation obligating the Owner will be made to any Bidder as to the meaning of the Drawings, Specifications and Contract Documents. Every request for such an interpretation shall be made in writing and addressed and forwarded to the Owner. No inquiry received within seven (7) days prior to the day fixed for opening of the Bids shall be given consideration. Every interpretation made to the Bidder shall be in the form of an addendum to the Specifications. All such Addenda shall become part of the Contract Documents. Failure of Bidder to receive any such interpretation shall not relieve any Bidder from any obligation under this Bid. All Addenda shall be issued in accordance with the Public Bid Law, LSA-R.S. 38:2212(O)(2)(a) and (b).
- 02.14 The Owner reserves the right to reject any or all Bids for just cause in accordance with the Public Bid Law, LSA-R.S. 38:2214(B). Incomplete, informal or unbalanced Bids may be rejected. Reasonable grounds for belief that any one Bidder is concerned directly or indirectly with more than one Bid will cause rejection of all Bids wherein such Bidder is concerned. If required, a Bidder shall furnish satisfactory evidence of its competence and ability to perform the Work stipulated in its Proposal. Incompetence will constitute cause for rejection. If the Parish determines that the bidder is not responsive or responsible for any reason whatsoever, the bid may be rejected in accordance with State law.
- 02.15 The Contractor shall indemnify and hold harmless the Owner from any and all suits, costs, penalties or claims for infringement by reason of use or installation of any patented design, device, material or process, or any trademark and copyright in connection with the Work agreed to be performed under this Contract, and shall indemnify and hold harmless the Owner for any costs, expenses and damages which it may be obliged to pay by reason of any such infringement at any time during the prosecution or after completion of the Work.
- 02.16 Bidders shall familiarize themselves with and shall comply with all applicable Federal and State Laws, municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the Project, which may directly or indirectly affect the Work or its prosecution. These laws and/or ordinances will be deemed to be included in the Contract, as though herein written in full.
- 02.17 Each Bidder shall visit the site of the proposed Work and fully acquaint itself with all surface and subsurface conditions as they may exist so that it may fully understand this Contract. Bidder shall also thoroughly examine and be familiar with drawings,

Specifications and Contract Documents. The failure or omission of any Bidder to receive or examine any form instrument, Drawing or document or to visit the site and acquaint itself with existing conditions, shall in no way relieve any Bidder from any obligation with respect to its Bid and the responsibility in the premises.

- 02.18 The standard contract form enclosed with the Proposal documents is a prototype. It is enclosed with the Contract Documents for the guidance of the Owner and the Contractor. It has important legal consequences in all respects and consultation with an attorney is encouraged. Contractor shall be presumed to have consulted with its own independent legal counsel.
- 02.19 When one set of Contract plans show the Work to be performed by two or more prime Contractors, it is the responsibility of each Bidder to become knowledgeable of the Work to be performed by the other where the Work upon which this bid is submitted is shown to come into close proximity or into conflict with the Work of the other. In avoiding conflicts, pressure pipe lines must be installed to avoid conflict with gravity pipe lines and the Bidder of the smaller gravity pipe line in conflict with the larger gravity pipe line must include in his Bid the cost of a conflict box at these locations. The location of and a solution to the conflicts do not have to be specifically noted as such on the plans.
- 02.20 Bidder shall execute affidavit(s) attesting compliance with LSA-R.S. 38:2212.10, 38:2224, 38:2227, each as amended, and other affidavits as required by law, prior to execution of the contract.
- 02.21 Sealed Proposals (Bid) shall be received by St. Tammany Parish Government at the office of St. Tammany Parish Government, Department of Procurement, 21454 Koop Drive, Suite 2-F, Mandeville, LA 70471, until the time and date denoted in Notice to Bidders, at which time and place the Proposals (Bids), shall be publicly opened and read aloud to those present. In accordance with LSA-R.S. 38-2212(A)(3)(c)(i), the designer's final estimated cost of construction shall be read aloud upon opening bids. Sealed Proposals (Bids) may also be mailed by certified mail to St. Tammany Parish Government, Department of Procurement, 21454 Koop Drive, Suite 2-F, Mandeville, LA 70471, and must be received before the bid opening. Bids may also be submitted electronically. Information concerning links for electronic bidding is contained in the Notice to Bidders.
- 02.22 Proposals (Bids) shall be executed on Forms furnished and placed in a sealed envelope, marked plainly and prominently as indicated in the Notice to Bidders, and these General Conditions, and addressed:
- St. Tammany Parish Government
Department of Procurement
21454 Koop Drive, Suite 2-F
Mandeville, LA 70471
- 02.23 Complete sets of Drawings, Specifications, and Contract Documents may be secured at the Office of the Owner. See Notice to Bidders for deposit schedule.
- 02.24 The successful bidder shall be required to post in each direction a public information sign, 4' x 8' in size, at the location of the project containing information required by the Owner. The Owner shall supply this information.
- 03.00 AWARD, EXECUTION OF DOCUMENTS, BONDS, ETC.
- 03.01 The award of the Contract, if it is awarded, will be to the lowest responsible Bidder, in accordance with State Law. No award will be made until the Owner has concluded such investigations as it deems necessary to establish the responsibility, qualifications and financial ability and stability of the Bidder to do the Work in accordance with the Contract Documents to the satisfaction of the Owner within the time prescribed as established by the Department based upon the amount of work to be performed and the conditions of same. The written contract and bond shall be issued in conformance with LSA-R.S. 38:2216. The Owner reserves the right to reject the Bid of any Bidder in accordance with the Public Bid Law, LSA-R.S. 38:2214. If the Contract is awarded, the Owner shall give the successful Bidder written notice of the award within forty-five (45) calendar days after the opening of the Bids in conformance with LSA-R.S. 38:2215(A), or any extension as authorized thereunder.

- 03.02 At least three counterparts of the Agreement and of such other Contract Documents as practicable shall be signed by the Owner and the Contractor. The Owner shall identify those portions of the Contract Documents not so signed and such identification shall be binding on both parties. The Owner and the Contractor shall each receive an executed counterpart of the Contract Documents.
- 03.03 Prior to the execution of the Agreement, the Contractor shall deliver to the Owner the required Bonds.
- 03.04 Failure of the successful Bidder to execute the Agreement and deliver the required Bonds within twenty (20) days of the Notice of the Award shall be just cause for the Owner to annul the award and declare the Bid and any guarantee thereof forfeited.
- 03.05 In order to ensure the faithful performance of each and every condition, stipulation and requirement of the Contract and to indemnify and save harmless the Owner from any and all damages, either directly or indirectly arising out of any failure to perform same, the successful Bidder to whom the Contract is awarded shall furnish a surety Bond in an amount of at least equal to one hundred percent (100%) of the Contract Price. The Contract shall not be in force or binding upon the Owner until such satisfactory Bond has been provided to and approved by the Parish. The cost of the Bond shall be paid for by the Contractor unless otherwise stipulated in the Special Provisions.
- 03.06 No surety Company will be accepted as a bondsman who has no permanent agent or representative in the State upon whom notices referred to in the General Conditions of these Specifications may be served. Services of said notice on said agent or representative in the State shall be equal to service of notice on the President of the Surety Company, or such other officer as may be concerned.
- 03.07 In conformance with LSA-R.S. 38:2219(A)(1)(a), (b), and (c):

Any surety bond written for a public works project shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the Federal Register, or by a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide, to write individual bonds up to ten percent of policyholders' surplus as shown in the A.M. Best's Key Rating Guide or by an insurance company that is either domiciled in Louisiana or owned by Louisiana residents and is licensed to write surety bonds.

For any public works project, no surety or insurance company shall write a bond which is in excess of the amount indicated as approved by the U.S. Department of the Treasury Financial Management Service list or by a Louisiana domiciled insurance company with an A- rating by A.M. Best up to a limit of ten percent of policyholders' surplus as shown by A.M. Best; companies authorized by this Paragraph who are not on the treasury list shall not write a bond when the penalty exceeds fifteen percent of its capital and surplus, such capital and surplus being the amount by which the company's assets exceed its liabilities as reflected by the most recent financial statements filed by the company with the Department of Insurance.

In addition, any surety bond written for a public works project shall be written by a surety or insurance company that is currently licensed to do business in the state of Louisiana. All contractors must comply with any other applicable provisions of LSA-R.S. 38:2219.

- 03.08 Should the Contractor's Surety, even though approved and accepted by the Owner, subsequently remove its agency or representative from the State or become insolvent, bankrupt, or otherwise fail, the Contractor shall immediately furnish a new Bond in another company approved by the Owner, at no cost to the Owner. The new Bond shall be executed under the same terms and conditions as the original Bond. The new bond shall be submitted within thirty (30) days of such time as the Owner notifies Contractor or from the time Contractor learns or has reason to know that the original surety is no longer financially viable or acceptable to the Parish, whichever occurs first. In the event that Contractor fails or refuses to timely secure additional surety, then the Owner may secure such surety and thereafter deduct such cost or expense from any sum due or to become due Contractor.

- 03.09 The Contractor's bondsman shall obligate itself to all the terms and covenants of these Specifications and of contracts covering the Work executed hereunder. The Owner reserves the right to do Extra Work or make changes by altering, adding to deducting from the Work under the conditions and in the manner herein before described without notice to the Contractor's surety and without in any manner affecting the liability of bondsman or releasing it from any of its obligations hereunder.
- 03.10 The Bond shall also secure for the Owner the faithful performance of the Contract in strict accordance with plans and Specifications. It shall protect the Owner against all lien laws of the State and shall provide for payment of reasonable attorney fees for enforcement of Contract and institution or concursus proceedings, if such proceedings become necessary. Likewise, it shall provide for all additional expenses of the Owner occurring through failure of the Contractor to perform.
- 03.11 The surety of the Contractor shall be and does hereby declare and acknowledge itself by acceptance to be bound to the Owner as a guarantor, jointly and in solido, with the Contractor, for fulfillment of terms of Section 03.00.
- 03.12 The performance Bond and Labor and Material Bond forming part of this Contract shall be continued by Contractor and its Surety for a period of one (1) year from date of acceptance of this Contract by Owner to assure prompt removal and replacement of all defective material, equipment, components thereof, workmanship, etc., and to assure payment of any damage to property of Owner or others as a result of such defective materials, equipment, workmanship, etc.
- 03.13 Contractor shall pay for the cost of recording the Contract and Bond and the cost of canceling same. Contractor shall also secure and pay for all Clear Lien and Privilege Certificates (together with any updates) which will be required before any final payment is made, and that may be required before any payment, at the request of the Owner, its representative, agent, architect, engineer and the like. All recordation and Clear Lien and Privilege Certificate requirements shall be in accordance with those requirements noted herein before in contract Specifications.

04.00 SUBCONTRACTS

- 04.01 Contractor shall be fully responsible for all acts and omissions of its Subcontractors and of persons and organizations for whose acts any of them may be liable to the same extent that it is responsible for the acts and omissions of persons directly employed by it. Nothing in the Contract Documents shall create any contractual relationship between Owner and any Subcontractor or other person or organization having a direct Contract with Contractor, nor shall it create any obligation on the part of the Owner to pay or to see to the payment of any monies due any Subcontractor.
- 04.02 Nothing in the Contract Documents shall be construed to control the Contractor in dividing the Work among approved Subcontractors or delineating the Work to be performed by any trade.
- 04.03 The Contractor agrees to specifically bind every Subcontractor to all of the applicable terms and conditions of the Contract Documents prior to commencing Work. Every Subcontractor, by undertaking to perform any of the Work, shall thereby automatically be deemed bound by such terms and conditions.
- 04.04 The Contractor shall indemnify and hold harmless the Owner and their agents and employees from and against all claims, damages, losses and expenses including Attorney's fees arising out of or resulting from the Contractor's failure to bind every Subcontractor and Contractor's surety to all of the applicable terms and conditions of the Contract Documents.

05.00 ASSIGNMENT

- 05.01 Neither party to this Contract shall assign or sublet its interest in this Contract without prior written consent of the other, nor shall the Contractor assign any monies due or to become due to it under this Contract without previous written consent of the Owner, nor without the consent of the surety unless the surety has waived its right to notice of assignment.

06.00 CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS.

- 06.01 It is the intent of the Specifications and Drawings to describe a complete Project to be constructed in accordance with the Contract Documents. The Contract Documents comprise the entire Agreement between Owner and Contractor. Alterations, modifications and amendments shall only be in writing between these parties.
- 06.02 The Contract Documents are intended to be complimentary and to be read *in pari materii*, and what is called for by one is as binding as if called for by all. If Contractor finds a conflict, error or discrepancy in the Contract Documents, it shall call it to the Owner's attention, in writing, at once and before proceeding with the Work affected thereby; however, it shall be liable to Owner for its failure to discover any conflict, error or discrepancy in the Specifications or Drawings. In resolving such conflicts, errors and discrepancies, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Special Conditions, General Conditions, Construction Specifications and Drawings. The general notes on the plans shall be considered special provisions. Figure dimensions on Drawings shall govern over scale dimensions and detail Drawings shall govern over general Drawings. Where sewer connections are shown to fall on a lot line between two lots, the Contractor shall determine this location by measurement not by scale. Any Work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described herein which so applied to this Project are covered by a well-known technical meaning or specification shall be deemed to be governed by such recognized standards unless specifically excluded.
- 06.03 Unless otherwise provided in the Contract Documents, the Owner will furnish to the Contractor (free of charge not to exceed ten (10) copies) Drawings and Specifications for the execution of Work. The Drawings and Specifications are the property of the Owner and are to be returned to it when the purpose for which they are intended have been served. The Contractor shall keep one copy of all Drawings and Specifications, including revisions, Addenda, details, Shop Drawings, etc. on the Work in good order and available to the Owner or the regulatory agency of the governmental body having jurisdiction in the area of the Work.

07.00 SHOP DRAWINGS, BROCHURES AND SAMPLES

- 07.01 After checking and verifying all field measurements, Contractor shall submit to Owner for approval, five copies (or at Owner's option, one reproducible copy) of all Shop Drawings, which shall have been checked by and stamped with the approval of Contractor and identified as Owner may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable Owner to review the information as required.
- 07.02 Contractor shall also submit to Owner, for review with such promptness as to cause no delay in Work, all samples as required by the Contract Documents. All samples will have been checked by and stamped with the approval of Contractor identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended. At the time of each submission, Contractor shall in writing call Owner's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- 07.03 Owner will review with reasonable promptness Shop Drawings and samples, but its review shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The review of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Owner and shall return the required number of corrected copies of Shop Drawings and resubmit new samples for review. Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by Owner on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner that Contractor has determined and verified all quantities, dimensions, field construction criteria, materials catalog numbers and similar data and thereafter assumes full

responsibility for doing so, and that it has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.

07.04 Where a Shop Drawing or sample submission is required by the Specifications, no related Work shall be commenced until the submission has been reviewed by Owner. A copy of each reviewed shop Drawing and each inspected sample shall be kept in good order by Contractor at the site and shall be available to Owner.

07.05 Owner's review of Shop Drawings or samples shall not relieve Contractor from its responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Owner's attention to such deviation at the time of submission and Owner has given written approval to the specific deviation, nor shall any review by Owner relieve Contractor from responsibility for errors or omissions in the Shop Drawings. The mere submittal of shop drawings which contain deviations from the requirements of plans, specifications and/or previous submittals in itself does not satisfy this requirement.

08.00 RECORD DRAWINGS

08.01 The Contractor shall keep an accurate record in a manner approved by the Owner of all changes in the Contract Documents during construction. In Work concerning underground utilities, the Contractor shall keep an accurate record in a manner approved by the Owner of all valves, fittings, etc. Before the Work is accepted by the Owner, and said acceptance is recorded, the Contractor shall furnish the Owner a copy of this record.

08.02 Contractor shall keep an accurate drawing measured in the field to the nearest 0.1' of the location of all sewer house connections. The location shown shall be the end of the connection at the property line measured along the main line of pipe from a manhole.

08.03 Contractor shall keep an accurate drawing of the storm water drainage collection system. Inverts to the nearest 0.01' and top of castings shall be shown as well as location of all structures to the nearest 0.1'. Upon completion of the Work, the plan will be given to the Owner.

09.00 PROGRESS OF WORK

09.01 Contractor shall conduct the Work in such a professional manner and with sufficient materials, equipment and labor as is considered necessary to ensure its completion within the time limit specified.

09.02 The Owner shall issue a Notice to Proceed to the Contractor within twenty (20) calendar days from the date of execution of the Contract. Upon mutual consent by both parties, the Notice to Proceed may be extended. The Contractor is to commence Work under the Contract within ten (10) calendar days from the date the Notice to Proceed is issued by the Owner.

09.03 The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's approval an estimated progress schedule for the work to be performed, as well as a construction signing layout for all roads within the project area. The Contractor shall not start work or request partial payment until the work schedule has been submitted to the Owner for approval.

09.04 Revisions to the original schedule will be made based on extension of days granted for inclement weather or change orders issued under the contract. No other revision shall be made which affects the original completion or updated completion date, whichever is applicable.

09.05 Failure of the Contractor to submit an estimated progress schedule or to complete timely and on schedule the Work shown on the progress schedule negates any and all causes or claims by the Contractor for accelerated completion damages. These accelerated damage claims shall be deemed forfeited.

09.06 Meetings will be held as often as necessary to expedite the progress of the job. Meetings will be held during normal working hours at the jobsite and shall be mandatory for the

Contractor and all Sub-Contractors working on the project. Meetings may be requested by the Owner at any time and at the discretion of the Owner.

10.00 OWNER'S RIGHT TO PROCEED WITH PORTIONS OF THE WORK

- 10.01 Upon failure of the Contractor to comply with any notice given in accordance with the provisions hereof, the Owner shall have the alternative right, instead of assuming charge of the entire Work, to place additional forces, tools, equipment and materials on parts of the Work. The cost incurred by the Owner in carrying on such parts of the Work shall be payable by the Contractor. Such Work shall be deemed to be carried on by the Owner on account of the Contractor. The Owner may retain all amounts of the cost of such Work from any sum due Contractor or those funds that may become due to Contractor under this Agreement.
- 10.02 Owner may perform additional Work related to the Project by itself or it may let any other direct contract which may contain similar General Conditions. Contractor shall afford the other contractors who are parties to such different contracts (or Owner, if it is performing the additional Work itself) reasonable opportunity for the introduction and storage of materials and equipment and the execution of Work, and shall properly connect and coordinate its Work with the subsequent work.
- 10.03 If any part of Contractor's Work depends upon proper execution or results upon the Work of any such other contractor (or Owner), Contractor shall inspect and promptly report to Owner in writing any defects or deficiencies in such Work that render it unsuitable for such proper execution and results. Failure to so report shall constitute an acceptance of the other Work as fit and proper for the relationship of its Work except as to defects and deficiencies which may appear in the other Work after the execution of its Work.
- 10.04 Whatever Work is being done by the Owner, other Contractors or by this Contractor, the parties shall respect the various interests of the other parties at all times. The Owner may, at its sole discretion, establish additional rules and regulations concerning such orderly respect of the rights of various interests.
- 10.05 Contractor shall do all cutting, fitting and patching of its Work that may be required to integrate its several parts properly and fit to receive or be received by such other Work. Contractor shall not endanger any Work of others by cutting, excavating or otherwise altering Work and will only alter Work with the written consent of Owner and of the other contractors whose Work will be affected.
- 10.06 If the performance of additional Work by other contractors or Owner is not noted in the Contract Documents, written notice thereof shall be given to Contractor prior to starting any such additional Work. If Contractor believes that the performance of such additional Work by Owner or others may cause additional expense or entitles an extension of the Contract Time, the Contractor may make a claim therefor. The claim must be in writing to the Owner within thirty (30) calendar days of receipt of notice from the Owner of the planned additional Work by others.

11.00 TIME OF COMPLETION

- 11.01 The Notice to Proceed will stipulate the date on which the Contractor shall begin work. That date shall be the beginning of the Contract Time charges.
- 11.02 Contractor shall notify the Owner through its duly authorized representative, in advance, of where Contractor's work shall commence each day. A daily log shall be maintained by Contractor to establish dates, times, persons contacted, and location of work. Specific notice shall be made to the Owner if the Contractor plans to work on Saturday, Sunday, or a Parish approved holiday. If notice is not received, no consideration will be given for inclement weather and same shall be considered a valid work day.
- 11.03 The Work covered by the Plans, Specifications and Contract Documents must be completed sufficiently for acceptance within the number of calendar days specified in the Proposal and/or the Contract, commencing from the date specified in the Notice to Proceed. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the time of completion is an essential condition of this Contract, and it is further mutually understood and agreed that if the Contractor shall neglect, fail or refuse to

complete the Work within the time specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as partial consideration for the awarding of this Contract, to pay the Owner based on **Table 3.1** as specified in the Contract, not as a penalty, but as liquidated damages for such breach of contract for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the Work. It is specifically understood that the Owner shall also be entitled to receive a reasonable attorney fee and all costs in the event that Contractor fails to adhere to this agreement and this contract is referred to counsel for any reason whatsoever. Reasonable attorney fees shall be the prevailing hourly rate of the private sector, and in no event shall the hourly rate be less than \$175.00 per hour. All attorney fees shall be paid to the operating budget of the Office of the Parish President.

11.04 Prior to final payment, the Contractor may, in writing to the Owner, certify that the entire Project is substantially complete and request that the Owner or its agent issue a certificate of Substantial Completion. See Section 29.00.

11.05 The Owner may grant an extension(s) of time to the Contractor for unusual circumstances which are beyond the control of the Contractor and could not reasonably be foreseen by the Contractor prior to Bidding. Any such request must be made in writing to the Owner within seven (7) calendar days following the event occasioning the delay. The Owner shall have the exclusive and unilateral authority to determine, grant, and/or deny the validity of any such claim.

11.06 Extensions of time for inclement weather shall be processed as follows:

Commencing on the start date of each job, the Parish Inspector assigned to same shall keep a weekly log, indicating on each day whether inclement weather has prohibited the Contractor from working on any project within the specific job, based upon the following:

1. Should the Contractor prepare to begin work on any day in which inclement weather, or the conditions resulting from the weather, prevent work from beginning at the usual starting time, and the crew is dismissed as a result, the Contractor will not be charged for a working day whether or not conditions change during the day and the rest of the day becomes suitable for work.
2. If weather conditions on the previous day prevent Contractor from performing work scheduled, provided that no other work can be performed on any project within the package. The Parish Inspector shall determine if it is financially reasonable to require the Contractor to deviate from the schedule and relocate to another location.
3. If the Contractor is unable to work at least 60% of the normal work day due to inclement weather, provided that a normal working force is engaged on the job.

Any dispute of weather conditions as related to a specific job shall be settled by records of the National Weather Service.

11.07 Extensions of time for change orders

When a change order is issued, the Owner and Contractor will agree on a reasonable time extension, if any, to implement such change. Consideration shall be given for, but not limited to, the following:

1. If material has to be ordered;
2. Remobilization and or relocation of equipment to perform task; and
3. Reasonable time frame to complete additional work.

Time extensions for change orders shall be reflected on the official document signed by the Owner and Contractor.

11.08 At the end of each month, the Owner or its agent will furnish to the Contractor a monthly statement which reflects the number of approved days added to the contract. The

Contractor will be allowed fourteen (14) calendar days in which to file a written protest setting forth in what respect the monthly statement is incorrect; otherwise, the statement shall be considered accepted by the Contractor as correct.

- 11.09 Apart from extension of time for unavoidable delays, no payment or allowance of any kind shall be made to the Contractor as compensation for damages because of hindrance or delay for any cause in the progress of the Work, whether such delay be avoidable or unavoidable.

12.00 LIQUIDATED DAMAGES

- 12.01 In case the Work is not completed in every respect within the time that may be extended, it is understood and agreed that per diem deductions per **Table 3.1** for liquidated damages, as stipulated in the Proposal and/or Contract, shall be made from the total Contract Price for each and every calendar day after and exclusive of the day on which completion was required, and up to the completion of the Work and acceptance thereof by the Owner. It is understood and agreed that time is of the essence to this Contract, and the above sum being specifically herein agreed upon in advance as the measure of damages to the Owner on account of such delay in the completion of the Work. It is further agreed that the expiration of the term herein assigned or as may be extended for performing the Work shall, *ipso facto*, constitute a putting in default, the Contractor hereby waiving any and all notice of default. The Contractor agrees and consents that the Contract Price, reduced by the aggregate of the entire damages so deducted, shall be accepted in full satisfaction of all Work executed under this Contract. It is further understood and agreed that Contractor shall be liable for a reasonable attorney fee and all costs associated with any breach of this agreement, including but not limited to this subsection. In the event that any dispute or breach herein causes referrals to counsel, then Contractor agrees to pay a reasonable attorney fee at the prevailing hourly rate of the private sector. In no event shall the hourly rate be less than \$175.00 per hour.

13.00 LABOR, MATERIALS, EQUIPMENT, SUPERVISION, PERMITS AND TAXES

- 13.01 The Contractor shall provide and pay for all labor, materials, equipment, supervision, subcontracting, transportation, tools, fuel, power, water, sanitary facilities and all incidentals necessary for the completion of the Work in substantial conformance with the Contract Documents.
- 13.02 The Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. It shall at all times maintain good discipline and order at the site.
- 13.03 Unless otherwise specifically provided for in the Specifications, all workmanship, equipment, materials, and articles incorporated in the Work covered by this Contract are to be new and of the best grade of their respective kinds for the purpose intended. Samples of materials furnished under this Contract shall be submitted for approval to the Owner when and as directed.
- 13.04 Whenever a material or article required is specified or shown on the plans by using the name of a proprietary product or of a particular manufacturer or Contractor, any material or article which shall perform adequately the duties imposed by the general design will be considered equal, and satisfactory, providing the material or article so proposed is of equal substance and function and that all technical data concerning the proposed substitution be approved by the Owner prior to the Bidding. The Owner shall have the exclusive and unilateral discretion to determine quality and suitability in accordance with LSA-R.S. 38:2212(T)(2).
- 13.05 Materials shall be properly and securely stored so as to ensure the preservation of quality and fitness for the Work, and in a manner that leaves the material accessible to inspection. Materials or equipment may not be stored on the site in a manner such that it will interfere with the continued operation of streets and driveways or other contractors working on the site.
- 13.06 The Contractor, by entering into the Contract for this Work, sets itself forth as an expert in the field of construction and it shall supervise and direct the Work efficiently and with its best skill and attention. It shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

- 13.07 Contractor shall keep on the Work, at all times during its progress, a competent resident Superintendent, who shall not be replaced without written Notice to Owner except under extraordinary circumstances. The Superintendent will be Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the Superintendent shall be as binding as if given to the Contractor. Owner specifically reserves the right to approve and/or disapprove the retention of a new superintendent, all to not be unreasonably withheld.
- 13.08 Any foreman or workman employed on this Project who disregards orders or instructions, does not perform his Work in a proper and skillful manner, or is otherwise objectionable, shall, at the written request of the Owner, be removed from the Work and shall be replaced by a suitable foreman or workman.
- 13.09 The Contractor and/or its assigned representative shall personally ensure that all subcontracts and divisions of the Work are executed in a proper and workmanlike manner, on scheduled time, and with due and proper cooperation.
- 13.10 Failure of the Contractor to keep the necessary qualified personnel on the Work shall be considered cause for termination of the Contract by the Owner.
- 13.11 Only equipment in good working order and suitable for the type of Work involved shall be brought onto the job and used by the Contractor. The Contractor is solely responsible for the proper maintenance and use of its equipment and shall hold the Owner harmless from any damages or suits for damages arising out of the improper selection or use of equipment. No piece of equipment necessary for the completion of the Work shall be removed from the job site without approval of the Owner.
- 13.12 All Federal, State and local taxes due or payable during the time of Contract on materials, equipment, labor or transportation, in connection with this Work, must be included in the amount bid by the Contractor and shall be paid to proper authorities before acceptance. The Contractor shall furnish all necessary permits and certificates and comply with all laws and ordinances applicable to the locality of the Work. The cost of all inspection fees levied by any governmental entity whatsoever shall be paid for by the Contractor.
- 13.13 In accordance with St. Tammany Police Jury Resolution 86-2672, as amended, the Contractor must provide in a form suitable to the Owner an affidavit stating that all applicable sales taxes for materials used on this project have been paid.
- 13.14 During the period that this Contract is in force, neither party to the Contract shall solicit for employment or employ an employee of the other.
- 13.15 All materials or equipment shown on the Drawings or included in these specifications shall be furnished unless written approval of a substitute is obtained from the Designer, or Owner if no separate designer.
- 13.16 If a potential supplier wishes to submit for prior approval a particular product other than a product specified in the contract documents, he shall do so no later than fourteen working days prior to the opening of bids. Within ten days, exclusive of holidays and weekends, after such submission, the prime design professional shall furnish to both the public entity and the potential supplier written approval or denial of the product submitted. The burden of proof of the equality of the proposed substitute is upon the proposer and only that information formally submitted shall be used by the Designer in making its decision.
- 13.17 The decision of the Designer/Owner shall be given in good faith and shall be final.
- 14.00 QUANTITIES OF ESTIMATE, CHANGES IN QUANTITIES, EXTRA WORK
- 14.01 Whenever the estimated quantities of Work to be done and materials to be furnished under this Contract are shown in any of the documents, including the Proposal, such are given for use in comparing Bids and the right is especially reserved, except as herein otherwise specifically limited, to increase or diminish same not to exceed twenty-five percent (25%) by the Owner to complete the Work contemplated by this Contract. Such increase or diminution shall in no way vitiate this Contract, nor shall such increase or diminution give cause for claims or liability for damages.

- 14.02 The Owner shall have the right to make alterations in the line, grade, plans, form or dimensions of the Work herein contemplated, provided such alterations do not change the total cost of the Project, based on the originally estimated quantities, and the unit prices bid by more than twenty-five percent (25%) and provided further that such alterations do not change the total cost of any major item, based on the originally estimated quantities and the unit price bid by more than twenty-five (25%). (A major item shall be construed to be any item, the total cost of which is equal to or greater than ten percent (10%) of the total Contract Price, computed on the basis of the Proposal quantity and the Contract unit price). Should it become necessary, for the best interest of the Owner, to make changes in excess of that herein specified, the same shall be covered by supplemental agreement either before or after the commencement of the Work and without notice to the sureties. If such alterations diminish the quantity of Work to be done, such shall not constitute a claim for damages for anticipated profits for the Work dispensed with, but when the reduction in amount is a material part of the Work contemplated, the Contractor shall be entitled to only reasonable compensation as determined by the Owner for overhead and equipment charges which it may have incurred in expectation of the quantity of Work originally estimated, unless specifically otherwise provided herein; if the alterations increase the amount of Work, the increase shall be paid according to the quantity of Work actually done and at the price established for such Work under this Contract except where, in the opinion of the Owner, the Contractor is clearly entitled to extra compensation.
- 14.03 Without invalidating the Contract, the Owner may order Extra Work or make changes by altering, adding to, or deducting from the Work, the Contract sum being adjusted accordingly. The consent of the surety must first be obtained when necessary or desirable, all at the exclusive discretion of the Owner. All the Work of the kind bid upon shall be paid for at the price stipulated in the Proposal, and no claims for any Extra Work or material shall be allowed unless the Work is ordered in writing by the Owner.
- 14.04 Extra Work for which there is no price or quantity included in the Contract shall be paid for at a unit price or lump sum to be agreed upon in advance in writing by the Owner and Contractor. Where such price and sum cannot be agreed upon by both parties, or where this method of payment is impracticable, the Owner may, at its exclusive and unilateral discretion, order the Contractor to do such Work on a Force Account Basis.
- 14.05 In computing the price of Extra Work on a Force Account Basis, the Contractor shall be paid for all foremen and labor actually engaged on the specific Work at the current local rate of wage for each and every hour that said foremen and labor are engaged in such Work, plus ten percent (10%) of the total for superintendence, use of tools, overhead, direct & indirect costs/expenses, pro-rata applicable payroll taxes, pro-rata applicable workman compensation benefits, pro-rata insurance premiums and pro-rata reasonable profit. The Contractor shall furnish satisfactory evidence of the rate or rates of such insurance and tax. The Contractor will not be able to collect any contribution to any retirement plans or programs.
- 14.06 For all material used, the Contractor shall receive the actual cost of such material delivered at the site of the Work, as shown by original receipted bill, to which shall be added five percent (5%). There will be absolutely no additional surcharges or additional fees attached hereto with respect to this subsection.
- 14.07 For any equipment used that is owned by the Contractor, the Contractor shall be allowed a rental based upon the latest prevailing rental price, but not to exceed a rental price as determined by the Associated Equipment Distributors (A.E.D. Green Book).
- 14.08 The Contractor shall also be paid the actual costs of transportation for any equipment which it owns and which it has to transport to the Project for the Extra Work. There will be absolutely no additional surcharges or additional fees attached hereto with respect to this subsection.
- 14.09 If the Contractor is required to rent equipment for Extra Work, but not required for Contract items, it will be paid the actual cost of rental and transportation of such equipment to which no percent shall be added. The basis upon which rental cost are to be charged shall be agreed upon in writing before the Work is started. Actual rental and transportation costs shall be obtained from receipted invoices and freight bills.

- 14.10 No compensation for expenses, fees or costs incurred in executing Extra Work, other than herein specifically mentioned herein above, will be allowed.
- 14.11 A record of Extra Work on Force Account basis shall be submitted to the Owner on the day following the execution of the Work, and no less than three copies of such record shall be made on suitable forms and signed by both the Owner or his representative on the Project and the Contractor. All bids for materials used on extra Work shall be submitted to the Owner by the Contractor upon certified statements to which will be attached original bills covering the costs of such materials.
- 14.12 Payment for Extra Work of any kind will not be allowed unless the same has been ordered in writing by the Owner.
- 15.00 STATUS OF THE ENGINEER (NOT APPLICABLE)
- 16.00 INJURIES TO PERSONS AND PROPERTY
- 16.01 The Contractor shall be held solely and exclusively responsible for all injuries to persons and for all damages to the property of the Owner or others caused by or resulting from the negligence of itself, its employees or its agents, during the progress of or in connection with the Work, whether within the limits of the Work or elsewhere under the Contract proper or as Extra Work. This requirement will apply continuously and not be limited to normal working hours or days. The Owner's construction review is for the purpose of checking the Work product produced and does not include review of the methods employed by the Contractor or to the Contractor's compliance with safety measures of any nature whatsoever. The Contractor agrees to pay a reasonable attorney fee and other reasonable attendant costs of the Owner in the event it becomes necessary for the Owner to employ an attorney to enforce this section or to protect itself against suit over the Contractor's responsibilities. Attorney fees shall be at the prevailing hourly rate of the private sector. The attorney fee hourly rate shall not be less than \$175.00 per hour. All attorney fees collected shall be paid to the operating budget of the Office of the Parish President.
- 16.02 The Contractor must protect and support all utility infrastructures or other properties which are liable to be damaged during the execution of its Work. It shall take all reasonable and proper precautions to protect persons, animals and vehicles or the public from the injury, and wherever necessary, shall erect and maintain a fence or railing around any excavation, and place a sufficient number of lights about the Work and keep same burning from twilight until sunrise, and shall employ one or more watchmen as an additional security whenever needed. The Contractor understands and agrees that the Owner may request that security be placed on the premises to ensure and secure same. The Owner shall have exclusive authority to request placement of such security. Contractor agrees to retain and place security as requested, all at the sole expense of Contractor. Additional security shall not be considered a change order or reason for additional payment by the Owner. The Contractor must, as far as practicable and consistent with good construction, permit access to private and public property and leave fire hydrants, catch basins, streets, etc., free from encumbrances. The Contractor must restore at its own expense all injured or damaged property caused by any negligent act of omission or commission on its part or on the part of its employees or subcontractors, including, but not limited to, sidewalks, curbing, sodding, pipes conduits, sewers, buildings, fences, bridges, retaining walls, tanks, power lines, levees or any other building or property whatsoever to a like condition as existed prior to such damage or injury.
- 16.03 In case of failure on the part of the Contractor to restore such property or make good such damage, the Owner may upon forty-eight (48) hours' notice proceed to repair or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any monies due or which may become due under its Contract.
- 16.04 Contractor agrees to protect, defend, indemnify, save, and hold harmless St. Tammany Parish Government, its elected and appointed officials, departments, agencies, boards and commissions, their officers, agents servants, employees, including volunteers, from and against any and all claims, demands, expense and liability arising out of injury or death to any person or the damage, loss or destruction of any property to the extent caused by any negligent act or omission or willful misconduct of Contractor, its agents, servants, employees, and subcontractors, or any and all costs, expense and/or attorney fees incurred by St. Tammany Parish Government as a result of any claim, demands, and/or causes of

action that results from the negligent performance or non-performance by Contractor, its agents, servants, employees, and subcontractors of this contract. Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demand, or suit at its sole expense and agrees to bear all other costs and expenses related thereto caused by any negligent act or omission or willful misconduct of Contractor, its agents, servants, employees, and subcontractors.

- 16.05 As to any and all claims against Owner, its agents, assigns, representatives or employees by any employee of Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts as may be liable, the indemnification obligation under Paragraph 16.04 shall not be limited in any way or by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.
- 16.06 No road shall be closed by the Contractor to the public except by written permission of the Owner. If so closed, the Contractor shall maintain traffic over, through and around the Work included in his Contract, with the maximum practical convenience, for the full twenty-four hours of each day of the Contract, whether or not Work has ceased temporarily. The Contractor shall notify the Owner at the earliest possible date after the Contract has been executed and, in any case, before commencement of any construction that might in any way inconvenience or endanger traffic, in order that necessary and suitable arrangements may be determined. Any and all security, maintenance, labor or costs associated with traffic control herein shall be at the sole expense of Contractor. This expense shall be paid directly by the Contractor. This expense shall not be considered as a change order nor shall it allow the Contractor any additional cost reimbursement whatsoever. All traffic deviations herein shall be coordinated with the appropriate law enforcement officials of this Parish.
- 16.07 The convenience of the general public and residents along the Works shall be provided for in a reasonable, adequate and satisfactory manner. Where existing roads are not available as detours, and unless otherwise provided, all traffic shall be permitted to pass through the Work. In all such cases, the public shall have precedence over Contractor's vehicles insofar as the traveling public's vehicles shall not be unduly delayed for the convenience of the Contractor. In order that all unnecessary delay to the traveling public may be avoided, the Contractor shall provide and station competent flagmen whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the Work. Any and all security, maintenance, labor or costs associated with traffic control herein shall be at the sole expense of Contractor. This expense shall be paid directly by the Contractor. This expense shall not be considered as a change order nor shall it allow the Contractor any additional cost reimbursement whatsoever. All traffic deviations herein shall be coordinated with the appropriate law enforcement officials of this Parish.
- 16.08 The Contractor shall arrange its Work so that no undue or prolonged blocking of business establishments will occur.
- 16.09 Material and equipment stored on the right of way or work site shall be so placed and the Work at times shall be so conducted as to ensure minimum danger and obstruction to the traveling public.
- 16.10 During grading operations when traffic is being permitted to pass through construction, the Contractor shall provide a smooth, even surface that will provide a satisfactory passageway for use of traffic. The road bed shall be sprinkled with water if necessary to prevent a dust nuisance, provided the dust nuisance is a result of the Work.
- 16.11 Fire hydrants shall be accessible at all times to the Fire Department. No material or other obstructions shall be placed closer to a fire hydrant than permitted by ordinances, rules or regulations or within fifteen (15) feet of a fire hydrant, in the absence of such ordinance, rules or regulations.
- 16.12 The Contractor shall not, without the written permission of the Owner, do Work for a resident or property owner abutting the Work at the time that this Work is in progress.
- 16.13 No Work of any character shall be commenced on railroad right-of-way until the Railroad Company has issued a permit to the Owner and has been duly notified by the Contractor in

writing (with a copy forwarded to the Owner) of the date it proposes to begin Work, and until an authorized representative of the Railroad Company is present, unless the Railroad Company waives such requirements. All Work performed by the Contractor within the right-of-way limits of the railroad shall be subject to the inspection and approval of the chief engineer of the Railroad Company or its authorized representative. Any precautions considered necessary by said chief engineer to safeguard the property, equipment, employees and passengers of the Railroad Company shall be taken by the Contractor without extra compensation. The Contractor shall, without extra compensation, take such precautions and erect and maintain such tell-tale or warning devices as the Railroad Company considers necessary to safeguard the operation of its trains. The temporary vertical and horizontal clearance specified by the chief engineer of the Railroad Company in approving these shall be maintained at all times. No steel, brick, pipe or any loose material shall be left on the ground in the immediate vicinity of the railway track. Before any Work is done within Railroad right of way, the Contractor shall provide and pay all costs of any special insurance requirements of the Railroad.

- 16.14 The Contractor, shall, without extra compensation, provide, erect, paint and maintain all necessary barricades. Also, without extra compensation, the Contractor shall provide suitable and sufficient lights, torches, reflectors or other warning or danger signals and signs, provide a sufficient number of watchmen and flagmen and take all the necessary precautions for the protection of the Work and safety of the Public.
- 16.15 The Contractor shall erect warning signs beyond the limits of the Project, in advance of any place on the Project where operations interfere with the use of the road by traffic, including all intermediate points where the new Work crosses or coincides with the existing road. All barricades and obstructions shall be kept well painted and suitable warning signs shall be placed thereon. All barricades and obstructions shall be illuminated at night and all lights or devices for this purpose shall be kept burning from sunset to sunrise.
- 16.16 Whenever traffic is maintained through or over any part of the Project, the Contractor shall clearly mark all traffic hazards. No direct payment will be made for barricades, signs and illumination therefore or for watchmen or flagmen.
- 16.17 The Contractor will be solely and completely responsible for conditions on the job site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Owner to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, or near the construction site.

17.00 SANITARY PROVISIONS

- 17.01 The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of its employees as may be necessary to comply with the rules and regulations of the State Health Agency or of the other authorities having jurisdiction and shall permit no public nuisance.

18.00 RIGHTS OF WAY

- 18.01 The Owner will furnish the Contractor with all necessary rights-of-way for the prosecution of the Work. The rights of way herein referred to shall be taken to mean only permission to use or pass through the locations or space in any street, highway, public or private property in which the Contractor is to prosecute the Work.
- 18.02 It is possible that all lands and rights of way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin its Work upon such land and rights of way as the Owner may have previously acquired. Any delay in furnishing these lands by the Owner can be deemed proper cause for adjustment in the Contract amount and/or in the time of completion.

19.00 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

- 19.01 The Contractor shall not enter upon private property for any purpose without first obtaining permission from the Owner, as well as the private property owner and/or and private property Lessees. The Contractor shall use every precaution necessary for the preservation

of all public and private property, monuments, highway signs, telephone lines, other utilities, etc., along and adjacent to the Work; the Contractor shall use every precaution necessary to prevent damage to pipes, conduits, and other underground structures; and shall protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. The street and highway signs and markers that are to be affected by the Work shall be carefully removed when the Work begins and stored in a manner to keep them clean and dry. The Contractor must obtain all necessary information in regard to existing utilities and shall give notice in writing to the owners or the proper authorities in charge of streets, gas, water, pipes, electric, sewers and other underground structures, including conduits, railways, poles and pole lines, manholes, catch basins, fixtures, appurtenances, and all other property that may be affected by the Contractor's operations, at least forty-eight (48) hours before its operations will affect such property. The Contractor shall not hinder or interfere with any person in the protection of such Work or with the operation of utilities at any time. When property, the operation of railways, or other public utilities are endangered, the Contractor shall at its own expense, maintain flagmen or watchmen and any other necessary precautions to avoid interruption of service or damage to life or property, and it shall promptly repair, restore, or make good any injury or damage caused by its negligent operations in an acceptable manner. The Contractor must also obtain all necessary information in regard to the installation of new cables, conduits, and transformers, and make proper provisions and give proper notifications, in order that same can be installed at the proper time without delay to the Contractor or unnecessary inconvenience to the Owner.

19.02 The Contractor shall not remove, cut or destroy trees, shrubs, plants, or grass that are to remain in the streets or those which are privately owned, without the proper authority. Unless otherwise provided in the Special Provisions or the Proposal, the Contractor shall replace and replant all plants, shrubs, grass and restore the grounds back to its original good condition to the satisfaction of the Owner and/or the property owner. The Contractor shall assume the responsibility of replanting and guarantees that plants, shrubs, grass will be watered, fertilized and cultivated until they are in a growing condition. No direct payment will be made for removing and replanting of trees, shrubs, plants or grass unless such items are set forth in the Proposal.

19.03 When or where direct damage or injury is done to public or private property by or on account of any negligent act, omission, neglect or otherwise of the Contractor, it shall make good such damage or injury in an acceptable manner.

20.00 CONTRACTORS RESPONSIBILITY FOR WORK

20.01 Until final acceptance of the Work by the Owner as evidence by approval of the final estimate, the Work shall be in the custody and under the charge and care of the Contractor and it shall take every necessary precaution against injury or damage to any part thereof by the action of the elements or from the non-execution of the Work; unless otherwise provided for elsewhere in the Specifications or Contract. The Contractor shall rebuild, repair, restore and make good, without extra compensation, all injuries or damages to any portion of the Work occasioned by any of the above causes before its completion and acceptance, and shall bear the expenses thereof. In case of suspension of the Work from any cause whatever, the Contractor shall be responsible for all materials and shall properly and securely store same, and if necessary, shall provide suitable shelter from damage and shall erect temporary structures where necessary. If in the exclusive discretion of the Owner, any Work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of its Subcontractors to so protect the Work, such materials shall be removed and replaced at the sole expense of the Contractor. Such amount shall be deducted from any sum due or to be due Contractor.

20.02 The Contractor shall give all notice and comply with all Federal, State, and local laws, ordinances, and regulations in any manner affecting the conduct of the Work, and all such orders and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the Work, and shall indemnify and hold harmless the Owner against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order or decree, whether by itself, its employees or Subcontractors.

21.00 TESTS AND INSPECTIONS CORRECTION & REMOVAL OF DEFECTIVE WORK

- 21.01 Contractor warrants and guarantees to Owner that all materials and equipment will be new unless otherwise specified and that all Work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents. All unsatisfactory Work, all faulty or Defective Work and all Work not conforming to the requirements of the Contract Documents at the time of acceptance shall be considered Defective. Prompt and reasonable notice of all defects shall be given to the Contractor.
- 21.02 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested or approved by some public body, Contractor shall assume full responsibility therefor, pay all costs in connection therewith and furnish Owner the required certificates of inspection, testing or approval. All other inspections, tests and approval required by the Contract Documents shall be performed by organizations acceptable to Owner and Contractor and the costs thereof shall be borne by the Contractor unless otherwise specified.
- 21.03 Contractor shall give Owner timely notice of readiness of the Work for all inspections, tests or approvals. If any such Work required to be inspected, tested or approved is covered without written approval of Owner, it must, if requested by Owner, be uncovered for observation, and such uncovering shall be at Contractor's expense unless Contractor has given Owner timely notice of its intention to cover such Work and Owner has not acted with reasonable promptness in response to such notice.
- 21.04 Neither observations by Owner nor inspections, tests or approvals shall relieve Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Document.
- 21.05 Owner and its representatives will at reasonable times have access to the Work. Contractor shall provide proper and safe facilities for such access and observation of the Work and also for any inspection or testing thereof by others.
- 21.06 If any Work is covered contrary to the written request of Owner, it must, be uncovered for Owner's observation and replaced at Contractor's expense. If any Work has been covered which Owner has not specifically requested to observe prior to its being covered, or if Owner considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, at Owner's request, shall uncover, expose or otherwise make available for observations, inspections or testing as Owner may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is Defective, Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such Work is not found to be Defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.
- 21.07 If the Work is Defective, or Contractor fails to supply sufficient skilled workmen or suitable materials or equipment, or if the Contractor fails to make prompt payments to Subcontractors or for labor, materials or equipment, Owner may order Contractor to stop the Work, or any portion thereof, until the cause of such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor or any other party.
- 21.08 Prior to approval of final payment, Contractor shall promptly, without cost to Owner and as specified by Owner, either correct any Defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not correct such Defective Work or remove and replace such rejected Work within a reasonable time, all as specified in a written notice from Owner, Owner may have the deficiency corrected or the rejected Work removed and replaced. All direct or indirect costs of such correction or removal and replacement including compensation for additional professional services shall be paid by Contractor, and an appropriate deductive Change Order shall be issued. Contractor shall also bear the expense of making good all Work of others destroyed or damaged by its correction, removal or replacement of its Defective Work.

- 21.09 If, after the approval of final payment and prior to the expiration of one year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be Defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such Defective Work or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instructions, Owner may have the Defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by Contractor. The Contractor agrees to pay a reasonable attorney fee and other reasonable attendant costs of the Owner in the event it becomes necessary for the Owner to employ an attorney to enforce this section or to protect itself against suit over the Contractor's responsibilities. Attorney fees shall be at the prevailing hourly rate of the private sector. The attorney fee hourly rate shall not be less than \$175.00 per hour. All attorney fees collected shall be paid to the operating budget of the Office of the Parish President.
- 21.10 If, instead of requiring correction or removal and replacement of Defective Work, Owner (and prior to approval of final payment) prefers to accept it, the Owner may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price, or, if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by Contractor to Owner.
- 21.11 If Contractor should fail to progress the Work in accordance with the Contract Documents, including any requirements of the Progress Schedule, Owner, after seven (7) days written Notice to Contractor, may, without prejudice to any other remedy Owner may have, make good such deficiencies and the cost thereof including compensation for additional professional services shall be charged against Contractor. In such cases, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents including an appropriate reduction in the Contract Price. If the payments then or thereafter due Contractor are not sufficient to cover such amount, Contractor shall pay the difference to Owner.
- 21.12 The Owner may appoint representatives to make periodic visits to the site and observe the progress and quality of the executed Work. These representatives shall be governed by the same restrictions placed on the Owner by these Specifications. The governing body of the Federal, State or local government exercising authority in the area of the Work may appoint representatives to observe the progress and quality of the Work. Contractor shall cooperate with and assist these representatives in the performance of their duties.
- 21.13 The Contractor shall be responsible for the faithful execution of its Contract and the presence or absence of the Owner's or Government's Representative is in no way or manner to be presumed or assumed to relieve in any degree the responsibility or obligation of the Contractor.
- 21.14 The Contractor shall notify the Owner and the Governmental Agency having jurisdiction as to the exact time at which it is proposed to begin Work so the Owner may provide for inspection of all materials, foundations, excavations, equipment, etc., and all or any part of the Work and to the preparation or manufacture of materials to be used whether within the limits of the Work or at any other place.
- 21.15 The Owner or its representatives shall have free access to all parts of the Work and to all places where any part of the materials to be used are procured, manufactured or prepared. The Contractor shall furnish the Owner all information relating to the Work and the material therefor, which may be deemed necessary or pertinent, and with such samples of materials as may be required. The Contractor, at its own expense, shall supply such labor and assistance as may be necessary in the handling of materials for proper inspection or for inspection of any Work done by it.
- 21.16 No verbal instructions given to the Contractor by the Owner, Project Representative or any of their agents shall change or modify the written Contract. Contractors shall make no claims for additional payments or time based upon verbal instructions.

22.00 SUBSURFACE CONDITIONS

- 22.01 It is understood and agreed that the Contractor is familiar with the subsurface conditions that will be encountered and its price bid for the Work includes all of the costs involved for Work in these conditions and it is furthermore agreed that it has taken into consideration, prior to its Bid and acceptance by Owner, all of the subsurface conditions normal or unusual that might be encountered in the location of the Work.
- 22.02 Should the Contractor encounter during the progress of the Work subsurface conditions at the site materially differing from those shown on the Drawings or indicated in the Specifications, the attention of the Owner shall be directed to such conditions before the conditions are disturbed. If the Owner finds that the conditions materially differ from those shown on the Drawings or indicated in the Specifications, it shall at once make such changes in the Drawings or Specifications as it may find necessary, and any increase or decrease in cost or extension of time resulting from such changes shall be adjusted in the same manner as provided for changes for Extra Work. The Contractor shall submit breakdowns of all costs in a manner as instructed and approved by the Owner.

23.00 REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

- 23.01 Bidder shall thoroughly examine the site of the Work and shall include in its Bid the cost of removing all structures and obstructions in the way of the Work.
- 23.02 The Contractor shall remove any existing structures or part of structures, fence, building or other encumbrances or obstructions that interfere in any way with the Work. Compensations for the removal of any structure shall be made only if the item(s) to be removed was/were listed as pay item(s) on the Proposal.
- 23.03 If called for in the Special Conditions, all privately and publicly owned materials and structures removed shall be salvaged without damage and shall be piled neatly and in an acceptable manner upon the premises if it belongs to an abutting property owner, otherwise at accessible points along the improvements. Materials in structures which is the property of the Owner or property of any public body, private body or individual which is fit for use elsewhere, shall remain property of the original Owner. It shall be carefully removed without damage, in sections which may be readily transported; same shall be stored on or beyond the right of way. The Contractor will be held responsible for the care and preservation for a period of ten (10) days following the day the last or final portion of the materials stored at a particular location are placed thereon. When privately owned materials are stored beyond the right of way, the Contractor will be held responsible for such care and preservation for a period of ten (10) days responsibility period for care and preservation of the materials begins. The Contractor must furnish the Owner with evidence satisfactory that the proper owner of the materials has been duly notified by the Contractor that the said owner must assume responsibility for its materials on the date following the Contractor's ten (10) day responsibility.

24.00 INSURANCE

- 24.01 Contractor shall secure and maintain at its expense such insurance that will protect it and the Parish from claims for injuries to persons or damages to property which may arise from or in connection with the performance of Services or Work hereunder by the Contractor, his agents, representatives, employees, and/or subcontractors. The cost of such insurance shall be included in Contractor's bid.
- 24.02 The Contractor shall not commence work until it has obtained all insurance as required for the Parish Project. If the Contractor fails to furnish the Parish with the insurance protection required and begins work without first furnishing Parish with a currently dated certificate of insurance, the Parish has the right to obtain the insurance protection required and deduct the cost of insurance from the first payment due the Contractor. Further deductions are permitted from future payments as are needed to protect the interests of the Parish including, but not limited to, renewals of all policies.
- 24.03 Payment of Premiums: The insurance companies issuing the policy or policies shall have no recourse against the Parish of St. Tammany for payment of any premiums or for assessments under any form of policy.

- 24.04 Deductibles: Any and all deductibles in the described insurance policies shall be assumed by and be at the sole risk of the Contractor.
- 24.05 Authorization of Insurance Company(ies) and Rating: All insurance companies must be authorized to do business in the State of Louisiana and shall have an A.M. Best rating of no less than A-, Category VII.
- 24.06 Policy coverages and limits must be evidenced by Certificates of Insurance issued by Contractor's carrier to the Parish and shall reflect:

Date of Issue: Certificate must have current date.

Named Insured: The legal name of Contractor under contract with the Parish and its principal place of business shall be shown as the named insured on all Certificates of Liability Insurance.

Name of Certificate Holder: St. Tammany Parish Government, Office of Risk Management, P. O. Box 628, Covington, LA 70434

Project Description: A brief project description, including Project Name, Project Number and/or Contract Number, and Location.

Endorsements and Certificate Reference: All policies must be endorsed to provide, and certificates of insurance must evidence the following:

Waiver of Subrogation: The Contractor's insurers will have no right of recovery or subrogation against the Parish of St. Tammany, it being the intention of the parties that all insurance policy(ies) so affected shall protect both parties and be the primary coverage for any and all losses covered by the below described insurance. *Policy endorsements required for all coverages.*

Additional Insured: The Parish of St. Tammany shall be named as additional named insured with respect to general liability, marine liability, pollution/environmental liability, automobile liability and excess liability coverages. *Policy endorsements required.*

Hold Harmless: Contractor's liability insurers shall evidence their cognizance of the Hold Harmless and Indemnification in favor of St. Tammany Parish Government by referencing same on the face of the Certificate(s) of Insurance.

Cancellation Notice: Producer shall provide thirty (30) days prior written notice to the Parish of policy cancellation or substantive policy change.

- 24.07 The types of insurance coverage the Contractor is required to obtain and maintain throughout the duration of the Contract, include, but is not limited to:
1. Commercial General Liability insurance with a Combined Single Limit for bodily injury and property damage of at least \$1,000,000 per Occurrence/\$2,000,000 General Aggregate/Products-Completed Operations Per Project. The insurance shall provide for and the certificate(s) of insurance shall indicate the following coverages:
 - a) Premises - operations;
 - b) Broad form contractual liability;
 - c) Products and completed operations;
 - d) Personal Injury;
 - e) Broad form property damage;
 - f) Explosion and collapse.
 2. Marine Liability/Protection and Indemnity insurance is required for any and all vessel and/or marine operations in the minimum limits of \$1,000,000 per occurrence/\$2,000,000 per project general aggregate. The coverage shall include,

but is not limited to, the basic coverages found in the Commercial General Liability insurance and coverage for third party liability.

3. Contractors' Pollution Liability and Environmental Liability insurance in the minimum amount of \$1,000,000 per occurrence, \$2,000,000 general aggregate and include coverage for full contractual liability and for all such environmental and/or hazardous waste exposures affected by this project.
 4. Business Automobile Liability insurance with a Combined Single Limit of \$1,000,000 per Occurrence for bodily injury and property damage, and shall include coverage for the following:
 - a) Any automobiles;
 - b) Owned automobiles;
 - c) Hired automobiles;
 - d) Non-owned automobiles;
 - e) Uninsured motorist.
 5. Workers' Compensation/Employers Liability insurance: worker's compensation insurance coverage and limits as statutorily required; Employers' Liability Coverage shall be not less than \$1,000,000 each accident, \$1,000,000 each disease, \$1,000,000 disease policy aggregate, except when projects include exposures covered under the United States Longshoremen and Harbor Workers Act, Maritime and/or Jones Act and/or Maritime Employers Liability (MEL) limits shall be not less than \$1,000,000/\$1,000,000/\$1,000,000. *Coverage for owners, officers and/or partners shall be included in the policy and a statement of such shall be made by the insuring producer on the face of the certificate.*
 6. Owners Protective Liability (OPL) (formerly Owners and Contractors Protective Liability (OCP) Insurance) shall be furnished by the Contractor naming St. Tammany Parish Government as the Named Insured and shall provide coverage in the minimum amount of \$1,000,000 combined single limit (CSL) each occurrence, \$2,000,000 aggregate. Any project valued in excess of \$3,000,000 shall be set by the Office of Risk Management. The policy and all endorsements shall be addressed to St. Tammany Parish Government, Office of Risk Management, P. O. Box 628, Covington, LA 70434.
 7. Builder's Risk Insurance shall be required on buildings, sewage treatment plants and drainage pumping stations, and shall be written on an "all-risk" or equivalent policy form in the amount of the full value of the initial Contract sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising 100% total value for the entire project including foundations. Deductibles should not exceed \$5,000 and Contractor shall be responsible for any and all policy deductibles. This insurance shall cover portions of the work stored off the site, and also portions of the work in transit. In addition, Installation Floater Insurance, on an "all-risk" form, will be carried on all pumps, motors, machinery and equipment on the site or installed. Both the Builder's Risk Insurance and the Installation Floater Insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors and shall terminate only when the Project has been accepted. St. Tammany Parish Government, P. O. Box 628, Covington, LA 70434 shall be the first named insured on the Builder's Risk and Installation Floater Insurance.
 8. Professional Liability (errors and omissions) insurance in the sum of at least One Million Dollars (\$1,000,000) per claim with Two Million Dollars (\$2,000,000) annual aggregate.
 9. An umbrella policy or excess policy may be required and/or allowed to meet minimum coverage limits, subject to the review and approval by St. Tammany Parish Government, Office of Risk Management.
- 24.08 All policies of insurance shall meet the requirements of the Parish of St. Tammany prior to the commencing of any work. The Parish of St. Tammany has the right, but not the duty, to approve all insurance policies prior to commencing of any work. If at any time, it becomes known that any of the said policies shall be or becomes unsatisfactory to the

Parish of St. Tammany as to form or substance; or if a company issuing any such policy shall be or become unsatisfactory to the Parish of St. Tammany, the Contractor shall promptly obtain a new policy, timely submit same to the Parish of St. Tammany for approval and submit a certificate thereof as provided above. The Parish agrees to not unreasonably withhold approval of any insurance carrier selected by Contractor. In the event that Parish cannot agree or otherwise authorize said carrier, Contractor shall have the option of selecting and submitting new insurance carrier within 30 days of said notice by the Parish. In the event that the second submission is insufficient or is not approved, then the Parish shall have the unilateral opportunity to thereafter select a responsive and responsible insurance carrier all at the cost of Contractor and thereafter deduct from Contractor's fee the cost of such insurance.

- 24.09 Upon failure of Contractor to furnish, deliver and/or maintain such insurance as above provided, the contract, at the election of the Parish of St. Tammany, may be forthwith declared suspended, discontinued or terminated. Failure of the Contractor to maintain insurance shall not relieve the Contractor from any liability under the contract, nor shall the insurance requirements be construed to conflict with the obligation of the Contractor concerning indemnification.
- 24.10 Contractor shall maintain a current copy of all annual insurance policies and provide same to the Parish of St. Tammany as may be reasonably requested.
- 24.11 It shall be the responsibility of Contractor to require that these insurance requirements are met by all contractors and sub-contractors performing work for and on behalf of Contractor. Contractor shall further ensure the Parish is named as additional insured on all insurance policies provided by said contractor and/or sub-contractor throughout the duration of the project, and that renewal certificates for any policies expiring prior to the Parish's final acceptance of the project shall be furnished to St. Tammany Parish Government, Department of Legal, Office of Risk Management, without prompting.

NOTICE:

These are only an indication of the coverages that are generally required. Additional coverages and/or limits may be required for projects identified as having additional risks or exposures. Please note that some requirements listed may not necessarily apply to your specific services. St. Tammany Parish Government reserves the right to remove, replace, make additions to and/or modify any and all of the insurance requirement language upon review of the final scope of services presented to Office of Risk Management prior to execution of a contract for services.

For inquiries regarding insurance requirements, please contact:

**St. Tammany Parish Government
Office of Risk Management
P. O. Box 628
Covington, LA 70434
Telephone: 985-898-5226
Email: riskman@stpgov.org**

- 24.12 Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's Responsibility for payment of damages resulting from its operations under this Contract.

25.00 OWNER'S RIGHT TO OCCUPANCY

- 25.01 The Owner shall have the right to use, at any time, any and all portions of the Work that have reached such a stage of completion as to permit such occupancy, provided such occupancy does not hamper the Contractor or prevent its efficient completion of the Contract or be construed as constituting an acceptance of any part of the Work.
- 25.02 The Owner shall have the right to start the construction of houses, structures or any other building concurrent with the Contractor's Work.

26.00 SURVEY HORIZONTAL AND VERTICAL CONTROL

- 26.01 The Owner shall provide surveys for construction to establish reference points which in its judgment are necessary to enable Contractor to layout and proceed with its Work. Contractor shall be responsible for surveying and laying out the Work and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of the Owner. Contractor shall report to Owner whenever any reference point is lost or destroyed and the Owner shall decide if the reference point shall be replaced by its or the Contractor's forces.
- 26.02 The Contractor shall establish lines and grades with its own forces in sufficient number and location for the proper execution of the Work.
- 26.03 If the Contractor, during the construction, damages the established property corners and/or other markers and thereafter requests the Owner to re-stake same in order to complete the project, this expense will be borne solely by the Contractor.

27.00 TERMINATION OF THE CONTRACT, OWNER'S AND CONTRACTORS RIGHT TO STOP WORK.

- 27.01 If the Contractor should be adjudged bankrupt (voluntarily or involuntarily) or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or if it should persistently or repeatedly refuse or should fail (except in cases for which extension of time is provided) to supply enough properly skilled workmen or proper materials, or if it should fail to make prompt payment to Subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon the certificate of the Owner that, in its unilateral discretion and judgment, believes sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor ten (10) calendar days written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools and appliances thereon and finish the Work by whatever method the Owner may deem expedient.
- 27.02 Failure of the Contractor to start the Work within the time limit specified herein or substantial evidence that the progress being made by the Contractor is sufficient to complete the Work within the specified time shall be grounds for termination of the Contract by the Owner.
- 27.03 Before the Contract is terminated, the Contractor and its surety will first be notified in writing by the Owner of the conditions which make termination of the Contract imminent. When after ten (10) calendar days' notice is given and if satisfactory effort has not been made by the Contractor or its surety to correct the conditions, the Owner may declare, in its exclusive discretion, that the Contract is terminated and so notify the Contractor and its surety accordingly.
- 27.04 Upon receipt of notice from the Owner that the Contract has been terminated, the Contractor shall immediately discontinue all operations. The Owner may then proceed with the Work in any lawful manner that it may elect until Work is finally completed.
- 27.05 The exclusive right is reserved to the Owner to take possession of any machinery, implements, tools or materials of any description that shall be found upon the Work, to account for said equipment and materials, and to use same to complete the Project. When the Work is finally completed, the total cost of same will be computed. If the total cost is less than the Contract Price, the difference will not be paid to the Contractor or its surety.
- 27.06 In case of termination, all expenses incident to ascertaining and collecting losses under the Bond, including legal services, shall be assessed against the Bond.
- 27.07 If the Work should be stopped under any order of any court or public authority for period of sixty (60) calendar days, through no act or fault of the Contractor or anyone employed by it, or if the Owner shall fail to pay the Contractor within a reasonable time any sum certified by the Owner, then the Contractor may, upon ten (10) calendar days written notice to the Owner, stop Work or terminate this Contract and recover from the Owner payment for all Work properly and professionally executed in a workmanlike manner. This loss

specifically includes actual cost of materials and equipment, together with all wages inclusive of all federal, state, and local tax obligations. This loss specifically includes reimbursement of all insurances on a pro-rata basis from the date of termination to date of policy period. This loss excludes and specifically does not include recovery by the Contractor for lost profit, indirect & direct expenses, overhead, and the like.

28.00 PAYMENTS TO THE CONTRACTOR

- 28.01 Monthly certificates for partial payment, in a form approved by the Owner, shall be transmitted to the Owner upon receipt from the Contractor and acceptance by the Owner. In accordance with LSA-R.S. 38:2248(A), when the Contract Price is less than five hundred thousand dollars, these certificates shall be equal to ninety percent (90%) of both the Work performed and materials stored at the site; and when the Contract Price is five hundred thousand dollars or more, these certificates shall be equal to ninety-five percent (95%) of both the Work performed and materials stored at the site. Partial payment certificates shall include only Work, materials and equipment that are included in official Work Order and which meet the requirements of plans, Specifications and Contract Documents. These monthly estimates shall show the amount of the original estimate for each item, the amount due on each item, the gross total, the retained percentage, the amount previously paid and the net amount of payment due.
- 28.02 After final completion and acceptance by the Owner of the entire Work, and when the Contract Price is less than five hundred thousand dollars, the Owner shall issue to the Contractor Certificate of Payment in sum sufficient to increase total payments to ninety percent (90%) of the Contract Price. After final completion and acceptance by the Owner of the entire Work, and when the Contract Price is five hundred thousand dollars or more, the Owner shall issue to the Contractor Certificate of Payment in sum sufficient to increase total payments to ninety-five percent (95%) of the Contract Price.
- 28.03 When the Contract Price is less than five hundred thousand dollars, the final payment certificate of the remaining ten percent (10%) of the Contract Price, minus any deduction for deficient or Defective Work or other applicable deductions, will be issued by the Owner forty-five (45) days after filing acceptance in the Mortgage Office of the Parish and a Clear Liens and Privilege Certificate has been secured. When the Contract Price is five hundred thousand dollars or more, the final payment certificate of the remaining five percent (5%) of the Contract Price, minus any deduction for deficient or Defective Work or other applicable deductions, will be issued by the Owner forty-five (45) days after filing acceptance in the Mortgage Office of the Parish and a Clear Liens and Privilege Certificate has been secured. Before issuance of the final payment certificate, the Contractor shall deposit with the Owner a certificate from the Clerk of Court and Ex-Officio Recorder of Mortgages from the Parish in which the Work is performed to the effect that no liens have been registered against Contract Work.
- 28.04 When, in the opinion of the Contractor, the Work provided for and contemplated by the Contract Documents has been substantially completed, the Contractor shall notify the Owner in writing that the Work is substantially complete and request a final inspection. The Owner shall proceed to perform such final inspection accompanied by the Contractor. Any and all Work found by this inspection to be Defective or otherwise not in accordance with the plans and Specifications shall be corrected to the entire satisfaction of the Owner and at the sole expense of the Contractor. If the Contract is found to be incomplete in any of its details, the Contractor shall at once remedy such defects, and payments shall be withheld and formal acceptance delayed until such Work has been satisfactorily completed.
- 28.05 If payment is requested on the basis of materials and equipment not incorporated in the Work, but delivered and suitably stored and protected from damage and theft at the site, the Request for Payment shall also be accompanied by such data, satisfactory to the Owner, as will establish Owner's title to the material and equipment and protect its interest therein, including applicable insurance.
- 28.06 Each subsequent Request for Payment shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied to discharge in full all of Contractor's obligations reflected in prior Request for Payment.
- 28.07 Each subsequent request for payment shall include an affidavit by Contractor that Contractor, all subcontractors, agents, material suppliers and all other persons supplying

material to the project upon which State of Louisiana and/or St. Tammany sales taxes are lawfully due have paid these taxes and that all supplies and materials purchased for this project and for which Contractor has been paid have had all lawfully due State and/or St. Tammany sales taxes paid.

- 28.08 The Bid Proposal, unless otherwise modified in writing, and the Contract constitute the complete Project. The Contract Prices constitute the total compensation payable to Contractor and the cost of all of the Work and materials, taxes, permits and incidentals must be included into the Bid submitted by the Contractor and included into those items listed on the Proposal.
- 28.09 Any additional supporting data required by the Owner in order to substantiate Contractor's request for payment shall be furnished by Contractor at no cost to the Owner.
- 28.10 Owner may withhold from payment to Contractor as may be necessary to protect itself from loss on account of:
- (1) Defective and/or inferior work;
 - (2) Damage to the property of Owner or others caused by Contractor;
 - (3) Failure by Contractor to make payments properly to sub-contractors or to pay for labor, materials or equipment used on this project;
 - (4) Failure by Contractor to pay taxes due on materials used on this project;
 - (5) Damage by Contractor to another Contractor;
 - (6) Insolvency;
 - (7) Bankruptcy, voluntary or involuntary;
 - (8) Revocation of corporate status;
 - (9) Failure to follow corporate formalities;
 - (10) Unprofessional activities;
 - (11) Unworkmanlike performance;
 - (12) Fraud and/or misrepresentation of any kind.

29.00 ACCEPTANCE AND FINAL PAYMENT(S)

- 29.01 Upon receipt of written notice from Contractor that the work is substantially complete and usable by Owner or the Public in suitable manner, the Owner and the Contractor shall jointly inspect the work.
- 29.02 If the Owner by inspection determines that the work is not substantially complete in a suitable manner for use by the Owner or the Public, then the Owner shall so notify the Contractor in writing stating such reason. All reasons need not be disclosed unless actually known. The Owner is afforded an opportunity to amend said notices as are reasonably possible.
- 29.03 If the Owner by its inspection determines that the work is substantially complete, it shall prepare a list of all items not satisfactorily completed and shall notify the Contractor and Owner in writing that the work is substantially complete and subject to satisfactory resolution of those items on the list (punch list). Punch lists may be amended from time to time by Owner in the event that additional deficiencies are discovered. In accordance with LSA-R.S. 38:2248(B), any punch list generated during a construction project shall include the cost estimates for the particular items of work the design professional has developed based on the mobilization, labor, material, and equipment costs of correcting each punch list item. The design professional shall retain his working papers used to determine the punch list items cost estimates should the matter be disputed later. The contract agency shall not withhold from payment more than the value of the punch list. Punch list items completed shall be paid upon the expiration of the forty-five (45) day lien period. The provisions of this Section shall not be subject to waiver.
- 29.04 Upon determination of substantial completeness with the punch list, the Contract Time is interrupted and the Contractor is given a reasonable time not to exceed thirty (30) consecutive calendar days to effect final completion by correcting or completing all of those items listed on the punch list. If the items on the punch list are not completed in a satisfactory manner within the thirty day period, then the Contract Time will begin to run again and will include for purposes of determining liquidated damages the thirty day period the grace period being withdrawn.

29.05 Upon receipt by Owner of written determination that all work embraced by the contract has been completed in a satisfactory manner, the Owner shall provide a written acceptance to Contractor who shall record Owner's written acceptance with the recorder of Mortgages, St. Tammany Parish. The Contractor shall properly prepare, submit and pay for all costs associated with said Acceptance. The Contractor is also responsible for preparation, re-submission and payment of any and all updated certificates.

29.06 Retainage monies, minus those funds deducted in accordance to the requirements of this agreement including but not limited to Paragraph 28.10, shall be due Contractor not earlier than forty-six (46) calendar days after recordation of certificate of Owner's acceptance provided the following:

- (1) Contractor shall prepare, secure, pay for and submit clear lien and privilege certificate, signed and sealed by Clerk of Court or Recorder of Mortgages, Parish of St. Tammany and dated at least forty-six (46) days after recordation of certificate of acceptance;
- (2) Ensure that the official representative of the Owner has accepted as per LSA-R.S. 38:2241.1, *et seq.* and that all following sub-sections have been properly satisfied as per law;
- (3) Ensure that all signatures are affixed and that there exists the requisite authority for all signatures;
- (4) Ensure accurate and proper legal descriptions;
- (5) Properly identify all parties and/or signatories;
- (6) Properly identify all mailing addresses;
- (7) Correctly set for the amount of the contract, together with all change orders;
- (8) Set out a brief description of the work performed;
- (9) Reference to any previously recorded contract, lien or judgment inscription that may affect the property;
- (10) Certification that substantial completion has occurred, together with any applicable date(s);
- (11) Certification that no party is in default and/or that the project has been abandoned.

29.07 After securing the clear lien and privilege certificate the Contractor shall prepare its final application for payment and submit to Owner. The Owner shall approve application for payment, or state its objections in writing and forward to Contractor for resolution.

30.00 NOTICE AND SERVICE THEREOF

30.01 Any Notice to Contractor from the Owner relative to any part of this Contract shall be in writing and shall be considered delivered and the service thereof completed when said notice is posted; by certified mail, return receipt requested to the said Contractor at its last given address, or delivered in person to said Contractor or its authorized representative on the Work.

31.00 INTENTION OF THESE GENERAL CONDITIONS

31.01 These General Conditions shall be applicable to all contracts entered into by and between the Owner and Contractors, except as may be altered or amended with the consent of the Owner, and/or provided for in the Special Conditions of each contract. Contractor shall be presumed to have full knowledge of these General Conditions which shall be applicable to all contracts containing these General Conditions, whether Contractor has obtained a copy thereof or not.

32.00 SEVERABILITY

32.01 If any one or more or part of any of the provisions contained herein and/or in the Specifications and Contract for the Work shall for any reason be held invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this Agreement or attachment, but it shall be construed as if such invalid, illegal, or unenforceable provision or part of a provision had never been contained herein.

32.02 **CHANGING THESE CONDITIONS:** Owner reserves the right to change or modify these General Conditions as it deems best, or as required by law. The General Conditions may also be modified for a particular project by the use of Special Conditions prior to the issuance of the Advertisement for Bid. However, once an advertisement for bid is made for any specific project, any changes to the General Conditions as they affect that specific project must be made in writing and issued via an addendum in accordance with State Law.

33.00 LAW OF THE STATE OF LOUISIANA

33.01 The Contract Documents shall be governed by the Law of the State of Louisiana.

33.02 The Contractor agrees to pay reasonable attorney's fees and other reasonable attendant costs, in the event that it becomes necessary for the Owner to employ an attorney in order to enforce compliance with or any remedy relating to any covenants, obligations, or conditions imposed upon the Contractor by this Agreement. Attorney fees shall be based upon the prevailing hourly rate of attorney rates in the private sector. In no case shall the hourly rate be less than \$175.00 per hour. All attorney fees collected shall be paid the operating budget of the Office of the Parish President.

33.03 The jurisdiction and venue provisions shall apply to all contractors, sureties, and subcontractors. The 22nd Judicial District for the Parish of St. Tammany shall be the court of exclusive jurisdiction and venue for any dispute arising from these General Conditions and/or any contract executed in conjunction with these General Conditions. All parties specifically waive any rights they have or may have for removal of any disputes to Federal Court, or transfers to different State District Court.

33.04 Contractor warrants that it has and/or had received a copy of these General Conditions at all times material hereto; Contractor further agrees that it has read and fully and completely understands each and every condition herein.

33.05 The property description will be more fully set out by an attached exhibit.

33.06 The Contractor warrants that it has the requisite authority to sign and enter this agreement.

33.07 It is specifically understood and agreed that in the event Contractor seeks contribution from the Parish or pursues its legal remedies for any alleged breach of this agreement by the Parish, then the following list of damages **SHALL NOT BE RECOVERABLE BY CONTRACTOR**. This list includes, but is not limited to:

1. indirect costs and/or expenses;
2. direct costs and/or expenses;
3. time-related costs and/or expenses;
4. award of extra days;
5. costs of salaries or other compensation of Contractor's personnel at Contractor's principal office and branch offices;
6. expenses of Contractor's principal, branch and/or field offices;
7. any part of Contractor's capital expenses, including any interest on Contractor's capital employed for the work;
8. any other charges related to change orders;
9. overhead and general expenses of any kind or the cost of any item not specifically and expressly included in Cost of Work.

33.08 DEFAULT AND WAIVERS

It is understood that time is of the essence. It is specifically understood between the parties

that Contractor waives any and all notice to be placed in default by the Owner. This subsection shall supersede and prime any other subsection herein above that is in conflict. The Owner specifically reserves its right and specifically does not waive the requirement to be placed in default by the Contractor as per law.

- 33.09 St. Tammany Parish Government contracts to be awarded are dependent on the available funding and/or approval by members designated and/or acknowledged by St. Tammany Parish Government. At any time St. Tammany Parish Government reserves the right to cancel the award of a contract if either or both of these factors is deficient.
- 33.10 It is the Parish's policy to provide a method to protest exclusion from a competition or from the award of a contract, or to challenge an alleged solicitation irregularity. It is always better to seek a resolution within the Parish system before resorting to outside agencies and/or litigation to resolve differences. All protests must be made in writing, and shall be concise and logically presented to facilitate review by the Parish. The written protest shall include:
1. The protester's name, address, and fax and telephone numbers and the solicitation, bid, or contract number;
 2. A detailed statement of its legal and factual grounds, including a description of the resulting prejudice to the protester;
 3. Copies of relevant documents;
 4. All information establishing that the protester is an interested party and that the protest is timely; and
 5. A request for a ruling by the agency; and a statement of the form of relief requested.

The protest shall be addressed to Director of Procurement, St. Tammany Parish Government, P.O. Box 628, Covington, LA 70434.

The protest review shall be conducted by the Parish Procurement Department.

Only protests from interested parties will be allowed. Protests based on alleged solicitation improprieties that are apparent before bid opening, or the time set for receipt of initial proposals must be filed with and received by the Procurement Department BEFORE those deadlines.

Any other protest shall be filed no later than ten (10) calendar days after the basis of the protest is known, or should have been known (whichever is earlier).

The Parish will use its best efforts to resolve the protest within thirty (30) days of the date that it is received by the Parish. The written response will be sent to the protestor via mail and, fax, if a fax number has been provided by the protestor. The protester can request additional methods of notification.

Last day to submit questions and/or verification on comparable products will be no later than 2:00 pm CST, fourteen (14) working days prior to the opening date of the bid/proposal due date. Further any questions or inquires must be submitted via fax to 985-898-5227, or via email to Procurement@stpgov.org. Any questions or inquires received after the required deadline to submit questions or inquires will not be answered.

Section 13

Technical Specifications

Division 01 – General Requirements

- 01010 Summary of Work
- 01025 Measurement and Payment
- 01041 Project Coordination
- 01043 Job Site Administration
- 01047 Control of Work
- 01050 Site Condition Video Survey
- 01090 Reference Standards
- 01152 Applications for Payment
- 01153 Change Order Procedures
- 01200 Project Meetings
- 01300 Submittals
- 01311 Construction Schedule
- 01370 Schedule of Values
- 01380 Construction Photographs
- 01400 Testing Laboratory
- 01505 Mobilization
- 01515 Temporary Utilities
- 01600 Materials and Equipment
- 01610 Delivery, Storage, and Handling
- 01700 Contract Closeout
- 01710 Cleaning
- 01720 Project Record Documents
- 01730 Operation and Maintenance Data
- 01740 Warranties and Bonds

Division 02 – Sitework

- 02050 Demolition
- 02200 Earthwork
- 02300 Excavation and Backfill
- 02525 Water Wells
- 02580 Pipeline Installation and Testing
- 02720 Storm Sewerage
- 02831 Chain Link Fences and Gates
- 02920 Seeding and Sodding

Division 03 – Concrete

- 03300 Cast-In-Place Concrete

Division 04 – Masonry

- 04200 Unit Masonry

Division 05 – Metals

- 05500 Miscellaneous Metals

Division 06 – Wood, Plastics, and Composites

- 06100 Rough Carpentry

Division 07 – Thermal and Moisture Protection

- 07610 Preformed Metal Roofing
- 07900 Sealants

Division 08 – Doors and Windows

- 08110 Hollow Metal Doors and Frames
- 08410 Aluminum Fixed Glazing Windows
- 08711 Door Hardware
- 08800 Glass and Glazing

Division 09 – Finishes

- 09800 Protective Coatings
- 09963 Chemical Resistant Lining

Division 10 – Not Used

Division 11 – Equipment

- 11107 Booster Pumps
- 11151 Sodium Hypochlorite Disinfection System
- 11259 Chemical Metering Pumps
- 11281 Chlorine Gas Feed System

Division 12 – Not Used

Division 13 – Special Construction

- 13300 Systems Integration
- 13400 Magnetic Flow Meters
- 13423 Analysis Instrumentation

Division 14 – Not Used

Division 15 – Mechanical

- 15009 Pipe Supports
- 15042 Ductile Iron Pipe
- 15064 Plastic Pressure Pipe
- 15110 Valves and Appurtenances
- 15140 Pipe Hangers and Supports
- 15183 Gauges

Division 16 – Electrical

- 16010 Basic Electrical Requirements
- 16050 Basic Electrical Materials Methods
- 16060 Grounding and Bonding
- 16120 Low Voltage Conductors
- 16130 Raceway Fittings and Support
- 16140 Wiring Devices
- 16150 Motors
- 16230 Emergency Generators
- 16270 Low Voltage Transformers
- 16415 Automatic Load Transfer Switch
- 16440 Disconnects
- 16445 Panelboards
- 16500 Pump Control Panel
- 16550 Lighting

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 CONTRACT COORDINATION

- A. The Owner has elected to construct the improvements to the River Oaks water well site with two contracts. The first contract includes the construction of an elevated steel water storage tank at this site (by others). The second contract (this contract) includes improvements to the existing well and construction of a new control building. The contractor is expected to cooperate fully with the tank contractor.
 - a. STORAGE TANK PROJECT. The required time to complete the elevated storage tank work is 360 calendar days from the issuance of the Notice to Proceed. It is anticipated that the tank contractor will begin work prior to the issuance of the Notice to Proceed for this project.

1.02 WORK REQUIRED BY THE CONTRACT

- A. The Work of this of this Contract consists of the construction of a new Control Building, well improvements, associated piping, valves, controls, equipment, testing, grading and drainage, and site work at the River Oaks site located at 1004 Sewell St. in Slidell, LA. Additional work includes demolition, electrical work, site cleanup, and other miscellaneous items as shown on the Drawings and specified herein.
- B. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, startup, cleanup, replacements and restoration required as a result of damages caused during this construction.
- C. The Contractor shall furnish all labor, materials, equipment, tools, services, and incidentals to complete all work required by these Specifications and as shown on the Drawings.
- D. The Contractor shall furnish and install all materials, equipment, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.
- E. The Contractor shall perform the Work under a lump sum price contract as stated in the Bid Form.

1.03 REQUIREMENTS

- A. The Contractor shall assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.

- B. The Contractor shall move any stored products under Contractor's control, which interfere with operations of the Owner or separate contractor.
- C. The Contractor shall obtain and pay for the use of additional storage or work areas needed for the Contractor's operations.

1.04 WORK SEQUENCE

- A. The Contractor shall begin work on the project within ten (10) days of the Notice to Proceed and complete the work within the period specified in the contract.

1.05 QUALITY OF WORK

- A. All work shall be subject to examination and approved by the Engineer and by all inspectors and authorities having jurisdiction. The Contractor shall replace all imperfect or condemned work with work conforming to all applicable requirements and codes to the satisfaction of the Engineer without additional cost to the Owner. If any work is covered before inspection and approval, the Contractor shall bear all costs for uncovering it, correcting it if necessary, and covering it again, at no additional cost to the Owner.

1.06 ENVIRONMENTAL CONTROLS

- A. Provisions for Control of Erosion and Pollutants: Sufficient precautions shall be taken during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride, or other materials harmful to humans, fish, or other life, into the ground and surface waters of the State. Control measures shall be adequate to assure that turbidity in the receiving waters will not be increased more than otherwise required by the State or other controlling agency. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion. The Contractor shall be responsible for obtaining all permits in conjunction with the conveyance of storm water during construction activities.
- B. In the event of inclement weather, the Contractor shall protect the Work and materials and equipment against damage or injury from the weather. Damaged Work and materials shall be removed and replaced. If, in the opinion of Engineer, any portion of Work or materials has been damaged or injured by reason of failure on the part of the Contractor to so protect the Work, neither additional time nor additional payment for removal and replacement will be given by the Owner to the Contractor.
- C. Public Nuisance:
 - 1. The Contractor shall not create a public nuisance, including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands, or excessive noise.

2. Sound levels from Contractor operations shall not exceed 45 dBA 6 PM to 7 AM or 55 dBA 7 AM to 6 PM, unless approved otherwise in writing. This sound level shall be measured at the exterior of the nearest exterior wall of the nearest residence or business. Levels at operating equipment shall not exceed 85 dBA at the equipment at any time. Sound levels in excess of these values are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the Engineer for excessive noise shall not relieve the Contractor of any obligations under the contract, including, but not limited to, performance of the work at the contract time and contract price.
3. No additional payment to the Contractor will be made for time lost due to work stoppage resulting from the creation of a public nuisance.

D. Work Hours:

No work shall be done between 6:00 p.m. to 7:00 a.m. nor on Saturdays, Sundays, or legal holidays without permission of Owner. Emergency work may be done without prior permission; however, notification is required to the Engineer.

Night work may be undertaken as a regular procedure with the permission of Owner; such permission, however, may be revoked at any time by Owner if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the work at night. Regular working hours shall not exceed a maximum of 40 hours per week. Requests to work during other than regular working hours as established by Contractor must be submitted to the Engineer at least 72 hours in advance of the period for such overtime work and shall set forth the proposed schedule for work to give the Engineer ample time to arrange for his personnel to be at the site of the work.

The contractor shall pay for all additional engineering charges to the Owner on account of the overtime work which may be authorized as stated above. Such engineering charges shall be a subsidiary obligation of the Contractor and no extra payment shall be made by the Owner on account of such overtime work. Engineer overtime charges shall be assessed in accordance with the terms of the Owner 's agreement with the Engineer.

E. Hazardous Locations

1. For operations in hazardous locations, the Contractor shall use spark-proof tools and explosion-proof temporary lighting and shall not use electric power tools, open flame devices, electric welding or any device or methods which might conceivably cause ignition or explosion.
2. If a working area atmosphere is unsafe, the Contractor shall furnish, install, operate, and later remove such temporary auxiliary ventilating facilities as

are necessary to provide a safe atmosphere.

3. The Contractor shall instruct its employees and the employees of all subcontractors to avoid smoking while in the hazardous areas. Suitable prominent "No Smoking" signs shall be placed at locations where hazardous gas could be present.

1.07 PERMITS

Upon notice of award, the Contractor shall immediately apply for all applicable permits not previously obtained by the Owner to do the work from the appropriate governmental agency or agencies. No work shall commence until all applicable permits have been obtained and copies delivered to the Engineer. The costs for obtaining all permits shall be borne by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, materials, tools, equipment, appurtenances, and all services necessary to perform all Work required, at the lump sum or unit prices for the items listed herein.
- B. The items listed below beginning with Article 1.03 are the same pay items listed in the Unit Prices Table of Section 00300 - Louisiana Uniform Public Works Bid Form. These items constitute all the pay items for completion of the Contract. No direct or separate payment will be made for providing miscellaneous, temporary, or accessory works, plant, services, Contractor's or Engineer's field offices, layout surveys, job signs, sanitary requirements, testing, safety devices, approval and record drawings, water supplies, power, removal of waste, watchmen, bonds, insurance, taxes, and all other requirements of the Contract Documents. Compensation for all such services, things and materials required for a complete and usable facility shall be included in the prices stipulated for the lump sum and unit pay items listed herein.
- C. Alternates, if accepted, shall be accepted in the order in which they are listed on the Bid Form. The determination of the low bidder shall be on the basis of the sum of the Base Bid and any alternates accepted by the Owner. However, the Owner shall reserve the right to accept alternated(s) in any order which does not affect determination of the low bidder.

1.02 ESTIMATED QUANTITIES

The estimated quantities for unit price bid items, as listed in the Louisiana Uniform Public Works Bid Form Unit Prices Table, are approximate only, and are included solely for the purpose of comparison of Bids. Certain pay item quantities are based on theoretical plan quantity and will not be adjusted; these items are noted in 1.03 or on the Drawings. The Owner does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground, or the actual quantities of material encountered or required will correspond therewith and reserves the right to increase or decrease any quantity, or to eliminate any quantity, as Owner may deem necessary.

A. ITEM 1 – MOBILIZATION

- 1. Description and measurement: Includes all work as identified in Section 01505 – Mobilization associated with mobilization to the River Oaks site. Mobilization for this item shall not exceed 5% of the total contract price for the Base Bid. No partial measurement will be made for this item.

Measurement will be made upon completion of the required items in Section 01505.

2. Payment: Mobilization shall be paid for at the LUMP SUM price given in the prices bid table.

B. ITEM 2 – WELL REHABILITATION

1. Measurement: Includes all labor, materials, equipment and incidentals necessary for rehabilitation of the existing well at the River Oaks site. This pay item shall include all work associated with improvements to the casing, screen, well head, new mechanical piping, connection to new piping, pump and motor.
2. Payment: This item shall be paid by the lump sum price given in the prices bid table.

C. ITEM 3 – MECHANICAL, ELECTRICAL, & CONTROL BUILDING

1. Measurement: Includes all labor, materials, equipment, and incidentals necessary for constructing the new mechanical and electrical control building. This item includes the new structure, chemical storage containers, pumps, motors, controls, interconnecting pipes, tubing, control wiring, conductors, HVAC, switchgear, and all other incidentals necessary to complete the control building in accordance with the plans and specifications. Measurement will be made by a lump sum based on schedule of values submitted by the Contractor and accepted by the Engineer.
2. Payment: This item shall be paid for at the LUMP SUM price given in the prices bid table.

D. ITEM 4 –DISINFECTION

1. Description and measurement: Includes all labor, materials, chemicals, equipment and incidentals required for disinfection of the waterlines. Measurement will be made on total project percent complete.
2. Payment: This item shall be paid for at the LUMP SUM price given in the prices bid table.

E. ITEM 5 – EQUIPMENT STARTUP

1. Description and measurement: Includes all labor, materials, equipment and factory representative, and incidentals required to demonstrate that the installed equipment at the River Oaks site has been installed per the specified project requirements and has passed all required tests and evaluations. Measurement will be made by percentage complete according to the schedule of values submitted by the Contractor and accepted by the Engineer.
2. Payment: This item shall be paid for at the LUMP SUM price given in the prices bid table.

F. ITEM 6 –SITE IMPROVEMENTS

1. Measurement: This item includes all labor, materials, equipment, and incidentals necessary to complete site improvements not specifically covered under another pay item in order to carry out the intent of the contract documents. This includes payment for, but not limited to, miscellaneous excavations, drainage, site grading, drives, grassing, erosion control, repair to damaged pavement, pavement, signs, or other features not required to be replaced. No payment will be made for restoring any damage caused by the contractor's negligence.
Measurement will be made by a lump sum based on schedule of values submitted by Contractor and accepted by Engineer.
2. Payment: This item shall be paid for at the LUMP SUM price given in the prices bid table.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01041 - PROJECT COORDINATION

PART 1 - GENERAL

1.01 REQUIREMENTS

The Contractor shall plan, schedule, and coordinate his operations in a manner that will facilitate the simultaneous progress of the work included under other contracts outside the scope of these Contract Documents. The Contractor shall plan, schedule and coordinate with all utilities in a manner conducive to timely and efficient progress in the execution of the contract.

1.02 NOTICE TO PROPERTY OWNERS AND UTILITIES

A. The Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them. Utilities and other concerned agencies shall be contacted at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines. When it is necessary to temporarily deny the access of owners or tenants to their property, or when any utility service connections must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruptions and instructions on how to limit their inconvenience.

B. Notice to Electric Utility:

The Contractor shall review with Electric Utility the construction methods to be used in the vicinity of that entity's power lines. This review shall establish which lines, if any, need temporary relocation or de-energizing work being required. The Contractor shall be responsible for notifying and coordinating with Utility officials prior to and during the construction of all facilities within the project limits. The Contractor shall schedule work activities in cooperation with the utility personnel to ensure uninterrupted electrical service to the public. The Contractor shall coordinate all construction activities that affect Electric Utility facilities through the local representative of the local office.

C. Notice to Gas Utility:

The Contractor shall review with the Gas Utility any work to be done in the vicinity of gas lines. Where temporary relocation of gas lines or reinforcement of coating is required, the Contractor shall meet with the Gas Utility as soon as possible, but no less than thirty (30) days in advance of when relocation is required. The Contractor shall give at least 48 hours' notice for temporary shutdown of gas mains

and other notification as required by the Gas Utility when working in the vicinity of gas mains.

1.03 CONNECTIONS TO EXISTING FACILITIES

- A. Unless otherwise specified or indicated, the Contractor shall make all necessary connections to existing facilities including structures, drain lines, and shall make all necessary connections to existing utilities such as water, sewer, gas, telephone, and electric. In each case, the Contractor shall receive permission from the Owner or the Utility prior to undertaking connections. A minimum of 48 hours of prior notification is required. The Contractor shall protect facilities against deleterious substances and damage.
- B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock if necessary) to complete connections in the minimum time. Operation of valves of other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the utility company.

1.04 OPERATION OF EXISTING FACILITIES

- A. All existing facilities shall be kept in continuous operation throughout the construction period. No interruption will be permitted. Provided permission, if any, is obtained from the Owner in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.
- B. The Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.05 COORDINATION OF STRUCTURAL, MECHANICAL, AND ELECTRICAL WORK

The Contractor shall coordinate all details of the equipment with other related parts of the Work including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that shown in the Contract Drawings or Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01043 - JOB SITE ADMINISTRATION

PART 1 - GENERAL

1.01 SITE ADMINISTRATION

- A. The Contractor shall be responsible for all areas of the site used by the Contractor and shall exert full control over the actions of all employees, all subcontractors, all suppliers, and other persons with respect to the use and preservation of property and existing facilities, except as such controls are specifically reserved to the Owner and the Engineer. A full-time superintendent, who is a regular full-time employee of the Contractor, shall be on site at all times during the Work. The Contractor's full-time superintendent shall be on site at all times during the Work, including any activities by subcontractors or suppliers.
- B. The Contractor has the right to exclude from the areas of the site used by the Contractor all persons who have no purpose related to the Work or its inspection, except the Owner's personnel required to operate and maintain the existing treatment facilities. The Contractor may require all persons in the areas of the site used by the Contractor to observe the same safety regulations as required of its employees.

1.02 UNFAVORABLE CONSTRUCTION CONDITIONS

- A. The Contractor shall confine his operations to work which will not be adversely affected by unfavorable weather, wet ground, or other unsuitable construction conditions. No portion of the Work shall proceed under conditions which would adversely affect the quality or efficiency of the Work, unless suitable special precautions or countermeasures are taken by the Contractor.

1.03 LAND FOR CONSTRUCTION PURPOSES

- A. The Contractor shall provide arrangements with the Owner for any land required for construction purposes including the storage of materials and equipment. The location and extent of the areas so used shall be as directed by the Owner. The Contractor shall immediately move stored material or equipment if any occasion arises, as determined by Owner, requiring access to the area used for storage. Materials or equipment shall not be placed on the property of Owner until Owner has agreed to the location to be used for storage.
- B. The Contractor shall provide arrangements for additional land required for construction, if necessary, beyond that furnished by the Owner. This work shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be absorbed by the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01047 - CONTROL OF WORK

PART 1 - GENERAL

1.01 SITE WORK

- A. The Contractor shall furnish all necessary equipment and labor that will be sufficient to produce a satisfactory quality of work at a rate of progress which will insure the completion of the work within the Contract Time. If at any time such equipment and labor appear to the Engineer to be insufficient for producing the quality of work required at the rate of progress aforesaid, the Engineer may order the Contractor to increase the efficiency, change the character, increase the personnel, or increase the equipment, and the Contractor shall conform to such order. Failure of the Engineer to give any such order shall in no way relieve the Contractor of the obligation to complete the Work within the Contract Time.

1.02 PRIVATE LAND

- A. Contractor shall not enter or occupy private land outside of easements, except by permission of the landowner.

1.03 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons and damage to property. The Contractor shall provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the surrounding conditions but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

1.04 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of underground construction features shall be excavated and backfilled at the direction of the Engineer. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.05 CARE AND PROTECTION OF PROPERTY

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

1.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from damage of any kind. Any damage resulting from the Contractor's operations shall be repaired by the Contractor.
- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, electrical duct banks, drain lines and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be borne by the Contractor.

1.07 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During execution of the Work, the Contractor shall keep the site of its operations in as clean and neat a condition as is possible. The Contractor shall dispose of all residues resulting from the Work and, at the conclusion of the Work, shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor shall comply with, and shall require all subcontractors to comply with, all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01050 - SITE CONDITION VIDEO SURVEY

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Prior to the start of construction on the Contract, the Contractor shall furnish to the Engineer audio-video recordings (AVR's) of the construction area. In addition, the Contractor shall supply the (AVR's) of the interior and exterior of structures requested by the Owner. Also, date stamped photos of the inside of the structures are required of the surveyed properties. The minimum coverage area is indicated on the plans. The Engineer shall review the AVR's and photos and either approve or additional coverage will be required to fully show the physical conditions of the work areas. The Contractor shall have the additional coverage recorded and shall not begin work, including moving equipment and/or material on the project site, until the AVR survey has been approved by the Engineer. After approval, the Contractor shall supply two copies of the AVR's and photos to the Engineer. One copy of the AVR and photos will remain available for viewing by the Contractor and may be reviewed by him for any assistance that the AVR may provide in resolving disputes, which arise with the property owners claiming improper restoration of their properties. That copy of the AVR and photos will also be used as a guide by the Engineer, prior to issuance of final payments, in determining the adequacy of restoration and the extent of damages attributable to the Contractor's work. The remaining copy of the AVR and photos will be delivered to the Owner. The video and photos will be used as a record of existing site conditions and as a guide by the Engineer, prior to issuance of final payments, in determining the adequacy of restoration and the extent of damages attributable to the Contractor's work.
- B. The Contractor is required to get signed consent from the property owner prior to conducting the survey. If the property owner does not allow access to their property, documentation shall be provided to the Engineer.

PART 2 - PRODUCTS

2.01 TECHNICAL REQUIREMENTS

- A. The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project, as well as those more subjective requirements of high-quality audio and video production. The video portion of the recording shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of picture imperfection. The audio portion of the recording shall reproduce precise and concise explanatory notes by the camera operator with proper volume, clarity, and freedom from distortion.

2.02 OPERATOR EXPERIENCE

The video survey should be conducted by an independent company experienced in this field. The operator in charge of the video recording should have had previous experience video documenting a minimum of five (5) public works construction projects. Any apprentice operators should be continuously supervised by an above-described experienced operator.

PART 3 - EXECUTION

3.01 GENERAL

- A. Coverage. The video recording shall include coverage of all surface features located within the construction zone-of-influence. This zone shall be defined as (1) the area within the construction site, and areas directed by the Owner as described above. The surface features within the construction zone shall include, but not be limited to, all structures, slabs, sidewalks, retaining walls, equipment, and fences. Of particular concern shall be the existence, or non-existence, of any faults, fractures, or defects.
- B. Identification Summary. At the start of production, at the beginning of a new tank site, an identification summary shall be read into the record while, at the same time, a wide-angle view with numeric displays shall be provided for a visual record. This summary will include (1) tape number, (2) job title, (3) job location, (4) positional location at job start, (5) date and time, (6) weather and (7) any other notable conditions.
- C. Character Printout. All video recordings must, by electronic means, display continuously and simultaneously, generated transparent digital information to include (1) the date and the time of the recording, or as directed by the Engineer, (3) the name of the site, (4) the project name, and (5) the direction of the view. The time and date shall appear linearly in the bottom left-hand corner (e.g., 9-20-15 8:30:15).

The remainder of the printed information shall appear at the bottom of the viewing screen. To maximize viewing area no more than twenty-four rasters shall be used to express the transparent digital information.

- D. Visibility. No recording shall be done during periods of significant precipitation, mist, or fog. The recording shall only illuminate the subjects of recording.

3.02 RECORDING SCHEDULE

The preconstruction video recording shall be performed prior to the placement of any construction materials or equipment on the proposed construction site, but not more than seven weeks prior to the placement of materials or equipment.

3.03 VIDEO INDEXING

All discs and their storage cases shall be properly identified by video index number, project title and general project location. Displayed on the storage case of each video shall be a log of that disc's contents. That log shall describe the various segments contained on that disc, coverage start, direction, and endpoints, with corresponding video disc player counter numbers. A cumulative index correlating the various segments of coverage to their corresponding tapes shall be typed and supplied to the Owner.

3.04 UNACCEPTABLE DOCUMENTATION

The Engineer/Owner shall have the authority to reject all or any portion of the video documentation not conforming to the specifications. Those rejected portions shall be resurveyed at no additional cost to the Owner.

END OF SECTION

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SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Abbreviations and acronyms used in the Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, the Contractor shall comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of the Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

The Contractor shall obtain copies of referenced standards directly from the publication source, when needed for proper performance of work, or when required for submittal by the Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150, Reford Station Detroit, MI 48219
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020

AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ASHRAE	American Society of Heating, Refrigerating and Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers Two Park Avenue New York, NY 10016
ASTM	American Society for Testing and Materials 100 Bar Harbor Drive West Conshocken, PA 19428
AWWA	American Water Works Association 6666 W. Quincy Avenue, Denver, CO 80235
AWS	American Welding Society 2501 NW 7th Street Miami, FL 33125
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Building 197 Washington, DC 20407
LSSRB	Louisiana Standard Specifications for Roads and Bridges Louisiana Department of Transportation and Development Headquarters Administration Building - Room 100 1201 Capitol Access Road Baton Rouge, Louisiana 70802

MLSFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NEMA	National Electrical Manufacturers' Association 2101 L Street, N.W. Washington, DC 20037
OSHA	Occupational Safety and Health Administration 200 Constitution Ave NW Washington, DC 20210
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
SDI	Steel Door Institute 712 Lakewood Center North Cleveland, OH44107
SMACNA	Sheet Metal and Air Conditioning Contractors" National Association 8224 Old Court House Road Vienna, VA 22180
SSPC	Steel Structures Painting Council 4400 Fifth Avenue Pittsburg, PA
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01152 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

The Contractor shall submit applications for payment to the Engineer in accord with the schedule established by Conditions of the Contract.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Agreement between Owner and Contractor: Lump-Sum.
- B. Conditions of the Contract: Progress Payments, Retainages and Final Payment.
- C. Section 01380: Construction Photographs.
- D. Section 01700: Contract Closeout.

1.03 FORMAT AND DATA REQUIRED

- A. The Contractor shall submit payment applications in the form required by the Owner with itemized data typed on 8 ½ x 11 white paper continuation sheets.
- B. The Contractor shall provide itemized data on continuation sheet: format, schedules, line items and values.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. All payment applications shall be accompanied by a completed pay application checklist and shall include a signed affidavit regarding previous payments received, a short progress narrative describing work performed since previous payment submittal, progress photos as per Section 01380, current updated project schedule, and invoices for any stored materials billed. The pay application checklist form shall be as provided on Page 01152-3. All items required on the checklist must be included with each pay application for the application to be processed.
- B. When the Owner or the Engineer requires additional substantiating data, the Contractor shall submit suitable information, with a cover letter.
- C. The Contractor shall submit one copy of all data required with a cover letter for each monthly pay application. Any additional substantiating data requested shall also be submitted as required in Part B above.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. The Contractor shall complete application form as specified for progress payments.
- B. The Contractor shall use continuation sheet for presenting the final statement of accounting as specified in section 01700 - Contract Closeout.

1.06 SUBMITTAL PROCEDURE

- A. The Contractor shall submit applications for payment to the Engineer at the times stipulated in the Agreement.
- B. Number required: Three original copies of each application, or as determined at the Preconstruction Conference.
- C. Once the Engineer determines the application properly completed and correct, a certificate for payment will be prepared and transmitted to the Owner, with a copy to the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PAY APPLICATION CHECKLIST
(CONSTRUCTION CONTRACT)

PARTIAL APPLICATION:

- Pre-Construction Video (Date Submitted): _____
- Construction Schedule (Updated) _____
- Progress Narrative _____
- Schedule of Values _____
- Affidavit Re: Previous Payments _____
- Progress Photos _____
- List of Stored Materials Billed _____
- Invoice for Stored Materials Billed _____
- Insurance for (off Site) _____
- Stored Materials Billed _____

FINAL APPLICATION:

- Application for Payment _____
- w/Final Statement of Accounts _____
- Punch List (checked off) _____
- O & M Manuals (Date Submitted) _____
- Record Drawings (Date Submitted) _____
- Spare Parts Lists _____
- Receipt for Material _____
- (Spare Parts) Delivered _____
- To Owner _____
- Clear L & P Certificate _____
- Warranties & Bonds _____
- Consent of Surety to Final Payment _____
- Letter from Contractor stating _____
- warranty of the Work for _____
- one year following date of _____
- Substantial Completion _____
- Verification of Bond to Remain in _____
- effect for one year from Final _____
- Payment _____

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SECTION 01153 - CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall promptly implement Change Order procedures as follows:
 - 1. The Contractor shall provide full written data required to evaluate changes.
 - 2. The Contractor shall maintain detailed records of work done on a time and material basis.
 - 3. The Contractor shall provide full documentation to Engineer.
- B. The Contractor shall designate in writing, and submit to the Engineer, the member of Contractor's organization as follows:
 - 1. Person authorized to accept changes in the Work.
 - 2. Person responsible for informing others in the Contractor's employ of the authorization of changes in the Work.
- C. The Owner will designate in writing the person authorized to execute Change Orders.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract are included in the Agreement, General Conditions and Supplementary Conditions, including the following:
 - 1. Methods of determining cost or credit to Owner resulting from changes in Work made on a time and material basis.
 - 2. Contractor's claims for additional costs.

1.03 DEFINITIONS

- A. Change Order: See General Conditions of the Contract.
- B. Work Directive Change: A written order to the Contractor, signed by the Owner and the Engineer, which amends the Contract Documents as described and authorizes Contractor to proceed with a change which affects the Contract Sum or the Contract Time, for inclusion in a subsequent Change Order.
- C. Field Order: A written order to the Contractor signed by the Engineer and the Contractor, which is issued to interpret/clarify the Contract Documents, order

minor changes in the work, and/or memorialize trade-off agreements. The Work described by a Field Order shall be accomplished without change to the Contract Sum, Contract Time, and without claims for other costs.

1.04 PRELIMINARY PROCEDURES

A. The Owner or the Engineer may initiate changes by submitting a Request for Proposal (RFP) to the Contractor. Request will include:

1. Detailed description of the Change, Products and location of the change in the Project.
2. Supplementary or revised Drawings and Specifications.
3. The projected time span for making the change and a specific statement as to whether overtime work is, or is not, authorized.
4. A specific period of time during which the requested price will be considered valid.
5. Such request is for information only and is not an instruction to execute the changes, or to stop work in progress.

B. The Contractor may initiate changes by submitting a written Proposal to the Engineer. The Proposal shall include the following:

1. Description of the proposed changes.
2. Statement of the reason for making the changes.
3. Statement of the effect on the Contract Sum and the Contract Time.
4. Statement of the effect on the work of separate contractors.
5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.05 WORK DIRECTIVE CHANGE AUTHORIZATION

A. In lieu of a Request for Proposal (RFP), the Engineer may issue a Work Directive Change Authorization for the Contractor to proceed with a change for subsequent inclusion in a Change Order.

B. Authorization will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change and will designate the method of determining any change in the Contract Sum and any change in Contract Time.

C. The Owner and the Engineer will sign and date the Work Directive Change Authorization as authorization for the Contractor to proceed with the changes.

D. The Contractor shall sign and date the Work Directive Change Authorization to indicate agreement with the terms therein.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. The Contractor shall support each quotation for a lump sum proposal and for each unit price, which has not previously been established, with sufficient substantiating data to allow Engineer to evaluate the quotation.

B. The Contractor shall provide additional data to support time and cost computations as follows:

1. Labor required.
2. Equipment required.
3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
4. Taxes, insurance, and bonds.
5. Credit for work deleted from Contract, similarly documented.
6. Overhead and profit.
7. Justification for any change in Contract Time.

C. The Contractor shall support each claim for additional costs and for work done on a time and material basis, with documentation as required for a lump sum proposal, plus additional information as follows:

1. Name of the Owner's authorized agent who ordered the work and date of the order.
2. Dates and times work was performed, and by whom.
3. Time record, summary of hours worked, and hourly rates paid.
4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts (The Contractor shall also provide full documentation supporting the subcontract amount).

1.07 PREPARATION OF CHANGE ORDERS AND FIELD ORDERS

A. Engineer will prepare Change Orders and Field Orders.

B. The Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.

C. The Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

- D. The Field Order will describe interpretations or clarifications of Contract Documents, order minor changes in the Work, and/or memorialize trade-off agreements.
- E. Field Order work shall be accomplished without change in the Contract Sum, Contract Time, and/or claims for other costs.
- F. Change Order and Field Order forms for Owner will be provided by the Engineer. The Contractor shall provide the Change Orders and Field Orders on correct forms as provided.

1.08 LUMP SUM CHANGE ORDER PROCEDURE

- A. Content of Change Orders will be based on, either:
 - 1. The Engineer's RFP and the Contractor's responsive Proposal as mutually agreed between the Owner and the Contractor.
 - 2. The Contractor's Proposal for a change, as recommended by the Engineer.
- B. The Owner and the Engineer will sign and date the Change Order as authorization for the Contractor to proceed with the changes.
- C. The Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

1.09 WORK DIRECTIVE CHANGE AUTHORIZATION PROCEDURE

- A. The Engineer and the Owner may issue a Work Directive Change Authorization directing the Contractor to proceed with the changes.
- B. At completion of the change, the Contractor shall submit itemized accounting and supporting data as provided herein.
- C. The Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.
- D. The Engineer will sign and date the Change Order to establish the change in the Contract Price and in the Contract Time.
- E. The Contractor shall sign and date the Change Order to indicate agreement therewith.
- F. The Owner will sign and date the Change Order to indicate agreement therewith.

- G. All time and material Work shall be documented and approved by the Project Representative on a daily basis.

1.10 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. The Contractor shall periodically revise the Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. The Contractor shall periodically revise the Construction Schedule to reflect each change in Contract Time.
 - 1. The Contractor shall revise subcontractor schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, the Contractor shall enter pertinent changes in Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Engineer will schedule and administer a preconstruction meeting, construction progress meetings, and specially called meetings throughout the progress of the work. The Engineer will:
 - 1. Prepare agenda for meetings.
 - 2. Make physical arrangements for meetings.
 - 3. Preside at meetings.
 - 4. Record notes; including significant proceedings and decisions.
 - 5. Reproduce and distribute copies of minutes.
- B. The Contractor shall attend all meetings. When appropriate, the Contractor shall require subcontractors and suppliers to attend. Those in attendance shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Contractor shall attend and identify at the meetings the actual status of the Contract Work. When the Work is not being performed consistently with the Contract Documents and construction schedules, the Contractor shall identify at the meetings the steps being taken to resolve the inconsistency.
- D. The Contractor shall provide all required documentation including Construction Schedule and required updates to Construction Schedule in accordance with Section 01311 – Construction Schedules.

1.02 PRE-CONSTRUCTION MEETING

- A. The Contractor shall participate in a preconstruction meeting to be held after the effective date of the Agreement and prior to the date of Notice to Proceed.
- B. The following shall be in attendance:
 - 1. The Owner's Representative and other staff as appropriate.
 - 2. The Engineer's Representative.
 - 3. The Resident Project Representative.
 - 4. The Contractor's Project Manager
 - 5. The Contractor's Construction Superintendent.
 - 6. Subcontractors as appropriate.
 - 7. Suppliers as appropriate.
 - 8. Utility representatives as appropriate.
 - 9. Others as appropriate.

- C. The Contractor shall supply sufficient copies of the following documents:
1. Construction Schedule.
 2. Schedule of Values.
 3. List of Subcontractors.
 4. List of Suppliers.
 5. Schedule of Submittals.
- D. The following matters shall be addressed:
1. Distribution and discussion of:
 - a. Project Construction Schedule.
 - b. Schedule of Values.
 - c. List of Subcontractors.
 - d. List of Suppliers.
 - e. Schedule of Submittals.
 2. Critical work sequencing.
 3. Project Coordination.
 4. Designation of responsible personnel.
 5. Procedures and processing of:
 - a. Applications for Payment.
 - b. Submittals.
 - c. Field decisions.
 - d. Proposal requests.
 - e. Change Orders.
 6. Procedures for maintaining Record Documents.
 7. Use of premises:
 - a. Contractor's Field Office, work and storage areas.
 - b. Owner's requirements.
 8. Construction facilities and controls.
 9. Temporary utilities.
 10. Housekeeping procedures.
 11. Insurance certifications.
 12. Liquidated damages for delay.
 13. Laboratory testing of material requirements.

14. Notice to Proceed and Final Completion date.

1.03 CONSTRUCTION PROGRESS MEETINGS

- A. Construction progress meetings will be held monthly with the first meeting 30 days after the date of Notice to Proceed.
- B. Special construction progress meetings will be held as required by progress of the Work.
- C. The following shall be in attendance:
 - 1. The Owner's Representative and other staff as appropriate.
 - 2. The Engineer and his professional consultants as appropriate.
 - 3. The Contractor's Representative and/or construction Superintendent.
 - 4. Subcontractors as appropriate.
 - 5. Suppliers as appropriate.
 - 6. Others as appropriate.
- D. The following matters shall be addressed:
 - 1. Review of progress during succeeding work period.
 - 2. Revisions to Construction Schedule.
 - 3. Problems which impede Construction Schedule.
 - 4. Field observations, problems, conflicts.
 - 5. Review of off-site fabrication, delivery schedules.
 - 6. Corrective measures and procedures for Construction Schedule.
 - 7. Remaining Submittals.
 - 8. Review of Record Drawings.
 - 9. Payment applications and processing.
 - 10. Maintenance of quality standards.
 - 11. Review proposed changes and Change Orders:
 - a. Effect on Construction Schedule and completion date.
 - b. Effect on other contracts of the Project.
 - 12. Other matters as appropriate.

- E. The Contractor shall be prepared to discuss the above topics and to make commitments for resolving deficiencies.
- F. The Contractor shall provide sufficient copies of the following documents for each meeting:
 - 1. Revised Construction Schedule in accordance with Section 01311.
 - 2. Revised Submittal Schedule.
 - 3. Current Submittal Log in accordance with Section 01340.
 - 4. Updated Record Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section describes the procedures and requirements for submittals of materials, equipment, and other items to be incorporated into the Work, such as shop drawings, product data, and samples. The requirements for administrative submittals are described in other sections.
- B. Additional individual item submittal requirements are specified in the Sections for each item of work.
- C. Definitions. The work-related submittals of this Section, in addition to the definitions of the General Conditions and elsewhere in the Contract Documents, are further categorized for convenience as follows:
 - 1. Shop drawings include specially prepared technical data of all forms including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for application to more than one project.
 - 2. Product data includes standard printed information on materials, products, and systems, not specifically prepared for this project, other than the designation of selections from among available choices printed therein.
 - 3. Samples include both fabricated and unfabricated physical examples of materials, products, and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or (where indicated) for more detailed testing and analysis.
 - 4. Other non-administrative submittals include warranties, certifications, maintenance agreements, survey data and reports, field measurement data, factory and quality testing reports, record drawings, operating and maintenance manuals, and other items applicable to the Work that are not processed as shop drawings, product data, or samples.

1.02 GENERAL SUBMITTAL REQUIREMENTS

- A. Scheduling. Required administrative submittals shall include submittal requirements and time schedules for coordination and integration of submittal activity with related work.

1. Within ten (10) days after the Notice to Proceed, a schedule shall be submitted to the Engineer for all material and equipment items. For each required item, the date shall be given for intended submission of the drawing to the Engineer for review and the date required for its incorporation into the Work.
- B. Coordination of Submittal Times. The Contractor shall prepare and transmit each submittal to the Engineer sufficiently in advance of performing related work or other applicable activities, such that the installation will not be delayed or improperly sequenced by processing times, including resubmittal if required. Coordinate each submittal with other submittals, testing, purchasing, delivery, and similar sequenced activities. There will be no extension of Contract Time given due to Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the work.
- C. Preparation of Submittals. The Contractor shall provide permanent marking on each submittal to include all of the following items:
1. The date of submittal, and the date(s) of any previous submittal(s).
 2. The project title and number.
 3. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 - d. Subcontractor.
 4. Identification of Specification Section number and equipment tag numbers.
 5. Notification to the Engineer in writing, at the time of submission, of any deviations in the submittal from the requirements of the Contract Documents.
 6. The Contractor's review stamp, signed or initialed, certifying Contractor's review of submittal, and that verification of products required, field dimensions, adjacent construction Work, and coordination of information within the submittal, has been completed and is in accordance with the requirements of the Work and the Contract Documents.
 7. A 4" x 6" minimum blank space for the Engineer's review stamp and review comments.
 8. Identification of revisions on resubmittals.
 9. Field dimensions clearly identified as such.
 10. Relation to adjacent or critical features of the Work.
 11. Applicable standards, such as ASTM or Federal Specification numbers.
 12. Any submittal sheets or drawings showing more items than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out or blanked out. Standard drawing or data sheets with multiple options unmarked will cause the submittal to be returned not reviewed.

- E. Transmittal Form. All submittals shall be accompanied by the Contractor's standard submittal transmittal form. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned not reviewed. Submittals received from sources other than the Contractor, such as suppliers or subcontractors, will not be reviewed by the Engineer.
- F. Transmittal Identification. The Contractor shall number transmittals in sequence for each Division and each Section of the Specifications. The Contractor shall identify resubmittals with a letter of the alphabet following the original number, using A for the first resubmittal, B for the second resubmittal, etc.
- G. Resubmittal. The Contractor shall be allowed to make one (1) resubmittal to address the Engineer's comments if the original submittal is returned for resubmittal. Any review of subsequent resubmittals will be considered Contractor required engineering services and treated in accordance with the requirements of the specifications. There will be no extension of Contract Time given due to Contractor's failure to adequately address all of the Engineer's comments in the first resubmittal.
- H. Engineer's Review. The Engineer will review the Contractor's submittal, and upon completion will return to the Contractor marked with one of the following designations, with required action by the Contractor:
 - 1. "Reviewed: No Exceptions." No further submission is required by the Contractor for this item.
 - 2. "Reviewed: Exceptions Noted." No further submission is required by the Contractor for this item. The Contractor shall incorporate all of the Engineer's review notes into the Work.
 - 3. "Revise and Resubmit." The Contractor shall incorporate all of the Engineer's review notes into a revised submittal and resubmit, in accordance with Paragraph G. above.
 - 4. "Rejected." The item submitted is not in conformance with the Contract Documents and cannot be used on this project. The Contractor shall provide the item as specified and resubmit in accordance with Paragraph G. above.
 - 5. "Information Only." No further submission is required by the Contractor for this item.
- I. Record Document. After the Engineer's review, if no further submission is required by the Contractor, the reviewed document shall be printed and maintained by the Contractor as the "Record Document". The Contractor shall not proceed with installation of materials, products, or systems until a copy of the final reviewed document is in possession of the Contractor.

1.03 SPECIFIC CATEGORY REQUIREMENTS

- A. Shop Drawings. The Contractor shall provide newly prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated), with name of preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Drawings shall show dimensions and note which are based upon field measurements. Drawings shall identify materials and products and indicate compliance with standards and special coordination requirements. The Contractor shall not allow shop drawing copies without the appropriate final review markings by the Engineer to be used in connection with the Work.
- B. Product Data. The Contractor shall collect all required data into one comprehensive submittal for each unit of work or system, and clearly mark the choices and options applicable to the Work. The Contractor shall include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one (1) set of product data (for each submittal) at project site, available for reference by the Engineer or others.
- C. Samples. The Contractor shall provide samples identical with final condition of proposed materials or products for the work. Range samples shall be included (not less than three (3) units) where unavoidable variations must be expected and shall describe or identify variations between units of each set. The Contractor shall provide a full set of optional samples where the Engineer's selection is required. Information shall be included with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.
 - 1. Submittal. The Contractor's shall provide submittal of a single set of samples for the Engineer's review.
 - 2. Quality Control Set. The Contractor shall maintain a final set of samples at the project site, in suitable condition and available for quality control comparisons by the Engineer and the Owner.

1.04 SUBMITTAL SCHEDULING

- A. Review Time. Unless otherwise specified, a minimum of fifteen (15) calendar days following receipt of submittals shall be included in the project schedule for the Engineer's review. A suitable longer period shall be included in the project schedule where the Engineer's review must be delayed for coordination with subsequent submittals due to the Contractor's submittal sequencing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01311 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Within ten (10) days after the effective date of the Agreement, the Contractor shall submit to the Engineer for review a preliminary Construction Schedule indicating the starting and completion dates of the various stages of the work.
- B. The Contractor shall submit a revised Construction Schedule monthly with each request for payment.
- C. The Construction Schedule shall be coordinated and updated with all changes including Field Orders, Work Directive Changes, and Change Orders through the completion of the Work.

1.02 FORM OF SCHEDULES

- A. The Contractor shall prepare all schedules in the form of a horizontal bar chart. The chart shall include the following:
 - 1. A separate horizontal bar for each trade or operation.
 - 2. A horizontal time scale: Identify the first workday of each week.
 - 3. Scale and spacing to allow for notations and future revisions.
 - 4. A minimum sheet size of 8-1/2" X 11".
- B. The Construction Schedule shall:
 - 1. Show the complete sequence of construction by activity.
 - 2. Show the dates for the beginning and completion of each major element of construction.
 - 3. Show projected percentage of completion for each item, as of the first day of each month.
- C. A Submittals Schedule for Shop Drawings, Product Data, and Samples, shall be provided and shall include the following:
 - 1. Dates of Contractor's submittals.
 - 2. Dates the submittal items will be required for inclusion in the Work.

1.04 CONSTRUCTION SCHEDULE REVISIONS

- A. Construction Schedule revisions shall indicate the progress of each activity to the date of submission.
- B. Construction Schedule revisions shall show changes occurring since previous submission of schedule to include the following:

1. Major changes in scope.
 2. Activities modified since previous submission.
 3. Revised projections of progress and completion.
 4. Other identifiable changes.
- C. The Contractor shall provide a narrative report as needed to define:
1. Problem areas, anticipated delays, and the impact on the schedule.
 2. Corrective action recommended and its effect.

1.05 SUBMISSIONS

- A. The Contractor shall submit the initial Construction Schedule in accordance with the General Conditions.
1. The Engineer will review and return a review copy within ten (10) days after receipt.
 2. If required, the Contractor shall resubmit within seven (7) days after return of review copy.
- B. The Contractor shall submit a revised Construction Schedule with each application for payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the Engineer for review a preliminary Schedule of Values allocated to the various portions of the Work within ten (10) days after bid opening, ten (10) days after the effective date of the Agreement, and at any other time required in the specifications. The Notice to Proceed will not be issued prior to receipt of a Schedule of Values acceptable to the Engineer. Upon request of the Engineer, the Contractor shall provide supporting documentation for substantiating the values used.
- B. The Schedule of Values shall be used as a basis for the Contractor's Applications for Payment. The sum of all values listed in the Schedule shall equal the total Contract Price. General Conditions (mobilization, bonds, insurance, etc.) shall be no more than 5% of the total Contract Price.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. The Schedule shall be on minimum 8-1/2 in. x 11 in. white paper. The Contractor's standard form and/or automated printout will be considered for acceptance by the Engineer upon the Contractor's request, provided the standard form includes all of the requirements herein. The Schedule shall be identified as follows:
 - 1. Title of Project and location.
 - 2. Engineer and Project number.
 - 3. Name and Address of Contractor.
 - 4. Date of submission.
- B. The Schedule shall list the installed value of the appropriate component parts for each item of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Component Parts shall be defined as any single item with a value of more than \$5,000.00, or defined by separate construction trade, whichever is of less value. The Engineer may direct further break down of additional parts. Component parts shall be identified by Specification Section, where applicable.
- C. The Schedule shall be itemized by each separate structure. For projects with multiple site locations, the Schedule shall be itemized by each separate location.

1.03 SCHEDULE OF MAJOR EQUIPMENT ITEM VALUES

- A. Major equipment items, defined as any item with a value of more than \$20,000, shall be subdivided into components to include the following:
 - 1. Preparation and processing of submittal and any required resubmittals.
 - 2. Fabrication and delivery to the Site (subdivided further by equipment items as defined in the equipment list contained in the Specification Section for the equipment).
 - 3. Installation (subdivided further by equipment items as defined in the equipment list contained in the Specification Section for the equipment).
 - 4. Start-up and operator training.
 - 5. Delivery of spare parts, warranties, and Operation & Maintenance Manuals to the Owner.

1.04 REQUIRED ITEMS

- A. In addition to the requirements above, the Schedule shall contain separate items as listed below (at a minimum, and as applicable):
 - 1. General Conditions (to include mobilization)
 - 2. Demolition
 - 3. Bypass Pumping
 - 4. Paving
 - 5. Coatings
 - 6. Mechanical Equipment
 - 7. Piping
 - 8. Electrical Equipment
 - 9. Electrical Work
 - 10. Site Restoration
 - 11. Submission of Record Documents

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01380 – CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall employ a competent photographer to take construction record photographs prior to and periodically during the course of the Work.
- B. Progress payments will not be processed unless photographs are included and current with construction progress.

1.02 SUBMITTALS

- A. The Contractor shall provide at least six (6) photographs each month of each major portion of the work taken at each major stage of construction. The Contractor shall provide digital files of each photograph identified with project title, description of view and date.

PART 2 - PRODUCTS

2.01 PRINTS

- A. All prints shall be color as follows:
 - 1. Paper: 20lb Bond Paper.
 - 2. Print Size: 3 ½ in. x 5 in.
 - 3. Each picture shall be date stamped.
 - 3. Prints: 1 column and 2 rows of pictures per sheet.
- B. Each print shall be identified by caption below the picture, listing:
 - 1. Project Subject / Item.
 - 2. Location / Station.
 - 3. Direction of view.

PART 3 - EXECUTION

3.01 TECHNIQUE FOR STILL PHOTOGRAPHS

- A. Factual presentation.
- B. Correct exposure and focus.
 - 1. High resolution and sharpness.

2. Maximum depth-of-field.
3. Minimum distortion.

3.02 VIEWS REQUIRED FOR STILL PHOTOGRAPHS

- A. Contractor shall photograph from locations to adequately illustrate conditions of construction and state of progress.
- B. Prior to construction, at least six photographs of pertinent features shall be taken at various locations at the site and promptly submitted to the Engineer. Additional progress photographs shall be made monthly throughout the progress of the work and of significant milestones items or areas when work has taken place at that location during the month and submitted with each of the Contractor's applications for payment.

3.03 DELIVERY OF PHOTOGRAPHS AND PRINTS

- A. Preconstruction photographs shall be delivered to the Engineer prior to the beginning of construction.
- B. Digital photographs shall be of at least 4 megapixels and shall be clear, sharp and encompass depth of field. The photographs shall be submitted as a color printed composite PDF, digital PDF file and original digital camera files on a CD/DVD ROM. Two (2) printed colored PDFs on bond paper and (2) CD/DVD ROMS labeled with the Project Title and date shall be furnished with each set of photographs. All digital photographs taken during construction by the contractor shall be retained, and a copy of all digital files shall be delivered on CD/DVD ROM to the Engineer at the completion of the project or as directed by the Engineer or Project Representative.

END OF SECTION

SECTION 01400 - TESTING LABORATORY

PART 1-GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall provide the services of an independent testing laboratory to perform specified testing upon recommendation of the Engineer. All samples of the Work will be collected by the testing laboratory. Any equipment, supplies, and delivery services required for testing will be provided by the testing laboratory.
- B. The Contractor shall cooperate with the laboratory to facilitate the execution of the required testing services. Representatives of the testing laboratory shall have access to the work at all times and facilities for such access shall be provided in order that the laboratory may perform its functions properly. The Contractor shall consult the testing laboratory in advance to determine the time required to perform the tests and to issue findings. The testing laboratory shall be notified by the Contractor of any schedule changes.

1.02 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall:

- A. Coordinate with the laboratory to request testing, as directed by the Engineer.
- B. Secure and deliver to the laboratory, when requested by Engineer, adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Furnish copies of material test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To facilitate inspections and tests.
 - 3. For field storage and curing of test samples.
- G. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- H. Make arrangements with laboratory and pay for additional samples and tests

required by failed test results, or for the Contractor's convenience.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01505 - MOBILIZATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall set up necessary construction facilities including storage areas, temporary facilities, Contractor's field offices and such sanitary and other facilities as are required by local or state law or regulation; all as required for the proper performance and completion of the Work.

A. The Contractor shall provide all items of work covered in this Section which shall include but not be limited to the following principal items:

1. Establishment on site of all Contractor's field offices, facilities, and equipment required for the first month of operation.
2. Installation of temporary construction power, wiring, and lighting facilities.
3. Development of construction water supply.
4. Provision of on-site sanitary facilities and potable water facilities as specified.
5. Establishment of Contractor's work and storage yard.
6. Procurement and submittal of all required subcontractor insurance certificates and bonds.
7. Obtaining all required permits.
8. Posting of all OSHA required notices and other information as required by Federal, State and Local Agencies.
9. The Contractor's superintendent established at the job site full time.
10. Provision of a detailed construction schedule acceptable to the Owner for project use as specified.
11. Erection of two project signs as specified.
12. Provision of pre-construction and post-construction site survey videos.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01515 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall provide equipment that is adequate for the performance of the work under this contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required work, and shall be subject to inspection and approval by the Owner's representative at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction and shall conform with requirements of the National Electric Code.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 POWER AND LIGHTING

- A. **Power:**
The Contractor shall provide all necessary power required for construction operations under the Contract and shall provide and maintain all temporary power lines required to perform the work in a safe and satisfactory manner.
- B. **Construction Lighting:**
All work conducted at night or under conditions of deficient daylight shall be suitably lighted to ensure proper work and to afford adequate facilities for inspection and safe working conditions.
- C. **Approval of Electrical Connections:**
All temporary connections for electricity shall be subject to approval of the Owner and the power company representative and shall be removed in like manner prior to final acceptance at work.
- D. **Separation of Circuits:**
Lighting circuits shall be separated from power circuits.
- E. **Construction Wiring:**
All wiring for temporary electric light and power shall be properly installed and maintained and securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction and shall be subject to approval of the Owner.

3.02 WATER SUPPLY

- A. General:
The Contractor shall provide an adequate supply of water for construction purposes. The Contractor shall pay the water utility for water used at the job site.
- B. The Contractor shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the temporary water supply system. The Contractor shall insure the adequate functioning of the temporary water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.
- C. Potable Water: All drinking water on the site during construction shall be furnished by the Contractor.
- D. Water Connections:
The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a backflow preventer, valve, and meter, if required by the said authority, of a size and type acceptable to said authority and agency. Only approved hydrants wrenches may be used to open and close hydrants. In instances where connections are made to water pipelines for the purpose of pressure testing newly constructed force mains or sewers, a double check valve system and pressure gauge shall be utilized to prevent back flow into the water main system.
- E. Removal of Water Connections:
Before final acceptance of the Work on the project, all temporary connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Owner and to the agency owning the affected utility.
- F. Fire Protection:
The construction plant and all other parts of the work shall be connected with the Contractor's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the work, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The Contractor's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

3.03 SANITATION

- A. Toilet Facilities:
Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1026.51 of the OSHA Standards for Construction.

- B. Sanitary and Other Organic Wastes:
The Contractor shall establish and provide regular collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic materials wastes from any other source related to the Contractor's operations shall be disposed of away from the site in accordance with all laws and regulations pertaining thereto.

3.04 SAFETY

- A Public Safety:
During the performance of the work the Contractor shall erect and maintain temporary fences, bridges, railings, and barriers as necessary for the prevention of accidents. The Contractor shall take all other necessary precautions and place proper guards for the prevention of accidents. The Contractor shall erect and maintain suitable and sufficient lights and other signals.

END OF SECTION

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SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS

1. All materials and equipment furnished and installed under this contract shall conform to the general stipulations set forth in this Section, except as otherwise specified in other sections of these Specifications. All materials and equipment furnished under this contract shall be submitted to the Engineer for review. The Contractor shall not incorporate into the Work any materials or equipment not submitted for review and accepted by the Engineer.

1.02 WORKMANSHIP

1. The Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.
2. All equipment shall be new and designed, fabricated, and assembled in accordance with the best modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least $\frac{1}{4}$ inch thick.

1.03 MATERIALS AND EQUIPMENT

1. The Contractor shall be fully responsible for all materials and equipment furnished under this Contract and shall furnish necessary replacements at any time prior to expiration of the Correction Period.
2. The Contractor shall stock additional supplies of materials and equipment as the Contractor deems necessary for timely and efficient execution of this Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01610 - DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies the general requirements for the delivery, handling, storage, and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY

- A. Items shall be transported and handled in accordance with the manufacturer's instructions and requirements.
- B. The Contractor shall schedule delivery to reduce long term on-site storage prior to installation and/or operation. Equipment shall not be delivered to the site more than three weeks prior to installation without written authorization from the Engineer.
- C. The Contractor shall coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Products shall be delivered to the sites in the manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting, and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner that will not hamper the Owner's normal operation.
 - 1. During construction, operations/ items that cannot be hindered include the well, associated piping, hydropneumatic tank, generator, control shed, transformer, and drainage. Items shall not be stored within five (5) feet of the existing fence.
- F. The Contractor shall provide all necessary equipment and personnel to unload items delivered to the sites.
- G. The Contractor shall promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others, the Contractor shall perform inspection in the presence of the Engineer. The Contractor shall notify the Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION

- A. The Contractor shall store and protect products 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. Instructions shall be carefully followed, and a written record kept by the Contractor.

The Contractor shall arrange storage to permit access for inspection by the Engineer.

- B. Loose granular materials shall be stored on solid flat surfaces in a well-drained area. The Contractor shall prevent mixing with foreign matter.
- C. 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 accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner 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.
- D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it shall be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. The Contractor shall maintain temperature and humidity within range required by manufacturer.
 - 1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
 - 2. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period to ensure that the equipment does not deteriorate from lack of use.
 - 3. 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.
 - 4. Prior to acceptance of the equipment, the Contractor shall require the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such certification is not provided, the equipment shall be judged to be defective and shall be removed and replaced.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall comply with all requirements stated in Contract Documents in closing out the Contract.

1.02 RE-INSPECTION FEES

- A. Should the Engineer perform re-inspections due to failure of the Work to comply with claims of status of completion made by the Contractor the following shall apply:
 - 1. Owner will compensate Engineer for such additional services.
 - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.03 FINAL SUBMITTALS

- A. No application for final payment will be accepted until all required submittals have been made to the Engineer and processed by the Engineer, including, but not limited to, the following:
 - 1. Consent of Surety to Final Payment as specified in the General and Supplementary Conditions.
 - 2. Affidavit of Final Payment and Release as specified in the General and Supplementary Conditions.
 - 3. Project Record Documents as specified in Section 01720.
 - 4. All submittals required by federal, state, and local regulatory agencies.
 - 5. Record Drawings.

1.04 FINAL ADJUSTMENT OF ACCOUNTS

- A. The Contractor shall submit a final statement of accounting to the Engineer.
- B. The Statement shall reflect all adjustments to the Contract Price as follows:
 - 1. The original Contract Price.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Allowances (if applicable).
 - c. Unit Prices (if applicable).
 - d. Deductions for uncorrected work.

- e. Deductions for liquidated damages.
 - f. Deductions for re-inspection payments.
 - g. Deductions for resubmittal review payments.
 - 3. Total Contract Price, as adjusted.
 - 4. Previous payments.
 - 5. Sum remaining due.
- C. The Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Price which were not made by previous Change Orders.

1.05 FINAL PAYMENT

- A. The Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General and Supplementary Conditions.
- B. Final payment will be made to the Contractor in accordance with the General and Supplementary Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall carry out cleaning during progress of the Work on a daily basis, and at completion of the Work, as required by the Contract Documents.

1.02 DISPOSAL REQUIREMENTS

- A. Cleaning and disposal operations shall comply with all local, state, and federal codes, ordinances, regulations, and anti-pollution laws.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Cleaning materials which will not create hazards to health or property, and which will not damage surfaces shall be used only.
- B. The Contractor shall only use cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned.
- C. The Contractor shall use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3-EXECUTION

3.01 DURING CONSTRUCTION

- A. Premises shall be kept free from accumulation of waste materials or rubbish caused by Contractor's operations. The Contractor shall oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste material and rubbish.
- B. At reasonable intervals during progress of work, the Contractor shall clean-up site, buildings, and access, and dispose of waste materials, rubbish, and debris. Appropriate containers shall be provided and located on site for collection of waste materials, rubbish, and debris. The Contractor shall not allow waste materials, rubbish, and debris to accumulate and become an unsightly or hazardous condition.
- C. Waste materials shall be transported in a controlled manner with as few handlings as possible. Dusty debris and dusty areas shall be sprinkled with water.

- D. Burning or burying of rubbish and waste materials on the site shall not be performed. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems shall not be performed. The Contractor shall remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off the Owner's property.
- E. The Contractor shall properly clean up and dispose of any chemicals and materials which may be toxic or hazardous in accordance with all federal, state, and local codes.

3.02 DUST CONTROL

- A. The Contractor shall clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. The Contractor shall schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
- C. The Contractor shall broom clean interior building areas when ready to receive finish painting and continue cleaning on an as-needed basis until building is ready for acceptance or occupancy.

3.03 FINAL CLEANING

- A. The Contractor shall employ skilled workmen for final cleaning.
- B. The Contractor shall remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from interior and exterior surfaces.
- C. The Contractor shall wash and shine glazing and mirrors.
- D. The Contractor shall polish glossy surfaces to a clear shine.
- E. For ventilating systems, the Contractor shall:
 - 1. Clean permanent filters and replace disposable filters if units were operated during construction.
 - 2. Clean ducts, blowers, and coils if units were operated without filters during construction.
- F. The Contractor shall broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- G. The Contractor shall remove waste materials and rubbish from and about the site as well as tools, construction equipment, machinery, and surplus materials.

- H. Prior to final completion, or Owner occupancy, the Contractor shall conduct an inspection of interior and exterior surfaces and all work areas, to verify that the entire site where Work was performed is clean. The Contractor shall clean any areas found to be not clean.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall maintain at the site at all times during construction one copy of the following Project Record Documents:
 - 1. Conformed Drawings.
 - 2. Conformed Specifications.
 - 3. Change Orders and other modifications to the Contract.
 - 4. Engineer's Field Orders or written instructions.
 - 5. Approved Shop Drawings, Product Data and Samples.
 - 6. Field test records.
 - 7. Construction photographs.
 - 8. Current updated progress schedule.
- B. Progress payments will not be approved unless Project Record Documents are current with construction progress.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Documents and samples shall be stored in the Contractor's office apart from documents used for construction.
 - 1. The Contractor shall provide files and racks for storage of documents.
 - 2. The Contractor shall provide locked cabinet or secure storage space for storage of samples.
- B. Documents and samples shall be filed in accordance with specification section numbers.
- C. Documents shall be maintained in a clean, dry, legible condition and in good order. Record Documents shall not be used for construction purposes.
- D. Documents and samples shall be made available at all times for inspection by the Engineer and Owner.

1.03 MARKING DEVICES

- A. The Contractor shall provide felt tip marking pens for recording information in the color codes designated by the Engineer. Record Documents shall be marked accordingly.

1.04 RECORDING

- A. Each Record Document shall be labelled "PROJECT RECORD" with rubber stamp.
- B. The Contractor shall record information concurrently with construction progress, and shall not conceal any work until required information is recorded.
- C. Drawings shall be legibly marked to record actual construction, and shall include the following:
 - 1. Locations of all underground pipe and conduits installed.
 - 2. Elevations where applicable for all underground piping installed or located.
 - 3. Locations of all underground utilities, structures, obstacles, etc. encountered during construction, whether being installed or not, in the manner indicated above for underground pipes and conduits.
 - 4. Location of internal utilities and appurtenances concealed in the construction by referencing to visible and accessible features of the structure.
 - 5. Field changes of dimension and detail.
 - 6. Changes made by Field Order or by Change Order.
 - 7. Details not on original Drawings.
 - 8. Location and elevation of all equipment and piping.
 - 9. Location and elevation of all structures including channels and platforms.
 - 10. Identify pumping equipment installed by manufacturer's name, model number, impeller size, rated capacity and serial number.
- D. Specifications shall be legibly marked by each Section to record the following:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Field Order, Change Order, or other modifications to the Contract.
- F. Reviewed submittals:
 - 1. One set of record drawings for each process equipment item, piping, electrical system and instrumentation system.

G. The Contractor shall provide certified site survey and elevations.

1.05 FINAL SUBMITTAL

A. At Contract closeout, all Record Documents shall be delivered to the Engineer.

B. The submittal shall have a transmittal letter containing the following:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each Record Document.
5. Signature of Contractor or his authorized representative.

C. Final Acceptance will not be granted until the Record Documents have been turned over and accepted by the Engineer as complete.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01730 - OPERATION AND MAINTENANCE DATA

PART I - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall compile product data and related information appropriate for Owner's maintenance and operation of products furnished under contract. The Contractor shall prepare operating and maintenance data as specified in this section and as referenced in other pertinent sections of the specifications.
- B. The Contractor shall instruct the Owner's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED REQUIREMENTS

- A. Section 01300: Submittals.
- B. Section 01700: Contract Closeout.
- C. Section 01740: Warranties and Bonds.

1.03 FORM OF SUBMITTALS

- A. The Contractor shall prepare data in form of an instructional manual for use by the Owner's personnel.
- B. The format shall be as follows:
 - 1. DVD/ROM.
 - 2. PDFs.
 - 3. Text: Manufacturer's printed data, or typewritten.
 - 4. Drawings: Full size PDFs
 - 5. Fly-leaf for each separate product or each piece of operating equipment.
 - a. Description of product and major component parts of equipment.
 - b. Indexed tabs.
 - 6. Identification of each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS", and the following:
 - a. Title of project.
 - b. Identification of separate structure as applicable.
 - c. Identification of general subject matter covered in the manual.

1.04 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. The Contractor shall submit three (3) copies of the complete manual in final form.
- B. The manual content, for each unit of equipment and system, shall be as follows:
 - 1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts, which are cross-referenced with manufacturer's parts list.
 - 2. Operating procedures:
 - a. Start-up, break-in, routine, and normal operating instructions.
 - b. Regulation, control, stopping, shutdown, and emergency instructions.
 - c. Summer and winter operating instructions (if applicable).
 - d. Special operating instructions.
 - 3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "troubleshooting".
 - c. Disassemble, repair, and reassemble.
 - d. Alignment, adjusting and checking.
 - 4. Servicing and lubrication schedule with list of lubricants required.
 - 5. Manufacturer's printed operating and maintenance instructions.
 - 6. Description of sequence of operation by control manufacturer.
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 - 8. As-installed control diagrams by controls manufacturer.
 - 9. As-installed color-coded piping diagrams.
 - 10. Charts of valve tag numbers, with location and function of each valve.
 - 11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 - 12. Other data as required under pertinent sections of specifications.
- C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories of panel boards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As-installed color-coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "troubleshooting".
 - c. Disassembly, repair, and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.
 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 8. Other data as required under pertinent sections of specifications.
- D. The Contractor shall Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of specifications.

1.05 SUBMITTAL SCHEDULE

- A. The Contractor shall Submit preliminary draft of proposed formats and outlines of contents for Engineer's review.
- B. The Contractor shall Submit one (1) copy of completed data in final form fifteen days prior to final inspection. Copy will be returned after final inspection with comments.

- C. The Contractor shall Submit specified number of copies of approved data in final form within ten (10) days after final inspection.

1.06 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, the Contractor shall fully instruct the Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment, and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction. The Contractor shall review contents of the manual with the Owner's designated operating and maintenance personnel, in full detail, to explain all aspects of operations and maintenance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall compile specified warranties and bonds.
- B. The Contractor shall compile specified service and maintenance contracts.
- C. The Contractor shall co-execute submittals when so specified.
- D. The Contractor shall review submittals to verify compliance with Contract Documents.
- E. The Contractor shall submit to Engineer for review and transmittal to owner.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Performance Bond and Labor and Material Payment Bond.
- B. Conditions of the Contract: General Warranty of Construction.
- C. Section 01700: Contract Closeout.
- D. Section 01730: Operating and Maintenance Data.

1.03 SUBMITTAL REQUIREMENTS

- A. The Contractor shall assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors as specified in respective sections of these specifications
- B. Table of Contents: Neatly typed, in orderly sequence. The Contractor shall provide complete information for each item as follows:
 - 1. Product or work item.
 - 2. Firm, with name of principal, address, and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond, or service maintenance contract.
 - 6. Information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor, with name of responsible principal, address, and telephone number.

1.04 FORM OF SUBMITTALS

A. Format:

1. Size 8 ½" x 11" or legal-size sheets.
2. Scanned, original signed PDFs on DVD-ROM with case
3. Cover: Identify each DVD and case with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of project.
 - b. Name of Contractor.

1.05 TIME OF SUBMITTALS

- A. The Contractor shall make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, the Contractor shall provide an updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals required and demolish, modify, alter, and convert existing structures and pipelines as required for the construction of the new storage tanks and related improvements as shown on the Drawings and as specified herein.
- B. This Section covers demolition and initial modifications necessary to allow existing operations including well operation and production during the construction phase and final modifications during activation of the improved facility. Included, but not limited to, are demolition, modification and removal of existing materials, equipment or work necessary to install the new work as shown on the Drawings and as specified herein and to connect with existing work in an approved manner.
- C. This Section calls attention to certain activities necessary to maintain and facilitate operation during and immediately following construction and does not purport to cover all of the activities necessary. The Contractor shall exercise due concern for facility operation and diligently direct all activities toward maintaining continuous operation and minimizing operator inconvenience.
- D. Demolition includes:
 - 1. Complete demolition of all existing structures which are encountered in the way of the new work, as shown on the Drawings.
 - 2. Partial demolition as necessary below finished grade of all existing structures which are not in service or required for construction.
 - 3. Temporary modification of structures, equipment, appurtenances, and utilities as necessary to allow for operation of the facilities during construction.
 - 4. Removal of existing equipment.
 - 5. Removal or plugging of existing piping.
 - 6. Removing all existing wiring, conduit, switches, junction boxes, pull boxes, panels, outlets, and other electrical devices
 - 7. Distribution of salvageable and excess unacceptable material as specified below.
 - 8. Off-site disposal of excess and unacceptable materials.
- E. Blasting and the use of explosives shall not be used for any demolition work.

1.02 RELATED WORK

- A. Section 02300 - Excavation and Backfill.
- B. Section 03300 - Concrete.
- C. Demolition of electrical material and equipment is included in Division 16.

1.03 SUBMITTALS

- A. The Contractor shall submit to the Engineer, in accordance with Section 01300, proposed methods and operations of demolition of the structures and modifications prior to the start of work. Coordination of shutoff, capping and continuation of utility service as required shall be included.
- B. The Contractor shall furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.
- C. Before commencing demolition work affecting current facility operation, all modifications necessary to bypass the affected structure shall be completed. Actual work shall not begin until the Engineer has inspected and approved the modifications and authorized commencement of the demolition work in writing.

1.04 CONDITION OF STRUCTURES

- A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure or on the site may occur prior to the start of demolition work.

1.05 DISPOSAL OF MATERIAL

- A. Where directed by the Engineer, salvageable material and equipment listed hereinafter shall become the property of the Owner. All such items shall be dismantled to a size that can be readily handled and delivered to a designated storage area.
- B. Designated materials and items of equipment shall remain the property of the Owner and stored where directed on site. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the Contractor.
- C. All other material and items of equipment shall become the Contractor's property and shall be removed from the site. The storage or sale of removed items on the site shall not be conducted.

1.06 TRAFFIC AND ACCESS

- A. Demolition and modification operations and the removal of equipment and debris shall be conducted to ensure minimum interference with roads, streets, walks both onsite and offsite and to ensure minimum interference with occupied or used facilities.
- B. Special attention shall be directed towards maintaining safe and convenient access to the existing facilities by operational personnel and associated vehicles.
- C. Streets, walks or other occupied or used facilities shall not be closed without written permission from the Engineer. Alternate routes around closed or obstructed traffic in access ways shall be provided.

1.07 PROTECTION

- A. The Contractor shall conduct operations to minimize damage by falling debris or other causes to adjacent buildings, structures, roadways, and other facilities, including persons. The Contractor shall furnish interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.
- B. The Contractor shall exercise precautions for fire prevention. Acceptable fire extinguishers shall be available at all times in areas where demolition work by burning torches is being performed. Burning of demolition debris shall not be permitted onsite or near the site.
- C. The Contractor shall erect and maintain barriers, lights, sidewalk sheds, and other required protective devices.

1.08 DAMAGE

- A. The Contractor shall promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no additional cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.
- B. Where sidewalks, curbs, roadways, drainage inlets or other surface fixtures must be demolished in order to perform work or are damaged during work, they shall be replaced.

1.09 UTILITIES

- A. The Contractor shall maintain existing utilities as directed by the Engineer to remain in service and protect against damage during demolition operations.

- B. Existing utilities serving occupied or used facilities shall not be interrupted except when authorized by the Engineer. The Contractor shall provide temporary services during interruptions to existing utilities as acceptable to the Engineer.
- C. The Contractor shall cooperate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.
- D. All necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under the jurisdiction of the utility companies shall be made by the Contractor.
- E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.10 NOTIFICATION

- A. At least 48 hours prior to commencement of a demolition or removal, the Engineer shall be notified in writing. Owner shall be allowed to inspect the existing equipment to identify and mark those items which are to remain the property of the Owner. No removals shall be started without the permission of the Engineer.
- B. Prior to any demolition or excavation, the Contractor shall locate all underground utilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. All materials and equipment removed from existing work shall become the property of the Contractor except for those which the Owner has identified and marked. All materials and equipment marked by the Owner to remain shall be carefully removed, so as not to be damaged, cleaned and stored on or adjacent to the site in a protected place specified by the Engineer or loaded onto trucks provided by the Owner.
- B. All demolition materials, equipment, debris, and all other items not marked by the Owner to remain shall be properly disposed offsite, in accordance with all applicable laws and regulations. Demolition debris shall not be used for fill or backfill.
- C. Pollution Controls

1. The Contractor shall use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattered in the air to the lowest practical level. The Contractor shall comply with governing regulations pertaining to environmental protection.
 - a. The Contractor shall not use water when it may create hazardous or objectionable conditions such as flooding or pollution.
 - b. The Contractor shall clean adjacent structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Adjacent areas shall be returned to conditions existing prior to the start of the work.

3.02 REMOVAL OF EXISTING EQUIPMENT, PIPING AND APPURTENANCES

- A. Mechanical removals shall consist of dismantling and removing existing piping, equipment, and other appurtenances as specified, shown, or required for the completion of the work. It shall include cutting, capping, and plugging as required.
- B. Existing water, wastewater, and other piping not required for the new work shall be removed where shown on the Drawings, or where it will interfere with the new work. Chemical and gas fuel lines shall be purged and made safe prior to removal or capping.
- C. When underground piping is to be altered or removed, the remaining piping shall be properly capped. Abandoned underground piping may be left in place unless it interferes with new work or is shown or specified to be removed.
- D. All equipment, piping and appurtenances shall be cleaned, flushed, and drained. Equipment to be retained by the Owner as specified in Paragraph 1.06 shall be dismantled sufficiently to permit thorough cleaning and draining. All valves shall be left open. All discontinued piping shall be capped and sleeves and openings remaining after removal of the existing equipment, piping and appurtenances shall be plugged and sealed as shown on the Drawings and as directed by the Engineer.
- E. Any changes to potable water piping and other plumbing and heating system work shall be made in conformance with all applicable codes and under the same requirements as other underground piping. All portions of the potable water system that have been altered or opened shall be pressure tested and disinfected in accordance with Louisiana Health Department and AWWA requirements. Other plumbing and heating piping shall be pressure tested only.

3.03 DEMOLITION

- A. Demolition shall be performed to the limits shown on the Drawings, or if no limits

are shown, to a depth at least two feet below final grade, or two feet below any new foundation or pipe.

- B. The Contractor shall wet down work during demolition operations to prevent dust from arising. The Contractor shall furnish maximum practicable protection from inclement weather for materials, equipment and personnel located in partially dismantled structures.
- C. Existing, below grade slabs to be abandoned but not demolished shall have sufficient holes cut to allow for positive drainage to prevent flotation.
- D. The Contractor shall remove all existing items as indicated on the Drawings and prepare adjoining areas for installation of new work or for blocking up and filling in of openings.
- E. Structural Demolition
 - 1. Unless otherwise approved by the Engineer, the Contractor shall proceed with demolition from the top of the structure to the ground. The Contractor shall complete demolition work above each floor or tier before disturbing supporting members of lower levels.
 - 2. All mechanical, electrical, piping, and miscellaneous appurtenances shall be removed prior to demolition of the structure.
 - 3. The Contractor shall demolish concrete and masonry in small sections. The Contractor shall remove structural framing members and lower to ground by means of hoist, derricks, or other suitable methods. The Contractor shall break-up and remove foundations and slabs-on-grade, unless otherwise shown to remain. The Contractor shall locate demolition equipment throughout the structure and remove material to not impose excessive loads on supporting walls, floors, or framing.
 - 4. The Contractor shall remove structures to the lines and grades shown unless otherwise directed by the Engineer. Where no limits are shown, the limits shall be 4 inches outside the item to be installed. Removal beyond these limits shall be at no additional expense to the Owner, and these excess removals shall be reconstructed to the satisfaction of the Engineer with no additional compensation to the Contractor.
 - 5. All concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metal, plaster, wire mesh and other items contained in or upon the structure shall be removed and taken from the site, unless otherwise approved by the Engineer. Demolished items shall not be used in backfill adjacent to structures or in pipeline trenches.

6. After removal of parts or all masonry walls, slabs and like work which tie into new work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

3.04 MISCELLANEOUS CONCRETE SLABS AND SIDEWALKS

- A. The Contractor shall remove miscellaneous concrete slabs and sidewalks where shown on the Drawings or where necessary for the construction of new structures or modification of existing structures.

3.05 ELECTRICAL REMOVALS

- A. Electrical removals shall consist of the removal of existing transformers, distribution switchboards, control panels, motors, conduits and wires, poles and overhead wiring, panelboards, lighting fixtures and miscellaneous electrical equipment all as shown on the Drawings, specified herein, or required to perform the work.
- B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.
- C. Conduits and wires shall be abandoned or removed where shown or as required.
- D. Wall switches, receptacles, starters, and other miscellaneous electrical equipment shall be removed and disposed of off the site as required.

3.06 MODIFICATIONS

- A. Modifications to existing structures, piping, tanks, etc. shall be performed as shown on the Drawings or required to perform the construction of the work under this Contract.

3.07 CLEAN-UP

- A. Upon completion of the demolition work, all materials, equipment, waste and debris of every sort shall be removed, and the premises shall be kept clean, neat, and orderly.

END OF SECTION

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SECTION 02200 – EARTHWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary conditions and other Division - 1 Specifications sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of earthwork is indicated on drawings.
- B. Layout and scale all lines and levels.
- C. Preparation of suitable subgrade, subbase, and base for the following is included as part of this work:
 - 1. Site improvements including parking areas, drives, and walks.
 - 2. Filling and backfilling to attain indicated grades.
 - 3. Backfilling of trenches within building lines.
 - 4. Preparation of subgrade and subbase for building foundations.
- D. Excavation for Mechanical work is included as part of this work.
- E. The contractor shall furnish all labor, supervision, material, equipment and services necessary for the clearing and stripping, excavation, transportation, grading, compacting of all materials that are not provided for under other section of these specifications including excavation for ditches and channels and all other grading operations necessary for the construction work in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the Engineer.
- F. It is understood and agreed that the Contractor is familiar with the surface conditions that will be encountered at the site and his price bid for the work includes all the costs involved for work in these conditions.

1.3 DEFINITIONS

- A. Subgrade Material: The original or in situ soil encountered and existing after excavation

or under fill.

- B. Subbase Material: The material transported in or moved into the jobsite that sits upon the subgrade below the pavement. The plans will show by section or note the depth of subbase material required.
- C. Base Material: The material transported in or moved into the jobsite that sits upon the subbase and under the pavement. The plans will show by section or note the depth of base material required.
- D. Deleterious Material: The material that would be harmful to the completed foundation. It consists of mixtures of soil and organic material, which will decay or produce unsatisfactory subsidence and may be made up of decaying vegetation, roots, stumps, logs, humus, or other material.
- E. Excavation: Consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1.4 REFERENCES

- A. ASTM C 136: Sieve analysis of fine and coarse aggregate
- B. ASTM D 698: Moisture density relations of soils and aggregate mixture using a 5.5 lb. rammer and 12" drop.
- C. ASTM D 1557: Moisture density relations of soils and aggregate mixture using a 10 lb. rammer and 18" drop.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. The Contractor shall select and pay for the services of an independent testing laboratory to perform inspection and tests.
- C. The testing laboratory shall test and inspect the earthwork for compliance with these specifications. Any earthwork not meeting the requirements of these specifications shall be replaced.
- D. Contractor is responsible for coordinating these tests.

1.6 TESTS

- A. Tests and analysis of fill materials will be performed in accordance with ASTM D 698 and ASTM D 1557 and under provisions of Section 01400. Run ASTM D 698 and ASTM D 1557 to determine the optimum moisture and compaction conditions of soils approved for fill.
- B. Perform in-place compaction tests for all fill material. Tests shall be performed for each 6" to 8" layer of fill; one test for each 200 square feet or portion thereof of pavement or other site improvement. Tests shall also be performed at each lift of fill used to backfill the hole after removal of tree stumps with trunk diameters over 24”.

1.7 SAMPLES

- A. Submit samples under provisions of Section 01400 and confirm fill materials meet specifications as to classification.

1.8 JOB CONDITIONS

- A. Existing Utilities: Should uncharted, or incorrectly charted, piping, or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation.
- B. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post warning lights.
- C. Operate warning lights as recommended by authorities having jurisdiction.
- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operation.
- E. Perform excavation within dripline of large trees to remain by hand and protect the root system from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Structural Fill Material: Soils that are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, GC, SW, SP, SM and SC or any combination of these groups, with a liquid limit of 40 or less and a plasticity index of 20 or less and less than 30% of fines passing a #200 sieve in accordance with ASTM C136 free of organics

and rock or gravel larger than 1.5 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious material. Structural Fill shall have a minimum dry density of 110 pcf.

- B. Unsatisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups ML, MH, CL, CH, OL, OH, and PT. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction as defined by ASTM D1557.
- C. Structural Fill Material: satisfactory soil materials free of rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious material.
- D. Geotextile Fabric shall meet the requirements of Sections 1019 of the “Louisiana Standard Specification for Roads and Bridges”, 1992 Edition, for Class D Geotextile.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavation is unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered such as pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not unauthorized excavation.
- B. Stripping (excavating the topsoil layer at existing grade at the building site, in the parking/drive areas and under other site improvements) includes removal of all vegetation, topsoil, organics, debris and other deleterious materials.
- C. Strip the area under the proposed parking areas/drives, buildings, and an area 1 foot around the perimeter of these areas to a minimum depth below existing grade to remove all vegetation, roots, silty topsoil, and organics. The Geotechnical Investigation determined that there is 10 – 12 inches of silty topsoil with organics at the site. Stump holes and depressions should be thoroughly cleaned of loose soil and backfilled with new fill. The site should be proof rolled with loaded dump truck or equivalent to identify weak spots to be removed.
- D. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer shall be at Contractor's expense.
- E. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification unless otherwise directed by Engineer.

- F. Additional Excavation: When excavation has reached subgrade elevations, notify Engineer who will make an inspection of conditions.
- G. Proof roll the subgrade areas under the proposed structures and drives, parking areas with a tandem axle or similar heavily loaded vehicle weighing approximately 20 tons. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material with approved structural fill as directed by Engineer.
- E. For the excavation of additional soil beyond the required subgrade elevations after clearing, grubbing, and stripping, the contractor shall provide the Engineer a topographic survey of the top of the subgrade before the additional excavation and after the additional excavation to determine the actual depth of the additional excavation. The points for the topographic survey shall be on a grid not exceeding 10' on center. The contractor shall also provide the Engineer with the horizontal dimensions of the additional excavation. The topographic survey and horizontal measurements will be monitored by the testing laboratory. The Engineer will calculate from the topographic survey and horizontal measurements, the actual in place volume of the additional soil excavated and volume of in-place compacted fill required to backfill the hole.
- F. The construction site including areas of excavation shall be properly prepared to prevent ponding of water and provide immediate runoff of all rainfall and groundwater with proper drainage.
- G. The Contractor's work includes initially grading the site to positively drain away runoff and groundwater from the building, pavement, and any other areas of excavation in the construction site including digging sump holes to collect runoff and groundwater or installing wellpoints. Provide and maintain pumps, suction and discharge lines, and other dewatering systems components necessary at wellpoints and sumps to convey water away from excavations at all times. Due to the potential for a perched water table in the surficial soils, ground water may tend to migrate towards ditches and shallow excavations until the surficial soils are drained. It may be necessary for the Contractor to excavate and place interior ditches or swales on close centers to adequately drain the surficial soils under the building footprint and pavement. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
- H. The near surface soils are easily rutted by motorized equipment when wet. All clearing, filling and compaction operations should not be done during periods of inclement weather. The area of excavation for stripping the existing grade under the building footprint and pavement shall be limited to the amount that can be backfilled prior to any rainy weather. If an area under the building footprint or pavement is stripped and left exposed in rainy weather, any additional excavation required to remove the wet soil for any reason below the specified subgrade shall be at the Contractor's expense.
- I. Material Storage: Stockpile satisfactory excavated materials where directed, until

required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

- J. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
- K. Dispose of excess soil material and waste materials as herein specified.
- L. Excavation for Structures: Conform to elevations and dimensions which stay 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.
- M. Excavation for Pavement and other site improvements: Cut existing grade to cross sections shown on plans and specified herein.
- N. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.2 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.
 - 1. Pavement and other site improvements: Compact loose 6" to 8" lifts of structural fill to 95% of maximum dry density within +/- 2% of optimum moisture content as compared to ASTM D 698. Each lift shall be tested and approved before placing subsequent lifts.
 - 2. Lawn or Unpaved Areas: Compact loose 6" lifts of satisfactory excavated or borrow material by several passes of a bulldozer or other spreading equipment.
- B. Moisture Control: Where subgrade or layer of soil materials must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
- C. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
- D. 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 value.

3.3 BACKFILL AND FILL

- A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
1. Under grassed areas, use satisfactory excavated or borrow material. Suitability of excavated material is to be determined by the Engineer.
 2. Under walks, use Structural Fill Material.
 3. Under concrete pavement use Structural Fill Material.
 4. Under buildings and other site improvements use Structural Fill Material.
 5. Under piping and conduit, use Structural Fill Material where indicated under piping or conduit; shape to fit bottom 180 degrees of cylinder. Limestone is required for bedding or embedment for certain utilities. Refer to other specifications and details on the plans for material specifications and compaction requirements.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and recording locations of underground utilities.
 2. Removal of concrete formwork.
 3. Removal of trash and debris.
- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- D. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.
- E. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to the required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
- F. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

3.4 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
- C. Finish surfaces free from irregular surface changes, as follows:
 - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
 - 2. Walks: Shape surface or areas under walks to line, grade, and cross-section, with finished surface not more than 0.10' above or below required subgrade elevation.
 - 3. Parking Areas/Drives: Shape areas to line, grade, and cross section with finish surface not more than 0.05 feet above or below required elevations.
- D. Compaction: After grading, compact surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.5 FIELD QUALITY CONTROL

- A. Quality control Testing During Construction: Allow testing lab to inspect and approve subgrades and fill layers before further construction work is performed.
- B. The Contractor's representative testing laboratory will perform field density tests in accordance with ASTM D 2922-81 (nuclear density tests). The General Contractor is responsible for coordinating these tests.
- C. If in opinion of Engineer, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.6 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. 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.

3.7 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal From Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION

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SECTION 02300 - EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Work under this Section includes, except as provided elsewhere, trenching for installation of pipelines and appurtenances, including excavation, backfilling, disposal of surplus material, and restoration of trench surfaces.
- B. Excavation shall extend to the width and depth shown on the Drawings or as specified; or where not specified, the Contractor shall confine the excavation to the least width practicable and shall provide suitable room for installing pipe, structures, and appurtenances.
- C. The Contractor shall furnish and place all necessary sheeting, bracing, and supports in accordance with OSHA regulations.
- D. The Contractor shall remove from the excavation all materials which are unsuitable for backfill, including that which the Engineer deems unsuitable for backfill.

1.02 RELATED WORK

Section 02140: Dewatering

Section 02160: Sheeting, Shoring, and Bracing

PART 2 - PRODUCTS

2.01 BACKFILL AND BEDDING MATERIAL

Backfill and bedding material shall be granular material, stone, or an approved blend as shown on the Drawings.

2.02 FOUNDATION MATERIAL

Foundation material shall be as shown on the Drawings.

2.03 GEOTEXTILE FABRIC

Geotextile fabric shall be Mirafi 500X, or approved equal.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Excavation shall be open cuts with vertical sides using sheeting and bracing as required, all sheeting and bracing for excavations shall be in accordance with OSHA regulations.
- B. The bottom of the excavation shall be firm, dry, and in all respects, acceptable. If required on the Drawings, the Contractor shall install limestone for pipe bedding, or limestone refill for excavation below grade. This material shall be placed directly onto the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever.
- C. In case the excavation for any pipeline is directed by the Engineer to be carried below the required depth, the Contractor shall fill the bottom of the excavation up to grade with compacted bedding material.
- D. If the Contractor excavates below grade through error or for convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, the Engineer may direct the Contractor to excavate below grade as set forth in the preceding paragraphs; in which case the work of excavating below grade and finishing and placing the refill shall be performed at no additional cost to the Owner.
- E. All material excavated shall be placed so as to minimize interference with public travel and to permit proper access for inspection of the work.

3.02 DISPOSAL OF MATERIALS

- A. Excavated material shall be stacked without excessive surcharge on the trench bank and without obstructing free access to hydrants and valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.
- B. All excavated material which is either unsuitable for backfill or that will not be used for backfill in the same location shall be removed from the site of the Work by the Contractor. The Contractor shall remove and properly dispose of excess excavated material.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be rehandled and used in backfilling the trench, or hauled to the Owner's designated storage site, or disposed of properly.

3.03 REMOVAL OF STUMPS, ROOTS, AND LOGS

- A. Stumps, roots, and logs, which are encountered within the trench area, shall be cut to a depth of one foot (1') below the bottom of the trench and removed. The Contractor shall fill the excavated space with compacted bedding material.
- B. When directed by the Engineer, the Contractor shall probe one foot (1') below the established bottom of the trench. If any stumps, roots, or logs are discovered by this probing, the Contractor shall remove them as required in Paragraph A above.
- C. Blasting shall not be used for the removal of stumps, roots, and logs. All removed stumps, roots, and logs shall be disposed of properly.

3.04 TEST PITS

Test pits for the purpose of locating underground utilities or structures in advance of the construction may be excavated by the Contractor. Test pits shall be backfilled immediately after the desired information has been obtained. The backfilled surface shall be restored and maintained in a manner satisfactory to the Engineer. Test pits and related restoration and shall be at no additional cost to the Owner.

3.05 PLACEMENT OF BEDDING MATERIAL

- A. Bedding shall conform to the details on the Drawings. When laying pipe, the groove for the pipe and bell hole shall be accurately shaped, and the bedding material shall be closely packed under and around the pipe.
- B. If required on the Drawings, the bedding and pipe shall be enclosed in a geotextile fabric. Geotextile fabric shall be installed in accordance with the manufacturer's recommendations.

3.06 BACKFILL

- A. As soon as practical after the pipe has been laid and jointed, backfill material (free from stones, pieces of lumber, and other foreign material) shall be hand placed and hand tamped to a depth over the top of the pipe as shown on the Drawings.
- B. Where pipes are laid in developed areas, the trench shall be filled with approved backfill material to an elevation six inches below the existing grade. The remainder of the trench shall be filled with top soil.
- C. Where pipes are laid within street rights-of-ways, the remainder of the trench above the bedding shall be backfilled as shown on the Drawings.
- D. All road surfaces adjacent to backfilling operations shall be broomed and hose cleaned immediately after backfilling.

3.07 RESTORING TRENCH SURFACE

- A. The Contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, additional fill shall be installed to restore the level to the adjacent ground.
- B. The surface of any street, driveway, sidewalk or any other area which is disturbed by the trench excavation, shall be restored by the Contractor to a condition at least equal to that existing before work began.
- C. In sections where the pipeline passes through maintained grassed areas, the Contractor shall regrade and re-sod all disturbed areas.

3.08 PROTECTION

Guard rails, curbing, and fencing in the vicinity of the Contractor's operations shall be adequately protected and, if necessary, removed and restored after backfilling. All curbing, fencing, or guard rails which are damaged during construction shall be replaced with material fully equal to that existing prior to construction.

3.09 TESTING

Compaction tests shall be performed for each lift of bedding and backfill, at no less than one per 100 linear feet of trench. Re-testing for failed result shall be at no additional cost to Owner.

END OF SECTION

SECTION 02525 – WATER WELLS

PART I – GENERAL

Construct water well improvements as specified in Section 01010 - Summary of Work, as shown on the drawings, and according to AWWA A100-20, as modified by the project documents. The well improvements and water well capacity shall be based on the allowable safe yield of the new well determined by a well pump test as required by Louisiana Sanitary Code (LAC 51, Part XII), and as approved by the Engineer.

Qualifications: Contractor (or sub-contracted Well Driller) shall be licensed by the Louisiana Contractor's Board in "Specialty: Water Well Drilling"; shall be listed as an active water well driller by the Louisiana Department of Natural Resources and shall have successfully completed no less than 5 public water supply wells exceeding 1,800 ft in the last 5 years. Submit qualifications and references prior to construction for approval.

Submittals: Contractor shall submit all required information listed in Louisiana Administrative Code, Title 56, Part I, and as required by the Contract Documents. Sequence of work and submittals shall generally be as follows:

1. Pumping Test – Perform capacity test and submit results of test well yield,
2. Water Quality Testing - sample and test the quality of the test well water,
3. Obtain Approval – Final well improvements cannot start until engineer approval of Water Well Test Report,
4. Production Well Pump Test – Establish aquifer and well flow characteristics as specified. Recommend and submit pump equipment for approval.

PART II – PRODUCTS

Materials shall be as required by the drawings, referenced in Part III of this specification, Execution, related specification sections as applicable, and as in this Part II.

Deep Well Vertical Turbine Pump: Furnish, install, and make operational a deep well water lubricated lineshaft turbine pump with above ground discharge, in accordance with this specification and the drawings. Materials in contact with water shall be NSF 61 certified.

Approved Manufacturers:

1. Goulds
2. National
3. Or approved equal

Dimensions, pumped flow, pressure, and depth shown on drawings are basis of bid. Contractor's design report shall confirm or recommend alteration to pump and drive equipment based on production well pump test results. Submit manufacturer's pump curves

with combined multi-stage performance annotated with design point, substantiated with pump test system prediction.

Pump Construction

1. Discharge Head – ASTM A48 Class 30 cast iron, or fabricated steel, with rabbet fit for mounting driver and pump column assembly support. Discharge flange machined to ANSI standards. Headshaft shall couple above the stuffing box.
2. Stuffing Box – Cast iron, containing no less than 5 acrylic graphite packing rings and grease chamber. Packing gland shall be bronze, secured with stainless steel studs and adjusting nuts.
3. Column Pipe – ASTM A53, Grade B, furnished in threaded sections no greater than 10 ft.
4. Bowls – Close grained ASTM A48 Class 30 Cast Iron. Free from blow holes, sand holes, or other fault. Vitreous enamel lined waterways.
5. Bowl Bearings – C-844 Bronze, with replaceable wear rings
6. Impellers – CDA 872 Cast bronze, fastened to shaft with 416 stainless steel taper split collet
7. Discharge Case – ASTM A48 Class 30 Cast Iron.
8. Suction Case – C-844 bronze replaceable wear ring, grease packed C-844 bronze bearing, protected by bronze C-844 sand collar.
9. Bowl shaft – ASTM A582 416 stainless steel, ground and polished. Extend through the stuffing box.
10. Strainer – stainless steel.
11. Motor – See Section 16150.

PART III – EXECUTION

Well Test Plan: Prior to the start of well improvement activities at the site, the contractor must submit a well construction test plan that describes:

1. Description of pumping test procedures,
2. Water quality sampling and testing including identifying certified analytical laboratory to be used, and
3. Other details as required under the DH Design Requirements.

Well Pumping Test: To determine the expected yield from the test well and to assure acceptable water quality, a pumping test shall be performed in the well. The test well shall be constructed in accordance with state sanitary code requirements. The results of the pumping test must be submitted as part of the Water Well Test and Permanent Well Design Report and must include data table, graphs, and pumping test descriptions.

Water Well Test Report - PRIOR to the start of final well improvements, the contractor must provide the engineer a water well test report that includes water quality lab results, and pump test results, for approval. The Water Well Test must be submitted and approved by the engineer prior to installing any permanent well features.

The Water Well Test Report shall include:

1. Water quality lab results
2. Pump test results

Structural integrity of the well is the complete responsibility of the Contractor. Well construction shall be sequenced to prevent buckling, displacement, or other defect of casing, screen and downhole components. After approval of the Water Well Test, the Contractor may start construction of the well improvements.

Performance Testing: Upon completion of the well improvements, the Driller shall at a minimum conduct a continuous 6- hour pumping test at the designed flow rate. Drawdown will be recorded from time-zero at the following time intervals:

First 5 minutes—every 30 seconds
Next 5 minutes – every minute
Next 50 minutes—every 10 minutes
Next 2 hours—every 20 minutes
Next 2 hours—every 40 minutes
Last hour—one sample at end

If water levels are recorded digitally with a transducer, smaller time intervals are often programmed into the software. This is acceptable. The above guidance serves as minimum time intervals. Recovery data will also be recorded at intervals described above. Recovery data will be recorded until drawdown reaches 90% of pre- pumping levels.

Well Disinfection. The well shall be disinfected to remove bacteriological contamination that may cause the well- water supply to be unsafe for human consumption. The chlorine solution used for disinfecting the well shall be of such volume and strength and shall be so applied that a concentration of at least 50 ppm of available chlorine shall be obtained for the entire water depth of the well, and this solution shall remain in the well for a period of at least 12 hr. If the samples collected after disinfection show bacteriological contamination, the contractor shall prepare and apply to the entire depth of the well a total volume of the chlorine solution of at least 100 mg/L of available chlorine equal to at least four times the volume of water in the well. The contractor shall allow this solution to remain in the well for a period of at least 24 hr.

Well Pump – A multi-stage lineshaft turbine pump shall be installed as shown on the drawings. Control of the pump shall be as indicated on the drawings.

Backflow Prevention – An appropriate backflow prevention device and shut-off valve (downstream of the backflow device) must be placed on the above-ground well discharge piping to prevent water from flowing back down the well.

WATER QUALITY SAMPLING AND ANALYSIS

The Contractor shall perform water quality sampling and testing at the source. The Contractor shall utilize well-qualified and equipped testing firm, acceptable to Owner.

Sample, test, and report for the National Primary Drinking Water Regulations (NPDWR) and Secondary Drinking Water Standards (NSDWR).

Work Hours: Contractor shall observe project work hours. During test well and production well drilling and grouting, or other critical task, Contractor may request weekend and 24-hr operations. Requests shall be in writing to Engineer no later than 7 days prior. Owner may deny, grant, or revoke such permission, at Owner's sole discretion, without result to Contract performance period or costs.

END OF SECTION

SECTION 02580 - PIPELINE INSTALLATION AND TESTING

PART 1 - GENERAL

1.01 Description

- A. The Contractor shall furnish all labor, equipment and materials required to perform all work required for installation of pipelines as indicated on the drawings and specified herein.
- B. The Drawings indicate the alignment of all known pipelines within the limits of the Work, based upon records. The Contractor shall inspect the entire project to verify the location of all existing pipelines and to determine the existence of any conflicts with the Work. The location of proposed pipelines may be field adjusted, with prior approval from the Engineer, to avoid conflicts with other utilities. Damage to any pipelines by the Contractor, subcontractors, material and equipment suppliers or other persons, prior to acceptance, shall be repaired by the Contractor to the satisfaction of the Engineer and Owner at no additional cost to the Owner.

1.02 Construction Layout

The Contractor shall establish all lines and grades and stake out all work on this project from controls shown on the Drawings.

1.03 Related Work

Section 02160 - Sheeting, Shoring, and Bracing
Section 02300 - Excavation and Backfill
Section 15042 - Ductile Iron Pipe
Section 15064 - Plastic Pressure Pipe

PART 2 - PRODUCTS

- 2.03 Identification tape shall be color coded, foil backed with lettering reading "WARNING (or CAUTION) - BURIED WATERLINE (or WASTEWATER) LINE".

PART 3 - EXECUTION

3.01 General

- A. The installation of pipelines shall be strictly in accordance with these specifications, latest applicable AWWA standards, and the manufacturer's requirements and recommendations.
- B. Trenching requirements are included in Section 02160 - Sheeting, Shoring and Bracing, and Section 02300 - Excavation and Backfill.

- C. Pipe installation shall be accomplished with pipe sections and fittings such that pipe cutting is held to an absolute minimum. Should pipe cutting be required, cutting shall be done in a neat manner, without damage to the pipe or to the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners. All cutting of pipe shall be done with mechanical equipment only. Pipe ends shall be cut with a saw or abrasive wheel. Field cut holes for saddles shall be cut with mechanical pipe cutters.
- D. The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter, and for waterlines, shall be swabbed with chlorine prior to installation and shall be kept clean until the work has been accepted. Swabbing herein shall mean the forceful introduction of a large sponge type device through a pipe to remove debris, such as stones and sand. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other materials shall not be placed in or allowed to enter the pipe.
- E. A representative of the Owner shall be present or shall be given the chance to inspect all installed pipe prior to backfill. The Owner may require the Contractor to uncover any or all water distribution system items installed for inspection, at no additional cost to the Owner.

3.02 Water System Valves and Hydrants Operation

- A. All water distribution system valves and hydrants shall be operated by the Owner. The Contractor shall not operate water system valves or hydrants without prior written permission from the Owner. The Contractor may be allowed to operate water system valves or hydrants without prior written permission only when the Owner's representatives are present at all times during operation, and give specific verbal permission.

3.03 Material Handling

- A. Pipes, fittings, couplings, and all other incidentals and accessories shall be handled in a manner that will insure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire ropes and chains shall not be used. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.
- B. All pipe and fitting coatings which have been damaged shall be repaired by the Contractor before installation. Any such repairs shall be done in total conformance with the manufacturer's requirements and recommendations, shall use approved materials only, and shall be subject to final acceptance by the Engineer.

3.05 Connection to Existing Piping

- A. The Owner's representative shall be present during all work being done at the tie-in points. All tie-in locations shall be excavated and existing piping shall be investigated (material type, size, outside diameter, condition, photograph, etc.) prior to ordering material and equipment, and especially prior to the cutting of the existing pipe. Connections between new work and existing piping shall be made using fittings suitable for the conditions encountered and as indicated on the drawings. Each connection to an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by the Owner.
- B. Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatered lines and excavations without damage to adjacent properties.

3.06 Allowable Clearance Between Pipelines

- A. Between Waterlines and Wastewater Lines - When wastewater lines are parallel to waterlines, the clearance shall be a minimum of 10 feet (measured horizontally); when wastewater lines and waterlines cross, vertical clearance shall be 18 inches, with the waterline crossing above the wastewater line.
- B. Between Waterlines and Any Private Utility Lines - Minimum clearance between a waterline and any private utility line shall be 6 feet (measured horizontally).

3.07 Pipe Marking

- A. All pipelines shall be installed with buried warning tape. All non-metallic pipelines shall be installed with detector wire.
- B. Warning tape shall be laid in the trench while backfilling, and shall be placed between 12 to 18 inches above the top of the pipe.
- B. Detector wire shall be laid directly over the pipe and shall terminate in valve boxes, meter boxes, or bored or drilled crossings.

3.08 Pipeline Pressure Testing

- A. All pipelines shall be pressure tested. The Contractor shall supply all labor, equipment, material, gauges, pumps, and incidentals required for testing.
- B. The test pressure shall be 150 psig for waterlines and 100 psig for sewer force mains, unless noted otherwise. The test pressure shall be measured at the highest point along the test section.
- C. Testing shall be conducted only after backfilling has been completed.
- D. Testing procedure shall be as follows:

- 1) Fill line slowly with water. Maintain flow velocity less than two feet per second.
- 2) Expel air completely from the line during filling and again before applying test pressure. Air shall be expelled by means of taps at points of highest elevation.
- 3) Apply test pressure. Measure the quantity of water that must be pumped into the line to maintain pressure within five (5) psig of the test pressure for a period of two (2) hours. This quantity is defined as leakage.
- 4) Carefully examine any exposed pipe, fittings, and joints for leakage during the test.

E. Allowable leakage: Leakage shall be less than that determined by the following formula:

$$L = \frac{(S)(D)(P)^{1/2}}{133,200}$$

L = Loss in gallons per hour
 S = Length of pipe tested in feet
 D = Nominal pipe diameter in inches
 P = Recorded test pressure in psig

- F. If any test of a pipeline section discloses leakage greater than that allowed, the Contractor shall, at no additional cost to the Owner, locate and repair the cause of leakage and retest the line.
- G. All visible leaks shall be repaired regardless of the amount of leakage.

3.09 Waterline Disinfection

- A. Before being placed into service, all new, modified, and/or contaminated segments of the water distribution system shall be cleaned, flushed, and disinfected (chlorinated) by the Contractor under the direct supervision of the Owner. The disinfection of piping shall conform to AWWA C651 "Standard for Disinfection of Water Mains". All disinfection procedures shall be in full compliance with the Louisiana Sanitary Code (Code), Part XII Water Supplies, Chapter 3, Section 353. The procedures to be used, including the chemicals to be used, shall be submitted to the Engineer for approval.
- B. The interior of the piping shall be thoroughly cleaned, flushed, disinfected, flushed, and tested. Flushing shall be done at flow rates sufficient to provide a velocity in the lines of at least 2.5 feet per second.
- C. The Contractor shall arrange for sampling and bacteriological testing to be conducted by the Owner. Water prepared for sampling, and water used for flushing, shall not have a chlorine residual higher than that normally maintained in the water system. The piping shall be cleaned, flushed, disinfected, flushed, and tested as many times as necessary to

achieve a suitable bacteriological test result, at no additional cost to the Owner. No additional Contract Time will be awarded the Contractor for work necessary due to failed bacteriological testing.

- D. Only after satisfactory pressure testing, disinfection, and successful bacteriological test results from the Owner is completed, shall the waterline segment be connected to the existing water distribution system. Under no circumstances shall the Contractor make a connection to the existing water distribution system without direct supervision of the Owner.

3.10 Water Usage

- A. Water for flushing, pressure testing, and disinfection may be obtained by the Contractor from the Owner's water system. In order to prevent backflow (back siphon, back pressure) or reversal of the flow of potentially unclean liquids into the drinking water system a separate check valve, as a minimum, shall be used by the Contractor at the point of connection to the Owner's system. A meter shall be used to record the Contractor's water usage.
- B. The Contractor will not be charged for the water used in filling, flushing, testing and chlorinating of pipelines. The Contractor will be charged for any water necessary for retesting due to negligence of the Contractor, and for any water necessary due to failed bacteriological testing.

END OF SECTION

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SECTION 02720 – STORM SEWERAGE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Refer to Division-2 section "Earthwork" for excavation and backfill required for storm sewerage systems piping and structures.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of storm sewerage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm sewage work similar to that required for project.

1.4 CODES AND STANDARDS

- A. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewerage system's materials and products, and coordinate activities with the local governing authorities Department of Engineering.
- B. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewerage systems.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewerage system materials and products.
- B. Shop Drawings: Submit shop drawings for precast concrete storm drainage manholes, drop inlets, and catch basins, including frames, covers, and grates.
- C. Record Drawings: At project closeout, submit record drawings of installed storm sewerage piping and products, in accordance with requirements of Division 1.

- D. Maintenance Data: Submit maintenance data and parts lists for storm sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

- A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated, selection is Installer's option.
- B. Provide shop drawings as submittal for approval by the Engineer. This submittal should comply with the type of pipe as indicated on the drawings.
- C. PVC pipe shall meet the requirements of A.S.T.M. D 3034 with a minimum SDR of 26. All PVC pipe shall be solid wall, corrugated PVC is not allowed.
- D. All fitting and joints should be per manufacturer recommendations for all specified pipe.
- E. Corrugated Metal Pipe: Corrugated metal pipe (CMP) shall be bituminous coated steel pipe – 14 gage minimum in accordance with LADOTD specification 1007.
- F. All reinforced concrete pipe shall be wrapped with plastic filter cloth (D.O.T.D. Specification 1019) 24 inches wide, centered on the joint and lapped a minimum of 24".
- G. Reinforced Concrete Pipe: Reinforced concrete pipe shall conform to ASTM C76, Class 3, with A or B wall thickness, Section 1016.02 of the LADOTD Specifications. Joints shall be Type 3 joints in accordance with LADOTD Specification 1016.01.
- H. Reinforced Concrete Arch Pipe: Reinforced concrete arch pipe shall be Class 3 pipe and shall conform to ASTM C-506 and as amended by LADOTD Specification 1016.03. Joints shall be Type 3 joints in accordance with LADOTD Specification 1016.01.

2.2 DROP INLETS AND MANHOLES

- A. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, of depth indicated. Sections shall have provision for rubber gasket joints. Base section slab shall have minimum thickness of 8 inches, riser sections shall have minimum thickness of 4 inches and be 48 inches inside diameter, and top section and grade rings shall match 24-inch frame and grate, unless otherwise indicated.
 - 1. Base Section: Base riser section and separate base slab, or base riser section with integral floor.
 - 2. Riser Sections: Sections shall be of lengths to provide depth indicated.

3. Top Section: Flat slab type with opening to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into riser sidewall at 12-to-16-inch intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.
9. Catch Basin Steps: Wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.
10. Material: Ductile iron or cast aluminum.
11. Catch Basin Frames and Grates: ASTM A 536 Grade 60-40-18, heavy-duty, ductile iron, 24 inch inside diameter by 7-to-9-inch riser with 4-inch minimum width flange, and 26-inch diameter flat grate having small, square or short slotted drainage openings.

PART 3 – EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED STORM SEWERAGE SYSTEMS

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipe bedding is to be installed. Remove all standing, visible water prior to placement of the bedding or embedment material. Install and compact the bedding material to the compaction requirements as indicated on the plans. Backfill with acceptable material as indicated on the drawings to indicated level.
- C. Shape bottom of trench as indicated on the drawings. Fill unevenness with compacted bedding. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation material.

3.2 INSTALLATION, GENERAL

- A. Install piping in accordance with requirements of the local governing authorities Department of Engineering, except where more stringent requirements are indicated.

- B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
- C. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground storm sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- D. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cement, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- E. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
- F. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of the flow is prohibited.
- G. Install piping pitched down in direction of flow at a constant slope between points and elevations indicated, at a minimum slope as indicated.
- H. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.3 CATCH BASINS, DROP INLETS AND MANHOLES

- A. General: Construct to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated. If there is a problem due to plan grade requirements, contact the Engineer before installation.
- C. Holes in precast structures to be made with a coring machine.

3.4 BACKFILLING

- A. General: Conduct backfilling operations of open-cut trenches closely following layout, jointing, and bedding of pipe, and after initial inspection and testing are completed.
- B. Allow no more than 50' between pipe laying and point of complete backfilling.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Complete cleaning of the entire drainage system is required before substantial completion.
- C. In large, accessible piping, brushes and brooms may be used for cleaning.
- D. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
- E. Flush piping between manholes or drop inlets, if required by local authority, to remove collected debris.

3.6 INTERIOR INSPECTION

- A. Inspect piping to determine whether line displacement or other damage has occurred.
- B. Make inspections after pipe between manholes, catch basins, or drop inlets and / or their locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
- C. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and reinspect.
- D. Contractor shall provide lights, mirrors, ladders, and all other equipment necessary to completely inspect the interior of the pipeline.

END OF SECTION

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SECTION 02831 - CHAINLINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Instruction to Bidders and General Provisions of the Contract apply to this Section.

1.2 DESCRIPTION

- A. The Contractor shall furnish all labor, materials, tools, and equipment necessary to construct chainlink fences including gates to the sizes, lines, and grades specified; and in the locations shown on the plans. When installation procedures are not covered within these specifications, standard details, special provisions, plans or other documents, installation shall comply with ASTM F567. The Contractor shall construct the fence in a manner that provides a rigid, taut fence closely conforming to the surface of the ground.
- B. Unless specified otherwise, the chainlink fence shall be six (6) feet in height and shall be topped by three (3) lines of two-strand barbed wire supported by post top arms; posts shall not be placed at more than 10-foot intervals and continuous top rails shall be provided; fabric shall be placed on outside of post line.
- C. The Contractor shall coordinate all work with the Engineer. The work shall consist of erecting or reinstalling a chain link fence and/or gate system. This Item shall include all the necessary fence sections including fence fabric, rails, posts, and caps; gates and related hardware; excavation and anchorage for posts including aggregate, concrete, cement and blocking.

1.3 SUMMARY

- A. Section Includes:
 - 1. Chainlink fence: framework, fabric, and accessories.
 - 2. Swing gates.
 - 3. Excavation for fence posts.
 - 4. Concrete encasement for fence posts.
- B. Some products specified in this section may not be required for this project.
- C. Related Requirements:

1. Section 01050 "Site Condition Video Survey" for recording existing conditions.
2. Section 03300 "Cast-in-Place Concrete" for setting fence and gate posts.

CHAINLINK FENCES AND GATES

1.4 REFERENCES

A. GENERAL

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - a. ASTM INTERNATIONAL (ASTM)
 - 1) ASTM A116 (2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
 - 2) ASTM A121 (2013) Specification for Metallic-Coated Carbon Steel Barbed Wire
 - 3) ASTM A153 (2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4) ASTM A702 (2013) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
 - 5) ASTM A780 (2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - 6) ASTM A90 (2013) Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
 - 7) ASTM C94 (2015) Standard Specification for Ready-Mixed Concrete
 - 8) ASTM F552 (2014) Standard Terminology Relating to Chain Link Fencing
 - 9) ASTM F668 (2017) Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric
 - 10) ASTM F900 (2011) Specification for Industrial and Commercial Swing Gates

- 11) ASTM F934 (2013) Specification for Standard Colors for Polymer-Coated Chain Link
- 12) ASTM F1043 (2016) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
- 13) ASTM F1083 (2016) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
- 14) ASTM F1183 (2011) Standard Specification for Aluminum Alloy Chain Link Fence Fabric
- 15) ASTM F567 (2014a) Standard Practice for Installation of Chain Link Fence
- 16) ASTM F626 (2014) Standard Specification for Fence Fittings
- 17) ASTM F883 (2013) Padlocks
- b. U.S. GENERAL SERVICES ADMINISTRATION (GSA)
 - 1) FS RR-F-191/3 (Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
- c. CHAIN LINK FENCE MANUFACTURERS INSTITUTE (CLFMI)
 - 1) CLFMI CLFS 2445 (2013) Guide for Specifying Commercial Industrial and Security Chain Link Fence and Gates

1.5 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at a location to be determined after award of contract.

1.6 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chainlink fabric, reinforcements, and attachments.
 - c. Accessories: Barbed wire.
 - d. Gates and hardware.
 - e. Anchorages.

- f. Manufacturer's installation instructions.
 - B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, gate operation, and operational clearances. C.
- Samples for Initial Selection: For each type of factory-applied finish.
- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
 - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

1.7 INFORMATIONAL SUBMITTALS

- A. A complete and detailed list of any and all variations to this specification.
- B. Qualification Data: For testing agency and factory-authorized service representative.
- C. Product Certificates: For each type of chainlink fence and gate.
- D. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency. E. Field quality-control reports.
- F. Sample Warranty: For special warranty.

1.8 QUALITY ASSURANCE

- A. Manufacturer: Company headquartered in the United States having U.S. manufacturing facility/facilities specializing in manufacturing chain link fence products with at least 5 years' experience.
- B. Fence Contractor: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least 5 years' experience.
- C. Tolerances: Current published edition of ASTM specifications tolerances apply. ASTM specification tolerances supersede any conflicting tolerance.
- D. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities fence installation operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
 3. The Contractor shall ensure the project site is protected and secure during fence installation and reconstruction.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Faulty operation of gate operators and controls.
 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chainlink Fence Fabric
 1. Steel Chain Link Fence Fabric ASTM F668

- a. Size and Gauge: 2-inch mesh, 9-gauge (0.148 inch) wire with polymer coating
 - b. Polymer Coating: ASTM F668, Class 2a or 2b
 - 1) Class 2a: extruded and Adhered
 - 2) Class 2b: fused and adhered
 - c. Color: Black in accordance with ASTM F934
2. Selvage: Knuckled at bottom, twisted at top.
- B. Fence Framework
- 1. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 based on the following:
 - a. Fence Height: 72 inches or as otherwise specified.
 - b. Heavy-Industrial-Strength Material: 50,000 psi minimum yield strength: Group IC, round steel pipe, electric-resistance-welded pipe, AASHTO M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe or RR-F-191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe
 - 1) Line Post: 2.375 inches in diameter.
 - 2) End, Corner, and Pull Posts: 2.875 inches in diameter.
 - c. Horizontal Framework Members: Intermediate and top rails according to ASTM F1043.
 - 1) Intermediate and Top Rail: 1.66 inches in diameter.
 - d. Brace Rails: ASTM F1043.
 - 1) Brace Rail: 1.66 inches in diameter.
- C. Metallic Coating for Steel Framework:
- 1. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A123 or 4.0-oz./sq. ft. zinc coating according to ASTM A653.
 - 2. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
 - 3. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil-thick, zinc-pigmented coating.
 - 4. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. coating.

5. Coatings: Any coating above, plus polymer to match fabric.
- D. Tension Wire
1. For Polymer Coated Fabric
 - a. Polymer Coated Steel Tension Wire: 7-gauge (0.177 in) wire complying with ASTM F1664. Wire gauge specified is the core wire gauge. Match coating class and color to that of the chain link fabric.
 - 1) Class 2a, extruded and adhered.
 - 2) Class 2b, fused and adhered.
 2. For Aluminum Alloy Fabric
 - 1) Aluminum Wire: 0.192-inch-diameter tension wire, mill finished, according to ASTM B211, Alloy 6061-T94 with 50,000-psi minimum tensile strength.
- E. Swing Gates
1. General: ASTM F900 for gate posts and double swing gate types.
 - a. Gate Leaf Width (Contractor to Verify): 175.5± inches, opening width of 351± inches.
 - b. Framework Member Sizes and Strength: Based on gate fabric height of 72 inches.
 2. Pipe and Tubing:
 - a. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
 - b. Aluminum: ASTM B429; manufacturer's standard finish.
 - c. Gate Posts: Round tubular steel or round tubular aluminum posts.
 - d. Gate Frames and Bracing: Round tubular steel or round tubular aluminum.
 - e. Finish: Match coating and color to that of the chain link fabric.
 3. Frame Corner Construction: Welded or assembled with corner fittings.
 4. Extended Gate Posts and Frame Members: Fabricate gate posts and frame end members to extend 12 inches above top of chain-link fabric at both ends of gate frame to attach barbed wire assemblies.
 5. Hardware:
 - a. Hinges: 360-degree inward and outward swing.

- b. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
- c. Lock: Manufacturer's standard internal device.
- d. Padlock and Chain: Per ASTM F883.
- e. Closer: Manufacturer's standard.

6. All gate fence fabric shall be new in accordance with Section 2.1, Subparagraph A.

F. Fittings

1. Provide fittings according to ASTM F626 and the following:
2. Post Caps: Provide for each post.
 - a. Provide weatherproof line post caps with loop to receive tension wire or top rail.
3. Rail and Brace Ends: For each gate, corner, pull, and end post.
4. Rail Fittings: Provide the following:
 - a. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 - b. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails to posts.
5. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of 3/4 inch.
6. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
 - a. Bars for 2 inch and 1-3/4 inch mesh shall have a minimum cross section of 3/16 inch by 3/4 inch.
 - b. Bars for 1 inch mesh shall have a cross section of 1/4 inch by 3/8 inch.
 - c. Bars for small mesh 3/8-inch, 1/2 inch and 5/8 inch shall be attached (sandwiched) to the terminal post using a galvanized steel strap having a minimum cross section of 2 inches by 3/16 inch with holes spaced 15 inches on center to accommodate 5/16-inch carriage bolts which are to be thru bolted thru the strap the mesh and thru the terminal post.
7. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
8. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts, for each post unless otherwise indicated, and as follows:

- a. Provide line posts with arms that accommodate top rail or tension wire.
- b. Provide corner arms at fence corner posts unless extended posts are indicated.
- c. Single-Arm Type: Type I, slanted arm.

9. Tie Wires, Clips, and Fasteners: According to ASTM F626.

- a. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - 1) Hot-Dip Galvanized Steel: 0.148-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
 - 2) Aluminum: ASTM B211; Alloy 1350-H19; 0.192-inch-diameter, mill finished wire.

10. Finish:

- a. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
- b. Polymer Coating to match fabric.

G. Barbed Wire

1. Steel Barbed Wire: ASTM A121, three-strand barbed wire, Design Number 12-4-5-14R, double 12-1/2 gauge (0.099 inch) twisted strand wire, with 4 point 14 gauge (0.080 inch) round barbs spaced 5 inches on center. Match coating type to that of the chain link fabric.

- a. Zinc Coating: Type Z, Class 3.

H. Grout and Anchoring Cement

1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

I. Grounding Materials

1. Comply with requirements in Section 16060 "Grounding and Bonding."
2. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.

- a. Connectors for Below-Grade Use: Exothermic welded type.
- b. Grounding Rods: Copper-clad steel, 5/8" by 96 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading is completed unless otherwise permitted by Engineer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 50 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by fence installation operations.
- C. Protect and maintain erosion and sedimentation controls during fence installation operations.

3.3 FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
 1. Install fencing at locations shown on the Construction Drawings and within established boundary lines inside property line.
 2. No posts shall be installed within the limits of the proposed aggregate driveway.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
 1. Space footings for line posts 10 feet on center maximum and at closer intervals when indicated, with bottoms of the holes approximately 3-inches below the bottoms of the posts.

- Set bottom of each post not less than 36-inches below finished grade when in firm, undisturbed soil. Set posts deeper, as required, in soft and problem soils and for heavy, lateral loads.
2. Uniformly spread soil from excavations adjacent to the fence line or as directed.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Verify that posts are set plumb, aligned, and at correct height and spacing, and held in position during setting with concrete or mechanical devices.
 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Concealed Concrete: Place the top of concrete 2 inches below grade to allow covering with surface material.
 - b. Concrete for setting fence posts shall be in accordance with LADOTD Class M with a minimum 28-day design strength of 3,500 pounds per square inch.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
- E. Line Posts: Space line posts uniformly at 10 feet on center.
- E. Line Posts: Space line posts uniformly at 10 feet on center (maximum).
- F. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
1. Locate horizontal braces at midheight of fabric 36 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sagging. Fasten fabric to tension wire with 0.148-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches on center. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- H. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved

runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer. I. Intermediate Rails: Secure to posts with fittings.

- J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches on center.
- L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center.
- M. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- N. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.
 - 1. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F567. Direction of swing shall be both inward and outward. Gates shall be plumb in the closed position having a bottom clearance of 3 inches, grade permitting. Hinge and latch offset opening space shall be no greater than 3 inches in the closed position. Double gate drop bar receivers shall be set in a concrete footing a minimum of 9 inches in diameter and 24 inches deep. Gate leaf holdbacks shall be installed for all double gates.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 16060 "Grounding and Bonding."

B. Fence and Gate Grounding:

1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
2. Install ground rods and connections at maximum intervals of 1500 feet.
3. Fences within 100 feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
4. Ground fence on each side of gates and other fence openings.
5. Bond metal gates to gate posts.
6. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

C. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a ground rod located a maximum distance of 150 feet on each side of crossing.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect the conductor to each fence component at grounding location.

1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.

E. Connections:

1. Make connections with clean, bare metal at points of contact.
2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
4. Make above-grade ground connections with mechanical fasteners.
5. Make below-grade ground connections with exothermic welds.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

F. Bonding to Lightning Protection System: Ground fence and bond fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor according to NFPA 780.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor to engage a qualified testing agency to perform tests.
- B. Prepare test reports.

3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.8 CLEANUP

- A. The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

3.9 DEMONSTRATION

- A. Contractor to engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION

SECTION 02920 – SEEDING AND SODDING

PART 1 - GENERAL

1.01 REQUIREMENT

- A. The Contractor shall provide all labor, materials, and equipment to install seeding and sodding, with fertilizing and mulching for all disturbed areas that are not to be paved or otherwise treated in accordance with the Contract Documents. The Contractor shall re-establish vegetative cover in all areas where such cover existed prior to the beginning of the Work, and in areas so designated on the Drawings.
- B. The Work under this Section includes furnishing and placing topsoil, seed and sod, and mulching, fertilizing, watering, and maintenance until final acceptance by the Owner.

1.02 QUALITY ASSURANCE

- A. The Contractor shall deliver a satisfactory stand of grass as specified. If necessary, the Contractor shall repeat any or all the work, including grading, seeding, or sodding, fertilizing, and watering until a satisfactory stand is obtained.
- B. A satisfactory stand of grass is herein defined as a full lawn cover of the predominant vegetative species existing prior to the beginning of the Work, or species as required herein, over areas to be seeded or sodded. Grass shall be alive and growing, free from weeds, and leaving no bare spots larger than one square foot in area, separated by at least 10 feet in distance.
- C. If a satisfactory stand of grass has not been obtained within a reasonable period of time, the Engineer will instruct the Contractor in writing that the vegetative cover is not adequate and additional measures as determined by the Engineer, including installation of sodding on areas previously treated with seed applications, shall be undertaken by the Contractor to establish the required satisfactory stand of grass, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fertilizer: Fertilizer shall be a commercial, chemical type, uniform in composition, free flowing, conforming to state and federal laws and suitable for application with equipment designed for that purpose.

- B. Seed: Seed shall be delivered in original unopened packages bearing an analysis of the contents. Seed shall be guaranteed 95 percent pure with a minimum germination rate of 80 percent.
1. The following grass species may be established by seeding procedures.
 - a. Hulled Bermuda
 - b. Pensacola Bahia
 - c. Kentucky 31 Fescue
- C. Sod: The Contractor shall furnish sod equal to and similar in type as that disturbed by the Contractor's operations.
1. The following grass species shall be established by sodding procedures:
 - a. St. Augustine
 - b. Centipede
 - c. All other species not listed under Seeding.
 2. The following areas shall have vegetative cover restored by sodding procedures, regardless of the grass species.
 - a. Slopes steeper than four (4) horizontal to one (1) vertical.
 - b. Locations subject to concentrations of water flow or erosion including but not limited to roadway ditch bottoms and flume areas where storm water runoff is concentrated.
 - c. Repair of eroded areas within areas previously seeded.
- D. Mulch: Mulch shall be a fibrous, wood cellulose product produced for this purpose. It shall be dyed green and shall contain no growth or germination inhibiting substances and shall be manufactured so that when thoroughly mixed with seed, fertilizer, and water, in the proportions indicated it will form a homogenous slurry which is capable of being sprayed.
- E. Topsoil: Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the Owner. Topsoil shall be fertile, natural surface soil, capable of supporting the grassing specified.
- F. Water: Water shall be clean, fresh, and free of substances that would inhibit vigorous growth of turf. The Contractor shall make whatever arrangements necessary to ensure an adequate supply of water to meet the needs for the work. The Contractor shall furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as required.

PART 3 - EXECUTION

3.01 GENERAL

- A. Weather Conditions: Fertilizing, seeding, sodding, or mulching operations shall not be conducted when wind velocities exceed 15 miles per hour or when the ground is frozen, unduly wet, or otherwise not in a tillable condition.

- B. Soil Preparation: The ground to be seeded shall be graded in conformance with the Drawings and shall be loose and free of large rocks, roots, and other material which will interfere with the work. Areas to be sodded shall be pulverized or tilled to a depth of 3 inches.
- C. Soil Placement: Topsoil shall be spread evenly over all planting areas to a depth of 4 inches.
- D. Method of Seed Application: Fertilizer, seed, and mulch may be applied separately (Dry Method), or they may be mixed together with water and the homogeneous slurry applied by spraying (Hydraulic Method), except that all slopes 3 units horizontal to 1 unit vertical or steeper shall be stabilized by the Hydraulic Method.
- E. Sod placement shall begin upon arrival on site. Sod shall be placed with no space between edges and staggered so as to prevent a continuous seam. Sod shall be rolled, or hand tamped after placement.

3.02 DRY METHOD

- A. Fertilizing: The fertilizer shall be spread uniformly at the rate of approximately 1 pound per 55 square feet. The fertilizer shall be raked in and thoroughly mixed with the soil to a depth of approximately 2 inches prior to the application of seed or mulch.
- B. Seeding: The seed shall be broadcast uniformly at the rate of approximately 1 pound per 730 square feet. After the seed has been distributed it shall be incorporated into the soil by raking or by other approved methods.
- C. Mulch Application: Mulch shall be applied at the rate approximately 1 pound (air dried weight) per 30 square feet.

3.03 HYDRAULIC METHOD

The hydraulic method shall consist of the uniform application by spraying of a homogeneous mixture of water, seed, fertilizer, and mulch. The slurry shall be prepared by mixing the ingredients in the same proportions as indicated above. The slurry shall have the proper consistency to adhere to the earth slopes without lumping or running. Mixing time of materials shall not exceed 45 minutes from the time the seeds come into contact with the water in the mixer to the complete discharge of the slurry onto the slopes; otherwise, the batch shall be recharged with seed. The mixture shall be applied using equipment containing a tank having a built-in, continuous agitation and recirculation system, and a discharge system which will allow application of the slurry to the slopes at a continuous and uniform rate. The application rates of the ingredients shall be the same as those specified for the Dry Method. The nozzle shall produce a spray that does not concentrate the slurry nor erode the soil.

3.04 WATERING

Upon completion of the seeding and/or sodding, the entire area shall be soaked to saturation by a fine spray. The new planting shall be kept watered by a sprinkling system on the Site during dry weather or whenever necessary for proper establishment of the planting until final project acceptance. At no time shall the planting be allowed to dry out. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the Contractor, at no additional cost to the Owner.

3.05 MAINTENANCE PRIOR TO FINAL ACCEPTANCE

The Contractor shall maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, and sufficient watering to maintain the plant materials in a healthy condition. The Engineer may require replanting of any areas in which the establishment of the vegetative ground cover does not appear to be developing satisfactorily.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope: Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install cast-in-place concrete, reinforcement and related materials.
- B. Coordination: Review installation procedures under other Sections and coordinate the installation of items that must be installed in the concrete.

1.02 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Concrete Testing Service:
 - a. The Contractor will employ a testing laboratory to perform materials evaluation, testing and design of concrete mixes.
 - b. The Contractor's laboratory will also evaluate concrete delivered to and placed at the site.
 - 2. Quality Control: Contractor's laboratory will perform sampling and testing during concrete placement, as follows:
 - a. Sampling: ASTM C 172.
 - b. Slump: ASTM C 143, one test for each load at point of discharge.
 - c. Air Content: ASTM C 31, one for each set of compressive strength specimens.
 - d. Compressive Strength: ASTM C 39, one set for each 50 cubic yards or fraction thereof for each class of concrete; a minimum of one set for each pour of structural concrete; 1 specimen tested at 7 days, 2 specimens tested at 28 days.
- B. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ACI 301, Specifications for Structural Concrete for Building (includes ASTM Standards referred to herein except ASTM A 36).
 - 2. ACI 347, Recommended Practice for Concrete Formwork.
 - 3. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - 4. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 5. ACI 305, Recommended Practice for Hot Weather Concreting.
 - 6. ACI 306, Recommended Practice for Cold Weather Concreting
 - 7. ASTM A36, Structural Steel.
 - 8. Concrete Reinforcing Steel Institute, Manual of Standard Practice, include ASTM Standards referred herein.

1.03 SUBMITTALS

- A. Mix Design: In advance of concrete operations, materials proposed for use in concrete will be sampled and tested to determine their compliance with these specifications. Mix proportions shall be reviewed by the laboratory for each strength and type of concrete required and reports submitted to the Engineer for approval, showing the mix designs. Include the following information in concrete mix design:
1. Proportions of cement, fine and coarse aggregate, and water
 2. Water-cement ratio, 28-day compressive and design strength, slump, and air content
 3. Type of cement and aggregate
 4. Aggregate gradation
 5. Type and dosage of admixtures
 6. Special requirements for pumping
 7. Range of ambient temperature and humidity for which design is valid
 8. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified
- B. Samples: Submit samples of materials as specified and may be requested by the Engineer including names, sources, and descriptions.
- C. Shop Drawings: Submit the following for approval in accordance with the General Requirements and with additional requirements as specified.
1. Copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
 2. Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, Chapters 1 thru 8. For walls, show elevations to a minimum scale of 3 inch to 1 foot. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements, and assemblies, as required for the fabrication and placement of concrete reinforcement.
 3. List of concrete materials and concrete mix designs proposed for use. Include the results of all tests performed to qualify the materials and to establish the mix designs in accordance with ACI 301, 3.9. Submit written report to Engineer for each proposed concrete mix at least 15 days prior to start of Work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.
- D. Laboratory Test Reports: Submit copies of historical laboratory test reports for concrete cylinders, materials and mix design tests. Production of concrete to comply with specified requirements is the responsibility of the Contractor.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete reinforcement materials to the site bundled, tagged, and marked. Use tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- B. All materials used for concrete shall be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to ensure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

PART 2 - PRODUCTS

2.01 CONCRETE MIX DESIGN

- A. Concrete Paving for Drives: Unless noted otherwise, mix design shall be Type B as defined in the LSSRB, 2016 Edition and latest revisions.
- B. Concrete for Incidentals: Unless noted otherwise, mix design shall be Type M as defined in the LSSRB, 2016 Edition and latest revisions.
- C. Concrete for Structures: Mix design for structures shall be Type A1 as defined in LSSRB, 2016 Edition and latest revisions.

2.02 CONCRETE MATERIALS

- A. Portland Cement:
 - 1. Wet Well and Valve Box: ASTM C 150, Type II.
 - 2. All other Uses: ASTM C 150, Type I.
- B. Aggregates: ASTM C33.
 - 1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.
 - 2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
 - a. Crushed stone, processed from natural rock or stone.
 - b. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
- C. Coarse Aggregate Size: Size to be in accordance with ASTM C33, Nos. 57 or 67, unless permitted otherwise by Engineer.
- D. Water: Clean, potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Water-Reducing Admixture: ASTM C 494. Only use admixtures which have been tested and accepted in mix designs.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement of not less than one inch and not more than four inches.

2.03 FORM MATERIALS

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
- B. Exposed Concrete Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces. Use largest practical sizes to minimize form joints.
- C. Unexposed Concrete Surfaces: Suitable material to suit project conditions.
- D. Provide $\frac{3}{4}$ inch chamfer at all exposed corners.

2.04 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60.
- B. Welded Wire Fabric: ASTM A185.
- C. Steel Wire: ASTM A82.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcement in place.
 - 1. Use wire bar type supports complying with CRSI recommendations, except as specified below. Wood, brick, or other unacceptable materials, shall not be used.
 - 2. For slabs on grade, supports shall have sand plates or horizontal runners where base materials will not support chair legs.
 - 3. For all concrete surfaces, where legs of supports are in contact with forms, provide supports complying with CRSI, Manual of Standard Practice as follows:
Either hot-dip galvanized, plastic protected or stainless steel legs.

2.05 GROUT

- A. Non-metallic, 100 percent solids, high strength epoxy grout.
 - 1. Use clean well graded sand with epoxy resins suitable for use on dry or damp surfaces.
 - 2. Product and Manufacturer; Provide one of the following:
 - a. Euco High Strength Grout by the Euclid Chemical Company.
 - b. Sikadur 42 Grout by Sika Chemical Company.
 - c. Five Star Epoxy Grout by U.S. Grout Corporation.
 - d. Or equal.
- B. Nonshrink, Nonmetallic Grout:
 - 1. Premixed non staining cementitious grout requiring only the addition of water at the job site.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Euco N-S by the Euclid Chemical Company.
 - b. Masterflow 713 by Master Builders Company.
 - c. Five Star by U.S. Grout Corporation.
 - d. Or equal.
- C. Ordinary Cement-Sand Grout:

1. Except where otherwise specified use 1 part cement to 3 parts sand complying with the following:
 - a. Cement: ASTM C 150, Type I.
 - b. Sand: ASTM C 33.

2.06 JOINTS

- A. Expansion joint filler shall be preformed expansion joint filler complying with ASTM D1752, Type II cork.
- B. Joint sealer:
 1. Exterior and Interior Joints in Horizontal Planes: Two-Component Polyurethane Sealant:
 - a. Polyurethane-based, 2-part elastomeric sealant complying with the following:
 - (1) FS TT-S-00227, Type 1 (self-leveling) Class A.
 - (2) Water Immersion Bond, FS TT-S-00227; Elongation of 25 percent with no adhesive failure.
 - (3) Hardness (Standard Conditions), ASTM C 661: 30-40.
 - (4) Stain and Color Change, FS TT-S-00227 and ASTM C 510: No discoloration or stain.
 - (5) Accelerated Aging, ASTM C 793: No change in sealant characteristics after 250 hours in weatherometer.
 - b. Product and Manufacturer: Provide one of the following:
 - (1) Sonolastic Paving Joint Sealant by Sonneborn Division of Contech Incorporated.
 - (2) Vulkem 255 by Mameco International.
 - (3) Or equal.

PART 3 - EXECUTION

3.01 INSPECTION

The Contractor shall examine the substrate and the conditions under which Work is to be performed and notify the Engineer of unsatisfactory conditions. The Contractor shall not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.02 FORMWORK

- A. Formwork: Construct formwork so that concrete members and structures are correct size, shape, alignment, elevation, and position, complying with ACI 347.
- B. Provide openings in formwork to accommodate Work of other trades. Accurately place and securely support items built into forms.
- C. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.03 REINFORCEMENT, JOINTS, AND EMBEDDED ITEMS

- A. Comply with the applicable recommendations of specified codes and standards, and ACI Manual No. SP-66, latest edition, for details and methods of reinforcement placement and supports.
- B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
 - 1. Place reinforcement to obtain the minimum concrete converges as shown and as specified in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
 - 2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.
- D. Provide sufficient numbers of supports of strength required to carry reinforcement. Reinforcing bars shall not be placed more than 2 inches beyond the last leg of any continuous bar support. Supports shall not be used as bases for runways for concrete conveying equipment and similar construction loads.
- E. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements for minimum lap of spliced bars.
- F. Install welded wire fabric in as long lengths as practical, lapping at least one mesh.
- G. Concrete shall not be placed until the reinforcing steel is inspected and approved by the Engineer for placing concrete. All concrete placed in violation of this provision will be rejected.
- H. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs on ground to stabilize differential settlement and random cracking.
- I. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided under other Sections and other contracts for locating and setting. Refer also to Paragraph 1.01.B., Coordination, above.

3.04 CONCRETE AND PLACEMENT

- A. Only ready-mixed concrete shall be used. It shall be in accordance with ASTM C 94.

- B. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Placement shall not begin until work of other trades affecting concrete is completed.
- C. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.
- D. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.05 QUALITY OF CONCRETE WORK

- A. Make all concrete solid, compact and smooth, and free of laitance, cracks, and cold joints.
- B. Cut out and properly replace to the extent ordered by the Engineer, or repair to the satisfaction of the Engineer, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Patches or plastering shall not be used.
- C. Repair, removal, and replacement of defective concrete as ordered by the Engineer shall be at no additional cost to the Owner.

3.06 CURING

- A. Begin initial curing after placing and finishing concrete as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing with the use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protection as required to prevent damage to exposed concrete surfaces.
- B. Forms on structural walls shall be left in place for a minimum of 72 hours unless a cylinder break indicates the strength of the concrete has reached 75 percent of design strength.
- C. Forms on structural floors and ceiling shall be left in place until a cylinder break indicates the strength of the concrete has reached 85 percent of design strength.

3.07 FINISHES

- A. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently. Check and level the surface plane to a tolerance not exceeding 3 inch in 10 feet when tested with a 10-foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.

- B. After floating, begin the first trowel finish operation using a trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.
- i. Consolidate the concrete surface with the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10-foot straight edge. Grind smooth surface defects.
 - ii. Use trowel finish for the following: Interior exposed slabs unless otherwise shown or specified.
 - iii. Apply non-slip broom finish to exterior concrete slab and elsewhere as shown on the Drawings.

3.08 GROUT PLACEMENT

General:

1. Place grout as shown and in accordance with manufacturer's instructing. If manufacturer's instructions conflict with the Specifications do not proceed until the Engineer provides clarification.
2. Drypacking shall not be used.
3. Manufacturers of proprietary products shall make available upon 72 hours notification the services of a qualified, full-time employee to aid in assuring proper use of the product under job conditions.
4. Placing grout shall conform to the temperature and weather limitations described in Paragraph 3.04 above.

END OF SECTION

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies requirements for construction of masonry unit walls.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01300, SUBMITTALS.

B. Samples:

1. Concrete masonry units, when exposed in finish work.
2. Anchors, and ties, one each and joint reinforcing 12 inches long.

C. Shop Drawings:

1. Indicate special masonry shapes.
2. Indicate reinforcement, applicable dimensions, and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
3. Submit shop drawings for fabrication, bending, and placement of reinforcing bars prepared in accordance with ACI 315.

D. Certificates:

1. Submit certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment or delivery to which certificate applies.
2. Indicate that the following items meet specification requirements:
 - a. Face brick.
 - b. Solid and load-bearing concrete masonry units.
3. Identify testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

E. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Shear keys.
3. Reinforcing bars.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced.
Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society for Testing and Materials (ASTM):
- | | |
|----------------------|---|
| A615/A615M-12 | Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement |
| A675/A675M-03 (2009) | Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties |
| A951/A951M-11 | Steel Wire for Masonry Joint Reinforcement |
| C90-12 | Load bearing Concrete Masonry Units |
| C476-10 | Grout for Masonry |
- C. American Welding Society (AWS):
- | | |
|---------------|---|
| D1.4/D1.4M-11 | Structural Welding Code – Reinforcing Steel |
|---------------|---|
- D. Masonry Industry Council:
Hot and Cold Weather Masonry Construction Manual, 1999
- E. Masonry Standards Joint Committee; Specifications for Masonry Structures (TMS 602-11/ACI 530.1-11/ASCE 6-11) (MSJC)
- F. American Concrete Institute (ACI):
- | | |
|-------------|----------------------|
| SP-66(2004) | ACI Detailing Manual |
|-------------|----------------------|

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
1. Unit Weight: Normal or lightweight.
 2. Sizes: Modular.
 3. Finish: As shown on drawings.
 4. Color: none.
- B. Mortar: ASTM C476, Type S.

2.3 REINFORCEMENT

- A. Steel Reinforcing Bars: ASTM A615, deformed bars, Grade 60 for bars except as otherwise indicated.
- B. Joint Reinforcement:
 - 1. Form from wire complying with ASTM A951.
 - 2. Galvanized after fabrication.
 - 3. Width of joint reinforcement 1 5/8-inches less than nominal width of masonry wall or partition.
 - 4. Cross wires welded to longitudinal wires.
 - 5. Joint reinforcing at least 10 feet in length.
 - 6. Joint reinforcing in rolls is not acceptable.
 - 7. Joint reinforcing that is crimped to form drip is not acceptable.
 - 8. Maximum spacing of cross wires 16 inches to longitudinal wires.
 - 9. Ladder Design:
 - a. Longitudinal wires deformed 0.16-inch (min.) diameter wire.
 - b. Cross wires 0.10-inch (min.) diameter.
 - 10. Trussed Design:
 - a. Longitudinal and cross wires not less than 0.16-inch nominal diameter.
 - b. Longitudinal wires deformed.

2.4 ANCHORS, TIES, AND REINFORCEMENT

- A. Rigid Anchors: Fabricate from steel bars bent to configuration indicated.

2.5 PREFORMED COMPRESSIBLE JOINT FILLER

- A. Thickness and depth to fill the joint as specified.
- B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1.
- C. Non-Combustible Type: ASTM C612, Type V, 1800 degrees F.

2.6 ACCESSORIES

- A. Weeps: Glass fiber ropes, 3/8-inch minimum diameter, 12 inches long.
- B. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.

- C. Cavity Drain Material: Recycled polyester/polyethylene mesh trapezoidal shaped to maintain cavity air flow and drainage while suspending mortar droppings at unequal heights.
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- E. Masonry Cleaner:
 - 1. Detergent type cleaner selected for each type of masonry used.
 - 2. Acid cleaners are not acceptable.
 - 3. Use soap-less type specially prepared for cleaning brick or concrete masonry as appropriate.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Protection:
 - 1. Cover tops of walls with non-staining waterproof covering, when work is not in progress; secure to prevent wind blow off.
 - 2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.
- B. Cold Weather Protection:
 - 1. Masonry may be laid in freezing weather when methods of protection are utilized.
 - 2. Comply with MSJC and “Hot and Cold Weather Masonry Construction Manual”.

3.2 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:
- B. Maximum variation from plumb:
 - 1. In 10 feet - 1/4 inch.
 - 2. In 20 feet - 3/8 inch.
- C. Maximum variation from level:
 - 1. In any bay or up to 20 feet - 1/4 inch.
 - 2. In 40 feet or more - 1/2 inch.

D. Maximum variation from linear building lines:

1. In any bay or up to 20 feet - 1/2 inch.
2. In 40 feet or more - 3/4 inch.

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:

1. Minus 1/4 inch.
2. Plus 1/2 inch.

F. Maximum variation in prepared opening dimensions:

1. Accurate to minus 0 inch.
2. Plus 1/4 inch.

3.3 INSTALLATION GENERAL

A. Keep finish work free from mortar smears or spatters and leave neat and clean.

B. Anchor masonry as specified in Paragraph, ANCHORAGE.

C. Wall Openings:

1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
2. If items are not available when walls are built, prepare openings for subsequent installation.

D. Tooling Joints:

1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
2. Tool while mortar is soft enough to be compressed into joints and not raked out.
3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.
4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Lintels:

1. Lintels are not required for openings less than 3 feet 4 inches wide that have hollow metal frames, unless shown otherwise.
2. Openings 2 feet wide to 5 feet 4 inches wide with no structural steel lintel or frames, require a lintel formed of concrete masonry lintel or bond beam units filled with grout

- per ASTM C476 and reinforced with #5 bar reinforcing top and bottom for each 4 inches of nominal thickness unless shown otherwise.
3. Provide length for minimum bearing of 4 inches at ends.
- F. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.
- G. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.
- H. Wetting and Wetting Test:
1. Test and wet brick in accordance with BIA 11B.
 2. Do not wet concrete masonry units before laying.

3.4 REINFORCEMENT

- A. Joint Reinforcement:
1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
- B. Steel Reinforcing Bars:
1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.

3.5 CMU CONTROL JOINTS

- A. Provide CMU control (CJ) joints where shown on drawings.
- B. Keep joint free of mortar and other debris.
- C. Where joints occur in masonry walls:
1. Install preformed compressible joint filler in brick wythe.
 2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
 3. Install filler, backer rod, and sealant on exposed faces.
- D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.
- E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
- F. Fill opening in exposed face of expansion and control joints with sealant.

G. Cavity Type Exterior Walls:

1. Keep air space clean of mortar accumulations and debris.
 - a. Clean cavity by use of hard rubber, wood or metal channel strips having soft material on sides contacting wythes.
 - b. Lift strips with wires before placing next courses of horizontal joint reinforcement or individual ties or adjustable cavity wall ties.

3.6 CONCRETE MASONRY UNITS

A. Kind and Users:

1. Provide special concrete masonry shapes as required, including lintel and bond beam units, sash units, and corner units. Use solid concrete masonry units, where full units cannot be used, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout the cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.

B. Laying:

1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
7. Provide a 1/4-inch open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar.

10. Do not wedge the masonry against the steel reinforcing. Minimum 1/2-inch clear distance between reinforcing and masonry units.
11. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacing noted.
12. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.

3.7 GROUTING

A. Preparation:

1. Clean grout space of mortar droppings before placing grout.
2. Close cleanouts.

B. Placing:

1. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
2. Interruptions: When grouting must be stopped for more than an hour, top off grout 1-1/2 inch below top of last masonry course.

3.8 PLACING REINFORCEMENT

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.
- C. Splice reinforcement bars where shown; do not splice at other places unless accepted by the Engineer. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.

- E. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement not less than 150 mm (6 inches) at ends. Use prefabricated “L” and “T” sections to provide continuity at corners and intersections. Cut and bend joint reinforcement as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

3.9 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

B. Concrete Masonry Units:

1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

END OF SECTION

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SECTION 05500 - MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 REQUIREMENT

The CONTRACTOR shall provide miscellaneous metalwork and appurtenances, complete and in place, in accordance with the Contract Documents. This Section includes the requirements for handrailing and grating.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications

MIL-G-18015 A(3) (Ships) Aluminum Planks. (6063-T6)

MIL-A-907E Antiseize Thread Compound, High Temperature

B. Commercial Standards

AA-M32C22A41 Aluminum Association

AASHTO HS-20 Truck Loading

AISC Manual of Steel Construction

ASTM A 48 Gray Iron Castings

ASTM A 193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service

ASTM A 194 Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service

1.03 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish submittals in accordance with Section 01300 - Shop Drawings, Product Data, and Samples.

B. Shop Drawings: Shop Drawings shall conform to AISC recommendations and specifications and shall show holes, etc. required for other parts of the WORK. Drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.

1. Layout drawings for ladders, railings, grating, showing the direction of

span, type and depth of grating, size and shape of grating panels, seat angle details, and details of grating hold down fasteners. Load and deflection tables shall be submitted for each style and depth of grating used.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. **Stainless Steel:** Unless otherwise indicated, stainless steel metalwork and bolts shall be of Type 316 stainless steel.
- B. **Aluminum:** Unless otherwise indicated, aluminum metalwork shall be of Alloy 6061-T6. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with manufacturer's recommendations.

2.02 ALUMINUM RAILINGS

- A. **General:** Aluminum handrails and railings shall be component systems complete with anchors, attachments, balusters, brackets, caps, fasteners, gates (swing with self-latching hardware or be removable), posts, sleeves, trim, and any other related items required or necessary for a complete installation. Gates and removable rail sections shall be complete with hardware such as self-closing hinges, self-latching latches, hasps, etc. Railings shall conform to the Building Code and OSHA General Industry Occupational Safety and Health Standards (29CFR1910).
- B. **Materials:** Materials shall conform to the following:
 - 1. **Aluminum:** Aluminum shall be U.S. Alloy 6063 T-5 or T-6. Aluminum pipe rail shall not be less than 1-1/2 inch diameter Schedule 40 pipe.
 - 2. **Electrolysis Protection:** Electrolysis protective material shall be used for surfaces in contact with dissimilar metals and concrete.
 - 3. **Sleeves:** Sleeves shall be of galvanized steel or PVC.
 - 4. **Grout:** Grout for handrail posts shall consist of an inorganic, non-shrink, non-metallic premixed grout in accordance with Section 03300 - Cast in Place Concrete with a minimum 28 Day compressive strength of 4,000 psi.
 - 5. **Fasteners:** Fasteners, screws, and bolts shall be concealed and shall be of stainless steel or aluminum.
 - 6. **Welding Rods:** Aluminum welding rods shall be of a type recommended by the aluminum manufacturer for anodized finished products.
 - 7. **Kickplates:** Kickplates shall be provided on railings, not set in curbs.
- C. **Finishes:** Pipe railing system including handrails, railings, tube caps, and other miscellaneous parts of rails shall be provided with a clear anodized finish, AA-M32C22A41.

- D. System Performance Requirements
- a. For Aluminum: The Aluminum Association's specification for Aluminum Structures.
 - b. Structural Performance of Handrails and Railing systems: Engineer, fabricate, and install handrails and railing to withstand the following structural loads without exceeding allowable design working stress of the materials, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
 - i. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated.
 1. Concentrated load of 200 lb applied at any point and in any direction.
 2. Uniform load of 50 lb per linear ft. applied horizontally and concurrently with uniform load of 100 lb per linear ft. applied vertically downward.
 3. Concentrated load need not be assumed to act concurrently with uniform loads.
 - ii. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lb applied to one square foot at any point in the system.
 1. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.
- E. Manufacturers or Equal,
1. C-V Pipe Rail by Crane Veyor Corp.
 2. Connectorail by Julius Blum and Co.

2.3 METAL GRATING

- A. General: Metal grating shall be of the design, sizes, and types indicated. Grating shall be completely banded at edges and cutouts using material and cross section equivalent to the bearing bars. Such banding shall be welded to each cut bearing bar. Grating shall be supported around an opening by support members. Where grating is supported on concrete, embedded support angles matching grating material shall be used, unless indicated otherwise. Such angles shall be mitered and welded at corners.
1. Pieces of grating shall be fastened in 2 locations to each support.
 2. Where grating forms the landing at the top of a stairway, the edge of the grating that forms the top riser shall have an integral non-slip nosing, width equal to that of the stairway.
 3. Where grating depth is not given, grating shall be provided that will be within allowable stress levels and which shall not exceed a deflection of 1/4-inch or the span divided by 180, whichever is less. For standard duty plank and safety grating, the loading to be used for determining stresses and

deflections shall be the uniform live load of the adjacent floor or 100 psf, whichever is greater or a concentrated load of 1000 pounds. For heavy duty grating, the loading used for determining stresses and deflections shall be AASHTO HS-20. The minimum depth shall be one inch.

B. Material

1. Except where indicated otherwise, bar grating shall be fabricated entirely of aluminum as follows: Bearing and banding bars, alloy 6061-T6; cross bars, alloy 6063-T5.
2. Safety grating shall be fabricated of aluminum alloy 5052-H32.
3. Plank grating shall be fabricated of aluminum alloy 6063-T6.
4. Grating that may be partially or wholly submerged shall be fabricated entirely of stainless steel, Type 316.

C. Standard-Duty Grating

1. No single piece of grating shall weigh more than 80 pounds, unless indicated otherwise. Standard duty grating shall be serrated bar grating.
2. Cross bars shall be welded or mechanically locked tightly into position so that there is no movement allowed between bearing and cross bars.

D. Safety Grating: Safety grating shall be made of sheet metal punched into an open serrated diamond pattern and be formed into plank sections. The open diamond shapes shall be approximately 1-7/8 inch by 11/16-inch in size. Safety grating shall be Grip Strut by Metal Products Division, United States Gypsum Company; Deck Span by IKG Industries, or equal.

E. Plank Grating: Plank grating shall be extruded in 6-inch widths with a minimum of 6 integral 1-bar type bearing bars per plank. The top surface shall be solid with raised ribs, unless indicated otherwise. Where punched grating is required, the top surface shall be provided with a pattern of 3-inch by 19/32-inch rectangular openings spaced at 4-inches on center. The planks shall have continuous tongue and groove type interlock at each side, except that interlocking planks shall be arranged so that any 4-foot wide section may be removed independently from the other grating sections. Plank grating shall be provided with a clear anodized finish, except that punched grating may have standard mill finish.

2.3 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application): Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be steel as indicated. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated, steel for bolt material, anchor bolts, and cap screws shall be in accordance with the following:

1. Structural connections: ASTM A 307, Grade A or B, hot-dip galvanized.
2. Anchor Bolts: ASTM A 307, Grade A or B, or ASTM A 36, hot-dip

galvanized.

3. High strength bolts where indicated: ASTM A 325.
4. Pipe and equipment flange bolts: ASTM A 193, Grade B-7.

C. Corrosive Service: Bolts, nuts, and washers in the locations listed below shall be stainless steel as indicated.

1. Buried locations.
2. Submerged locations.
3. Locations subject to seasonal or occasional flooding.
4. Inside hydraulic structures below the top of the structure.
5. Inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump.
6. Chemical handling areas.
7. Inside trenches, containment walls, and curbed areas.
8. Locations indicated by the Contract Documents or designated by the ENGINEER to be provided with stainless steel bolts.

Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be Type 316 stainless steel, Class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.

1. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
2. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

D. Bolt Requirements

1. The bolt and nut material shall be free-cutting steel.
2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
3. Bolts and nuts shall be installed with washers fabricated of material matching the base material of bolts, except that hardened washers for high strength bolts shall conform to the requirements of the AISC Specification. Lock washers fabricated of material matching the bolts shall be installed where indicated.
4. The length of each bolt shall be such that the bolt extends at least 1/8-inch beyond the outside face of the nut before tightening, except for anchor bolts, which shall be flush with the face of the nut before tightening.
5. Dielectric material or insulating washers shall be used between dissimilar metals.

PART 3 - EXECUTION

3.01 FABRICATION AND INSTALLATION REQUIREMENTS

- A. Aluminum Ladders and Railings: Aluminum railing fabrication and installation shall be performed by craftsmen experienced in the fabrication of architectural metalwork. Exposed surfaces shall be free from defects or other surface blemishes. Dimensions and conditions shall be verified in the field. Joints, junctions, miters, and butting sections shall be precision fitted with no gaps occurring between sections, and with surfaces flush and aligned. Electrolysis protection of materials shall be provided.

END OF SECTION

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SECTION 06100

ROUGH CARPENTRY

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Rough carpentry and appurtenant work.
- B. The work shall include, but not be limited to, completion of the following principal items:
 - 1. Wood framing, blocking, furring, stripping, backing, and nailers, as shown, specified, or otherwise required for securing other work, except for such items as are specified to be furnished by other trades.
 - 2. Plywood sheathing.
 - 3. Rough hardware appurtenant to the work of this Section, as defined in the Paragraph in Part 2 entitled "Rough Hardware."
 - 4. Field Applied Preservative.

1.02 REFERENCE STANDARDS

Commercial Standards:

AWPA C1	AWPA Manual of Recommended Practice, Standard for Preservative Treatment by Pressure Process--All Timber Product
SPIB	Grading Rules for Southern Pine Lumber of the Southern Pine Inspection Bureau

1.03 SUBMITTALS

- A. Detailed, dimensioned shop drawings shall be submitted to the Engineer for review and approval in accordance with Section 01340.
- B. Shop drawing shall depict lumber quantity, lengths, cuts, connection details, manufactured fastener data sheets, and mill information.
- C. Preservative treatment information for pressure treatment prior to delivery, and for field applied products. Submit full color palette for field applied preservative.

PART 2: PRODUCTS

2.01 TREATED LUMBER

- A. Grade: Each piece of treated lumber shall be no less than No. 2 Grade Southern Pine, unless otherwise specified in the Drawings, and bear the stamp as such from the mill.
- B. Pressure-Treated Lumber: All wood shall be pressure-treated in accordance with AWWPA C1. Preservative shall conform to American Wood Preservers Assn. and American Wood Preservers Bureau Standard Specifications. Creosote shall not be used.
- C. Cuts: Wherever necessary to cut, notch, dap, drill, or frame treated lumber, newly cut or bored surfaces shall be treated with 2 heavy coats of the same preservative used in the original treatment. The minimum penetration depth shall be 1/4-inch.

2.02 ROUGH HARDWARE

- A. General: The term "rough hardware" shall include nails, screws, lag screws, bolts, nuts, washers, plates, metal fasteners, and framing anchors; anchor bolts which are to be embedded into concrete, concrete masonry, or brick masonry; and similar items employed in erection and construction of the rough carpentry work. Rough hardware shall be of standard manufacture, approved by a recognized agency for the intended applications and shall be provided with laboratory test results on capabilities when requested by the ENGINEER. Bolts, screws, and nails shall be of proper size to hold members securely in place. Bolts, nuts, washers, screws, and nails shall be galvanized.

Bolts for bolting wood blocking to concrete shall be 3/4-inch diameter and length suited to conditions. Washers and nuts shall be provided for all bolts. All bolts, washers, nuts, etc., shall be ASTM 325 galvanized or stainless steel.

Common nails shall be used for nailing all joints of rough carpentry work, unless recommended otherwise by the preservative manufacturer.

- B. Simpson Strong ties as noted on the drawings.

Ties shall have galvanized finish and fasteners as recommended by Simpson for use with treated lumber.

PART 3: EXECUTION

3.01 GENERAL

- A. Preliminaries: Rough carpentry shall be as specified, shown, and as necessary for complete work. Verify drawing dimensions with actual field conditions and inspect related work and adjacent surfaces, and report to the Engineer conditions which could prevent proper execution of this work.
- B. Work Coordination and Performance: Coordinate the Work and cooperate with subcontractors and trades doing related work. Work of construction shall be carefully planned and laid out. Perform Work under the direction of a capable, experienced supervisor.
- C. Rough Hardware: Provide and install rough hardware not otherwise specified and which is necessary for the satisfactory execution of framing, including nails, spikes, dowels, fasteners, and similar incidentals. Coordinate, furnish, install, and embed rough hardware as shown and as required for a complete work.
- D. Framing: Closely fit, accurately set, and rigidly secured framing members and assemblies to required lines, levels, and arrangements shown. Accurately and neatly cut framing and securely nail, screw, or otherwise fasten in place in a workmanlike manner.

3.02 FASTENERS AND FRAMING DEVICES

- A. Nailing: Where nail spacing is not otherwise regulated by the Building Code, nails shall not be driven closer together than $1/2$ their length unless driven in drilled holes, nor driven closer to the edge of a member than $1/4$ of their length. When necessary to prevent splitting, holes shall be drilled slightly smaller than nail diameters. The nails shall penetrate the second or farther member not less than $1/2$ the nail length. Common nails shall be used unless otherwise specified or shown.
- B. Bolts and Nuts: Malleable or cut-steel washers shall be provided under bolt heads and nuts except where bearing on steel plates or other steel attachments or where flat-head countersunk bolts are shown. Bolt holes shall be drilled $1/32$ -inch to $1/16$ -inch larger diameter than the bolts they are to accommodate and shall be bored true-to-line. Members shall be clamped together, and bolts shall be driven in place and nuts drawn up tightly. Bolts shall be drawn tight again immediately prior to enclosing with finish or, if left exposed, upon completion of other work. Holes at anchor bolts embedded in concrete may be $1/16$ -inch larger than bolt diameter.
- C. Screws: Lag and wood screws shall be screwed, not driven, into place. Holes to receive lag screws shall be bored first of the same diameter and depth as shank, then continued to depth equal to length of screw with diameter equal to the base of the screw thread. Screws shall penetrate into the farther member a distance equal to a least 7 times the diameter of the screw shank. Washers shall be installed under each lag screw head bearing on wood.

D. Metal Framing Devices: Metal framing devices shall be furnished and installed where shown. Nails for the framing devices shall be as furnished or recommended by the manufacturer of the anchor device. Nails shall be driven to their full depth at holes in anchors. Bolt and lag fasteners shall be drawn tight.

3.03 FRAMING

- A. Strength Considerations: Structural wood framing members shall not be spliced between bearing points or supports. Approval shall be secured from the Engineer before cutting of any wood members that may weaken structure. Due care shall be exercised in placing framing so that structural and other important members do not require cutting for openings, pipes, vents, conduits, or ducts. Bearing surfaces on which wood structural members are to rest shall be finished to give full, true, and even support. Wedges or shims shall not be used to correct faulty work. Wood members which have been split or otherwise damaged to such an extent as to impair their strength shall be removed and replaced at no additional cost to the Owner.
- B. Cutting and Notching: Only skilled workmen shall be used for all cutting and framing of wood members required to accommodate structural members, routing of piping, conduit, ducts, and the installation of mechanical, electrical, or other apparatus or equipment. Members shall not be cut, notched, nor bored more than 1/4 of their depth without adequate and approved reinforcing.
- C. Blocking and Backing: All blocking and backing in walls and ceilings shall be nominal 2-inch-thick material of a depth as needed and shall be accurately located around light fixtures, ceiling registers, grilles, and other required mechanical and electrical items. The blocking shall fit snugly and shall be spiked into the supporting framing members. Wood blocking (backing) to receive sheathing, siding, metal lath, and gypsum board shall be provided wherever necessary for securing the facing materials.
- D. Backing for Specialties and Accessories: Backing shall be accurately located and installed for all building specialties, toilet accessories, and finish hardware items as required.
- E. Concrete-Embedded Blocks: Where required and approved, nominal 2-inch-thick nailing blocks (dovetail type) shall be provided in concrete to receive superimposed wood stripping, grounds, and backing. Applied grounds or stripping shall be securely nailed into wood nailing blocks, using nails of approved length.
- F. Reserved.
- G. Sleepers: All sleepers for mechanical equipment and curb openings shall be provided and coordinated with appropriate trades for locations and sizes. Sleepers shall be ripped to conform to roof slope if necessary.

3.04 OTHER

Do not apply waterproofing wood sealer until sufficient time has elapsed to ensure proper absorption of the product.

Apply materials according to manufacturer's instructions and recommendations. Spread or flow materials to produce a finish free from runs, sags or thin spots.

Do not apply a coat over another coat until the preceding coat has thoroughly dried. Do not apply additional coats until previous coat has been approved. Do not apply finish over surfaces containing excessive moisture.

END OF SECTION

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SECTION 07610

PREFORMED METAL ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Preformed and prefinished metal roofing panels.
- B. Fasteners, clips, perimeter and penetration flashings, closures, insulation, sealant, seam caps, trim, vapor barriers, expansion joint covers, C-Channel, Framing Sections, Zee-Purlins, and miscellaneous accessories required to complete the roofing.
- C. Fascia, gutters, and downspouts.
- D. Corner trim, head, jamb, and sill flashing for windows, fans, and hoods.
- E. Metal splash pans on membrane roofs

1.02 SYSTEM DESCRIPTION

A. Design Requirements:

- 1. Continuous, one-piece, preformed, prefinished, mechanically seamed, single-length roof panels.
- 2. Panels, Cleats and other components required for specific project conditions.
- 3. Manufacturer is responsible for providing evidence acceptable to Engineer that Manufacturer's specified system is capable of meeting thermal, wind uplift, and performance requirements specified.

B. Thermal Movement:

- 1. Completed metal roofing, siding, and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress of structure, anchors, or fasteners, or reducing performance ability.
- 2. Interface between panel and expansion clip shall provide for applicable thermal movement in each direction along the longitudinal direction.
- 3. Location and sizes of metal roofing rigid connectors shall be as indicated on engineer's certification and located on shop drawings.

C. Design Standards:

- 1. Design Loads (Panels, Clips, and Purlins): Pressures are normal to roof surface in accordance with ASCE 7-16. Where load tests are required to certify performance, factor of safety shall be 2. Factor of safety for panel capacity for Live Loads shall be 2.0.

2. Fastener Requirements: Connection of panel fasteners to purlins shall be designed to resist loads developed by pressures with proper regard for prying forces and/or bending due to eccentric loading.
3. Deflection Limits: Installed roof system, including framing and deck, shall carry positive uniform design loads with maximum system deflection of L/240 as measured at rib (web) of panel.

D. Performance Requirements:

1. Underwriter's Laboratories, Inc. (UL) Wind Uplift Resistance Classification for Roof Assembly shall be Class UL90.
2. Completed metal roof system, including vapor barrier, shall have maximum static pressure air infiltration of 0.02 cfm/square foot with 6.24 psf air pressure differential when tested in accordance with ASTM E283.
3. Calculated pull-out capacities for purlins and fasteners shall be certified by a licensed Civil or Structural Engineer in the State of Louisiana. Fastener pull out for metal to purlins, purlins to plywood, and plywood to rafters shall be according to the National Design Specification (NDS).
4. Entire system (metal panels, flashings, expansion joints, and retrofit structural subsystem), are to be detailed to provide weather tight roof under peak weather conditions.

1.03 SUBMITTALS

A. Shop Drawings: Contract drawing details show design concept and relationship of roof to other conditions. It is the responsibility of the Installer to prepare detailed shop drawings that adapt proposed roof system and configuration of roof system to conditions of this Project and specified requirements. Shop drawings shall be reviewed by manufacturer's Technical Department before submittal to Engineer. Installer shall recommend and make any detail modifications required to insure a proper and watertight system.

1. Shop drawings must be submitted and returned as acceptable prior to beginning field or factory fabrication.

B. Product Data: Submit manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data, and specifications.

C. Submit a sample of each type of roof panel, complete with factory finish. Submit one (1) sample of each sealant type, indicating location of intended use. Submit samples of all available colors. Owner shall select the color of the roof.

D. Quality Control Submittals:

1. Design Calculations:
 - a. Submit design calculations sealed by licensed Civil or Structural Engineer in the State of Louisiana.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated accessories to Project site in manufacturer's unopened containers.
- B. Protect components during shipment, storage, handling, and erection from abuse, stains, discoloration, and corrosion.
- C. Physically damaged, stained, or marred material will be rejected and removed from project site.
- D. Panels with strippable film must not be stored in the open exposed to the sun.

1.07 SITE CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.
- B. Protection:
 - 1. Provide protection or avoid traffic on completed roof surfaces.
 - 2. Do not overload roof with stored materials.
 - 3. Support no roof-mounted equipment directly on roofing system.
- C. Determine that work of other trades which penetrate roof or is to be made watertight by roof is in place and accepted prior to installation of roofing system.

1.08 WARRANTIES

- A. Furnish manufacturer's Standard Twenty (20) Year Warranty stating architectural fluorocarbon coating finish will be:
 - 1. Free of fading or color change in excess of 2 NBS units as measured per ASTM D 2244-68;
 - 2. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D 659-74;
 - 3. Will not peel, crack, chip or exhibit any other mechanical failure of paint to adhere to the substrate.
- B. Provide Water-tightness Warranty executed jointly by the roof system manufacturer and installer which warrants the installed system to be free of leaks and free from defects in materials and workmanship for a period of twenty (20) years from date of substantial completion.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Berridge Manufacturing Company
- B. Approved Equal

2.02 SHEET MATERIALS

- A. Prefinished metal shall be Aluminum-Zinc Alloy Coated (AZ-50 Galvalume®) Steel Sheet, 24-Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi min.
- B. Finish shall be full strength Kynar 500® or Hylar 5000™ fluoropolymer coating applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil over 0.20 ± 0.05 mil prime coat, to provide a total top side dry film thickness of 0.95 ± 0.10 mil. Bottom side shall be coated with a primer and beige urethane coating with a total dry film thickness of 0.35 ± 0.05 mil.
- C. Strippable film shall be applied to the top side of all prefinished metal to protect the finish during fabrication, shipping and field handling. This strippable film MUST be removed immediately before installation.

2.04 ACCESSORY MATERIALS

- A. Fasteners: Stainless Steel with EPDM washers where required.
- B. Sealant
 - 1. Must not contain oil, asbestos, or asphalt.
 - 2. Factory-applied side-lap sealant: Non-drying non-skinning, synthetic polymer-based, designed for metal-to-metal joints. Spectrum 1 by Tremco or equal.

2.05 FABRICATION:

- A. Panels:
 - 1. Panels shall be fabricated in continuous lengths as required. No horizontal overlap joints are permitted in panel lengths.
 - 2. Provide pans in full lengths from peak to eave as indicated.
 - 3. Transverse or end-lap seams will not be permitted.
 - 4. Examine panels as they are formed to ensure panels are being formed within acceptable tolerances.

- B. Fabricate siding, roofing, and related sheet metal work in accordance with accepted shop drawings and applicable standards.
- C. Provide linear sheet metal items in minimum 10'-0" sections except as otherwise noted or required. Form flashing using single pieces for full width. Provide shop fabricated, mitered and joined corners.
- D. All exposed adjacent flashing shall be of the same material and finish as the panels.
- E. All flashings, hem exposed edges on underside 1/2 inch.
- F. All retrofit roof and wall structural subsystem framing materials to be pre-cut to required length and piece marked to facilitate assembly.

2.06 PREFORMED METAL ROOFING SYSTEM:

- A. Exposed fastener roofing system shall be 5V crimp pattern. Berridge Double-Rib Panel, or approved equal.

PART 3: EXECUTION

3.01 INSPECTION:

- A. Examine alignment of structural framing subsystem before proceeding with installation of preformed metal roofing.
- B. Examine metal roof plane before starting installation. Deck must be clear, clean and smooth, free of depressions, waves, or projections, dry and must remain dry and free of ice and snow, after roofing application commences.
- C. Structural supports shall be in place and sag rods, diagonal bracing, and connections shall be tightened before work can proceed.
- D. Field check dimensions and check support alignment with taut string or wire. Support misalignment will cause panel to oil can.
- E. Do not proceed with installation until conditions are satisfactory. Notify the Engineer in writing of unsatisfactory conditions.

3.02 INSTALLATION:

- A. General Installation Requirements:
 - 1. Install roofing, siding and flashings in accordance with accepted shop drawings and manufacturer's product data, within specified tolerances.
 - 2. Installation shall be over existing roofing and wall panels with sub-purlins and girts fastened to existing structural framing.
 - 3. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate and panels.

4. Limit exposed fasteners to extent indicated on shop drawings.
5. Anchorage shall allow for temperature expansion and contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.
6. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with the standards of SMACNA Manual. Remove and replace fascia, gutters, and downspouts, and any trim or flashing which might compromise system watertightness or performance.

3.03 CLEANING

- A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust staining on finished surfaces, immediately remove filings produced by drilling or cutting.
- B. Clean roof in accordance with manufacturer's recommendations.
- C. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at Date of Substantial Completion for Project. Touch up minor abrasions and scratches in finish.
- D. Replace metal panels that have been damaged or deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.
- E. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.
- F. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- G. Remove all scrap and construction debris from the site.

END OF SECTION

SECTION 07900 - SEALANTS

PART 1 - GENERAL

1.01 SCOPE: The required applications include, but are not necessarily limited to, the following:

- A. Flashing and Joints
- B. Expansion joints.
- C. Doors and windows
- D. Fasteners into existing masonry

1.02 SUBMITTALS:

- A. Manufacturer's Data, Joint Sealers: Submit manufacturer's specifications, recommendations, and installation instructions for each type of material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.
- B. Guarantee, Joint Sealers: Submit written guarantee agreeing to repair or replace joint sealers which fail to perform as airtight and watertight joints, or fail in joint adhesion, cohesion, abrasion resistance, stain resistance, or general durability, or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. Provide guarantee signed by the Contractor. The guarantee period shall be two (2) years.

1.03 JOB CONDITIONS:

- A. The Contractor must examine the joint surfaces and backing, and their anchorage to the structure, and the conditions under which the joint sealer work is to be performed. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected.
- B. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL:

- A. **Colors:** For exposed materials provide color as indicated or, if not indicated, as selected by the Engineer from manufacturer's standard colors. For concealed materials, provide the natural color that has the best overall performance characteristics.
- B. **Hardness:** As recommended by manufacturer for application shown, unless otherwise indicated.
- C. **Modulus of Elasticity:** Provide the lowest available modulus of elasticity, which is consistent with exposure to weathering, indentation, vandalism, abrasion, support of loading, and other requirements.
- D. **Compatibility:** Before purchase of each required material, confirm its compatibility with each material it will be exposed to in the joint system.
- E. **Size and Shape:** As shown or, if not shown, as recommended by the manufacturer for the type and condition of joint, and for the indicated joint performance or movement.
- F. **Grade of Sealant:** For each application, provide the grade of sealant (non-sag, self-leveling, no-track, knife grade, preformed) as recommended by the manufacturer for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions) to achieve the best possible overall performance. Grades specified herein are for normal conditions of installation.
- G. **One-Component Polysulfide Sealant:** Polysulfide based, one-part elastomeric sealant, complying with FS TT-S-00230, Class A, Type II (non-sag), unless Type I recommended by manufacturer for the application shown.
- H. **Two-Component Polysulfide Sealant:** Polysulfide based, two-part elastomeric sealant.

2.02 NON-ELASTOMERIC SEALANTS:

- A. **One-Component Acrylic Sealant:** Acrylic terpolymer, solvent-based, one-part, thermoplastic sealant compound; solids not less than 95 percent acrylic; complying with FS TT-S-00230, Class B, Type II, recommended by manufacturer for general use as an exposed building construction sealant.
- B. **Acrylic-Latex Sealant:** Latex-rubber-modified, acrylic-emulsion-polymer sealant compound permanently flexible, non-staining, and non-bleeding, recommended by manufacturer for protected exterior exposure.

2.03 CAULKING COMPOUNDS: Synthetic Resin Caulking Compounds - Oil-based caulking compound complying with FS TT-C-598, except compounded only with special synthetic resins, non-staining, non-bleeding, paintable.

2.04 JOINT FILLERS: Provide type as recommended by manufacturer for use with joint type and sealant, non-staining, resilient.

2.05 MISCELLANEOUS MATERIALS:

- A. Oakum Joint Filler: Provide untreated hemp or jute fiber rope, free of oil, tar, and other compounds which might stain surfaces, contaminate joint walls, or not be compatible with sealants.
- B. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.
- D. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS: Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.02 JOINT PREPARATION: Clean joint surfaces immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture, and other substances that would interfere with bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces as recommended by sealant manufacturer. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.03 INSTALLATION:

- A. Set joint filler units at proper depth or position in the joint to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.
- B. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- C. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

- D. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove so that joint will not trap moisture and dirt.
- E. Install sealant to depths shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - 1. For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
 - 2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but neither more than 1/2 inch deep nor less than 1/4 inch deep.
 - 3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75 percent to 125 percent of joint width.
- F. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

3.04 CURE AND PROTECTION: Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength, and surface durability. Protect joint sealers during the construction period so that they will be without deterioration or damage at the time of District's acceptance.

END OF SECTION

SECTION 08110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SCOPE:

- A. Steel doors, frames, and related items, complete and operable

1.02 SUBMITTALS:

- A. Include literature and shop drawings which contain the following information:
 - 1. Manufacturer's specifications and details:
 - a. Enumerated anchorage illustrations indicating anchor for the wall condition for each type required.
 - b. Enumerated door and frame elevations.
 - 2. Warranties: Statement of manufacturer's standard conditional warranty.
 - 3. Manufacturer's instructions and recommendations for handling and storage.
 - 4. Shop drawings:
 - a. Detailed, dimensioned shop drawings shall be submitted to the ENGINEER and approved before fabrication, shipment, or work specified under this section begins.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Approved manufacturers:
 - 1. Correct Door
- B. Doors, frames, and all related components shall conform to their respective applicable standards.
- C. Assembly Tolerances:
 - 1. Maximum Allowable Clearances:
 - a. Door edge and frame rabbet surfaces, all sides: 1/8 inch.
 - b. Push side door rim and frame stop surfaces, all sides: 1/16 inch.
 - c. Standard undercut of doors relative to the bottoms of the matching jambs shall be either 5/8 inch or 3/4 inch. Thresholds are specified in the hardware sets to be either 1/2-inch or 5/8-inch rise, depending on the standard undercut of the doors to be provided. Where such thresholds are specified, the maximum clearance is 1/8-inch to the top of threshold.

2. Manufacturing tolerances for all nominal dimensions shall be as prescribed in SDI-117.
- D. Finish: Surfaces of all hollow metal items shall be cleaned and given one shop coat of inorganic zinc primer. Finish coat in accordance with Section 09800.
- E. Hardware Preparations: Provide all hollow metal items with the necessary cutouts and reinforcements for the approved hardware. Reinforcement types, gauges and locations shall meet minimum requirements of ANSI A151.1 and the applicable DHI standards. Exact locations of mortise preparations may vary in accordance with manufacturer's regular procedure. Conform to specific location requirements as indicated. Reinforcements concealed in frames and doors for surface-applied hardware such as rim exit devices, closers, surface-bolts, and coordinators shall be of the standard recommended types; suspected omissions or deviations may subject materials to destructive inspection.
- F. Fire Rating and Labeling: Doors and frames indicated as fire-rated shall bear a UL label indicating the type of rating for which they are certified.

2.02 FRAMES:

- A. Provide frames for doors as indicated. All parts, reinforcements, and components shall be made of steel, unless otherwise indicated.
- B. Provide standard 16-gauge, one-piece double-rabbit profiles with 2-inch faces, 1/2-inch returns, and 5/8-inch stops, and depth as shown on the drawings.
- C. Provide frames set-up, tabs welded (full backweld acceptable), face joints continuously surface welded, faces ground smooth and spot primed. Where welded material is galvanized, spot coat welded areas with zinc-rich coating (cold galvanized) before priming. Tack weld and filler at face welds is not acceptable procedure. Provide temporary spreader bars welded or screwed between feet, forming square units.
- D. Provide door silencers as required for all door openings utilizing hollow metal frames supplied under this Section. Silencers and frame preparations shall be punch type.
- E. Anchors:
 1. Provide frames equipped for appropriate opening anchorage.
 2. Provide frames with manufacturer's standard anchors of types suited to the wall construction and label condition, welded in place where applicable. Anchor types fulfilling the required function and satisfying labeling requirements with respect to the individual listings of the frames are acceptable.
 3. Frames shall have a minimum of three anchors per jamb. Anchors shall be spaced in a manner corresponding as closely as practicable to the elevations of the hinge locations, but in no case at variance with listing procedure requirements where applicable.

4. Mortar Guards: Where frames are to be grouted full in installation, provide jambs with hardware mortise preparation covers to prevent mortar from occluding the mortises.
 5. Masonry anchors shall be galvanized.
- F. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp, or buckle.

2.03 DOORS:

- A. Provide 1-3/4-inch thick heavy-duty, Grade 18 gauge hollow, metal, steel doors in the size indicated.
- B. Doors shall have seamless face sheets with continuously and fully welded seam edges.
- C. Core Construction: Structural specifications for each type given in SDI 100 shall be taken as minimum acceptable for the type. Core construction shall be such as to afford a nominal apparent U-factor insulation rating for the door of not more than 0.1, polyurethane. Internal vertical stiffener type construction, face sheets welded, shall be used where required by manufacturer's recommendations or listings. Fire-rated doors shall be solid or fiber mineral core doors as required to meet code and Reference Standard requirements.
- D. Doors shall have flush closed tops. Invert channel top doors may be closed by galvanized steel caps, screws tack-welded, and seams completely filled and ground smooth so as to be continuously joined. All exposed surfaces of the modification shall be thoroughly shop primed. Vinyl top caps are not acceptable.
- E. Transom Panels: Transom panels shall be provided where indicated and shall be of the same construction as doors.
- F. Louvers: Louvers for steel doors shall be of the welded type of construction of size and location as shown on drawings.
- G. Glazed Openings: Glazed openings in doors shall be of sizes indicated, provided with mitered metal stops. Glazed openings in fire rated doors shall meet UL requirements. Glass shall be in accordance with SECTION 08800 Glass and Glazing.
- H. Where armor plating is called for on the drawings, attach at factory, 3/16-inch armor plating to exterior surface of each door prior to installing hardware.
 1. Fasteners: Attach armor plating to door with 5/16-inch oval head galvanized steel carriage screws and hex acorn nuts. (Nuts on interior of door). Locate screws 3-inches from edges of door and provide four equally spaced horizontal rows with three screws per row.
 2. Seams between door and armor plating to be welded, completely filled and ground smooth so as to be continuously joined.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE:

- A. Conform to manufacturer's printed instructions for handling and storage of materials.

3.02 INSTALLATION:

- A. Set frames accurately in position, plumb, square, and true, and securely braced.
- B. Install anchors checking frame positioning and alignment. Space loose anchors in a manner corresponding as closely as practicable to the elevations of the hinge locations.
- C. After completion of wall construction, remove temporary braces and spreader bars, leaving surfaces smooth and undamaged.
- D. See SECTION 08711 Door Hardware for door hardware installation. Note all requirements for coordinated scheduling of protective coatings.

3.03 ADJUSTMENTS AND CLEANING:

- A. Remove dirt and excess sealants, lubricants, and glazing compounds from exposed surfaces.
- B. Touch-up marred or abraded surfaces with same type coating and to match original coating.
- C. Putty repair of dents is not acceptable.
- D. Protect completed installation. Damaged work will be rejected and shall be replaced.

END OF SECTION

SECTION 08410 - ALUMINUM FIXED GLAZING WINDOWS

PART 1 - GENERAL

1.01 SCOPE:

- A. Work Included: Furnish all necessary materials, labor, and equipment for the complete installation of the Swinging Entrance Doors, Door Frames, Transoms and Sidelights as shown on the Drawings and specified herein.
 - 1. Fixed glazing windows
- B. Wind load: 50 psf

1.02 SUBMITTALS:

- A. Submit properly identified product data including material specifications, hurricane test reports from an accepted testing laboratory verifying compliance with local codes and printed installation and assembly instructions.
- B. Submit shop drawings for review showing materials, sizes, thicknesses, locations, construction details, frame reinforcing, glazing details, accessories, and erection details. Include wind load and deflection calculations, signed, and sealed by an Engineer registered in the state of Louisiana.
- C. Samples: Submit samples of the following for review by the ENGINEER:
 - 1. Extruded aluminum sections
 - 2. Sealant, including color to match aluminum
 - 3. Glazing gaskets
 - 4. Weather-stripping
 - 5. Glazing
 - 6. Standard color pallet

1.03 WARRANTY:

- A. All work under this section shall include water-tightness of the installation, in addition to other defects due to materials or workmanship.

PART 2 - PRODUCTS

2.01 FIXED GLAZING WINDOWS:

2.02 Kawneer (or equal) in accordance with the following:

- A. Material and Construction: Nominal 0.050" thick, 6063-T5 extruded, aluminum alloy sections including entrance and storefront framing, mullions and muntins and sub-sills, with watertight mechanical joints and reinforcing as required to comply with the specifications.
 - 1. Coating: 1.2 mil (min.) fluoropolymer coating, to meet or exceed AAMA 2604.
- B. Glazing Provisions:
 - 1. Glazing Beads: Manufacturer's standard extruded aluminum snap-in glazing beads for sill or head members as indicated to receive specified glass thickness and gaskets.
 - 2. Glazing Gaskets: Extruded resilient vinyl glazing gaskets for exterior and interior of glass to receive specified glass thickness. Return gaskets by grooves in frames. Gasket color to match frames.
- C. Weather-stripping: Vinyl bulb or silicone treated polypropylene pile weather-stripping
- D. Glazing Provisions: Marine glazing with stops and interior and exterior continuous vinyl gaskets. Gasket color to match door finish, no exposed screws. Exterior stops to be tamper proof.
- E. Manufacturer's color pallets. Owner may select any color at no additional cost.

2.03 FABRICATION:

- A. Corner construction shall consist of mechanical clip fastening. SIGMA deep penetration and fillet welds. Glazing stops shall be snap-in type with glazing gaskets.

2.04 FASTENERS:

- A. All exposed fasteners shall be tamper-resistant spanner head security type screws.

2.05 SEALANT FOR BEDDING, METAL TO METAL JOINTS AND FOR SEALING FASTENINGS:

- A. Butyl base of approved color to harmonize with adjacent metal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Erect and secure components together and to structure and in a level, plumb, and waterproof manner in accordance with accepted shop and erection drawings, published installation.
- B. Shims: Set frames in prepared openings; level and shim into position with aluminum shims or pressure treated wood shims. Pressure treated wood in contact with aluminum shall not contain copper salts. Provide galvanized steel shims as required for concealed steel reinforcing members.

C. Fastenings:

1. Wood Frame Openings: Secure frames with ¼-inch diameter screws, at interval recommended by manufacturer.
2. Concrete and Masonry Openings: Secure frames with not less than ¼-inch diameter machine screws in concrete expansion anchors at 24 inches o.c. maximum.
3. Metal Openings: Secure frames to mullions with 1/4-inch diameter machine screws through bolts or drilled and tapped into metal supports at 24 inches o.c. maximum.
4. Aluminum Mullion, Mullion Cover, and Muntin Connections to Concealed Steel Mullion Reinforcing Members: Connect horizontal aluminum muntin to mullions and to mullion reinforcing by suitable aluminum clips and fastening as specified. Provide suitable concealed or countersunk machine screw fastenings between aluminum members and concealed steel members of number, size and spacing as required to safely transfer wind and gravity loads to steel members. Space fasteners along members 12 inches o.c. maximum.
5. Where exposed screws are unavoidable, provide security spanner head type, countersink, and finish exposed heads to match frames.
6. Where aluminum is in contact with dissimilar metal, provide a protective coating or tape.

D. Sealing:

1. Bed metal to metal joints including flashings, and seal fastening penetrations to frames and corner joints with specified butyl base sealant. Set thresholds in polysulfide sealant.
2. Bed aluminum in direct contact with treated wood, metal, concrete, or masonry with butyl base sealant.

3.02 ADJUSTMENT AND LUBRICATION:

- A. Lubricate and adjust doors and hardware, including closers for easy operation with weather-stripping in uniform contact.

3.03 PROTECTION:

- A. Protect components to prevent damage and staining from concrete work, plaster and stucco work, painting, and other construction operations.

3.04 CLEANING:

- A. Remove temporary protection and clean stains off of aluminum and adjacent surfaces without damage to finish in accord with aluminum manufacturer's published directions.

END OF SECTION

SECTION 08711
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Door hardware.
 - 2. Americans with Disabilities Architectural Guidelines (ADAAG)

1.2 SUBMITTALS

- A. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item.
- B. Keying Schedule: Detail Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.
- B. Keys: Locks keyed to match Grand Master as dictated by Owner.
- C. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.
- D. Standards: Comply with BHMA A156 series standards, Grade 1
- E. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product: Subject to compliance with requirements, provide the product named for each door hardware item indicated in Door Hardware Sets.

- B. Basis-of-Design Product: Product named for each door hardware item indicated in Door Hardware Sets establishes the basis of design. Provide either the named product or a comparable product by one of the manufacturers specified for each type of hardware item.

2.2 DOOR HARDWARE

- A. Scheduled Door Hardware: Provide door hardware according to Door Schedule on drawings.

2.3 PIVOTS AND HINGES

- A. Manufacturers:

- 1. Hinges:

- a. Baldwin Hardware Corporation (BH).
- b. Hager Companies (HAG).
- c. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
- d. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
- e. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

- B. General: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

- C. Hinge Base Metal: Unless otherwise indicated, provide the following:

- 1. Exterior Hinges: Stainless steel, with non-removable stainless-steel pin
- 2. Interior Hinges: Stainless steel, with stainless-steel pin

- D. Nonremovable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed.

- E. Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.

- 1. Metal Doors and Frames: Machine screws (drilled and tapped holes).
- 2. Wood Doors and Frames: Wood screws.

2.4 PANIC SETS

- A. Von Duprin 99L with lever Handle trim.

2.5 BOLTS

- A. Surface Bolts: Flush bolt heads of minimum 1/2-inch diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod.
 - 1. Manufacturers:
 - a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - b. Hager Companies (HAG).
 - c. Ives, H. B. (IVS).

2.6 OPERATING TRIM

- A. Push-Pull Design: As scheduled.
 - 1. Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Forms + Surfaces (FS).
 - c. Hager Companies (HAG).
 - d. HEWI, Inc. (HEW).
 - e. Ives, H. B. (IVS).
 - f. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - g. Triangle Brass Manufacturing Company, Inc. (TBM).
 - 2. Finish: Stainless Steel

2.7 CLOSERS

- A. Surface-Mounted Closers:
 - 1. Manufacturers:
 - a. Arrow Architectural Hardware; Div. of ESSEX Industries, Inc. (AAH).
 - b. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
 - c. DORMA Door Controls Inc.; Member of The DORMA Group (DC).
 - d. LCN Closers; an Ingersoll-Rand Company (LCN).
 - e. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
 - f. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
 - g. Yale Security Inc.; Div. of Williams Holdings (YAL).

2.8 STOPS AND HOLDERS

- A. Stops and Holders: Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
 - 1. Manufacturers:

- a. Baldwin Hardware Corporation (BH).
 - b. DORMA Door Controls Inc.; Member of The DORMA Group (DC).
 - c. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - d. Hager Companies (HAG).
 - e. Ives, H. B. (IVS).
 - f. LCN Closers; an Ingersoll-Rand Company (LCN).
 - g. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
 - h. Yale Security Inc.; Div. of Williams Holdings (YAL).
- B. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

2.9 DOOR THRESHOLDS: comply with ADAAG

- A. Manufacturers:
- a. Hager Companies (HAG).
 - b. National Guard Products, Inc. (NGP).
 - c. Pemko Manufacturing Co., Inc. (PEM).
 - d. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
 - e. Zero International, Inc. (ZRO).

2.10 CYLINDERS, KEYING, AND STRIKES

- A. Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
1. Manufacturers:
- a. Same manufacturer as for locks and latches.
- B. Keying System: Factory-registered keying system; grand master key system.
1. Keys: Provide nickel-silver keys permanently inscribed with a visual key control number and "DO NOT DUPLICATE" notation. In addition to one extra blank key for each lock, provide three change keys and five master keys.
- C. Strikes: Manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with Americans with Disabilities Architectural Guidelines: (ADAAG)

- B. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- C. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- D. Wood Door Preparation: Comply with DHI A115-W series.
- E. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 4. American with Disabilities Architectural Guidelines ADAAG"
 - 5. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements. Undercut doors as shown and seal edges.
- G. Door Closers: Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

END OF SECTION

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SECTION 08800
GLASS AND GLAZING

PART 1 - GENERAL:

1.01 SCOPE:

- A. The CONTRACTOR shall provide all glass, caulking materials, and appurtenant items required to provide all the glass and glazing work, complete, all in accordance with the Contract Documents.
- B. The required applications of glass and glazing include, but are not necessarily limited to, the following:
 - 1. Glazing lites in entrances.
 - 2. Glazing exterior windows, sidelights, and transoms

1.02 JOB CONDITIONS:

- A. The CONTRACTOR must examine the framing and glazing channel surfaces, backings, removable stop design, and the conditions under which the glazing is to be performed and notify the CONTRACTOR in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the glazing until unsatisfactory conditions have been corrected in a manner acceptable to the CONTRACTOR and ENGINEER.

PART 2 - PRODUCTS

2.01 GLASS:

- A. Impact Resistant Clear Glass: 7/16-inch thick clear.

2.02 GLAZING SEALANTS/COMPOUNDS:

- A. General: Provide only compounds that are known (proven) to be fully compatible with surfaces contacted.
- B. Silicone Rubber Glazing Sealant: Silicone rubber, one-part elastomeric sealant. Provide acid-type for non-porous channel surfaces and provide non-acid type for porous channel surfaces (where any of the channel surfaces are porous).
- C. Impact Resistant Elastomeric Adhesives: Impact resistant adhesives shall be used with polycarbonate laminates. They shall be silicone adhesives that produce compatible impact resistant bonds, and which are specifically approved for such applications by the manufacturer of the polycarbonate laminates. Mating surfaces shall be prepared and primed in accordance with recommendations of the polycarbonate laminate manufacturer.

2.03 MISCELLANEOUS GLAZING MATERIALS:

- A. Setting Blocks: Neoprene, 70-90 durometer hardness, with proven compatibility with sealants used.
- B. Spacers: Neoprene, 40-50 durometer hardness, with proven compatibility with sealants used.
- C. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
- D. Miscellaneous Materials: Nylon pile glazing splines, leveling blocks, and other glazing accessories as required by manufacturer of demountable partition system.

PART 3 - EXECUTION

3.01 INSTALLATION:

3.02 STANDARDS AND PERFORMANCE:

- A. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure or any kind including loss or breakage of glass, failure of sealants, gaskets, and glazing splines to remain in place, deterioration of glazing materials and other defects in the work, including development of rattles of the glazing in its frames.
 - 1. Protect glass from edge damage at all times during handling, installation and operation of the building.
 - 2. Glazing channel dimensions as shown are intended to provide for necessary minimum bite on the glazing, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. The CONTRACTOR is responsible for correct glass size for each opening, within the tolerances and necessary dimensions established.
 - 3. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified, and except where manufacturer's technical representatives direct otherwise.
 - 4. Comply with "Glazing Manual" by the Glass Association of North America except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.
 - 5. Inspect each piece of glass immediately before installation and eliminate any that have observable edge damage or face imperfections.
 - 6. Unify the appearance of each series of lights by setting each piece to match the others as nearly as possible. Inspect each piece and set with patterns, draw, and bow oriented in the same direction as other piece.

3.03 PREPARATION FOR GLAZING:

- A. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings that are not firmly bonded to the substrate. Remove lacquer from metal surfaces wherever elastomeric sealants are used.
- B. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.

3.04 GLAZING:

- A. Where required, install setting blocks of proper size at quarter points of sill rabbet. Set blocks in thin course of the heel-bead compound, if any.
- B. Where required, provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 united inches, except where gaskets are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Do not attempt to cut, seam, nip or abrade glass which is tempered, heat strengthened, or coated.
- D. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- E. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.
- F. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation and eliminate stains and discolorations.

3.05 CURE, PROTECTION AND CLEANING:

- A. Cure glazing sealants and compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.
- B. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass.
- C. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during the construction period, including natural causes, accidents, and vandalism.
- D. Maintain glazing in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.

- E. Wash and polish glazing on both faces at time of acceptance of the WORK in each area. Comply with glass manufacturer's recommendations.

END OF SECTION

SECTION 09800 - PROTECTIVE COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

This specification covers preparation of surfaces, performance and completion of painting and coating of all surfaces unless specified otherwise elsewhere in the specifications and the drawings.

1.02 DELIVERY AND STORAGE

All materials delivered to job site shall be in original sealed and labeled containers of the paint manufactured.

1.03 SUBMITTALS

A. The Contractor shall submit manufacturer's literature for each product to be used giving the name, generic type, descriptive information and evidence of satisfactory past performance. Submittals shall include the following performance data as certified by a qualified testing laboratory:

1. Abrasion - Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load.
2. Adhesion - Elcometer Adhesion Tester.
3. Exterior Exposure - Exposed at 45 degrees facing ocean (South Florida Marine Exposure).
4. Hardness - ASTM D3363-74
5. Humidity - ASTM D2247-68
6. Salt Spray (Fog) - ASTM B117-73

B. Upon completion of installation, the Contractor shall submit written certification from the manufacturer that all work has been performed within the limits prescribed by the manufacturer.

PART 2 - PRODUCTS

2.01 COLORS

A. Colors, where not specified, shall be as selected by the Engineer. The Contractor shall furnish color chips for each protective coating system for review and selection.

B. Safety Color Code for Marking Physical Hazards. The safety color selected for the marking of physical hazards and safety, fire fighting and protection equipment shall be in accordance with OSHA 1910.144.

1. Safety Color Selection

Colors shall meet the tests specified in ANSI Z53.1. The colors used shall conform to the color chips identified by numbers specified in Federal Standard 595.

<u>Color</u>	<u>Standard</u>	<u>Color</u>	<u>Standard</u>
Red	11105	Blue	15120
Yellow	13655	Purple	17142
Orange	12246	White	17875
Green	14260	Black	17038

- C. Color selection for the items not covered by OSHA Color Standards shall either be in accordance with the Painting Schedule, or to be determined after submittal of color chips by Contractor.
- D. Piping Color Code. In order to facilitate identification of piping, the different above ground pipelines and equipment shall be color-coded. The following color scheme shall be used for the purposes of standardization. The use of paints containing lead or mercury is strictly prohibited. The contents and direction of flow shall be stenciled on the piping in a contrasting color. All piping shall be identified with labels and flow direction every 10 feet and with at least two labels in each room, closet, or pipe chase. The paint system shall be TNEMEC (specified in parenthesis below), or engineer approved equal.
- a. Water Lines
 - i. Raw or Recycle: Olive Green (110GN Clover)
 - ii. Settled or Clarified: Aqua (10GN Aqua Sky)
 - iii. Finished or Potable: Dark Blue (11sf Safety Blue)
 - iv. Pumping Unit: Dark Blue (11sf Safety Blue)
 - b. Chemical Lines
 - i. Alum or Primary Coagulant: Orange (04SF – Safety Orange)
 - ii. Ammonia: White (00WH White)
 - iii. Carbon Slurry: Black (35GR Black)
 - iv. Caustic: Yellow with Green Band (02SF Safety Yellow, 09SF Safety Green)
 - v. Chlorine (Gas and Solution): Yellow (02SF Safety Yellow)
 - vi. Chlorine Dioxide: Yellow with Violet Band
 - vii. Fluoride: Light Blue with Red Band (25BL Fountain, 06SF Safety Red)
 - viii. Lime Slurry: Light Green (37GN Irish Spring)
 - ix. Polymers or Coagulant Aids: Orange with Green Band (04SF – Safety Orange, 09SF Safety Green)
 - c. Others
 - i. Compressed Air: Dark Green (91GN Balsam)

- ii. Gas: Red (28Rd Monterrey Tile)
- iii. Other Lines: Light Gray (32GR Light Gray)

2.02 COATING SCHEDULE

A. Ferrous Metal Surfaces - Exterior Environment (UV exposure)

1. Surface Preparation for Carbon Steel: SSPC-SP6/NACE 3 Commercial Blast Cleaning.
2. Surface Preparation for Cast Iron & Ductile Iron: Clean as required to remove all soluble surface contaminants. Abrasive blast all surfaces to be coated in accordance with NAPF 500-03-04 to remove all insoluble surface contaminants and to achieve a minimum surface profile of 1.5 mils.
3. Coating System

		<u>Dry Film Thickness (mils)</u>
1 st Coat	Polyamidoamine Epoxy Tnemec Series N69	4.0-6.0
2 nd Coat	Polyamidoamine Epoxy Tnemec Series N69	4.0-6.0
3 rd Coat	Aliphatic Acrylic Polyurethane Tnemec Series 1074U	2.5-3.0
		Total System 10.5-15

4. Description: Ferrous metal surfaces not installed within an enclosed structure including piping, fittings, couplings, adaptors, valves, etc.

B. Ferrous Metal Surfaces - Corrosive Gas or Immersion Environment

1. Surface Preparation for Carbon Steel SSPC-SP10/NACE 2 Near-White Blast Cleaning
2. Surface Preparation for Cast Iron & Ductile Iron: Clean as required to remove all soluble surface contaminants. Abrasive blast all surfaces to be coated in accordance with NAPF 500-03-04 to remove all insoluble surface contaminants and to achieve a minimum surface profile of 1.5 mils
3. Coating System

		<u>Dry Film Thickness (mils)</u>
1 st Coat	Polyamidoamine Epoxy Tnemec Series N69	4.0-6.0
2 nd Coat	Cycloaliphatic Amine Epoxy	5.0-6.0

3 rd Coat	Tnemec Series 104 Cycloaliphatic Amine Epoxy Tnemec Series 104	5.0-6.0
		Total System 14-18

4. Description: Ferrous metal surfaces exposed or immersed in pump station wet wells, manholes immediately upstream of wet wells, drop manholes, discharge manholes, or similar locations, including piping, fittings, valves, pumps, etc.

C. Interior of Existing Concrete Structures - Corrosive Gas or Immersion Environment

1. System A - 100% Solids Epoxy.

- a. Surface Preparation: Abrasive blast to remove laitance, form release agents, curing compounds, sealers, or other contaminants and to achieve a surface profile equivalent to ICRI CSP 5.

b. Materials:

		<u>Dry Film Thickness (mils)</u>
1 st Coat	Cementitious Epoxy Resurfacer Tnemec Series 218 Motarclad	1/16 th Inch
2 nd Coat	100% Solids Polyamine Epoxy Mortar Tnemec Series 434 H2S Permashield	125
3 rd Coat	100% Solids Polyamine Epoxy Tnemec Series 435 H2S	12.0 - 15.0

2. System B - Cementitious Coating.

- a. Surface Preparation: The use of high pressure water cleaning, hydro blasting, abrasive blasting, grinding and detergent water cleaning shall conform to manufacturer's recommendations. All surface defects repair materials and procedures shall conform to manufacturer's recommendations.

b. Materials:

		<u>Dry Film Thickness (mils)</u>
1 st Coat	Cementitious Coating Dinjer CMS-10K	1/16 th Inch
2 nd Coat	Amine Epoxy Mortar Dinjer SG Mastic	100

- c. Cementitious Coating: Shall be quick setting, high strength, sulfide

resistant, calcium aluminate-based or portland cement material; suitable for troweling or rotary spray application to inside of structure. Additives shall be used to increase corrosion resistance or bond strength at manufacturer's direction and with Engineer's approval.

2.03 PERFORMANCE REQUIREMENTS

A. Polyamidoamine Epoxy: Polyamidoamine epoxy shall contain no lead or soluble chromates. Polyamidoamine epoxy shall be able to weather sixty (60) days prior to top coating with itself or aliphatic urethanes. Scarify surface before top coating if exposed to sunlight for 60 days or longer.

- 1) Minimum Solids per Gallon: 67.0 +/- 2.0%
- 2) Abrasion: No more than 115 mg loss after 1000 cycles (ASTM D 4060, CS-17 Wheel, 1,000 grams load)
- 3) Adhesion: Not less than 1600 psi pull average of three trials (ASTM D 4541 Elcometer Adhesion Tester)
- 4) Exterior Exposure: No blistering, cracking or delamination of the film. No more rust creepage at scribe or after seventy-two months exposure.
- 5) Fresh Water Immersion: No blistering, cracking, softening or delamination of the film after 4 years immersion in 77 F. tap water (ASTM D 870).
- 6) Hardness: Must pass 3H (ASTM D 3363)
- 7) Salt Fog: No blistering, rusting, cracking, softening or delamination of the film. No more than 1/8 inch rust creepage at scribe after 8,000 hours exposure (ASTM B117).
- 8) Manufacturer: Tnemec N69 Hi-Build Epoxoline II, or equal.

B. Cycloaliphatic Amine Epoxy:

- 1) Minimum Solids per Gallon: 82.0 +/- 2.0%
- 2) Abrasion: No more than 120 mg loss after 1000 cycles (ASTM D 4060, CS-17 Wheel, 1,000 grams load)
- 3) Chemical Resistance: No blistering, cracking, softening or delamination of the film after seven days exposure at 75°F to 10% sulfuric acid, 50% sodium hydroxide, 10% hydrochloric acid, 10% phosphoric acid and 5% sodium chloride.
- 4) Salt Spray Resistance: No blistering, rusting, cracking, softening or delamination of the film. No more than 1/32 inch rust creepage at scribe after 1,500 hours exposure (ASTM B 117-73).
- 5) Manufacturer: Tnemec 104 H.S. Epoxy, or equal.

C. Aliphatic Acrylic Polyurethane:

- 1) Minimum Solids per Gallon: 100.0 +/- 2.0%
- 2) Abrasion: No more than 116 mg loss after 1000 cycles (ASTM D 4060, CS-

- 17 Wheel, 1,000 grams load)
- 3) UV Resistance: No blistering, cracking, or chalking of the film, and no less than 64% gloss retention (33 units gloss change), after 7000 hours exposure (ASTM D 4587, UVA-340 bulbs, Cycle 4: 8 hours UV/4 hours condensation).
 - 4) Humidity Resistance: No blistering, rusting, cracking, or delamination of the film after 2,500 hours exposure (ASTM D 4585).
 - 5) Manufacturer: Tnemec 1074U Endurashield II, or equal.

D. Cementitious Coating:

- 1) Density when applied: 135 lb./cf. +/- 5 lb./cf.
- 2) Compressive strength (ASTM C109) at 1 day Minimum acceptable: 2,000 psi.
- 3) Compressive strength (ASTM C109) at 28 days Minimum acceptable: 5,500 psi.
- 4) Bond Strength (ASTM C882) at 28 days minimum acceptable: 1,640 psi.
- 5) Flexural Strength (ASTM C78) at 28 days minimum acceptable: 1,500 psi.
- 6) Manufacturer: Dinjer CMS-10K, or equal.

E. Amine Epoxy:

- 1) Compressive strength (ASTM D-695) at 1 day Minimum acceptable: 12,000 psi.
- 2) Compressive strength (ASTM D-695) at 7 days Minimum acceptable: 13,000 psi.
- 3) Bond Strength (ASTM C882) at 14 days minimum acceptable: 3,000 psi.

PART 3 - EXECUTION

3.01 GENERAL

- A. All surface preparation, coating and painting shall conform to applicable standards of the Steel Structures Painting Council (SSPC), and the manufacturer's printed instructions. Material applied prior to approval of the surface by the Engineer shall be removed and reapplied to the satisfaction of the Engineer at the expense of the Contractor.
- B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the Engineer.
- C. The Contractor shall provide a supervisor at the work site during cleaning and application operation. The supervisor shall have the authority to sign change

orders, coordinate work and make decisions pertaining to the fulfillment of the contract.

- D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags as per SSPC SP1.
- E. Coating and painting systems include surface preparations, prime coating and finish coatings. Any off-site work that does not conform to this specification is subject to rejection by the Engineer.
- F. Shop applied prime coatings, which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Engineer. The Contractor shall use repair procedures that insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire brushing, hand, or power tool cleaning or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle, distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch-up, then the item shall be re-cleaned and coated or painted as directed by the Engineer.
- G. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.
- H. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight-hour working day. Any cleaned areas not receiving first coat within eight-hour period shall be re-cleaned prior to application of first coat.
- I. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.
- J. Coatings shall be applied during good painting and coating weather. Air and surface temperatures as well as dew point shall be within limits prescribed by the manufacturer for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.
- K. Field touch up painting shall be required on scratched or damaged surfaces.

3.02 SURFACE PREPARATION

- A. The latest revision of the following surface preparation specifications of the Steel Structures Painting Council (SSPC) shall form a part of this specification.

1. Solvent Cleaning (SSPC SP): Removal of oil, grease soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
 2. Hand Tool Cleaning (SSPC SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wire brushing.
 3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire brushing, power impact tools or power sanders.
 4. White Metal Blast Cleaning (SSPC-SP5): Blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.
 5. Commercial Blast Cleaning (SSPC-SP6): Blast cleaning until at least two thirds of each element of surface area is free of all visible residues.
 6. Brush-Off Blast Cleaning (SSPC-SP7): Blast cleaning to remove loose rust, loose mill scale and other detrimental foreign matter to degree specified.
 7. Near White Blast Cleaning (SSPC-SP10): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.
- B. Slag and weld metal accumulation and spatters not removed by the fabricator, erector or installer shall be removed by chipping and grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer.
- C. Field blast cleaning for all surfaces shall be by dry method unless otherwise directed.
- D. Particle size of abrasives used in blast cleaning shall be that which will produce a 1 1/2 - 2 mil (37.5 microns - 50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.
- E. Abrasive used in blast cleaning operations shall be new, washed, graded, and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Engineer.
- F. Surface preparation will be based upon comparison with: "Pictorial Surface preparation Standards for Painting Steel Surfaces", SSPC-Vis 1 ASTM Designation

D220; "Standards Methods of Evaluation Degree of Rusting on Painted Steel Surfaces", SSPC-Vis-2 ASTM Designation D610; "Visual Standard for Surfaces of New Steel Air blast Cleaned with Sand Abrasive".

- G. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paint are not exposed to abrasion from blast cleaning.
- H. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the prosecution of the work or the operation of the existing facilities.
- I. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. No coatings or paint shall be applied over damp or moist surfaces.

3.03 APPLICATION

- A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specification SSPC-PA latest revision for "Shop Field and Maintenance Painting", and the manufacturer of the coating and paint materials.
- B. Thinning shall be permitted only as recommended by the manufacturer and approved by the Engineer.
- C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paints from being splattered onto surfaces that are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the Engineer.
- E. When two coats of paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.
- F. Film thicknesses per coat specified are the minimum required. Contractor shall apply additional coats as necessary to achieve the specified thickness.
- G. No coating or paint shall be applied: When the surrounding air temperature or the temperature of the surface to be coated or painted is below 40 degrees F., too wet or damp surfaces or in rain, snow, fog or mist; when the temperature is less than 5 degrees F. above the dew point; when it is expected the air temperature will drop

below 40 degrees F. six hours after application of coating and paint. Dew point shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables.

- H. If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.
- I. All material shall be applied as per manufacturer's recommendations.
- J. All welds and irregular surfaces shall receive a brush coat of the specified product prior to application of the first complete coat.
- K. All parts that can be disassembled such as vents and manhole covers shall be removed and coated inside and out as per applicable coating systems. Upon completion of coating, those parts disassembled shall be reassembled prior to placing in service.

3.04 ACCEPTANCE OF WORK

- A. All surface preparation and repairs shall be approved by the Engineer/Owner before primer is applied.
- B. The Contractor shall request and receive acceptance of each coat before applying next coat.
- C. The Contractor shall correct work that is not acceptable and request reinspection.
- D. Thickness of coatings and or the paint shall be checked with a non-destructive, magnetic type thickness gauge. (Use an instrument such as a Tooke Gauge if a destructive tester is deemed necessary.) Coating integrity of interior coated surfaces shall be tested with approved inspection devices. Holiday detection shall be performed prior to application of aluminum or metallic finish coats. Non-destructive holiday detector shall not exceed 67.5 volts nor shall destructive holiday detector exceed the voltage recommended by the manufacturer of the coating system. For thicknesses between 10 and 20 mils (250 microns and 500 microns) a non-sudsing type setting agent, such as Kodak Photo-Flo, shall be added to the water and detector sponge prior to detector use. All pinholes shall be marked and repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities shall be permitted in the final coating.
- E. The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coating and paint. The Contractor shall also

furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of dry-film thickness gauge and certified instrumentation to test accuracy of holiday detectors.

- F. The Contractor shall require regular checks with these devices to insure dry-film thicknesses meet specifications. The Engineer shall at his discretion use the Contractors or his own equipment to perform similar inspections.
- G. Dry-film thickness gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection device shall be operated in the presence of the Engineer.
- H. Concrete surfaces in immersion service must have void - and pinhole-free coating application. Inspection of coating system with 5X magnification will provide these assurances.
- I. Warranty inspection shall be conducted during the eleventh month following completion of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Engineer/Owner.
- J. In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working in, or about the project site.
- K. Equipment shall include protective helmets that shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirator with appropriate filter. Barrier creams shall be used on any exposed areas of skin.
- L. Where ventilation is used to control hazardous exposure, all equipment shall be explosion proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.
- M. Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.
- N. Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.

- O. All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.
- P. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paint must be stored to conform to City, Parish, State, and Federal safety codes for flammable coating or paint materials. At all times, coatings and paints shall be protected from freezing.

3.05 CLEAN UP

Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Coating or paint spots and oil or stains upon adjacent surfaces shall be removed and the job site cleaned. All damage to surfaces resulting from the work of painting contractor or subcontractor shall be cleaned, repaired, or refinished to the satisfaction of the Engineer at no cost to the Owner.

END OF SECTION

SECTION 09963 - CHEMICAL RESISTANT LINING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as specified, shown, and required to furnish, install and place into satisfactory service the containment liner.
2. Types of containment lining for concrete Work required include, but are not necessarily limited to, the following:
 - a. All systems shall include substrate cleaning, surface preparation, and containment lining application. Materials and thicknesses shall be as specified herein.
 - b. System shall consist of five products: Series 241 Ultratread MVT moisture vapor mitigation system, Series 215 Surfacing Epoxy or Series 218 MortarClad resurfacer; Series 251SC ChemBloc primer; Series 252SC ChemBloc, aggregate filled, novolac vinyl ester to provide 125 mils thickness, Series 252SC fiberglass mat reinforced, and Series 252SC ChemBloc, novolac vinyl ester finish coat.
 - c. Cant cove bases shall be installed using mixed trowelable version of lining system as manufactured by Tnemec Co. in accordance with the Manufacturer's written instructions and as indicated on the Standard Secondary Containment Lining Detail.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to application of the corrosion protection lining.
2. Coordinate and schedule preparation of substrates, before equipment and similar items are installed to avoid later difficulty or delay in performing the Work of this Section, and to provide substrates within tolerances and surface profile specified.
3. All substrate surface preparation and lining application, including concrete resurfacing, to be completed by manufacturer's approved Installer.

C. Related Sections:

1. Section 01300, Submittals.

1.2 REFERENCES

- ##### A.
- This Section contains references to the governing standards and documents listed below. They are a part of this Section as specified and modified; the current version shall apply unless otherwise noted. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.

1. American Concrete Institute, (ACI)

- a. ACI 301 – Specifications for Structural Concrete.
 - b. ACI 308R – Guide to Curing Concrete.
 - c. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - d. ACI 546.R – Concrete Repair Guide.
 - e. ACI 546.3R – Guide for the Selection of Materials for the Repair of Concrete
2. ASTM International, (ASTM)
- a. ASTM C307 – Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - b. ASTM C413 – Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - c. ASTM C531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - d. ASTM C579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - e. ASTM C580 – Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - f. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - g. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - h. ASTM D2240 – Standard Test Method for Rubber Property—Durometer Hardness.
 - i. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Linings by the Taber Abraser.
 - j. ASTM D4285 – Standard Test Method for Indicating Water or Oil in Compressed Air.
 - k. ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - l. ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
 - m. ASTM D4541 – Standard Method for Pull-Off Strength of Coatings using Portable Adhesion Testers.
 - n. ASTM D6944 – Standard Test Method for Measuring Humidity with a Psychrometer.
 - o. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
3. International Concrete Repair Institute, (ICRI)
- a. Guideline No. 310.1R – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
 - b. Guideline No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealer, Linings, and Polymer Overlays.
4. NACE International, (NACE)

- a. NACE Publication 6D-173 – A Manual for Painter Safety.
 - b. NACE SP0892 – Standard Practice for Coatings and Linings over Concrete for Chemical Immersion and Containment Service.
 - c. NACE No. 6/SSPC-SP13 – Surface Preparation of Concrete.
5. Occupational Safety and Health Administration, (OSHA)
- a. Safety and Health Standards (29 CFR 1910/1926).
6. SSPC: The Society for Protective Linings, (SSPC)
- a. SSPC-SP5/NACE No. 1 – White Metal Blast Cleaning
 - b. SSPC-SP13/NACE No. 6 – Surface Preparation of Concrete.
 - c. SSPC-Guide 12 – Guide for Illumination of Industrial Painting Projects.
 - d. SSPC-QP1 Certification – Field Application to Complex Industrial and Marine Structures.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents, the last version of the document before it was discontinued.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Installer shall have a minimum of 5 years experience in the application of the specified lining systems. Professional references will be required which Submit firm and qualifications of proposed Applicator to ENGINEER for approval.
2. Single Source Responsibility: Obtain primary resinous lining materials including primers, resins, hardening agents, finish, or sealing coats from a single manufacturer with not less than 5 years of successful experience in manufacturing principal materials described in this Section. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.
3. Installation shall be performed by an applicator having satisfactory experience in the application of these or similar materials or with on-site consultation by a qualified field service representative of the manufacturer.
4. Installer to establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of the project. Contractor to provide a fulltime, on-site person whose dedicated responsibilities will include quality control of the containment liner.
5. Quality control procedures and practices must include the following items:
 - a. Training of personnel in the proper surface preparation requirements.
 - b. Training of personnel in the proper storing, mixing, application, inspection, and repair of the corrosion protection lining.
 - c. Training of personnel in health and safety practices.

B. Mock-Ups:

1. Prior to the installation of the containment lining and auxiliary system components, but after Engineer's approval of the Samples, install 100 square foot stepped-back mock-ups of the systems showing each system component, in area selected by Engineer, to show representative installation of the Work.
2. Obtain Engineer's acceptance of visual qualities of the mock-ups before start of Work. Retain and protect mock-ups during construction as one standard for judging completed corrosion protection lining Work. Do not alter mock-ups after approval by Engineer.
 - a. Finished Work, in compliance with visual qualities of mock-ups, that fails other on-site quality control testing procedures shall be replaced by Contractor with new materials.
3. Build as many mock-ups as required to achieve Engineer's acceptance of the corrosion protection lining.
4. Accepted mock-up shall be considered the acceptable minimum standard of quality.
5. Containment lining Work that proceeds without approved mock-ups shall be stopped, and mock-ups prepared for approval.

C. Pre-Installation Conference:

1. Before erecting mock-ups, Contractor, Installer, and technical representative of the corrosion protection lining manufacturer shall meet on-site with Engineer to discuss approved products and workmanship to ensure proper application of the corrosion protection lining components and substrate preparation requirements.
2. Review foreseeable methods and procedures related to the containment lining Work, including but not necessarily limited to, the following:
 - a. Review Project requirements and the Contract Documents.
 - b. Review required submittals, both completed and yet to be completed.
 - c. Review status of substrate Work, including approval of surface preparations and similar considerations.
 - d. Review requirements of on-site quality control testing and requirements for preparing Site Quality Control Report as specified herein.
 - e. Review availability of materials, tradesmen, equipment, and facilities needed to make progress and avoid delays.
 - f. Review required inspection and testing.
 - g. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
 - h. Review regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations.
 - i. Review procedures required for the protection of the corrosion protection lining during the remainder of the construction period.
3. Record the discussions of the Pre-Installation Conference and the decisions and agreements or disagreements reached and furnish a copy for the record to each party attending. Record any revision or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.
4. Reconvene the conference at the earliest opportunity if additional information must be developed in order to cover the subjects under consideration.

1.4 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300 entitled “Submittals”, the CONTRACTOR shall submit all required information as specified herein.
- B. Submit for approval prior to commencing any Work:
 - 1. Copies of specifications, technical information, installation instruction and general recommendations from the corrosion protection lining manufacturer for Work required. Include requirements for environmental conditions and other conditions required for an acceptable installation, providing features and performance as stated in manufacturer’s literature.
 - 2. Submit to the Engineer for review in accordance with the General Requirements, complete shop drawings with the manufacturer's technical data showing complete methods of surface preparation and lining installation and general maintenance. Include plans and details of where and how chasing, coving, and expansion and control joints will be installed.
 - 3. Submit three sets of 3-inch by 6-inch samples of containment liner in the finish texture and color required.
 - 4. No lining work on site will be allowed until construction methods are approved and samples approved as to color and finish. All containment linings to be used shall conform to approved samples in all respects.
 - 5. Product Data Sheets: Copies of current technical data for each component specified and applied as outlined in this Section.
 - 6. Copies of Material Safety Data Sheets (MSDS) for all materials brought on-site to complete Work, including all clean-up solvents and containment lining materials.
 - 7. Performance Testing Reports: Copies of test data for the entire physical, chemical, and permeation properties listed herein and as outlined within this Section.
 - 8. Construction Details: Copies of manufacturer’s computer-generated standard lining details for specified materials, including leading edge termination, metal embedment in concrete, joint detail, wall-to-slab detail, pipe termination detail, and any other detail at the request of the ENGINEER.
 - 9. Product Substitution: The specified corrosion protection lining is the minimum standard of quality for this project. Equivalent materials of other manufacturers may be substituted only by approval of Engineer. Requests for material substitutions shall be in accordance with requirements of the project specification.
 - a. Manufacturers of “or equal” products shall provide direct property comparison with the materials specified in addition to complying with all other requires of these Specifications. “Or equal” products shall employ the same generic materials and system components as the corrosion protection lining specified.
 - b. Bidders desiring to use corrosion protection lining other than those specified shall submit proposed system with their proposal at the time of bid based, together with the information required herein, and indicate the sum which will be deducted from the base bid should alternate materials be accepted.
- C. Jobsite Reports: Submit at the completion of Work.

1. Daily Reports: Include surface preparation, substrate conditions, ambient conditions application procedures, lining materials applied, material quantities, material batch number(s), description of work completed and location thereof.

1.5 PRODUCT DELIVERY

A. Delivery of Materials:

1. Deliver material in manufacturer's original, unopened, and undamaged packages.
2. Clearly identify manufacturer's, brand name, contents, color, batch number, and any personal safety hazards associated with the use of or exposure to the materials on each package.
3. Packages showing indications of damage that may affect condition of contents are not acceptable.

B. Storage of Materials:

1. Materials shall be stored in accordance with manufacturer's recommendations in enclosed structures and shall be protected from weather. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 degrees F and 90 degrees F.
2. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life as defined by the manufacturer shall be removed promptly from the site. Store all materials only in area or areas designated by the ENGINEER solely for this purpose.
3. Store in original packaging under protective cover off of the ground using pallets and protect from damage.
4. Stack containers in accordance with manufacturer's recommendations.

C. Handling of Materials: Handle materials in such a manner as to prevent damage to products or finishes.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. For containment lining, concrete substrate shall have cured a minimum of 28 days utilizing a dissipating curing membrane (water). If a curing compound is used on the slab, it must be completely removed prior to application of final topping, and compound and removal system must be approved in writing by topping manufacturer. Concrete sub floors on or below grade shall be adequately waterproofed beneath and at the perimeter of the slab.
2. Proceed with containment lining Work only when temperature and moisture conditions of substrates, air temperature, relative humidity, dew point and other conditions comply with the containment lining manufacturer's written recommendations and when no damaging environmental conditions are forecasted for the time when the material will be vulnerable to such environmental damage. Record all such conditions and include in final Site Quality Control Report.
3. Do not begin Work when relative humidity is expected to rise above 90 percent during the time of installation and catalyzation, nor when substrate temperature are not at least five degrees above the dew point temperature and rising.

4. Utilities, including electric, water, heat (air temperature between 65 degrees F and 90 degrees F), and finished lighting to be supplied by the general contractor.
 5. Job area to be free of other trades during, and for a period of 24 hours, after lining installation.
 6. Do not begin containment lining Work until manufacturer's recommended environmental conditions can be maintained and only when manufacturer and installer are willing to guarantee the Work as required and without additional reservations and restrictions.
 7. Protection of finished walls and floor from damage by subsequent trade shall be the responsibility of the general contractor.
- B. Dust and Contaminants: Protect work and adjacent areas from excessive dust and airborne contaminants during protective lining application and curing. Schedule Work to avoid excessive dust and airborne contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Products and Manufacturers: Provide the following:
1. Tnemec Company, Inc., Kansas City, MO. (816) 483-3400 www.tnemec.com

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor shall examine the areas and conditions under which the corrosion protection coating Work is to be performed and notify Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected in a manner acceptable to Engineer.
- B. Contractor shall confirm the presence of a positive side waterproofing on the exterior of the concrete structure where below grade.

3.2 SUBSTRATE PREPARATION

- A. Concrete surfaces to be coated shall be free of curing compounds and form release agents, laitance and foreign particles that may inhibit bonding. Prior to start of protective lining systems application, high-pressure water clean, waterjet or abrasive blast surfaces to be covered as required and inspect the substrate in accordance with SSPC-SP13/NACE No. 6. Surface preparation procedures shall be in accordance with SSPC-SP13/NACE No. 6 and ICRI Guideline No. 310.2. Surface preparation requirement is to expose aggregate and obtain a uniform surface texture resembling an ICRI-CSP 5.
- B. All new cast-in-place and precast concrete shall cure for a period of 28 days in accordance with ACI 308R before protective lining system is installed, unless otherwise recommended by the Containment Lining manufacturer.

- C. Concrete surfaces to receive protective lining shall be a Smooth Form Finish as defined in ACI 301. Surfaces shall not be rubbed, sacked, troweled, or otherwise finished in any manner that will obscure or cover the firm substrate surface.
- D. Level or grind concrete substrates to manufacturer's recommended tolerances and produce a smooth, uniform installation, including removal of all sharp edges, ridges, or depressions.
- E. All surfaces must be clean, dry, and free of oil, grease, and other contaminants, prior to preparation in accordance with SSPC-SP13/NACE No. 6. Concrete surfaces must be sound and capable of supporting the protective lining system as determined by the engineer. Surface preparation requirement is to expose a sound, uniform surface texture conforming to the minimum recommended ICRI-CSP. The appropriate surface/filler/patcher shall be applied to the prepared surface to condition the substrate making suitable for protective lining system.

3.3 SYSTEM INSTALLATION

- A. All vertical surfaces shall be surfaced, filled, or patched utilizing Series 215 Surfacing Epoxy or Series 218 MortarClad to fill all bugholes, spalls, cracks, and other surface defects prior to the installation of the containment lining system.
- B. To all horizontal surfaces, apply Tnemec Series 241 Ultratread MVT at 70-80 Sq. Ft/kit and broadcast to rejection with 30/50 mesh silica.
- C. Cant cove bases shall be installed using mixed trowelable version of lining system in accordance with the Manufacturer's written instructions and as indicated on the Standard Secondary Containment Lining Details.
- D. To all horizontal and vertical surfaces, roller applied penetrating primer of Series 251SC ChemBloc at 6.0–8.0 mils DFT.
- E. To all horizontal and vertical surfaces, trowel applied mortar base coat of Series 252SC ChemBloc at 60.0–80.0 mils DFT.
- F. Embed ¾ ounce fiberglass reinforcing mat into the basecoat while still wet and smooth with ribbed roller to remove any voids or wrinkles.
- G. Saturate top of fiberglass mat completely with Series 252SC, ChemBloc resin at 6.0–8.0 mils until glass attains a translucent, even appearance.
- H. Once cured, sand to remove any imperfections or fiberglass fibers that may be sticking up through the cured film. Grind if required to remove.
- I. To all horizontal and vertical surfaces, roller applied topcoat of Series 252SC ChemBloc at 6.0–8.0 mils DFT.
- J. Flooring shall be finished in accordance with texture approved on samples and the mock-up unit.
- K. Saw cuts – All areas where the installed lining does not transition into another surface of a different angle shall be saw cut. The saw cut shall be ¼" wide by a ¼" in depth.

- L. Expansion and Control Joints – Where specified, a joint shall be saw-cut after the lining installation and filled with a flexible epoxy or urethane sealant.
- M. Application in direct sunlight and/or with rising surface temperature is not allowed, as this may result in blistering of the materials due to expansion of entrapped air or moisture in the concrete. In such cases, it will be necessary to postpone the application until later in the day when the temperature of the substrate is falling.
- N. Areas not to receive containment lining shall be masked or otherwise protected to prevent these surfaces from being coated.
- O. Ensure straight, even termination of protective lining system on wall edges and flush with embedded steel.

3.4 FIELD QUALITY CONTROL, INSPECTION, AND TESTING

- A. Inspection by the Engineer or others does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.
- B. Contractor and his Installer shall examine the areas and conditions under which the containment lining Work is to be performed in accordance with SSPC-SP13/NACE No. 6 and notify Engineer in writing of conditions deleterious or otherwise detrimental to the proper and timely completion of the work.
- C. Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the Contractor and his Installer and will produce a finished product meeting the requirements of the Specifications. All defects resulting from such accepted conditions shall be corrected by Contractor at his own expense.
- D. Dry-Film Thickness:
 - 1. Wet-Film Thickness shall be taken every 100 square feet in accordance with ASTM D 4414 and recorded.
 - 2. The Dry-Film Thickness can be determined using surface area calculation for material consumption.

3.5 ACCEPTANCE CRITERIA

- A. All surfaces shall be prepared in accordance with the specification and referenced standards herein.

3.6 ADJUSTMENTS AND CLEANING

- A. At the completion of the Work, Contractor shall remove all materials and debris associated with the Work of this Section.
- B. Clean all surfaces not designated to receive protective lining. Restore all other work in a manner acceptable to Engineer.

- C. Provide non-staining protective construction paper as approved over the entire surface area, with joints taped, and boards or planks where subjected to especially heavy traffic or hazards.
- D. All finished protective lining shall be protected from damage until Final Acceptance of the Work. Protective lining damaged in any manner shall be repaired or replaced at the discretion of Engineer, at no additional cost to Owner.
- E. Clean all protective lining as recommended by the manufacturer to provide finished Work acceptable to Owner just prior to Final Acceptance.

END OF SECTION

SECTION 11107 – BOOSTER PUMPS

PART 1 - GENERAL

1.01 SCOPE OF SUPPLY

The Contractor shall furnish all labor, materials, equipment, and incidentals to provide and install multi-stage in-line water booster pumps designed for pumping potable water. A control panel for the pumps is also included under this section. All items under this section shall be provided by a single supplier.

1.02 WARRANTY

The pump unit or any part thereof shall be warranted against defects in material or workmanship within one (1) year from date of installation and shall be replaced at no charge with a new or manufactured part, F.O.B. factory or authorized warranty service station.

1.03 SUBMITTALS

A. The submittal for establishing compliance to this specification shall include the following items:

1. Table of contents
2. A complete and detailed list of any and all variations to this specification
3. Scope of supply
4. Descriptive literature, bulletins, and/or catalog cut sheets of the equipment.
5. Data sheets for each model showing at least the following:
 - a. Pump model name
 - b. Motor size
 - c. Inlet and outlet connection size and type
 - d. Operating voltage required
 - e. Dimensions
 - f. Weight
6. Manufacturer's standard performance curves showing flow in gpm, pressure in feet of water, efficiency, and pump horsepower required, for each model.
7. Motor manufacturer's data sheet showing at least the following:
 - a. Motor manufacturer's name and model number
 - b. Amp draw: FLA, LRA
 - c. Motor RPM
 - d. Start and run winding resistance
8. Paint specification
9. Maintenance overview
10. Pump startup check list

11. Warranty information

- B. The Contractor shall provide two copies, one paper copy and one digital copy, of the Manufacturer's Operation and Maintenance Manual which shall include the following sections:
1. Technical Data
 2. Safety and Responsibility
 3. Design and Function
 4. Installation and Operating Conditions
 5. Installation Procedures
 6. Initial Start-up
 7. Operation
 8. Maintenance
 9. Spare parts and Service
 10. Drawings and Diagrams

1.04 FACTORY TESTING AND SHIPMENT

- A. Pumps shall be factory tested prior to shipment. Pumps shall be tested to CSA-C22.2 No. 108-01.
- B. Parts shall be properly lubricated and protected so that no damage or deterioration will occur even during a prolonged delay from the time of shipment until installation is completed and the pumps are ready for operation.
- C. Each pump shall be properly crated to protect against damage during shipment. All crates shall be identified with contents and weight.

PART 2 – PRODUCTS

2.01 MANUFACTURER

Pumps shall be Goulds Model 10GBS07, 8 Stage, 3500 RPM, or equal.

2.02 OPERATING CONDITIONS

- A. The pumps shall be designed for continuous operation at full load, without cavitation or overheating of the motor.
- B. Pump performance data curves shall show head and capacity over the entire operating range of the pump. The manufacturer shall separately indicate the head, capacity, and horsepower required at the design flow condition. The manufacturer shall indicate the limits recommended for stable operation without surge, cavitation, or excessive vibration on the submittal performance curves.
- C. Pumps shall deliver 12 gallons per minute while boosting the pressure by 67 psi.

2.03 CONSTRUCTION

- A. Pumps shall be multi-stage design providing steady, quiet, vibration free, operation. Pumps shall meet CSA No. 32236914. Pump threaded connections shall be 1 inch NPT. Discharge head shall be cast iron.
- B. O-Ring casing seal shall provide reliable high-pressure sealing with easy disassembly for maintenance or repair. Elastomer shall be Viton.
- C. Impellers and diffusers shall be glass filled engineered composite material with a fixed impeller design, offering high resistance to corrosion and abrasion.
- D. Bowls shall be 304 stainless steel rabbit lock for positive alignment with no gaskets required.
- E. Shaft and shaft coupling shall be stainless steel. Ball bearings shall carry all radial and axial thrust loads.
- F. Mechanical seals shall have materials of 316 stainless steel for metal parts, carbon for rotary faces, silicon carbide for stationary faces, and Viton for elastomer.
- G. Motor shall be NEMA standard 56J frame, open drip proof enclosure, 60 Hz, 3500 RPM, single phase, 240V.

2.04 PAINTING AND LABELLING

- A. The pumps shall be painted after assembly with the manufacturer's standard coating system. The paint shall cover all exterior ferrous surfaces.
- B. Pumps shall be equipped with stainless steel nameplates. Nameplates shall have model number, serial number, motor size, and motor speed clearly indicated.

2.05 CONTROL PANEL

- A. The control panel shall be a NEMA 4X type 304 stainless steel enclosure. Control panel shall be UL 508A listed and labeled. Power supply to the panel will be 240-volt, single phase, 3-wire plus ground. All components shall be mounted on an aluminum back-plate except as otherwise noted. All components shall be NEMA rated, as applicable; IEC rated components shall not be used. Control panel shall have auto-off-on selector switches and run lights mounted on an interior dead front aluminum panel. Dry contacts for power fail, pump fail, and pump run shall be provided on a terminal strip. Coordinate control panel design to function with overall project control scheme.

PART 3 – EXECUTION (NOT USED)

3.01 INSTALLATION

- A. The Contractor shall install pumps, controls, and accessories in accordance with the manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. The manufacturer's field engineer or representative shall inspect and check the installation and be present for initial start-up of the equipment. Manufacturer's representative shall also instruct the Owner's personnel in the operation and maintenance of the equipment. The Contractor shall furnish the Owner and the Engineer a minimum of three (3) day's advance notice of scheduled start-up.

END OF SECTION

SECTION 11151
SODIUM HYPOCHLORITE DISINFECTION SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish all labor, materials, equipment, and appurtenances required to provide a liquid sodium hypochlorite chemical feed system. System to be complete and operational with all control equipment and accessories as shown and specified. The Contractor shall provide a pre-assembled, packaged, fully enclosed, temperature controlled, duplex skid mounted chemical feed system with chemical metering pumps. The chemical feed package shall be hydraulically and electrically tested at the factory and shall be assembled to the fullest extent possible. The chemical feed package shall be furnished with all required lubricants, special tools, and installation instructions.
- B. Design equipment so parts are readily accessible for inspection and repair, easily duplicated and replaced, and suitable for service specified.

1.2 RELATED SECTIONS

- 09970 - Coatings
- 15110 - Valves and Appurtenances
- 13423 - Analysis and Instrumentation
- 11259 – Chemical Metering Pumps

1.3 REFERENCES, CODES AND STANDARDS

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

ANSI Z400.1/Z129.1	(2010) Hazardous Industrial Chemicals - Material Safety Data Sheets
AWWA B407	(2012) Liquid Ferric Chloride
AWWA/ANSI F101	Contact molded, Fiberglass-Reinforced Plastic Wash Water Troughs
ASME A13.1	(2015) Scheme for the Identification of Piping Systems
ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded
ASME B16.5 (2013) 24 Metric/Inch	Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS

ASTM D256	Standard Test Method for Determining Pendulum Impact Resistance of Notched Specimens of Plastic
ASTM D638	Standard Test Method for Determining Tensile Properties of Plastic
ASTM D648	Standard Test Method for Determining the Distortion of Plastic under controlled Exposure to Elevated Temperatures
ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80,
ASTM D790	Standard Test Method for Determining Flexural Properties of Plastic
ASTM D2583	Standard Test Method for Determining the Surface Hardness of Plastic using a Barcol Instrument
ASTM D2737	(2012a) Polyethylene (PE) Plastic Tubing
ASTM F441	(2013; E 2013) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80 and 120
HI 7.1-7.5	(2006) Controlled Volume Metering Pumps
HI 9.1-9.5	(2000) Pumps - General Guidelines for Types, Applications, Definitions, Sound Measurements and Documentation
NEMA 250 Maximum)	(2014) Enclosures for Electrical Equipment (1000 Volts
NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays , Rated 600 V
NFPA 37	(2015) Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(2017) National Electrical Code
NSF/ANSI 60	(2016) Drinking Water Treatment Chemicals - Health Effects
NAPHCC NSPC	(2015) National Standard Plumbing Code
UL 50	(2007; Reprint April 2012) Enclosures for Electrical Equipment, Non-environmental Considerations

1.4 DESCRIPTION OF SYSTEMS

The Sodium Hypochlorite Feed System shall include all components necessary for the metering of sodium hypochlorite using a flow input signal and a locally selected dosage rate. The Contractor shall furnish and install the connections between the pump station, the package feed system control panel, and the piping from the package feed system to the application point.

1.5 QUALITY ASSURANCE

- A. Pre-qualification Requirements: Any alternate chemical feed system manufacturer that is not named or listed as approved equal must submit the following 10 calendar days prior to bid to be considered for approval.
- B. To be considered, the manufacturer shall be regularly engaged in the manufacture of preassembled, packaged, fully enclosed, temperature controlled, duplex skid mounted chemical feed systems with a proven track record of at least fifteen (15) municipal installations in North America with contact names and phone numbers, where substantially similar installations for the equipment as specified has been in satisfactory operation for a minimum of two years.
- C. The manufacturer shall provide documentation of previous experience with municipal preassembled, packaged, fully enclosed, temperature controlled, chemical feed systems in wastewater applications with mechanically driven peristaltic metering pumps.
- D. Pre-qualification submittals from manufacturers shall include a complete and detailed proposal of equipment offered, including the number and type of pumps proposed and a detailed description of any exceptions taken to this specification.
- E. Documentation of chemical feed manufacturer's service capabilities including location and experience.
- F. Sample chemical feed performance guarantee including scope and duration of guarantee- minimum of 5 years required.
- G. All chemical feed manufacturers shall be required to pre-qualify unless the manufacturer is the basis of design manufacturer.
- H. The products of this section shall be provided by a single supplier who shall demonstrate previous experience in the manufacture of fully enclosed, temperature-controlled, skid-mounted chemical metering systems. The manufacturer must have a service center with trained technicians authorized to make repairs to all components of the chemical feed system. This supplier shall be responsible for providing all equipment, accessories, spare parts, documentation, and installation supervision required for a complete and operational chemical feed system.
- I. The pump skids shall be a regularly marketed product of the manufacturer who must have a physical plant, technical and design staff, and production personnel to complete the work as specified. Systems assembled by second party fabricators, integrators, equipment- distributors/representatives or contractors shall not be acceptable. The

chemical metering skids shall be assembled and tested by the manufacturer prior to delivery.

- J. The manufacturer shall have a minimum of 5 years' experience with a successful record of manufacturing and servicing of systems as specified herein.
- K. The manufacturer shall have a proven track record of after-market sales and service support on its equipment.
- L. Emergency Service: System manufacturer or manufacturer representative maintains service center capable of providing training, parts, and emergency maintenance and repairs at Project site with 48 hours maximum response time.
- M. Single-Source Responsibility: Obtain chemical feed equipment system components from single manufacturer with responsibility for entire system. Unit shall be representative product built from components that have proven compatibility and reliability and are coordinated to operate as unit as evidenced by records of prototype testing.

1.6 SUBMITTALS

Submittals shop drawings shall include the following:

- A. Complete description in sufficient detail to permit an item comparison with the specifications.
- B. A complete and detailed list of any and all variations to this specification.
- C. Dimensions and installation requirements including detailed schematic of equipment, piping, controls, enclosures, etc.
- D. Calculations demonstrating compliance with the specified system characteristics.
- E. Descriptive information including catalog cuts and manufacturers specifications for components.
- F. Wiring and control schematics and layouts.
- G. Documentation of experience with pre-assembled, packaged, fully enclosed, temperature controlled chemical feed system design and installation.
- H. Auxiliary Equipment and Spare Parts recommendations, special tools and lubricants. List shall include local source for supply of all parts and professional service.
- I. The proposed manufacturer's guarantee and local parts/service center information.
- J. three (3) hard copies of operation and maintenance manuals and two (2) additional electronic copies.
- K. Maintenance Proposal - Provide for the Owners' consideration a proposal for professional annual maintenance of the chemical metering skid. This proposal shall include the services of a qualified technician to perform maintenance as recommended by the manufacturer. The proposal shall include a schedule of services to be performed.

- L. Submit manufacturer's performance charts, and pump curves.
- M. List of materials.
- N. List of equipment, including a complete list of parts and supplies with current unit prices and source of supply.
- O. List of special tools for each type of equipment furnished including special tools necessary for adjustment, operation, maintenance, and disassembly.

1.7 DELIVERY, STORAGE, & HANDLING

- A. Protect from damage, deterioration, weather, excessive humidity, excessive temperature variation, dirt, dust, and contaminants equipment and materials delivered, handled, and placed in storage, from the time of shipment until installation is completed and the equipment and materials are ready for operation. Equipment shall be marked and stored to permit easy identification and inspection. Each item of the equipment shall be tagged or marked as identified in the delivery schedule or on the shop drawings. Include with each shipment complete packing lists and bills of materials.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide a chemical feed system consisting of chemical supply drums from which the chemical solution is pumped through piping or tubing, as appropriate, to the point of application. The chemical metering systems shall be completely self-contained and designed to safely feed metered amounts of all chemicals listed in this specification. Include with each chemical feed system temperature-controlled enclosure, controlled volume pumps, drums, mixers, gauges, back pressure regulators, strainers, pressure relief valves, sight glasses and flow metering devices, check valves, and hand valves.
- B. The pre-assembled, packaged, fully enclosed, temperature controlled, skid mounted chemical feed system shall be designed for complete outdoor installation. The chemical feed system must maintain the enclosed temperature above the crystallization temperature of the feed chemical at ambient temperatures as low as -20°F.

2.2 MANUFACTURER

- A. The basis of design manufacturer for the pre-assembled, packaged, fully enclosed, temperature controlled, skid mounted chemical feed system with chemical metering pumps shall be Lutz-Jesco America Corporation, of Rochester, New York, USA. If other equipment is proposed, the Contractor must demonstrate to the Engineer and the Owner that all requirements of materials, validation, experience, performance, and workmanship have been met or exceeded by the equipment proposed. Contractors proposing alternate manufacturers shall be responsible for all costs associated with system evaluation and redesign including all electrical, mechanical, and civil aspects of the installation.

2.3 SODIUM HYPOCHLORITE FEED SYSTEM

A. CHEMICAL METERING PUMPS

1. See section 11259 – Chemical Metering Pumps

B. VARIABLE SPEED CONTROLLER

1. Each chemical metering pump shall be equipped with a variable speed motor controller.
2. Controller shall be remote wall mounted and housed in a NEMA 4X enclosure. Open frame controller enclosures will not be acceptable.
3. Controller shall have an integral 5-button keypad with LED display.
4. Controller shall have the following interfacing functions:
 - a. Remote or manual speed control input (4-20 mA, DC voltage or Modbus RTU)
 - b. Start/stop control input
 - c. Local/remote select input
 - d. Tubing rupture fault input
 - e. Pump running output (running/stopped)
 - f. Speed feedback output (4-20 mA)
 - g. Status output (auto/manual)
 - h. Fault output
5. Unit shall be controlled through an on-off-remote circuit controlled by a three-position switch. In the remote switch position, the unit shall accept a run signal. Unit is manually controlled in the ON position.
6. The chemical metering pump manufacturer shall provide a two-year warranty on the pump drive and on the pump liquid end.
7. The pump shall be fully tested to meet rated flow and pressure by the manufacturer.
8. The Control panel shall be integrally mounted to the skid system. All control inputs and outputs for the Sodium Hypochlorite Feed system shall be pre-wired and tested prior to delivery to the jobsite. Each control panel shall include metering pump drives and all controls specified and shown on the Drawings. The control panel shall be assembled and tested by a qualified technician experienced with assembling controls for Sodium Hypochlorite feed systems.

9. Provide each pump with an over-pressure/hose burst device above the normal lubricant level to high pressure and detect leakage of pumped product into the pump housing for indication of hose failure. Device shall be capacitive proximity type and have a 110V power supply and relay outputs to monitor high pumping chamber pressures caused by hose failure.

C. CHEMICAL FEED SKID CONSTRUCTION

1. Skids shall be constructed from solid black high-density polyethylene having a minimum thickness of 1/2". The skid shall be assembled using thermal welding technology. Bolted construction shall not be used.
2. The design of the skid shall include a solid base, back panel, and side panels with an open front and top. A minimum 2" lip shall be provided at the front to provide containment and a drain plug shall be provided for wash down purposes. Pedestals shall be provided to elevate the metering pumps above the containment level.
3. All piping shall be Schedule 80 PVC. The skid manufacturer shall perform assembly in a controlled shop environment. All pipes shall be squarely cut with precision equipment. All socket-welded connections shall follow the guidelines set by the pipe/fitting manufacturer for proper cleaning, priming and gluing procedures. A medium bodied solvent suitable for use with the chemical shown in the Schedule shall be used. All threaded connections will utilize Teflon tape, a suitable thread sealant or a combination of both. Piping shall include isolation valves and unions for all serviceable components. Accessories shall be constructed of materials suitable for use with the chemical shown in the schedule.
4. The piping shall be attached to the chemical feed skid with non-metallic corrosion resistant support systems. All supports shall be welded to the chemical feed skid. Straps shall be removable and reusable for servicing. All inlet/outlet connections shall be marked clearly for installation. The skid system shall be tested at the factory on a computerized calibrated test stand to ensure rated flow, pressure, and hydrostatic conditions are met. Inlet and outlet piping sizes shall match the connecting piping sizes as shown on the Drawings.

D. SPARE PARTS

1. A spare parts kit shall be provided for each size pump. Kits shall include a complete set of O-rings, gaskets, and the pump tubing.

E. SURFACE PREPARATION AND SHOP COATINGS

1. Shop priming and surface preparation shall be as specified in Section 09970

2.4 CHEMICAL STORAGE TANKS

- A. Chemical storage tanks shall be constructed of virgin high-density cross-linked polyethylene.
- B. Tank wall thickness shall conform to ASTM D-1998.
- C. Tanks shall have a conical bottom section (inductor), allowing for complete drainage of liquid contents.
- D. Top head shall be integrally molded (one piece) with the cylinder shell. The minimum thickness of the top head shall be 3/16-in.
- E. The bottom head of the tank shall be integrally molded (one piece) with the cylinder shell. The minimum thickness for a fully supported flat bottom head shall be 3/16-in
- F. Tanks shall be equipped with the following components and fittings:
 - 1. polyethylene stand to provide a minimum of 36" between the floor and the base of the tank.
 - 2. manway/lid opening with lever-locking cover.
 - 3. PVC vent assembly, to prevent pressure or vacuum from damaging the tank when filling or draining. Connect to building vent header.
 - 4. a sight gauge assembly consisting of a single ball valve, two bulkhead fittings, and clear flexible PVC tubing.
 - 5. Gasketed PVC bulkhead fittings, sized appropriately for the connecting piping.
 - 6. a chemical fill line assembly consisting of the following PVC components.
 - a. Exterior drop tube
 - b. 90-degree elbow
 - c. Check valve
 - d. Ball valve
 - e. Male quick-disconnect coupling
 - f. Dust cap and exterior pipe support bracket
- G. All piping shall be supported independently of the tank. Flexible expansion joints are required to allow the tank to expand and contract when filling and draining.
- H. Storage tanks and all equipped components shall be certified to NSF/ANSI 61 and labeled accordingly.
- I. All flange and flange adapters shall be 150 lb. ANSI- drilled bolt patterns.
- J. Tanks, fittings, and accessories shall be as manufactured by Assmann Corporation of America, or equal.

2.4 CHEMICAL SCALES

- A. Chemical scales sized for maximum tank capacity and tank diameter shall be provided and shall be of the digital readout/electronic load cell type. Scale platform shall be sized to accept a 35-inch diameter tank. Four (4) adjustable tank restraint brackets shall be provided on the platform to increase tank lateral stability and to allow the use of hold down straps for securing the vessel to the platform. Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact, and UV light.
- B. Scale shall be of the single load cell design. Weight shall be transferred via a pivoted platform to a single, of the shear beam strain gauge type. Flexible cable shall connect load cell to indicator to allow easy remote installation of the readout. Cable length shall be 20 FT.
- C. Indicator shall monitor two (2) channels. The remote mounted LCD indicator shall carry CE marking and shall be housed in a NEMA 4X, UL approved enclosure. All operations shall be keypad operated & menu driven in order to avoid compromising the NEMA 4X seal at any time. The alphanumeric LCD readout shall have backlighting for readability in low light conditions. Power requirement shall be _____ (110 VAC, 220 VAC or 24 VDC)
- D. A 6-digit numerical display shall give the operator the ability to monitor chemical by weight (lb or kg) or volume (gallons or liters). A bar graph display shall read 0-100% for the net contents. A dual mode TARE key shall allow user to enter the tare weight of the vessel or enter the net weight of the chemical depending on application needs. A diagnostics menu shall allow recalibration without the need to apply field test weights. A user adjustable filter function shall stabilize display in the event of vibration from pumps or mixers in the immediate vicinity of the scale.
- E. Indicator shall output net weight via a 4-20mA signal and full-scale output shall be user adjustable via the keypad. Indicator shall have four adjustable set points to display low- or high-level conditions on the indicator.
- F. Set points shall activate four (4) Form C dry contact relays rated at 2A@30VDC, 60W max power, 220VDC max voltage.
- G. Scale shall carry a Full Five (5) Year Factory Warranty. "Limited" Warranties shall be considered unacceptable. Full scale accuracy shall be better than 1/4 of 1%.
- H. Scale shall be CHEM-SCALE™ with TUF-COAT™ coating, and SOLO G2™ digital display Model SRG2-1, as manufactured by FORCE FLOW, 2430 Stanwell Drive, Concord, CA 94520 USA.

PART 3 – EXECUTION

- A. All components of the Chemical Feed system shall be handled with care during transportation, storage, and installation. In case of doubt, the Contractor shall follow the manufacturer Guidelines for Storage and Handling.
- B. Verify that field conditions are acceptable and ready to receive work. Carefully remove components from original crating only at the time of installation. Examine the units completely and report any damage to the units prior to installation.

3.1 INSTALLATION

- A. Submit detail drawings containing complete piping, wiring, schematics, flow diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings must show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for installation, maintenance, and operation.
- B. In accordance with shop drawings, and Manufacturer's written instructions. Manufacturer's written instructions to be provided with shipped unit.
- C. Install enclosure according to installation instructions provided by the manufacturer.
- D. Ensure the structure is set plum, true, and level.
- E. Fasten to foundation using specified fasteners at specified spacing.
- F. Connect to power from protected circuit.
- G. Install chemical metering skid with controlled volume pumps, equipment, and appurtenances to provide a complete and integrated system in accordance with the instruction of the manufacturer and under the direct supervision of the manufacturer's representative.
- H. Install the chemical metering skids as indicated on the drawings and specified and in compliance with the manufacturer's instructions using a licensed plumbing contractor experienced with chemical system operations.
- I. Install chemical feed drums in accordance with the chemical feed system manufacturer's written instructions.
- J. Post framed instructions, containing wiring and control diagrams and condensed operating instructions before acceptance testing of the systems.

3.2 FIELD TESTING

- A. After installation of chemical feed skid, carry out operating tests, in the presence of the Engineer and a qualified manufacturer's representative, to assure that the chemical metering installation operates properly. If any deficiencies are revealed during any tests, correct such deficiencies and reconduct the tests. The Contractor shall furnish all the labor, materials and equipment required for such tests. Submit reports of all tests in booklet form prior to final acceptance of the installation. Show all field tests performed

to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Indicate in each test report the final position of controls.

- B. Test pumps to demonstrate that the pumps are capable of operating without vibration or leakage. Perform testing at the maximum design flow rate and at half the design flow rate. Demonstrate testing while controlled and operated in all feasible modes with the pumps operated singly and in unison. Plot the response of each pump on curves for the various operating pressures encountered and the results compare to the curves shown on the manufacturer's published pump data. If control characteristic curves are not available at the time of testing, the pump manufacturer's service engineer must generate such curves for each pump. Pump curves must graphically depict the pump displacement at 25, 50, 75, and 100 percent of motor speed for SCR equipped pumps, and at 25, 50, 75, and 100 percent of maximum stroke position for all pumps. Generate curves only for the specified back pressure.

3.3 SPILL CONTAINMENT

Clean enclosure and skid of loose debris and dry prior to testing. Field test enclosure and skid spill containment basin for leaks or damage in shipment. Hydrostatically test enclosure and skid spill basin per the manufacturer's written instructions, to detect large leaks and then with the specified chemical to detect small leaks. Test components with each solution for a period of 24 hours at which time no visible leakage is evident. Supply all pipes, hoses, pumps, water, power, and other equipment required to convey the test liquids and to carry out the tests. Repair damage or leaks in enclosure or skid spill basin or replace the component failing the leakage test.

3.4 WARRANTY

- A. The equipment furnished under this section shall be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 24 months from date of substantial completion or 30 months after shipment, whichever comes first.
- B. The system manufacturer shall provide a two (2) year parts and labor warranty for the metering pumps, skid material/construction, skid-mounted equipment, temperature-controlled enclosure, piping, and valves. This warranty shall be in addition to and not in lieu of any warranties provided by the manufacturer of the equipment itself.
- C. The system manufacturer shall pass through any warranties from the equipment suppliers for the pumps, controllers, and other system components manufactured by others.

3.5 START-UP SERVICES AND FIELD TESTING

- A. A lesson plan shall be prepared which shall include the elements presented in the outline specified below. Specific components and procedures shall be identified in the

proposed lesson plan. Specific instruction topics shall be detailed. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed lesson plan. Hands-on demonstrations planned for the instruction and estimated duration of each segment of the training shall be described in the lesson plan. Submit the proposed lesson plan of field instruction, 30 days prior to commencement of scheduled training. Field training shall cover each item contained in the operating and maintenance manuals.

- B. The elements presented in the following outline shall be included in the instruction as a minimum:
 - 1. Equipment operation.
 - 2. Detailed component description.
 - 3. Equipment preventative maintenance.
 - 4. Equipment troubleshooting.
 - 5. Equipment corrective maintenance.
 - 6. Hands-on demonstrations.

3.6 CLOSEOUT ACTIVITIES

- A. Submit operating instructions outlining the step-by-step procedures required for system startup, normal operation, short- and long-term deactivation, and shutdown. An introduction and overall equipment description, purpose, functions, and simplified theory of operation shall be included in the beginning of the instructions. Instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of each piece of equipment and its basic operating features. Instructions shall include component layouts, simplified wiring, and control diagrams for the system as installed. Performance test data shall be reflected in the operating instructions.
- B. Submit maintenance instructions listing routine maintenance procedures, calibration procedures, possible breakdowns and repairs and troubleshooting guides, prior to the start of the training course.
- C. Include in the instructions, as-built drawings of the piping layout, equipment layout, simplified wiring and control diagrams of the system as installed, and flow diagrams.

END OF SECTION

SECTION 11259

CHEMICAL METERING PUMPS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Chemical metering pumps shall be skid mounted and designed to safely feed the chemicals shown in the Schedule. The chemical metering skids shall include (2) identical, mechanically actuated chemical metering pumps and accessories as specified herein.

1.2 SCHEDULE

Name	River Oaks Site Pump 1	River Oaks Site Pump 2
Tag Number	CF-101-RO	CF-102-RO
Chemical	Sodium Hypochlorite, 12.5%	Sodium Hypochlorite, 12.5%
Capacity, liters per hour	3.2	3.2

PART 2 -- PRODUCTS

2.1 SKIDS

- A. Skids shall be constructed from solid black high-density polyethylene having a minimum thickness of 1/2". The skid shall be assembled using thermal welding technology. Bolted construction shall not be used.
- B. The design of the skid shall include a solid base, back panel, and side panels with an open front and top. A minimum 2" lip shall be provided at the front to provide containment and a drain plug shall be provided for wash down purposes. Pedestals shall be provided to elevate the metering pumps above the containment level.
- C. All piping shall be Schedule 80 PVC. The skid manufacturer shall perform assembly in a controlled shop environment. All pipes shall be squarely cut with precision equipment. All socket-welded connections shall follow the guidelines set by the pipefitting manufacturer for proper cleaning, priming and gluing procedures. A medium bodied solvent suitable for use with the chemical shown in the Schedule shall be used. All threaded connections will utilize Teflon tape, a suitable thread sealant or a combination of both. Piping shall include isolation valves and unions for all serviceable components. Accessories shall be constructed of materials suitable for use with the chemical shown in the schedule.
- D. The piping shall be attached to the chemical feed skid with non-metallic corrosion resistant support systems. All supports shall be welded to the chemical feed skid. Straps shall be removable and reusable for servicing. All inlet/outlet connections shall be marked clearly for installation. The skid system shall be tested at the factory on a computerized calibrated test stand to ensure rated flow, pressure, and hydrostatic conditions are met. Inlet and outlet piping sizes shall match the connecting piping sizes as shown on the Drawings.

2.2 METERING PUMPS

- A. General: Pumps shall be peristaltic type chemical feed pumps, heavy duty modular design suitable for 24 hr/day operation. Pumps shall be Lutz-Jesco America PERIDOS Series. All metering pumps

shall be from the product line of a single manufacturer. Parts coming into contact with the liquid shall be selected to ensure optimum corrosion resistance to the liquid being pumped as shown in the Schedule. Solenoid driven, stepper motor, mechanically actuated, or hydraulically actuated diaphragm pumps are not acceptable.

B. Pump Head:

- a. The stainless-steel pump head shall have a spring-loaded roller assembly utilizing high performance 3/32" (2.4mm) thick wall extruded tubing specifically formulated for use in peristaltic pumps.
- b. The pump head shall be capable of accepting a minimum of 6 different tubing diameters.
- c. Pump head roller assembly shall have adjustable occlusion to optimize pump performance. Rigid roller assembly designs shall not be acceptable.
- d. Pump head design shall be capable of pressures up to 100 psi (depending on tubing sizes) with a suction lift to 30 ft. vertical water column and run dry without damage.
- e. One of the two spring loaded rollers shall be always fully engaged to prevent backflow or siphoning. The tubing shall be in contact with the inside diameter of the pump head through an angle of 180 degrees and be held securely on the suction and discharge with a Viton tube seal.
- f. The pump head shall be a completely sealed design to prevent fluid leakage.
- g. Any fluid leakage due to a tubing rupture shall be completely contained within the pump head.

C. Tubing and Connectors

- a. The pump tubing shall be extruded from Floprene or other suitable material based on chemical compatibility. All tubing sizes will have a uniform wall thickness of 2.4mm.
- b. The pump head must accept tubing sizes from 1.6mm to 9.6mm ID.
- c. Leak-proof 4-piece machined PVC tubing connectors specifically designed for peristaltic pump tubing shall be provided. Inserts to be color coded for specific tubing sizes. The use of metal hose clamps will not be permitted.

D. Speed Controller

- a. The speed controller shall be as specified in Section 11151. ACCESSORIES

E. The following accessories shall be included on the chemical feed skid system:

1. One calibration column shall be provided and installed in the chemical supply piping as close to the metering pumps as possible. The top of the calibration column shall be vented back to the supply container for overflow protection.

2. Two pressure relief valves shall be provided to provide protection against excess line pressure. The pressure relief valves shall be constructed of PVC with a Teflon diaphragm. Pressure relief valves shall be model PRM2050-PS as manufactured by Griffco Valve, Inc., or equal.

Two Back Pressure Valves shall be provided to regulate the back pressure in the system. The back pressure valves shall be constructed of PVC with a Teflon diaphragm. Back pressure valves shall be model BPM050-PS as manufactured by Griffco Valve, Inc., or equal.

3. Pulsation dampeners shall be of the inline or T design with materials suitable for the chemical shown in the Schedule. Each dampener shall include a 2 1/2" pressure gauge and gas charging valve. Pulsation dampeners shall be model RC-10X-V50 as manufactured by Blacoh Fluid Control, Inc., or equal.
4. Piping shall be solvent welded schedule 80 PVC, and isolation valves shall be diaphragm valves with Viton O-rings and diaphragms. Diaphragm valves shall be true union style.
5. Two diaphragm protected pressure gauges shall be provided for indication of system pressure. PVC gauges shall be utilized, and the isolators shall have a PVC body with Teflon sealing diaphragm and suitable liquid filling.
6. One Y-strainer shall be installed in the main suction line of the skid system.
7. Each skid shall have a control panel as specified in Section 11151.

2.3 SPARE PARTS

- A. A spare parts kit shall be provided for each size pump. Kits shall include a complete set of O-rings, gaskets, and the pump tubing.

2.4 MANUFACTURER

- A. The chemical feed metering pumps shall be Series Peridos as manufactured by Lutz-JESCO America Corporation or engineered prior approved equal. Information must be received 10 days prior to bid date.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. The CONTRACTOR shall install the multiple pump chemical metering skids as indicated on the Drawings, specified herein, and in compliance with the manufacturer's instructions.
- B. Upon completion of the installation, a full operating test shall be performed in the presence of the ENGINEER and a qualified manufacturer's representative. The CONTRACTOR shall furnish all the labor, materials and equipment required for such a test and shall correct any installation related deficiencies noted.
- C. The CONTRACTOR shall provide a 24-month manufacturer's warranty for the metering pump systems. The warranty shall cover all materials and moving parts of the metering pump skids.
- D. Manufacturer's Field Services: The CONTRACTOR shall provide a minimum of two (2) day(s) of service at the site by a qualified representative of the system manufacturer to inspect the installation of their respective unit, make any necessary adjustments, test the equipment, place the equipment in initial hands-free operation and instruct the operating personnel in its operation and maintenance in accordance with Section 11151.

- END OF SECTION -

SECTION 11281 – CHLORINE GAS FEED SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install gas chlorination equipment and appurtenances necessary for a complete working system. The equipment shall be provided by a single supplier. The Contractor shall include incidental items of work not explicitly mentioned by the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 11107 - Booster Pumps
- B. Section 15183 - Gauges
- C. Section 13423 – Analysis and Instrumentation

1.03 REFERENCES

- A. The following references apply:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society for Quality Control (ASQC).
 - 3. International Standards Organization (ISO).
 - 4. National Electrical Manufacturers Association (NEMA).

1.04 SYSTEM DESCRIPTION

- A. The equipment provided shall be a complete vacuum operated, solution feed, 10 pounds per day (PPD) manually controlled chlorine gas feeder system with automatic switchover, safety equipment and accessories as shown on the Drawings and specified herein.

1.05 SUBMITTALS

- A. The Contractor shall submit the following:
 - 1. Sufficient information on each component to show that the equipment meets this specification.
 - 2. Dimensional drawings as required for the installation.
 - 3. Electrical wiring diagrams as required for the installation.
 - 4. Documentation demonstrating that the manufacturer is certified to the international quality standards ISO 9001 for design, assembly and manufacture.

1.06 QUALITY ASSURANCE

- A. The gas feed equipment shall be manufactured and tested under ISO certification meeting the following standards: ISO9001-1994, EN/ISO9001-1994, ANSI/ASQC9001-1994.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage and handling of products shall be in accordance with the manufacturer's recommendations.

1.08 WARRANTY REQUIREMENTS

- A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for a period of twelve (12) months from the date of installation and start-up.

PART 2 - PRODUCTS

2.01 MANUFACTURERS, OR EQUAL

- A. De Nora – Capital Controls.

2.02 EQUIPMENT

- A. Provide the following:
 1. Vacuum regulators, Capital Controls Model NXT3000.
 2. Gas flow control meter, wall panel mounted, Capital Controls Model MA30.
 3. Ejector/check valve assembly, Capital Controls Model EJ100C.
 4. Scales, dual cylinder, Force Flow Model GR150-2.
 5. Gas detectors, Capital Controls Model 1610B.

2.03 VACUUM REGULATORS

- A. The vacuum regulator shall feed gas under vacuum from the source to the point of application up to a feed rate of 100 PPD chlorine.
- B. The vacuum regulator shall mount directly on a chlorine cylinder gas valve or gas manifold by means of a yoke assembly and shall be provided with a gas valve direction indicator, integrated gas flowmeter and solid silver rate valve. The gas flowmeter shall have dual scale (English/metric) and be sized for an operating maximum capacity of 100 PPD/2 kg/h.
- C. The vacuum regulator shall be constructed of molded plastic, suitable for wet or dry gas service and all springs shall be of tantalum alloy. The corrosion-resistant yoke assembly shall have a fusion-bonded epoxy coating and shall be fitted with a field replaceable silver inlet valve and filter assembly.
- D. Vacuum shall be controlled by a spring-opposed double diaphragm in the vacuum regulator. Pressure shall be prevented from building in the system by means of a spring-loaded, diaphragm actuated pressure relief valve located in the vacuum regulator. Each regulator shall be equipped with a gravity-actuated loss-of-gas indicator. An integrated switch shall be provided to indicate loss of gas.
- E. The regulator shall have automatic switchover capability as a built-in feature.
- F. The following vacuum regulator spare parts shall be provided:
 1. One (1) set rate valve O-rings.
 2. One (1) set meter gaskets.
 3. One (1) replacement filter.
 4. One (1) insect screen.

5. One (1) multi-purpose wrench.

2.04 GAS FLOW CONTROL METER

- A. The gas flow control meter shall manually regulate chlorine gas feed rates. A wall panel shall be provided with a manual gas flowmeter and a vacuum gauge. The wall panel shall have a maximum capacity of 100 PPD. The flowmeter shall indicate the gas flow and shall have a maximum indicated capacity of 100 PPD. The entire panel shall operate under vacuum from the gas inlet connection to the gas outlet connection. The panel shall be of rigid plastic construction suitable for indoor installation. All components shall be pre-piped using materials suitable for chlorine gas service. The vacuum inlet and vacuum outlet shall be 1/2 inch. The vacuum gauge shall be as specified in Section 15183, and as shown on the instrument schedule on the Drawings.
- B. Meter Assemblies shall be provided to indicate gas flow rate and shall be suitable for mounting on the vacuum regulator or on a wall. A rotameter and rate control valve shall be furnished
- C. The Meter Assembly shall contain a rate valve. The gas flowmeter shall have dual scale (English/metric) and be sized for an operating maximum capacity of 100 PPD/2.0 kg/h
- D. The Meter Assembly shall be constructed of molded plastic, suitable for wet or dry gas service
- E. The vacuum inlet and outlet shall be 3/8 inch. A tubing fitting kit shall be provided with the Meter Assembly to facilitate connecting 3/8 inch
- F. The meter assembly shall be DE NORA WATER TECHNOLOGIES, INC. MA30, Meter Assembly only. Meter panel must be provided by the authorized factory representative. Must be OEM equipment

2.05 EJECTOR / CHECK VALVES

- A. The ejector/check valve assembly shall be a spring-opposed, O-ring seal, diaphragm type. The ejector/check valve shall be suitable for 100 PPD. The springs shall be tantalum alloy.
- B. The ejector shall have a 3/8-inch vacuum connection.
- C. The following ejector spare parts shall be provided:
 1. One (1) set ejector diaphragms.
 2. One (1) set ejector gaskets.
 3. One (1) wall mount bracket.
- D. The ejector/check valve assembly shall be DeNora Model EJ100C1. Ejector must be provided by the authorized factory representative and for the brand being offered.

2.07 CYLINDER SCALE

- A. Chlorine dual cylinder scales shall be provided and shall be of the digital readout/electronic load cell type.
- B. Scale shall be electronic CHLOR-SCALE[®] 150, and electronic SOLO[®] G2 digital indicator

Model SRG2-1, as manufactured by FORCE FLOW Concord, CA.

- C. Scale platforms shall be PVC and have chaining brackets, electronic load cells to handle - 150 lb. container. 4-20 mA outputs. Cable length shall be 6'
- D. Indicator shall monitor 1 channel. The remote mounted LCD indicator shall carry CE marking and shall be housed in a NEMA 4X, UL approved enclosure. All operations shall be keypad operated & menu driven in order to avoid compromising the NEMA 4X seal at any time. The alphanumeric LCD readout shall have backlighting for readability in low light conditions. Power requirement shall be 110 VAC, 220 VAC.
- E. A six-digit numerical display shall give operator the ability to monitor chemical by weight (lb or volume gallons). A bar graph display shall read 0-100% for the net contents. A dual mode TARE key shall allow user to enter the tare weight of the vessel or enter the net weight of the chemical depending on application needs. A diagnostics menu shall allow recalibration without the need to apply field test weights. A user adjustable filter function shall stabilize display in the event of vibration from pumps or mixers in the immediate vicinity of the scale.
- F. Indicator shall output net weight via a 4-20mA signal and full-scale output shall be user adjustable via the keypad. Indicator shall have four adjustable set points to display low- or high-level conditions on the indicator.
- G. Scale shall carry a Full Five (5) Year Factory Warranty. "Limited" Warranties shall be considered unacceptable. Full scale accuracy shall be better than 1/4 of 1%.

2.08 GAS DETECTOR

- A. Provide (1) chlorine gas detector shall consist of a wall mounted receiver and one (1) remote sensor. The chlorine gas detector shall have a range of 0-10 parts per million (ppm).
- B. The receiver shall provide a LED bar graph display. The LED bar graph display shall be color-coded to indicate sensor status, gas concentration and alarm set point. Additional LEDs shall provide for indication of set point alarm, sensor malfunction, power ON and sensor ready. The receiver shall be housed in a NEMA 12 enclosure.
- C. The sensor shall be an electrochemical type requiring no chemical addition with a response time of 60 seconds maximum for 80% of full range at 20 degrees C. The sensor shall be wall mounted and housed in a NEMA 12 enclosure.
- D. The alarm and malfunction contacts shall be SPDT rated at 10 amps at 240 Vac or 28 Vdc maximum resistive or inductive load. The alarm and malfunction contacts shall be field configurable for manual reset (latching) or automatic reset (non-latching).
- E. Communications between the sensor and receiver shall be 3-wire, shielded, 22-gauge cable. The maximum distance between the receiver and sensor shall be 1000 feet/305 meters.

- F. The gas detector shall operate from a (120 Vac), (240 Vac), 50/60 Hz, 1 phase power supply. The receiver and sensor electronics shall have provisions for protection against radio frequency/electromagnetic interference
- G. The gas detector shall be DE NORA WATER TECHNOLOGIES, INC. ADVANCE 1610B

PART 3 - EXECUTION

3.01 INSTALLATION

The Contractor shall install the equipment in accordance with the manufacturer's recommendations.

3.02 START-UP SERVICES AND TESTING

- A. The Contractor shall furnish the services of an equipment manufacturer's qualified field engineer to provide start-up and testing in accordance with the manufacturer's written instructions.
- B. After start-up and testing, the Contractor shall furnish the services of an equipment manufacturer's qualified representative to instruct the Parish's operating personnel in the proper operation and maintenance of the equipment.
- C. The Contractor shall provide the following minimum manufacturer's representative service requirements:
 - 1. 4 hours on site for start-up and testing.
 - 2. 4 hours on site for operator training.

END OF SECTION

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**SECTION 13300
SYSTEMS INTEGRATION**

PART 1 – GENERAL

1.1 SCOPE OF WORK:

- A. Furnish fully integrated and complete control and instrumentation systems including all elements, features, and components necessary to accomplish intended functions, smoothly and without hunting or undesirable abruptness, and which are fully adjustable to meet actual installed operating conditions.
- B. Coordinate and assume responsibility for compatibility of control functions with vendors of related equipment and devices actuated by or connected to the system.
- C. Neither Drawings nor Specifications are represented as identifying all features, functions, elements, or components which might be required for a properly performing installation. The vendor represents, however, that he understands the intent of the Contract Documents, and that he possesses sufficient knowledge to, and will in fact, translate such intent into the furnishing of a complete and satisfactory installation.
- D. Responsibilities:
 - 1. The Contractor, through the use of a qualified Instrumentation Subcontractor and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of the Instrumentation and Control (I&C) System and the integration of the I&C System with other required instrumentation and control devices.
 - 2. Due to the complexities associated with the interfacing of numerous control system devices, the Instrumentation Subcontractor shall be responsible to the Contractor for the integration of the I&C System with existing devices and devices provided under other Sections and provide a completely integrated control system free of signal incompatibilities; this includes providing review and comment to other vendor equipment submittals and overall coordination of the system.
 - 3. The following is a list of equipment and functions to be performed under this Contract. This list may not be inclusive
 - a. Provide the control and analysis devices as specified and shown on the Contract Drawings
 - b. Furnish all equipment and instruments for a complete and functional system
 - c. Provide all application engineering, equipment, programming etc.
 - 4. As a minimum, the Instrumentation Subcontractor or vendor shall perform the following work:
 - a. Prepare shop drawing submittals
 - b. Design, develop, and electronically draft loop drawings and control panel designs

- c. Prepare the test plan, the training plan, and the spare parts submittals
 - d. Procure hardware
 - e. Fabricate panels
 - f. Perform factory tests on panels, Control Panel CP-101 shall be functionally tested by Owner's integrator (Red Group) at panel builder factory, at Contractor's cost. Contractor's estimated cost for this service is approximately \$10,448.00. Owner's integrator (Red Group) will provide FAT (Factory Acceptance Testing) at the vendors panel shop and gateway/ switch configuration services which will be required prior to shipment of panel to the jobsite. Gateway shall be configured remotely by Red Group staff ahead of the FAT test.
 - g. Perform bench calibration and verify calibration after installation
 - h. Oversee and certify installation
 - i. Oversee, document, and certify loop testing
 - j. Oversee, document, and certify system commissioning
 - k. Conduct the performance test
 - l. Prepare operations and maintenance manuals
 - m. Conduct training
 - n. Prepare record drawings
 - o. Prepare calibration sheets
 - p. Certify the installation of the I&C System
 - q. Develop all requisite loop drawings and record loop drawings associated with equipment provided under other Divisions and existing equipment.
 - r. Resolve signal, power, or functional incompatibilities between the I&C and interfacing devices.
 - s. Review submittal drawings of equipment provided under other Divisions, Owner furnished and existing equipment. Provide overall system coordination to insure a complete and functional system.
5. Instrumentation Subcontractor or vendor responsibilities in addition to the items identified above shall be at the discretion of the Contractor. Additional requirements in this Section that are stated to be the Contractor's responsibility may be performed by the Instrumentation Subcontractor or vendor.
6. In the event of a conflict in the specification or Contract Drawings, include the more expensive item or work.

1.2 RELATED SECTIONS:

15110 – Valves and Appurtenances

- 15183 – Gauges
- 11281 – Chlorine Gas Feed System
- 11151 – Sodium Hypochlorite Disinfection System
- 16900 – Control Panel
- 11107 - Booster Pumps
- 13400 – Magnetic Flow Meters
- 13423 - Analysis Instrumentation
- 11259 - Chemical Metering Pumps

1.3 REFERENCES:

- A. Codes and Standards. Provide electrical equipment and materials, including installation, conforming to the following codes and standards as applicable. The equipment and materials shall bear labels to indicate manufacturing conformance to the specified standards or equal. Where two or more codes or standards are at variance, conform to the more restrictive requirement.
 - 1. NFPA 70; National Electrical Code (NEC).
 - 2. American National Standards Institute (ANSI).
 - 3. American Society for Testing and Materials (ASTM).
 - 4. Institute of Electrical and Electronics Engineers (IEEE).
 - 5. Insulated Cable Engineers Associated (ICEA).
 - 6. National Electrical Manufacturers Association (NEMA).
 - 7. National Electrical Testing Association (NETA), Section 16T, Electrical Acceptance Tests.
 - 8. National Fire Protection Association (NFPA).
 - 9. Occupational Safety and Health Act (OSHA).
 - 10. Underwriters' Laboratories, Inc. (UL).

- B. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 - 1. ANSI/ISA S 5.1 Instrumentation Symbols and Identification,
 - 2. ISA-S20 Specification Forms for Process Measurement and Control Instruments

1.4 QUALITY ASSURANCE:

- A. Vendor Qualification:

1. Furnish all work specified under this Section from a single vendor having overall responsibility for all system and components, including panels and subpanels. Such vendor must demonstrate a minimum of 20 years successful experience in the design, manufacture and commissioning of instrumentation and control systems of comparable nature, size and complexity to the proposed project. Provide a single warranty or guarantee from vendor covering the systems and all components. Also, upon request the system integrator will provide the ENGINEER with a list of similar installations which totals not less than 20, and at least one of this exact type of product, SCADA combination.
2. The system integrator will have a minimum of 10 years successful experience in the design and implementation of this type of proposed project. Also, upon request the system integration will provide the ENGINEER with a list of similar installations which totals not less than 20.

B. Service Availability:

1. Obtain process controls and instrumentation from a vendor having an established sales and service office within 100 miles of the area in which the Project is located, and whose representatives actively conduct business in that area. Such office must include staffing by a full-time manufacturer employed, service technician having at least five years field experience with the type of equipment being furnished. The service technician must be authorized to service any component furnished by the system vendor without voiding warranties or guarantees relating to either the system as a whole or to any component thereof.
2. General Performance and Design Requirements: Design, construct, install and implement a system to interface between the main control panel, SCADA system, analysis and instrumentation devices, and motor controls, as described in the plans and specifications.

1.5 SUBMITTALS:

- A. Product Data: For information only and as necessary to show compliance with these specifications, submit manufacturer's product data, specifications, recommendations, installation instructions, and operation and maintenance instructions for each equipment item required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each equipment unit complies with the requirements of the Specifications and is intended generally for the installation applications shown.
- B. Shop Drawings: Submit general arrangement drawings, installation detail drawings, loop drawings, panel layout drawings, and interconnection. Submit these drawings for review prior to construction and again as final as-builts at the completion of the project.

1. General Arrangement Drawings: Provide general arrangement for each main equipment unit, including the location and nature of each service and utility connection.
2. Installation Detail Drawings: Provide drawings showing all required details for the installation of the equipment and individual instruments.
3. Loop Drawings: Provide a loop drawing for each instrumentation, control, alarm, and indication loop associate with the control system. Submit these drawings as a complete package for the entire control system.
4. Panel Layout Drawings: Provide drawings showing the layout of all of the components within and on the face of the control panel. Panel Wiring Drawings: Provide wiring schematics showing the wiring of all of the components within and on the face of the control panels.
5. Interconnection Drawings: Provide interconnection wiring diagrams showing the interconnection wiring of all of field devices.

C. Data Sheets

1. Data sheet, specification sheets, and an instrument list shall be provided for all components provided under this section. The purpose of this material is to supplement the generalized catalog information by providing the specifics of each component (e.g., part numbers, scales, ranges, service, materials of construction, component location, options, and the individual tag number) as noted in the Drawings and Specifications
2. Include such other necessary data as would provide a complete and adequate specification for reordering an exact duplicate of the original item from the manufacturer at some future date. More than one tag numbered item may be included on a sheet.

D. SCADA HMI Display Screen submittal: Submit screen images of the HMI display screens.

E. Test Procedure Submittals:

1. Submit the proposed procedures to be followed during tests of the I&C System and its components. As a minimum provide factory, field, and operational test procedures.
2. Loop number
3. Preliminary Submittal: Outlines of the specific proposed tests and examples of proposed forms and checklists.
4. Detailed Submittals: After approval of the Preliminary Submittal, the Contractor shall submit the proposed detailed test procedures, forms, and checklists. The submittal shall include a statement of test objectives with the test procedures.
5. Certify in writing that for each loop or system checked out, and all discrepancies have been corrected.

- F. Continuing Service: Provide the Owner with a written agreement from the instrumentation and control vendor guaranteeing proper operation of all systems and components for a period of 12 months after final Project acceptance. Such guarantee must provide for the replacement, repair, and adjustment of systems and components which may become necessary due to defective materials or workmanship, or due to lack of reliability under actual operating conditions. Such guarantee must further provide that no charge of any nature will be made to the Owner for work performed under the guarantee by the vendor.
- G. Record Drawings: Keep current a set of complete loop, P&IDs and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing, mounting details, point — to — point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and instrument elements. One set of record drawings electronically formatted in AutoCAD format and 2 hard copies shall be submitted after completion of all pre-commissioning tasks but before Performance Testing. All such drawings shall be submitted for review before acceptance of the completed Work.

1.6 OPERATION & MAINTENANCE MANUALS:

- A. Bill of Materials. A listing of all the panels, racks, instruments, components, and devices supplied. All components shall be grouped by component type, with the component types identified in a similar manner to the component identification code used in these specifications. The list shall contain at a minimum:
 - 1. Instrument, panel, rack or device tag number
 - 2. Description
 - 3. Quantity supplied
 - 4. Reference to component data sheet and/or catalog cut
 - 5. Component type
 - 6. Component Data Sheets
 - 7. Catalog Cuts
 - 8. Component O&M Manuals
- B. An O&M manual shall be submitted for all instruments and device supplied. The O&M manuals shall contain, as a minimum:
 - 1. Operating procedures
 - 2. Installation procedures
 - 3. Maintenance procedures
 - 4. Troubleshooting procedures
 - 5. Calibration procedures

6. Internal device schematics, wiring diagrams and loop diagrams
7. Shut-down procedures
8. Component list and instrument list
9. Detailed circuit operational description including programmable controller ladder diagrams and loop descriptions.
10. Test results
11. Spare Parts and Expendables List
12. The spare parts and expendables list shall include not only those items supplied, but also the additional items recommended for successful long-term operation.
13. "As-Shipped" Drawings
 - a. Drawings shall be a record of work "As-Shipped" from the factory and shall be labeled as "As-Shipped." One copy of applicable schematics and diagrams shall be placed in each control panel in a protective envelope or binder. Provide the following "As-Shipped" drawings as a minimum
 - i. Panel Fabrication Drawings
 - ii. Panel Wiring and Interconnection Drawings

1.7 FINAL "AS-INSTALLED" DOCUMENTATION:

A. Reproducible Drawings

1. Contractors shall submit reproducible copies of complete schematics, wiring diagrams and installation drawings to include all installed field and panel instruments, mounting details, point to point diagrams with cable, wire, and termination numbers. Drawings shall be a record of work as actually constructed and shall be labeled as "AS-INSTALLED." One copy of applicable schematics and diagrams shall be placed in each control panel in a protective envelope or binder.
 - a. Loop Diagrams.
 - b. Panel Layout and Wiring Drawings.
 - c. Interconnecting Drawings.
 - d. Instrument Installation Details.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. PLC and SCADA devices shall be configured to have the required input and output signals listed in the instrumentation and control schedules on the construction plans, and to function as described in this section.

2.4 GENERAL CRITERIA:

- A. Code and Regulatory Compliance: All I&C Work shall conform to or exceed the applicable requirements of the National Electrical Code.
- B. Current Technology: All meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise required to match existing equipment.
- C. Hardware Commonality: All instruments that use a common measurement principle shall be furnished by a single Manufacturer. All panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single Manufacturer.
- D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of +0.5% of full scale and a minimum repeatability of +0.25% of full scale unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.
- E. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is preferred and use of "4-wire" transmitters shall be minimized. Individual loop or redundant power supplies shall be provided as required by the Manufacturer's instrument load characteristics to ensure sufficient power to each loop component. All power supplies shall be mounted 'within control panels or in the field at the point of application.
- F. Loop Isolators and Converters: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wirewound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.
- G. Environmental Suitability: All indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying

devices shall be provided in order to maintain all instrumentation devices 20% within the minimums and maximums of their rated environment operating ranges. Provide all power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

- H. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 mA DC except as indicated. Signals within enclosures may be 1 to 5 VDC. All electric signals shall be electrically or optically isolated from other signals.
- I. Control Panel Power Supplies: An uninterruptible power supplied (UPS) shall be provided for continued system operation in the event of an AC power failure. The unit shall be capable of providing one-half hour of battery backup operation for the main control panel. UPS shall be capable of providing full on-line protection and standby battery operation suitable for computer type loads without de-rating.
- J. Electrical Transient Protection
 - 1. Protectors for analog signal circuits for field instruments shall be Transtector DRDC 24.
 - 2. Protectors shall be provided for all conductors penetrating panel enclosures for power circuits. Protectors shall be Transtector SPD 12 R circuit protectors.
- K. Alternative Equipment and Methods: Equipment or methods requiring redesign of any project details are not acceptable without prior written approval of the Engineer through the "or equal" process of the Contract Documents. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage and maintenance enhancement over the equipment or method indicated or shall include evidence that an indicated component is not available.

2.5 OPERATING CONDITIONS:

- A. The I&C shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions.
 - 1. Environment: water treatment facility
 - 2. Temperature Range: 32 through 104 degrees F
 - 3. Thermal Shock: 1 degree F per minute, maximum
 - 4. Relative Humidity: 20 through 100%, non-condensing

PART 3 – EXECUTION

3.1 MANUFACTURER'S SERVICE

A. Furnish the following Manufacturer's services for the instrumentation provided:

1. Perform bench calibration
2. Oversee installation
3. Verify installation of installed instrument
4. Certify installation and reconfirm Manufacturer's accuracy statement
5. Oversee loop testing, prepare loop validation sheets, and certify loop testing
6. Oversee pre-commissioning, prepare pre-commissioning validation sheets, and certify pre-commissioning.
7. Train the Owner's personnel

3.2 INSTALLATION:

A. General:

1. All instrumentation, including instrumentation furnished under other Sections of Project Specifications, shall be installed per the manufacturer's instructions.
2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment that do not impact material quantities or cause material rework, make such changes without additional cost to the Owner.

B. Conduit, Cables, and Field Wiring:

1. All required conduits to be furnished as part of this project at no additional cost to the Owner.
2. All 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, and other field wiring and cables shall be provided as specified.
3. All terminations shall be checked by the equipment supplier and the electrical contractor.

C. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements that apply to the site.

- D. Ancillary Devices: The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements at no additional cost to the Owner. All such additions and all such changes, including the proposed method of installation, shall be submitted to the Engineer for approval before commencing the Work. Such changes shall not be a basis of claims for extra work or delay.
- E. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:
1. Installation personnel have been instructed on installation requirements of the Contract Documents.
 2. Technical assistance is available to installation personnel at least by telephone.
 3. Installation personnel have at least one copy of the approved shop drawings and data.
 4. Individual tubes shall run parallel and near the surfaces from which they are supported. Supports shall be used at intervals of not more than 3 feet of rigid tubing.
 5. Bends shall be formed to uniform radius with the proper tool without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.
 6. All flexible cables shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
 7. All wires shall be marked clearly with an identification tag that is of a permanent and reusable nature.
 8. All wire and cable shall be arranged in a neat matter and securely supported in cable groups and connected from terminal to terminal without splices unless specifically approved by the Engineer. All wiring shall be protected from sharp edges and corners.
 9. All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents
 10. Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. Certify in writing that for each loop or system checked out, all discrepancies have been corrected.
 11. The Owner will not be responsible for any additional cost of rework attributable to actions of the Contractor or the Instrumentation Subcontractor

3.3 CALIBRATION:

- A. General: All devices provided under the instrumentation sections shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements
- B. Calibration Points: Each instrument shall be calibrated at 20,40,60,80 and 100% of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards, and Technology (NIST).
- C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.
- D. Field Calibration: Instruments that were not bench-calibrated shall be calibrated in the field to ensure proper operation in accordance with the instrument loop diagrams or specification data sheets.
- E. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. Have the Instrumentation Supplier sign the tag when calibration is complete.

3.4 LOOP TESTING

- A. General: Individual instrument loop diagrams per ISA Standard 55.4 — Instrument Loop Diagrams, expanded format, shall be submitted to the Engineer for review before the loop tests. The Contractor shall notify the Engineer of scheduled tests a minimum of 30 days before the estimated completion date of installation and wiring of the I&C. After the Engineer's review of the submitted loop diagrams for correctness and compliance with the specifications, loop testing shall proceed.
- B. Control Valve Tests: All control valves, drives and connecting link ages shall be stroked from the operator interface units as well as local control devices and adjusted to verify proper control action, hand switch action limit switch settings, torque settings, remote control actions, and remote feedback valve status and positions. Control valve actions and positioner settings shall be checked with the valves in place to ensure that no changes have occurred since the bench calibration.
- C. Interlocks: All hardware and software interlocks between the instrumentation and the motor control circuits, and valve control circuits shall be checked to the maximum extent possible.
- D. Instrument and Instrument Component Validation: Each instrument shall be field tested, inspected, and adjusted to its indicated performance requirement in accordance with its Manufacturer's specifications and instructions. Any instrument that fails to meet any contract requirement, or in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer at no additional cost to the Owner.

- E. Loop Validation: Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. All control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, and final control elements. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested. Specified accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks that incorporate analog elements, simulated sensor inputs corresponding to 20,40,60,80 and 100% of span shall be applied, and resulting element outputs monitored to verify compliance to calculated root-mean-square-summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting of discrete devices. Provisional settings shall be made on controllers and alarms during analog loop tests. All analog loop test data shall be recorded on test that include calculated root-mean-square-summation system accuracy tolerance requirements for each output.

3.5 PRECOMMISSIONING:

- A. General: Precommissioning shall start after acceptance of all wire test, calibration tests and loop tests, and all inspections have demonstrated that the instrumentation and control system complies with all Contract requirements. Precommissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.
- B. Precommissioning Procedures and Documentation: All precommissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer as submitted for approval by the Systems Integrator. All test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, that include calculated tolerance limits for each step. Completion of all system precommissioning and test activities shall be documented by a certified report, including all test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that all system precommissioning and test requirements have been satisfied.
- C. Operational Validation: Where feasible, system precommissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. All hardwired and software

control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software-based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operation under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

3.6 ON-SITE SUPERVISION:

- A. Furnish the services of an on-site service engineer to supervise and coordinate installation, adjustment, testing, and start-up of the I&C system. A qualified team of the Instrumentation Subcontractor personnel shall be on site as required to check all equipment, perform the tests indicated in this Section, and furnish startup services.

3.7 PERFORMANCE TEST:

- A. The entire I&C System shall operate for 30 days without failure.
- B. Furnish all necessary support staff as required to maintain the system and to satisfy the repair or replacement requirements.
- C. If any component fails during the performance test, it shall be repaired or replaced within 4 hours and the I&C System shall be restarted. If the system is not repaired and running within four (4) hours the system shall be restarted and operated for an additional 30 days without failure.

3.8 TRAINING

- A. General: Train the Owner's personnel on the maintenance, calibration and repair of all instruments provided under this Contract.
- B. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.
- C. Duration: Each training class shall be a minimum of 8 hours in duration and shall cover, as a minimum, operational theory, maintenance, troubleshooting/repair, and calibration of instruments.
- D. Schedule: Training shall be performed during the precommissioning phase of the project and 30 days after acceptance. The training sessions shall be scheduled a minimum of 3 weeks in advance of when the courses are to be initiated.
- E. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.

- F. Documentation: Within 10 days after the completion of each session the Contractor shall submit the following:
1. List of all Owner personnel who attended the session.
 2. Evaluation of Owner personnel via written testing or equivalent evaluation.
 3. Copy of the training materials used including all notes, diagrams, and comments.

3.9 ACCEPTANCE:

- A. For the purpose of this Section, the following conditions shall be fulfilled before the Work is considered substantially complete:
1. All submittals have been completed and approved.
 2. The I&C system has been calibrated, loop tested and precommissioned.
 3. The Owner training has been performed.
 4. All required spare parts and expendable supplies and test equipment have been delivered to the Owner.
 5. The performance test has been successfully completed.
 6. All punch-list items have been corrected.
 7. All record drawings in both hard copy and electronic format have been submitted.
 8. Revisions to the operations and maintenance manuals information that may have resulted from the field tests have been made and reviewed.
 9. All debris associated with installation of instrumentation has been removed.
 10. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

- END OF SECTION-

SECTION 13400
MAGNETIC FLOW METERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Under this item, the contractor shall furnish and install the flow measurement equipment and accessories as indicated on the plans and as specified herein.
2. System to be complete and operational with all control equipment and accessories as shown and specified.

B. Related Sections

Section 13423 - Analysis and Instrumentation

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. ASME B16.1 (2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
 2. ASME B16.5 (2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
 3. NEMA 250 (2014) Enclosures for Electrical Equipment (1000 Volts Maximum)
 4. NEMA ICS 1 (2000; R 2015) Standard for Industrial Control and Systems: General Requirements
 5. NEMA ICS 2 (2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
 6. NFPA 70 (2017) National Electrical Code
 7. NSF/ANSI 61 (2016) Drinking Water System Components – Health Effects
 8. NAPHCC NSPC (2015) National Standard Plumbing Code UL 50 (2007; Reprint April 2012) Enclosures for Electrical Equipment, Non-environmental Considerations.

1.3 DEFINITIONS

- A. Amplifier – Device used for increasing the power of a signal. It does this by taking energy from a power supply and controlling the output to match the input signal shape but with larger amplitude.
- B. ANSI – (American National Standards Institute) A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.
- C. AWWA – (American Water Works Association) An international non-profit professional organization founded to improve water quality and supply.
- D. Detector Coils – Also called an “induction loop”, an electromagnetic communication or detection system which uses a moving magnet to induce an electrical current in a nearby wire.
- E. Electrode – An electrical conductor used to make contact with a nonmetallic part of a circuit (e.g., a semiconductor, an electrolyte or a vacuum).
- F. Modbus RTU – a serial communications protocol published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). This is used in serial communication & makes use of a compact, binary representation of the data for protocol communication.
- G. NEMA – (National Electrical Manufacturers Association) Is the 'Association of Electrical Equipment and Medical Imaging Manufacturers' in the United States. Its approximately 450 member companies manufacture products used in the generation, transmission, distribution, control, and end use of electricity. These products are used in utility, industrial, commercial, institutional, and residential applications.
- H. NSF International – An independent, accredited organization that develops standards, and tests and certifies products and systems. They provide auditing, education and risk management solutions for public health and the environment.
- I. PLCs – (Programmable Logic Controller) A digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.
- J. PTFE – (Polytetrafluoroethylene) A synthetic fluoropolymer of tetrafluoroethylene that finds numerous applications. The best-known brand name of PTFE is Teflon by DuPont Co.
- K. Serial Communications – In telecommunication and computer science, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect from damage, deterioration, weather, excessive humidity, excessive temperature variation, dirt, dust, and contaminants equipment and materials delivered, handled, and placed in storage, from the time of shipment until installation is completed and the equipment and materials are ready for operation. Equipment shall be marked and stored to permit easy identification and inspection. Each item of the equipment shall be tagged or marked as identified in the delivery schedule or on the shop drawings. Include with each shipment complete packing lists and bills of materials.

1.5 QUALITY ASSURANCE

A. Requirements

1. Perform calibration and submit test report for the flow measuring equipment for closed channel; Accuracy shall be +/- 0.4 % of rate for all flow rates greater than 1.9 feet per second. Calibration shall be in accordance with OIML R49 Type P standards.
 2. The products of this section shall be provided by a single supplier who shall demonstrate previous experience in the manufacture of flow measuring systems.
 3. The manufacturer must have a service center with trained technicians authorized to make repairs to all components of the flow measuring system. This supplier shall be responsible for providing all equipment, accessories, spare parts, documentation, and installation supervision required for a complete and operational flow measuring system.
- B. The flow meters and accessories shall be a regularly marketed product of the manufacturer who must have a physical plant, technical and design staff, and production personnel to complete the work as Specified. Systems assembled by second party fabricators, integrators, Equipment distributors/representatives or contractors shall not be acceptable. The flow meters and accessories shall be assembled and tested by the manufacturer prior to delivery.
 - C. The manufacturer shall have a minimum of 5 years' experience with a successful record of manufacturing and servicing of systems as specified herein.
 - D. The manufacturer shall have a proven track record of after-market sales and service support on its equipment.
 - E. Emergency Service: System manufacturer or manufacturer representative maintains service center capable of providing training, parts, and emergency maintenance and repairs at Project site with 48 hours maximum response time.
 - F. Single-Source Responsibility: Obtain flow meters and accessory components from a single manufacturer with responsibility for entire system. Unit shall be representative product built from components that have proven compatibility and reliability and are coordinated to operate as unit as evidenced by records of prototype testing.

1.6 SUBMITTALS

A. The following information shall be included in the submittal for this section:

1. Detailed Bill of Materials for all equipment and components, listing: manufacturer's name, quantity, size, description, and catalog/part number.
2. Manufacturer's product literature, specifications, performance capabilities, features and accessories, materials of construction, illustrations, and data in sufficient detail to demonstrate compliance with Specification requirements. Manufacturer's literature and data shall be marked to clearly delineate all applicable information and crossing out all inapplicable information.
3. Outline dimensions, conduit entry locations and weight.
4. Customer connection and power wiring diagrams.
5. Data sheets and catalog literature for microprocessor-based transmitter and transducer
6. Interconnection drawings. Electrical wiring schematics for flow sensor and signal converter/amplifier/transmitter. Interconnection wiring diagrams between signal converters /transmitters and related equipment and materials.
7. Diagrams showing meter grounding recommendations and grounding conductor/connection requirements (conductor size and connection type), including connection from meter terminal box or signal converter (if integrally mounted) to grounding ring(s), connection rod between grounding rings, and connection from grounding rings to ground rod.
8. Meter cable product data sheets.
9. Installation and operations manual.
10. List of spare parts.
11. A complete list of options provided along with a full listing of available options. Include a listing of available options not provided but recommended along with a statement justifying their recommendation for inclusion.
12. Any portions of this specification not met must be clearly indicated or the supplier and Contractor shall be liable to provide all additional components required to meet this specification at no additional cost to the project.
13. The proposed manufacturer's guarantee and local parts/service center information.
14. Operation and Maintenance Manual information.
15. Maintenance Proposal - Provide for the Owners' consideration a proposal for professional annual maintenance/calibration of the flow meter and accessories. This proposal shall include the services of a qualified technician to perform maintenance and calibration as recommended by the manufacturer. The proposal shall include a schedule of services to be performed.

16. List of special tools for each type of equipment furnished including special tools necessary for adjustment, operation, maintenance, and disassembly.

1.7 WARRANTY

- A. The equipment furnished under this section shall be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 24 months from date of substantial completion.
- B. The system manufacturer shall pass through any warranties from the equipment suppliers for the meter and other system components manufactured by others.

1.8 COORDINATION

- A. Flowmeters and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers and manufacturers under other sections of these Specifications and where applicable, with related existing equipment. All flowmeter and control devices shall be applied in full conformity with the Drawings and Specifications, and with the instructions and recommendations of the flowmeter manufacturer and the related equipment manufacturer.
- B. Related equipment and materials may include, but not be limited to valve actuators, chemical feed equipment, analytical measuring devices, supervisory control equipment (SCADA), telemetry, conduit, cable, and piping, as described in other Sections associated with the project and shown on the Drawings.
- C. Interconnection wiring diagrams shall be prepared between the related equipment and the equipment furnished under this Section. Interconnection wiring shall provide all functions specified herein and/or shown on the Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Magnetic flow meters shall measure, indicate, and transmit process flow in a full pipe. Meter must be a full-bore meter with the magnetic field traversing the entire cross-section of the flow tube. Insertion magmeters or multiple single point probes inserted into a spool piece are not acceptable.
- B. Type: Magnetic flowmeter, operating based on Faraday's law, using a pulsed dc type coil excitation with high impedance electrodes.
- C. Parts: Flow tube, transmitter, interconnection cables.

2.2 MANUFACTURER

- A. Subject to compliance with requirements of this specification, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB
 2. Emerson (Rosemount Magnetic Meters)
 3. Or Approved Equal.
- B. Manufacturers shall modify or supplement standard equipment to provide all features and capabilities specified herein.

2.3 GENERAL REQUIREMENTS

- A. The flow measuring equipment shall be the electromagnetic meter full bore type. The design shall permit ease of installation and shall not have any features hazardous to personnel or detrimental to the equipment. Provision shall be made to align and adequately lubricate moving parts. Interior parts shall be easily accessible for adjustment, repair, and replacement.
- B. Provide a magnetic flow meter where indicated on the Drawings. The magnetic flow meter shall be suitable for pipe diameters up to 24 inches.
- C. The magnetic flow meter system shall include a flow tube, semi-remote read-out receiver, remote transmission, and interconnecting cable where indicated.
- D. The flow meter shall be a tetrafluoroethylene-lined stainless steel or steel chloroprene-lined stainless steel or steel or fiberglass tube with the necessary cores and coils to provide a magnetic field without any interference and with 150 psi modified ASME B16.1 carbon steel flanges.
 - a. Electrodes shall be the conical self-cleaning stainless steel.
 - b. The tube shall operate from 120 volts, 60 hertz, single phase AC power.
- E. A weatherproof housing shall cover the magnets, coils, and connections. Provide a transformer within the transmitter housing to provide 120 volts power to the receiver.
- F. Provide a system for cleaning the electrodes or tube automatically without taking the tube out of service.
- G. The metering tube shall have an approximate laying length as indicated.
- H. Provide all necessary cables between the transmitter and receiver.
- I. Accuracy shall be +/- 0.4 % of rate for all flow rates greater than 1.9 feet per second or as noted otherwise within these specifications. The receiver shall convert the AC voltage signal generated in the flow tube to a uniform flow signal. There shall be an adjustment for zero and span.

2.4 DESIGN, CONSTRUCTION AND MATERIALS OF FABRICATION

A. Flow Sensor

1. Each flow sensor shall be provided with a flanged end flow tube and a non-conductive liner suitable for the liquid being metered. Unless specified otherwise, the flow tube shall be constructed of Type 304 or Type 316 stainless steel with stainless steel or carbon steel flanged ends. Flanges shall be ANSI Class 150 for meter sizes up to 24 inches. Flow sensors shall be provided with Teflon liner material.
2. The field coils of the flow sensor shall be supplied with a precisely adjusted bipolar direct current. Coil drive power shall be supplied by the signal converter/amplifier/transmitter. The output signal from the flow sensor shall be fed through cable to the signal converter/amplifier/transmitter. There shall be no electronic components in the flow sensor.
3. The flow sensor coil enclosure and cable connection housing shall be epoxy coated steel or epoxy coated aluminum. Plastic housings will not be acceptable.
4. Meters installed underground or in a below grade vault shall be manufactured to NEMA 6P standards to enable the meter to be submerged up to 30 feet for 48 hours and up to 10 feet with continuous submersion. Meters rated NEMA 6P shall have remote transmitters in separate NEMA 4X enclosures. The interconnecting cables shall be installed at the factory and the termination box filled with a non-setting, transparent potting material.
5. When installed in metallic piping, the flow sensor shall be provided with integral grounding electrodes. When installed in lined or non-metallic piping, the flow sensor shall be provided with Type 316 stainless steel grounding rings or grounding electrodes.
6. When installed in piping conveying raw sewage or sludge, the flow sensor shall be certified for use in Class I, Division 2 hazardous locations.
7. Flow sensor grounding electrode and sensing electrode material shall be compatible with the process fluid. Unless specified otherwise, electrodes shall be constructed of Type 316 stainless steel or Hastelloy C.
8. The flow sensor, including liner material, shall be certified in accordance with National Sanitation Foundation Standard 61 for use with potable water. Accuracy shall not be affected by cuts or scratches in the flow sensor liner.
9. The flow sensor shall be provided with multiple sensing electrodes to accurately measure mean velocity. The flow sensor shall be capable of accurately measuring slurries and water with entrained air. Accuracy of the flowmeter system shall be $\pm 0.2\%$ of rate. Accuracy shall be traceable to the US National Institute of Standards and Technology (NIST) and shall be guaranteed on-site for applications such as drinking water, raw sewage, and similar media, even with a permanent coating of raw sewage or similar on the electrodes. A NIST traceable calibration certificate shall be provided with each flowmeter.

10. The flow sensor shall incorporate an empty pipe detection feature, which shall cause the meter to register zero flow when the sensor is not full.
11. Unless specified otherwise, the flow sensor shall be rated for a minimum working pressure of 150 psig.
12. The flow sensor shall be suitable for operating temperatures ranging from -4°F to +122°F (minimum).
13. The measuring system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5.0 micromhos per centimeter.

C. Signal Converter/Amplifier/Transmitter

1. Unless specified otherwise, the signal converter/amplifier/transmitter shall be remote mounted from the flow sensor. Where special signal cable is required and recommended by the manufacturer, the cable shall be supplied by the meter manufacturer. Supplier shall confirm the length and installation requirements. Where signal converter/amplifier/transmitter location is not shown on the Drawings, each flowmeter shall be furnished with a minimum of 200 feet of signal cable.
2. The signal converter/amplifier/transmitter shall be suitable for outdoor exposure and shall be rated NEMA 4X.
3. Display: Three line back-lit graphical display with capacitive keys; allows for external configuration without removing covers and compromising the integrity of environmental classifications.
 - a. Programmable parameters of the converter/amplifier/transmitter include, but are not limited to: calibration factors, totalizer resets, unit of measure, analog and pulse output scaling, flow-alarm functions, language selection, low-flow cutoff, noise dampening factor and excitation frequency selection.
 - b. The signal converter/amplifier/transmitter shall be program selectable to display the following units of measure: U.S. gallons, imperial gallons, million gallons (U.S.), cubic feet, cubic meters, liters.
4. The signal converter shall be coordinated with the flow sensor selection for accurately measuring potable water, raw sewage, slurries, and water with entrained air.
5. The signal converter/amplifier/transmitter shall be capable of measuring bi-directional flow and shall have three separate totalizers.
6. The signal converter/amplifier/transmitter shall operate on 85 to 265 VAC, or 11 to 24 VAC supply power.
7. The signal converter/amplifier/transmitter shall include non-volatile memory capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.

8. The signal converter/amplifier/transmitter shall produce a 4-20 mA DC output signal into a minimum load of 800 ohms, linear to flow. Output shall be selectable as unidirectional or bi-directional. In addition, the signal converter/amplifier/transmitter shall provide a digital scaled pulse output for external display/recording of flow rate and total flow.
9. The signal converter/amplifier/transmitter shall be provided with a positive zero circuit to register zero flow.
10. The signal converter/amplifier/transmitter shall be suitable for operation in ambient temperatures ranging from -4°F to +140°F (minimum).
11. Where located indoors, the signal converter/amplifier/transmitter shall be wall mounted or flush panel door mounted as indicated on the Drawings.
12. Redundant data storage in sensor and transmitter with continuous replication of calibration factors, meter size, serial numbers, and site-specific settings.
13. Infrared service port for meter configuration and diagnostic interrogation. Shall have capability to connect to laptop. Shall be able to configure as keypad image, Hart or HyperTerminal. Shall be able to perform remote trouble shooting from remote location with computer laptop packages such as PC anywhere.
14. Where specified, local service communication with the meter shall be capable via a RJ-45 port and an Ethernet cable regardless of the output. The signal converter/amplifier/ transmitter shall have integral webserver capabilities with a unique IP address.

2.5 EQUIPMENT APPURTENANCES

- A. Bolts, nuts, anchors, washers, and all other types of supports necessary for the installation of the equipment shall be Hastelloy, titanium or Type 316 stainless steel.

2.6 SPARE PARTS

- A. Provide all standard recommended spare parts as specified in the manufacturer's instruction manuals for each component in the system. Spare parts shall include all parts required for (2) years of normal maintenance of all components of the flow measuring system. All parts shall be in one box and identified with labels describing contents.

PART 3 - EXECUTION

3.1 GENERAL

- A. All components of the Flow Measuring system shall be handled with care during transportation, storage and installation. In case of doubt, the Contractor shall follow the manufacturer Guidelines for Storage and Handling.

3.2 EXAMINATION

- A. Verify that field conditions are acceptable and ready to receive work.

3.3 FIELD MEASUREMENTS

- A. After becoming familiar with details of the work, verify all dimensions in the field, and advise the Engineer of any discrepancy before performing the work.

3.4 INSTALLATION

- A. Installation of magnetic flowmeters and signal converters/amplifiers/transmitters shall be in accordance with the manufacturer's written instructions.
- B. Wiring between flow sensors and remote mounted signal converters shall be supplied by the meter manufacturer.
- C. All magnetic flowmeters shall be grounded per manufacturer's requirements. The contractor shall coordinate grounding between signal converter, flow sensor, grounding rings, and ground rod to ensure compliance with the manufacturer's recommended grounding procedures. Prior to start up, the manufacturer shall provide written certification that the meter installation is in accordance with their requirements, including grounding.
- D. Unless specified or shown otherwise, signal converters/amplifiers/transmitters shall be remote mounted within NEMA 4X stainless steel enclosures. The enclosures shall be mounted to the wall adjacent to the respective meters.

3.5 CALIBRATION

- A. Test Mode: Provide the ability to verify the accuracy of the unit and the integrity of the current loop without any external equipment.
- B. Meter calibration shall be in accordance with OIML R49 Type P, self-calibration requirements.
- C. Meter must be able to periodically generate simulated signals that verify that the output is within predefined limits.
- D. Coil inductance and resistance along with electrode voltage and impedance must be verifiable through diagnostic functionality.
- E. Warnings and Alarms: Shall be classified to NAMUR NE 107 standards. Meter must have the ability to display severity of warning with "maintenance, checkfunction, failure and out of spec" warning indications.
- F. Alarm priorities shall be classified as: "None; Maintenance; Out-of-spec; Function check; and Error."
- G. The quantity of occurrences, total time duration of the alarm occurrences, and time since last occurrence.
- H. All replacement transmitters shall be interchangeable without need for programming sensor calibration factors, meter size, site information, and serial numbers.
- I. Insitu Calibration Verification: This system shall be used to verify in a quantifiable manner the meter's current conditions vs. the meters condition when originally manufactured. This calibration verification of the meter shall be performed without need for physical access to

the meter flow tube. Method must be able to print out hard copy of verification and diagnostic reports.

- J. Meters to be designed, manufactured, and calibrated in an ISO9001, UKAS/NAMAS, NIST, or NATA certified or traceable facility. Flow facility must be certified by volume or weight certified provers. Facility must have the capability to hold the flow rate at the specified calibration points for a minimum of five minutes to allow stabilization for flow and repeatability point checks.

3.6 FIELD TESTING

- A. Test and calibrate in place the flow measuring equipment to demonstrate that it meets the accuracy requirements for the full range of flows specified herein. Provide all labor, equipment, and incidentals required for the tests, including electric power and water required for tests. The Engineer shall witness all field tests and conduct all field inspections. The Contractor shall give the Engineer ample notice of the dates and times scheduled for tests. Rectify any deficiencies found and retest the work affected by such deficiencies at the Contractor's expense. Record data from each field test shall be recorded and documented in a formal field test report.

3.7 MANUFACTURER'S REPRESENTATIVE SERVICES

- A. As specified in the Manufacturer's written instructions.
- B. Provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified. The representative must supervise the installation, adjustment, and testing of the equipment.
- C. A field service technician or start-up engineer of the Flow Measuring System Supplier shall commission the Flow Measuring equipment.
- D. Local manufacturer's representatives are prohibited from performing these tasks unless authorized by the Flow Measuring System Supplier in writing.
- E. The field service technician shall certify that all equipment is properly installed and that the plant operators have been trained in proper operation and maintenance procedures.
- F. The minimum recommended man-days/trips for installation inspection, system commissioning, and operator training shall be two (2) days.
- G. The Owner reserves the right to videotape all training.
- H. Upon request of the Owner, at any time during the warranty period, the representative shall recheck the system, recalibrate and adjust equipment, answer plant operator's questions and review operation and maintenance procedures.

3.8 CLOSEOUT ACTIVITIES

- A. Operation and Maintenance Manual

1. The contractor shall submit a detailed Operation and Maintenance Manual for all equipment and components specified herein and incorporated into the Work. The Operation and Maintenance Manual shall be provided in accordance with the requirements of Section 017823 – Operation and Maintenance Data.
2. Operation and maintenance manuals shall include, but not be limited to, the following:
 - a. Equipment Performance Data and Drawings
 - 1) Detailed Bill of Materials for all equipment and components, listing: manufacturer's name, quantity, size, description, and catalog/part number.
 - 2) Manufacturer's product literature, specifications, performance capabilities, features and accessories, materials of construction, and illustrations.
 - 3) Dimensional drawings for each meter size.
 - 4) Electrical wiring schematics for flow sensor and signal converter/amplifier/transmitter. Interconnection wiring diagrams between signal converters/transmitters and related equipment and materials.
 - b. Equipment Installation Requirements
 - 1) Complete, detailed installation instructions for all equipment and components.
 - c. Equipment Operation Data
 - 1) Complete and detailed operating instructions, including operator interface menus, programming, and setup parameters.
 - 2) Printed list of all final setup parameters for each flowmeter, including factory settings and any field modifications to factory settings.
 - d. Equipment Service and Maintenance Data
 - 1) Maintenance data shall include all information and instructions required by the Department's personnel to keep equipment properly cleaned and adjusted so that it functions economically throughout its full design life.
 - 2) Unloading, handling, and long-term storage requirements.
 - 3) Explanation with illustrations as necessary for each maintenance task.
 - 4) Recommended schedule of maintenance tasks.
 - 5) Troubleshooting instructions.
 - 6) List of maintenance tools and equipment.

- 7) Recommended spare parts list.
 - 8) Name, address and phone number of manufacturer and manufacturer's local service representative.
- e. Manufacturer's Warranty.
 - f. Provide a signed written certification report with the Final Operation and Maintenance Manuals, certifying that the magnetic flowmeters have been properly installed, calibrated, and adjusted, and are suitable for satisfactory continuous operation under varying operating conditions, and meet all requirements specified in the Contract Documents.

END OF SECTION

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SECTION 13423 - ANALYSIS INSTRUMENTATION

PART 1 – GENERAL

A. SCOPE OF WORK:

1. Furnish all labor, materials, equipment, and appurtenances required to provide monitoring and control equipment at the locations indicated in the plans. New monitoring systems to be complete and operational with all control equipment and accessories as shown and specified.
2. Furnish, install, calibrate, test, adjust, and place into satisfactory operation all sensors and controllers as shown on the Drawings and specified herein.
3. The Drawings and Specifications illustrate and specify functional and general construction requirements of controllers and sensors, and do not necessarily show or specify all components, wiring, piping, and accessories required to make a completely integrated system. Provide all components, piping, wiring, accessories, and labor required for a complete and integrated system.
4. Coordinate with other suppliers for installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.
5. Controllers, modules, sensors, cables, and associated equipment are required for a complete monitoring system for measuring water quality parameters in water and wastewater treatment systems.

1.2 REFERENCES

NEMA: National Electrical Manufacturers Association

ASTM: American Society for Testing and Materials

ANSI: American National Standards Institute

NEC: National Electric Code

1.3 RELATED SECTIONS

15183 – Gauges

11151 – Sodium Hypochlorite Disinfection System

13300 – System Integration

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Terminals/Controllers, water quality measurement systems shall not be delivered to the site until all product information and system shop drawings for the system have been approved.
- B. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials during storage, handling, and installation to prevent damage.
 - 5. Temperature range for storage: 23°F to 149°F.

1.5 SUBMITTALS

- A. Shop drawings which shall include the following:
 - 1. Complete description in sufficient detail to permit an item comparison with the specification.
 - 2. A complete and detailed list of any and all variations to this specification.
 - 3. Manufacturer's complete system specification tailored to this specific project.
 - 4. Dimensions and installation requirements.
 - 5. Mounting bracket / sensor holder installation instructions.
 - 6. Descriptive information including catalog cuts and manufacturers specifications for components.
 - 7. Wiring and control schematics and layouts.
 - 8. Documentation of experience with water analysis equipment design and installation.
 - 9. Manufacturer's Certifications: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
 - 10. Operation and Maintenance Manual information.
 - 11. Manufacturer's recommended accessories and spare parts.
 - 12. Warranty Information.

1.6 WARRANTY

- A. The equipment furnished under this section shall be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 12 months from date of substantial completion.

1.7 QUALITY ASSURANCE

- A. Furnish universal controllers and sensors by the named manufacturers.
- B. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.
- C. The following product certifications are required:
 - 1. EMC: CE compliant for conducted and radiated emissions CISPR 11 (Class A limits), EMC Immunity EN 61326-1 (Industrial limits).
 - 2. Safety: General Purpose UL/CSA 61010-1 with cETLus safety mark.
 - 3. Australian C-TICK and Korean KC Markings
 - 4. NEMA 4X/IP65 Water and Dust Ingress Ratings

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide a chlorine residual and ammonia analyzer monitoring and control system complete with sensors, reagents, controllers, communications, hardware, etc. as indicated on the Drawings and as herein specified.
- B. Sensors and Controller shall be supplied by the same manufacturer.
- C. Monitoring systems shall be designed for complete outdoor installation of sensors and indoor installation of controls, with shelter and/or supplemental cooling or heating, if required by the system's manufacturer.
- D. With the exception of conduit adapters, all wiring and cabling shall be installed in rigid conduit (RNC, Type EPC-80-PVC).

2.2 CHLORINE RESIDUAL ANALYZERS

A. Operational Criteria

1. Operating temperature: 5 to 45 °C (41 to 113 °F)
2. Relative humidity: 0-95%, non-condensing

B. Sample Requirements

1. Maximum back pressure the chlorine sensor can manage without failure:
 - a. 0.5 bar, no pressure impulses and/or vibrations
2. Temperature: 0 to 45 °C (33 to 113 °F)
3. Temperature compensation range: 5 to 45 °C (41 to 113 °F)
4. Flow: 30-50 L/hr, 40 L/hr - optimal (7.9-13.2 g/hr, 10.6 g/hr - optimal)

C. Storage Requirements

1. Electrolyte: 15 to 25°C (59 to 77°F)
2. Chlorine sensors: 0 to 50°C (32 to 122°F) dry without electrolyte
3. Panel: -20 to 60°C (-4 to 149°F)

D. Performance Requirements

1. Measurement range: 0 to 20 ppm chlorine for either free or total chlorine
2. Total Chlorine
 - a. Low Limit Of Detection (LOD): 30 ppb (0.03 ppm) or better
 - b. Limit Of Quantitation (LOQ): 90 ppb (0.09 ppm) or better
 - c. Repeatability/precision: 30 ppb or 3%, whichever is greater
 - d. Response time: ~100 s for 90% change (T_{90}) (At a stable T and pH)
 - e. Interference: Chlorine Dioxide, Ozone, and chalk deposits
3. Free Chlorine
 - a. Low Limit Of Detection (LOD): 30 ppb (0.03 ppm) or better
 - b. Limit Of Quantitation (LOQ): 90 ppb (0.09 ppm) or better
 - c. Repeatability/precision: 30 ppb or 3%, whichever is greater
 - d. Response time: ~140 s for 90% change (T_{90}) (At a stable T and pH)
 - e. Interference: Monochloramine, Chlorine Dioxide, Ozone, and chalk deposits

4. Drift: <10% with regular calibration (calibration will be weekly to quarterly depending on the application, given stable sample temperature and pH of water sample)
5. Specificity/Selectivity: Non-specific to a certain chlorine form, responds to any chlorine species and other oxidizers as noted in the interference section.
6. Calibration method: Customer has the option to use one (zero or slope) or two-point (zero and slope) calibration. Two-point calibration with chemical zero is recommended for chlorine concentration <0.5 ppm.
7. Verification procedure: One-point process calibration (slope) against a standard reference method.

E. Manufacturers

1. Hach Company, Loveland, CO
 - a. Model CLF10sc Reagentless Free Chlorine Analyzer
 - b. Model CLT10sc Reagentless Total Chlorine Analyzer

F. Analyzer shall consist of:

1. Three-Electrode Amperometric Chlorine sensor
2. Chlorine sensor flow cell with integrated flow sensor
3. pH flow cell with grab sample port
4. Digital gateway for communication between probes and controller
5. Stainless steel panel

2.3 AMMONIA MONOCHLORAMINE ANALYZERS

A. Operational Criteria

1. Operating temperature: 5 to 45 °C (41 to 113 °F)
2. Relative humidity: 5-95%, non-condensing

B. Sample Requirements

1. Sample pressure:
 - a. 2.5 – 87 psi
2. Temperature: 5 to 50 °C (41 to 122 °F)
3. Flow: 100-1000 mL/minute

C. Storage Requirements

1. Panel: -20 to 60°C (-4 to 149°F)

D. Performance Requirements

1. Measurement range: 0.1 to 10.0 mg/l
2. Total Ammonia
 - a. Low Limit Of Detection (LOD): 0.01 ppm (as N)
 - b. Limit Of Quantitation (LOQ): 2 ppm (as N)
 - c. Repeatability/precision: 3% or 0.01 ppm (as N), whichever is greater
 - d. Response time: Within 5 minutes
3. Communication
 - a. Communication protocol is Modbus RTU. Cabling standard is RS-485.

E. Manufacturers

1. Hach Company, Loveland, CO
 - a. Model 5500 sc Ammonia Monochloramine Analyzer

2.4 EQUIPMENT

A The CLF10 and CLT10 will work with Hach sc model controllers only. The amperometric cell of the sensor consists of:

2. Gold cathode
3. Stainless steel counter electrode
4. Silver/silver chloride reference electrode
5. pH buffered electrolyte
6. Sensor membrane to filter chlorine species selectively and to provide interface between the electrochemical cell and the sample

A. Wetted materials as follows:

1. Chlorine Measuring Cell: PVC
2. Chlorine Sensor Body: PVC
3. Chlorine Sensor Flow Cell: Acrylic
4. pH Sensor Flow Cell: PVC

B. The sensor interface to the controller is through a digital gateway.

C. The chlorine sensor automatically compensates for temperature utilizing an embedded temperature sensor.

- D. The electrolyte provides internal, buffered pH compensation in the range of 4-9 pH units.
- E. The sensor includes proprietary Cal Watch self-diagnostic technology.
- F. The panel assembly includes a flow cell that integrates a flow meter and control valve.
- G. Temperature and pH levels will be transmitted to the controller from the CLT10sc analyzer.

2.5 COMPONENTS

A. Standard equipment:

- 1. Stainless Steel Mounting Panel
- 2. Chlorine Sensor with Membrane and Electrolyte
- 3. Chlorine Sensor flow cell
- 4. Flow meter with control valve
- 5. Digital gateway to sc controller with cable
- 6. User Manual

B. Dimensions

- 1. Sensor
 - a. Length: 7.68 in. (195 mm)
 - b. Diameter: 0.98 in. (25 mm)
- 2. Panel
 - a. Length: 19.0 in. (482.6 mm)
 - b. Width: 19.5 in. (495.3 mm)
 - c. Depth: 5.95 in. (151.2 mm)
- 3. Gateway to Controller cable: 3 ft. (1 m) (minimum)

C. Weight

- 1. Panel and empty panel-mounted components: approximately 12 lbs. (5.5 kg)
- 2. Complete panel with pH sensor: approximately 20 lbs. (9.1 kg)

2.6 ACCESSORIES

A. Required

- 1. Hach Controller – sc200 Digital Controller
 - a. Controller is microprocessor-based and is housed in an IP65 enclosure
 - b. Controller is a modular system consisting of:

- 1) Display Module
- 2) Probe Module
- 3) Controller has two connections for Hach digital Sensors.
- c. Communication.
 - 1) Communication protocol is Modbus RTU.
 - 2) Cabling standard is RS-485.
2. pH sensor
- B. Optional
 1. Acidification unit
 2. Sample conditioning kit

PART 3 – EXECUTION

3.1 Preparation

- A. Clearances
 3. The pre-assembled analyzer panel must be mounted to allow clearance for sensor removal and routine maintenance.
- C. Mounting
 1. Wall or panel mounted
- D. Sample Inlet (order with English or Metric Fittings)
 1. English Fittings
 - a. Speed-fit fitting – ¼ in OD Tube
 2. Metric Fittings
 - a. Speed-fit fitting – 6 mm OD Tube
- E. Sample Outlet (order with English or Metric Fittings)
 1. English Fittings
 - a. Speed-fit fitting – ½ in OD
 2. Metric Fittings
 - a. Speed-fit fitting – 12 mm OD

3.2 Installation

- A. Contractor will install the analyzer in strict accordance with the manufacturer's instructions and recommendation.
- B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician, if requested.
 1. Contractor will schedule a date and time for start-up.
 2. Contractor will require the following people to be present during the start-up procedure.

- a. General contractor
- b. Electrical contractor
- c. Hach Company factory trained representative
- d. Owner's personnel
- e. Engineer

3.3 Manufacturer's Service and Start-Up

- A. Contractor will include the manufacturer's services to perform start-up on instrument to include basic operational training and certification of performance of the instrument.
- B. Contractor will include a manufacturer's Service Agreement that covers all the manufacturer's recommended preventative maintenance, regularly scheduled calibration and any necessary repairs beginning from the time of equipment startup through to end user acceptance / plant turnover and the first 12 months of end-user operation post turnover.
- C. Items A and B are to be performed by manufacturer's factory-trained service personnel. Field service and factory repair by personnel not employed by the manufacturer is not allowed.
- D. Use of manufacturer's service parts and reagents is required. Third-party parts and reagents are not approved for use.
- E. The Contractor shall provide the following minimum manufacturer's representative service requirements:
 - 1. 4 hours on site for start-up and testing.
 - 2. 4 hours on site for operator training.

END OF SECTION

SECTION 15009 - PIPE SUPPORTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish labor, materials, equipment and incidentals and install pipe hangers, supports, beam clamps, hanger rods, friction clamps, concrete inserts, and anchor bolts including all hanging and supporting devices for supporting non-buried piping as shown on the Drawings and as specified herein. The Contractor shall note not all pipe supports, hangers, anchorages, or expansion joints may be shown on the drawings. The Contractor shall provide final responsibility for proper permanent support and anchorage of all piping systems.
- B. Unless otherwise noted, whenever the word “support” is used herein, it shall mean any overhead hangers, wall bracket, supports from the floor, friction clamps and attendant beam clamps, concrete inserts, pipe guides, rods, supports pipes and other necessary equipment for supporting and/or anchoring any pipes, tubing, or appurtenances. Where the word “pipe” is used it shall mean pipe, appurtenances and/or tubing.

1.02 RELATED WORK

- A. Concrete is included in Division 3.
- B. Miscellaneous metal fabrication is included in Section 05500.
- C. Field painting is included in Section 09800.
- D. Piping and valves are included in Division 15.

1.03 SUBMITTALS

- A. The Contractor shall submit to the Engineer as provided in Section 01300, complete sets of shop drawings of all items to be furnished under this Section. Submittals shall include complete layouts, schedules, location plans and complete total bill of materials for all pipe support systems.
- B. Submittals shall include a representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, 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.
- C. Submittals shall include complete piping drawings 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. Submittals shall use detail numbers as shown on the Drawings to indicate type of support proposed wherever possible.

- D. Type and locations of pipe hangers and/or supports shall also be shown on the piping layouts for each piping submittal as specified in the respective Division 13 and 15 pipe specifications.
- E. Submit complete design data for support systems to show conformance with this Specification.

1.04 QUALIFICATIONS

- A. Hangers, supports and appurtenances shall conform to the latest applicable requirements of ASME B31.1, except as supplemented or modified by the requirements herein.
- B. Hangers, supports and appurtenances shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for supporting equipment, with the exception of springs, shall be five times the ultimate tensile strength of the material, assuming 10 feet of water filled pipe being supported.
- C. Pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, submit certification stating that such requirements have been complied with.
- D. The supports specified under this section shall be furnished by a manufacturer who is fully experienced, reputable, qualified and is regularly engaged in the design of complete pipe support systems and the manufacture (or fabrication) of the items to be furnished.
- E. The piping supports and anchorages (including location of guides and expansion joints) shall be designed and supplied, as an integral system, by a single manufacturer. The pipe support manufacturer shall certify through the Contractor to the Engineer that the supports and/or anchorage have been designed as a system.
- F. Design calculations for pipe supports and anchorage systems (including guides and expansion joints) shall be submitted, along with the pipe system drawings. Calculations shall be stamped by a licensed Professional Engineer who is regularly engaged in pipe support system design.

1.05 DESCRIPTION OF SYSTEM

- A. All pipe and tubing shall be supported and anchored as required to prevent significant stresses in the pipe or tubing material, valves, fittings and other pipe appurtenances and to support and secure the pipe in the intended position and alignment. All supports and anchorage shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact.
- B. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, submit certification stating that such requirements have been complied with.
- C. All pipe supports shall be designed with liberal strength and stiffness to support the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement, and pressure forces, thermal expansion and contraction, vibrations, and all probable externally applied forces. Prior to installation, all pipe supports shall be approved by the Engineer.
- D. The minimum working factor of safety for all supporting equipment, with the exception of springs and anchorage, shall be five (5) times the ultimate tensile strength of the material, assuming a supported weight of a length of water filled pipe and equal to half the distance to the next supports. Valves and other concentrated loads shall be accounted for.
- E. The minimum factor of safety for thrust anchorage design shall be 1.5. Thrust design shall utilize: working pressure plus water hammer; or 1.5 times working pressure; or test pressure whichever is highest or as noted on the Drawings and as acceptable to the Engineer.
- F. All supports of the same type shall be identical, varying only with size, and the product of a single manufacturer or fabricator. Supports shall be provided where indicated on the Drawings, where required, and where acceptable to the Engineer to form a complete workable system. If types of pipe supports other than those shown on the Drawings or specified are required, they shall be as acceptable to the Engineer.

1.06 REFERENCE STANDARDS

- A. Manufacturer's Standardization Society (MSS):
 - 1. MSS SP-58 - Pipe Hangers and Supports - Materials and Design.
 - 2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
- C. American Society of Mechanical Engineers (ASME):
1. ASME B31.1 - Power Piping Code.

PART 2: PRODUCTS

2.01 GENERAL

- A. The equipment specified herein is intended to support the various types of pipe and piping systems. The details shown on the Drawings are intended to indicate the generally desired methods of support under normal conditions. It shall be the responsibility of the Contractor to develop final details and any details associated with special conditions not already covered to meet the system conditions specified in the respective Division 15 pipe specifications.
- B. Pipe and tubing shall be supported as required to prevent significant stresses in the pipe or tubing material, valves, fittings and other pipe appurtenances and to support and secure the pipe in the intended position and alignment. Supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact. Any structural steel members required to brace any piping from excessive dislocation shall conform to the applicable requirements of Section 05500 and shall be furnished and installed under this Section.
- C. Hangers and supports shall be spaced in accordance with ASME B31.1, except that the maximum unsupported spans shall not exceed 8 feet unless otherwise specified herein.
- D. Where flexible couplings are required at equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc., shall be rigidly supported. All sleeve couplings and expansion joints shall be supported on both sides.
- E. Pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- F. Rods, clamps, hangers, inserts, anchor bolts, brackets, and components for interior pipe supports shall be furnished with galvanized finish, hot dipped or elector-galvanized coated, except where field welding is required. Interior clamps on plastic pipe shall be plastic coated. Supports for copper pipe shall be copper plated or shall have a 1/16-in. plastic coating. Rods, clamps, hangers, inserts, anchor bolts, brackets, and components for exterior pipe, submerged piping, pipe subject to splashing and pipe within outdoor structures shall be of Type 316 stainless steel.

- G. Supports shall be sufficiently close together such that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports. There shall be no visible sagging.
- H. 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 galvanized steel protection shields or other method as approved by the Engineer. Where pipes are bottom supported 180 degrees, arc shields shall be furnished. Where 360 degree arc support is required, such as U bolts, protection shields shall be provided for the entire pipe circumference. Protection shields shall have an 18 gauge minimum thickness, not be less than 12 inches in length, and be securely fastened to pipe with stainless steel or galvanized metal straps not less than 3 inches wide.
- I. Insulated pipe shall be furnished with a rigid foam insulating saddle at each pipe support location as specified under respective pipe insulation. Provide galvanized protection shields as specified in Paragraph 2.01H above at each location.
- J. Where pipe hangers and supports come in contact with copper piping, provide protection from galvanic corrosion by wrapping pipe with 1/16-in. thick neoprene sheet material and galvanized protection shield isolators, or by using copper plated or PVC coated hangers and supports.
- K. Pipe supports shall be provided as follows:
1. Cast iron and ductile iron piping shall be supported at a maximum support spacing of 8 feet with a minimum of one support per pipe section at the joints.
 2. Support spacing for steel and stainless steel piping two inch and smaller diameter and copper tubing shall not exceed five feet.
 3. Vertical pipes shall be supported at each floor or at intervals of not more than twelve feet by approved pipe collars, clamps, brackets, or wall rests, and at points necessary to insure rigid construction.
 4. Pipe supports shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
 5. Supports shall be provided at changes in direction or specified herein. No piping shall be supported from other piping or from metal stairs, ladders, and walkways, unless specifically directed or authorized by the Engineer.
 6. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings, and sleeve type couplings and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.

7. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.
- L. Unless otherwise specified herein, pipe hangers and supports shall be as manufactured by Carpenter and Paterson, Inc., Woburn, MA; Anvil International, Portsmouth, NH; and Unistrut, Harvey, IL; or equal. 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.
- M. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes, concrete and anchor hardware similar to items previously specified herein and shall be subject to the approval of the Engineer.
- N. Wedge anchor bolts shall be equal to Kwik-Bolt as manufactured by the Hilti Corporation, or equal. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1 inch behind the steel reinforcement, but in no case less than 3 inches. Expansion type anchors shall not be used in locations where the normal loading will be direct tension.
- P. Cast-in-place anchor bolts for interior supports shall meet the requirements of ASTM A307. All anchor bolts, nuts and washers shall be hot dip galvanized or cadmium plated; except where pipe supports will be submerged or within one foot above liquid levels, in which case all bolts, nuts, washers and hardware shall be Type 316 stainless steel.

2.02 SINGLE PIPE HANGERS

- A. Single pipes shall be supported by hangers suspended by steel rods from structural steel members, concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets.
- B. Hanger rods shall be hot rolled steel, machine threaded. The strength of the rod shall be based on its root diameter.
- C. Except as otherwise specified herein, pipe hangers shall be adjustable clevis type similar to Carpenter and Paterson Figure 100, material as required.
- D. Hanger rods shall be attached to concrete structures using concrete inserts similar to Carpenter and Paterson Figure 650. Beam clamps, C clamps, or welded beam attachments shall be used for attaching hanger rods to structural steel members. Where necessary and approved by the Engineer, double expansion shields shall be used for attaching to concrete structures.
- E. Where pipes are near walls, beams, columns etc. and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and

Paterson Figures 69, 84, or 139, shall be used for hanging pipe. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.03 MULTIPLE PIPE HANGERS

- A. Suspended multiple pipes, running parallel in the same horizontal plane, which are adjacent to each other shall be suspended by trapeze type hangers or wall brackets. Trapeze hangers shall consist of structural steel channel supported from threaded rod or attached to concrete walls, columns or structural steel support members as required to meet the intent of this specification. Channel shall be similar to Carpenter and Paterson Figure 371. Rods, concrete inserts, "C" Clamps, beam clamps, welded beam attachments, and expansion shields shall be as specified in Paragraph 2.02 Single Pipe Hangers above.
- B. Except as otherwise specified herein, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchors or pipe chairs as required. Chair "U" bolts shall be tightened to allow freedom of movement for normal expansion and contraction, except where pipe must be anchored to control direction of movement or to act as a thrust anchor.

2.04 SINGLE AND MULTIPLE PIPE SUPPORTS

- A. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Drawings.
- B. Pipes 3 inches in diameter and larger shall be supported by adjustable stanchions similar to Carpenter and Paterson Figures 101 and 138. Stanchions shall provide at least a 4 inch adjustment and be flange mounted to the floor.
- C. Pipes less than 3 inches in diameter shall be held in position by fabricated "C" channel, welded post base similar to Unistrut Series P2072A and pipe clamps similar to Unistrut Series P1109 thru P1126. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by horizontal member of sufficient load capacity to support pipe. Wherever possible, supports shall be fastened to nearby walls or other structural members to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support.
- D. Where shown on the Drawings, pipe shall be supported using concrete anchor posts. The pipe shall be securely fastened to concrete anchor posts using suitable metal straps as required and approved by the Engineer.

2.05 WALL SUPPORTED PIPES

- A. Single or multiple pipes located adjacent to walls, columns or other structural members, whenever deemed necessary, shall be supported using welded steel wall brackets

similar to Carpenter and Paterson Figures 69, 84, or 139; or "C" Channel with steel brackets similar to Unistrut pipe clamps. All members shall be securely fastened to wall, column, etc. using double expansion shields or other method as approved by the Engineer. Additional wall bearing plates shall be provided where required.

- B. Pipe shall be attached to supports using methods hereinbefore specified to meet the intent of this Specification.

2.06 BASE ANCHOR SUPPORT

- A. Where pipes change direction from horizontal to vertical via a bend, a weld or cast base anchor support shall be installed at the bend to carry the load. The bend anchor shall be fastened to the floor and double expansion shields or other method as approved by the Engineer.
- B. Where pipe are to bends shall be supported using concrete anchor posts, pipes shall be securely fastened to concrete supports with suitable metal bands as required and approved by the Engineer.

2.07 VERTICAL PIPE SUPPORTS

- A. Where vertical pipes are not supported by a Unistrut system as specified in Paragraph 2.08, they shall be supported in one of the following methods.
 - 1. For pipes $\frac{1}{4}$ inch to 2 inches in diameter, an extension hanger ring may be used with an extension rod and hanger flange. The rod diameter shall be as recommended by the manufacturer for the type of pipe to be supported. The hanger ring shall be galvanized steel, stainless steel, or PVC clad depending on the supported pipe. The hanger ring shall be similar to Carpenter and Paterson Figure 81. The anchor flange shall be similar to Carpenter and Paterson Figure 85.
 - 2. For pipes equal to or greater than $\frac{1}{2}$ inches in diameter, extended pipe clamps similar to Carpenter and Patterson Figure 267 may be used. The hanger shall be attached to concrete structures using double expansion shields or to steel support members using welding lugs similar to Carpenter and Paterson Figure 220.
 - 3. Pipe riser clamps shall be used to support vertical pipes extending through floor slabs. Riser clamps shall be similar to Carpenter and Patterson Figure 126. Copper clad or PVC coating clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser clamp.
 - 4. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding twelve feet shall be supported by approved pipe collars, clamps, brackets or wall rests at all points required to insure a rigid installation.

2.08 SPECIAL SUPPORTS

- A. Pipe supports shall be provided for closely spaced vertical piping systems as required to provide a rigid installation. The support system shall consist of a framework suitably anchored to floors, ceilings and walls and be as manufactured by Unistrut, or equal.
- B. Vertical and horizontal supporting members shall be U shaped channels similar to Unistrut Series P1000 or P5500. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut Series P2558.
- C. The assemblies shall be furnished complete with nuts, bolts, and fittings required for a complete assembly including end caps for all members.
- D. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings, as specified above shall be submitted and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.
- E. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes in accordance with applicable provisions of Section 05500, shall have anchor hardware similar to items specified herein, shall meet the minimum requirements listed below, and shall be subject to the approval of the Engineer.
 - 1. Pipe support systems shall meet all requirements of this Section and all related Sections of this Specification.
 - 2. Complete design details of the entire pipe support system shall be provided for review by the Engineer in the submittals specified in subsection 1.03.
 - 3. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

2.09 SURFACE PREPARATION AND SHOP PRIME PAINTING

- A. Non-galvanized ferrous surfaces shall be prepared and shop painted as part of the work of this Section. Surface preparation and shop painting shall be specified in Section 09800.

PART 3 - EXECUTION

3.01 COATING

- A. After fabrication and before installation, all ferrous metal surfaces of pipe supports, hangers, anchors, rods, support pipes, brackets, nuts, bolts, washers and other metal used, shall be either galvanized (except cast or ductile iron), or shall receive the coating as specified in Section 09800.

3.02 SHIPPING, HANDLING, DELIVERY AND STORAGE

- A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.
- B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.

3.03 PREPARATION

- A. Locate hangers, supports and accessories to support piping, valves and at all concentrated loads.
- B. Locate hangers, supports and accessories within maximum span lengths specified to support continuous pipeline runs.
- C. Locate hangers and supports to prevent vibration or swaying and to provide for expansion and contraction.
- D. Install items to be embedded before concrete placement.
- E. Fasten embedded items securely to prevent movement during concrete placement.
- F. Install hanger and support units on piping systems as recommended by manufacturer.
- G. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations.
- H. Ferrous pipe shall be supported by galvanized steel or stainless steel pipe attachments.
- I. Copper pipe shall be supported by plastic-coated or copper-plated steel pipe attachments.
- J. Plastic pipe shall be supported by plastic-coated steel pipe attachments, or with suitable rubber shields.
- K. Stainless steel pipe shall be supported by plastic-coated steel pipe attachments.

3.04 INSTALLATION

- A. Supports and Hangers for Horizontal Pipes.

1. Space supports and hangers for all piping no farther apart than indicated below unless otherwise shown.
 - a. Copper Tube:
 - (1) 2 inches in diameter and smaller: 5 feet
 - (2) Greater than 2 inches in diameter: 8 feet
 - b. Steel Pipe:
 - (1) 1 inch in diameter and smaller: 6 feet
 - (2) Greater than 1 inch in diameter: 10 feet
 - c. Stainless Steel Pipe:
 - (1) 2 inches in diameter and smaller: 5 feet
 - (2) Greater than 2 inches in diameter: 8 feet
 - d. Plastic Pipe:
 - (1) Maximum support spacing for plastic pipe at ambient temperature shall be one-half the above values specified for steel pipe.
 - e. Ductile Iron Pipe:
 - (1) Two supports per length.
 2. Additional supports shall be placed immediately adjacent to any change in piping direction, and on both sides of valves and couplings.
 3. Accurately locate inserts for hanger rods in forms before concrete is placed.
 4. Use expansion anchors only to support rods, hangers and brackets for piping 2-in. and smaller and only if the expansion anchors are designed to carry 100 percent of the full load, hangers and/or bracket and pipe load.
- B. Supports for Vertical Piping.
1. Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve at each floor level.
 2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.

3.05 ACCEPTANCE AND SERVICE

- A. Pipe systems shall be brought to operating pressures and temperatures. Systems shall be cycled to duplicate operating conditions. If any part of the piping support system proves to be defective or inadequate, it shall be repaired or augmented under this section to the satisfaction of the Engineer and at no additional cost to the Owner. Contractor shall furnish labor and materials to readjust and correct faults with hangers and supports for the piping systems.

END OF SECTION

SECTION 15042 - DUCTILE IRON PIPE

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, and incidentals required and install ductile iron pipe, and ductile iron fittings for buried piping and above grade piping as shown on the drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

Section 09800 - Protective Coatings
Section 15000 - Pipe Supports

1.03 QUALITY ASSURANCE

- A. The Contractor shall obtain ductile iron pipe and fittings from no more than one manufacturer.
- B. Reference Standards: The material furnished and installed under this Section shall comply with the latest editions of the following:
 - 1. AWWA C104, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C110, Gray-Iron and Ductile-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
 - 3. AWWA C111, Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
 - 4. AWWA C115, Flanged Ductile- Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 5. AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 - 6. AWWA C151, Ductile-Iron Pipe, Centrifugally Cast.

1.04 SUBMITTALS

- A. The Contractor shall submit complete information on pipe and fittings including definitive demonstration of compliance with all applicable standards.
- B. The Contractor shall submit, and shall comply with, the recommendations of the pipe manufacturer for handling, storing, and installing pipe and fittings.
- C. The Contractor shall submit the pipe manufacturer's certification of compliance with the specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Ductile iron pipe shall conform to AWWA C151. Thickness of flanged pipe shall be Special Class 53 for 54" diameter and smaller. Fittings shall meet the requirements of AWWA C110.
- B. Flanged joints shall be provided for exposed locations. Pipe barrels shall conform to AWWA C151. Flanges shall be ductile iron in accordance with AWWA C115. The bolt holes shall be aligned per AWWA C115. Flanges shall be factory installed. Flanges shall conform to the drilling and facing of ANSI B16.1 Class 125 flanges.
- C. Fittings shall be ductile iron as specified herein. Flanges and flanged fittings shall be flat face and shall conform to ANSI A21.10 for 150 psi pressure rating. Fittings shall be full size.
- D. Full face gaskets designed specifically for the unique surface of ductile iron shall be used. Flat rubber gaskets shall not be used. All nuts and bolts shall be 316 stainless steel with anti-seize compound.
- E. Interior Lining
 - 1. Interior surfaces of pipe shall be cleaned and lined in the factory with a NSF 61 certified cement mortar lining in conformance with AWWA C104. Lining shall be double thickness for pipe to be used in waterlines. Pipe to be used in wastewater lines shall have a ceramic epoxy lining as follows:
 - a. Material: Amine cured novalac epoxy containing a minimum of 20 percent by volume ceramic quartz pigment meeting all the performance characteristics of Protecto 401 or equal coating system. Certification of test results for coating system shall be submitted.
 - b. Surface Preparation: The surface shall be prepared in strict accordance with the coating system manufacturer's procedures.
 - c. Application: Coating system shall be factory applied by the ductile iron pipe manufacturer.
 - d. Lining Thickness: Pipe shall receive 40 mils, minimum dry film thickness of coating.
 - e. Inspection: Pipe lining shall be checked in the factory for thickness using a magnetic film thickness gauge using the method outlined SSPCPA-2 Film Thickness Rating. Interior lining of pipe and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.
 - 2. Interior surfaces of fittings shall be lined in the factory with a NSF 61 certified

fusion bonded epoxy lining in conformance with AWWA C116.

F. Exterior Coating

1. Exposed. The exterior surfaces of pipe and fittings which will not be buried shall be coated in conformance with the requirements of Section 9800 - Protective Coating.
2. Buried. The exterior surfaces of pipe and fittings for buried service shall receive factory applied asphaltic coating, 1 mil minimum thickness.

G. Restrained joints shall be Series 1100 MEGALUG mechanical joint thrust restraint as manufactured by EBAA Iron, Inc. or approved equal. Joints shall be furnished with 316 stainless steel T-bolts. All gland bodies, wedges, and wedge activators and bolts shall be fusion bonded epoxy coated. Restrained joints are required at all fittings and at distances indicated on the plans.

2.02 IDENTIFICATION

Each length of pipe and each fitting shall be marked with the name of manufacturer, size and class. All gaskets shall be marked with the name of manufacturer, size, and proper insertion direction.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All piping shall be installed in accordance with recommendations of the pipe manufacturer and as specified herein.
- B. Care shall be taken in handling, storage, and installation of pipe and fittings to prevent injury to the pipe, lining or coating. Every precaution shall be taken to prevent damage to the lining. Pipe shall only be handled from the exterior. No interior handling forks, rods, ropes, straps or other handling means shall be used within the pipe. All pipe and fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coating shall be repaired according to the manufacturer's recommendations.
- C. Flanged faces shall bear uniformly on the gasket, and the bolts shall be tightened in a progressively crisscrossed pattern, such as by tightening the bottom bolt first; then, the top bolt; next, the bolts at either side; and finally, the remaining bolts. This process shall be repeated until all bolts are adequately tightened.
- D. The Contractor shall prevent bending or torsional strains from being applied to

flanges or flanged appurtenances.

END OF SECTION

SECTION 15064 - PLASTIC PRESSURE PIPE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. The Contractor shall furnish all labor, materials, equipment, and incidentals for plastic pressure pipe systems as shown on the Drawings.

1.02 RELATED SECTIONS

Section 02300 - Excavation and Backfill
Section 02580 - Pipeline Installation and Testing
Section 15042 - Ductile Iron Pipe

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
The Contractor shall obtain pipe from no more than one manufacturer.
- B. Reference Standards: The Contractor shall comply with the latest editions of the following:
 - 1. ASTM D1784, Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 2. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 3. AWWA C900 (ANSI A21.4), Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Submittals shall contain the following at a minimum:
 - a. Size, class, and other details of pipe to be used.
 - b. Information on typical joint and harnessing details.
 - c. Description of proposed testing methods, procedures, and apparatus.
- B. Tests: All test reports shall be submitted.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage and handling of pipe, fittings, and specials shall be in complete compliance with the manufacturer's instructions.
- B. All pipe, fittings and accessories shall be handled carefully with approved devices. The Contractor shall not drop or roll pipe off trucks or otherwise drop, roll, or skid pipe. Materials cracked, gouged, chipped, dented, or otherwise damaged shall not

- be used.
- C. Pipe, fittings, and specials shall be unloaded and stored as close to the place where they are to be laid as is practicable to avoid unnecessary handling. Interiors shall be kept free from dirt and foreign matter.
 - D. Piping shall be stored off the ground on wooden pallet or similar.

PART 2 – PRODUCTS

2.01 PIPE

- A. Pipe shall comply with the following standards:
 - 1. Material: ASTM D1784, Cell Classification 12454-B
 - 2. Class 235 DR 18, AWWA C900 for pipe sizes 4” – 12” diameter.
 - 3. Class 165 DR 25, AWWA C900 for pipe sizes 14” – 24” diameter.
- B. Joints shall be:
 - 1. ASTM D1689
 - 2. Type: Integral bell and spigot.
 - 3. Flexible seals: Elastomeric, conforming to ASTM F477.
 - 4. Lubricant: As recommended by manufacturer.
- C. Fittings shall be ductile iron as specified in Section 15042.
- D. Restrained joints shall be Series 2000 PV or 2000 SV MEGALUG mechanical joint thrust restraint as manufactured by EBAA Iron, Inc. or approved equal. Joints shall be furnished with 316 stainless steel T-bolts. All gland bodies, wedges, and wedge activators and bolts shall be fusion bonded epoxy coated. Restrained joints are required at all fittings and at distances indicated on the plans.

2.02 PIPE MARKING

- A. All pipe shall be continually marked at five feet maximum intervals.
- B. Designations shall include:
 - 1. Pipe nominal size.
 - 2. Pipe pressure class or (S)DR designation.
 - 3. AWWA standard designation.
 - 4. ASTM standard designation
 - 5. PVC cell classification, as applicable.
 - 6. Manufacturer's name or trade name and code.

2.03 DETECTOR WIRE

- A. Detector wire shall be minimum AWG 12-gauge solid copper, TWHN insulated. The wire shall be one continuous, unbroken length. The wire shall be high strength with minimum 450 lb. break load.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

1. The Contractor shall install piping as shown on the Drawings, as specified herein, and as recommended by the pipe manufacturer.
2. The Contractor shall request instructions from the Engineer before proceeding if there is a conflict between the Drawings or Specifications and the manufacturer's recommendations.
3. Minimum cover over piping shall be three feet unless otherwise shown or approved by the Engineer.
4. Sewer mains shall be laid at least 10' horizontally and 18" vertically from any water lines (water over sewer). Where water lines cross over sewer lines, the above requirements will be waived if pipe segments are centered to provide maximum spacing of the joints of both water and sewer lines and a vertical separation of at least 18" (water over sewer) is maintained

B. Bedding:

1. Excavation and bedding shall be as defined in Section 02300.

C. Laying Pipe:

1. The Contractor shall comply with manufacturer's instructions, technical specifications, and details on Contract Drawings.
2. Ground water level shall be at least six inches below bottom of trench. Pipe shall not be laid in water. A dry trench shall be maintained until jointing and backfilling are complete.
3. Bell and spigot pipe shall be placed so that bells face the direction of laying, unless otherwise approved by Engineer.
4. The Contractor shall excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
5. Permissible deflections at joints shall not exceed the amount allowed by manufacturer.
6. The Contractor shall ensure that no foreign material enters the piping prior to and during installation.
7. Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris, or other foreign materials shall be completely removed from the pipe interior before it is moved into the trench.
8. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.
9. Every time that pipe laying is not actively in progress, the open ends of pipe shall be closed by a watertight plug.

D. Restraints:

1. The Contractor shall provide and install restrained joints as shown, specified, required, and as recommended by the manufacturer.

E. Transitions from One Type of Pipe to Another:
The Contractor shall provide and install all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe.

F. Backfilling:
1. Backfilling shall be as defined in Section 02300.

3.02 TESTING OF PIPING

A. Testing shall be as defined in Section 02580.

3.03 CLEANING AND DISINFECTION

A. Cleaning and disinfection shall be as defined in Section 02580.

END OF SECTION

SECTION 15110

VALVES AND APPURTENANCES

PART 1 – GENERAL

1.01 Submittals

A. Shop Drawings:

1. Submit for approval detailed drawings, data, and descriptive literature on all valves and appurtenances, including:
 - a. Dimensions.
 - b. Size.
 - c. Materials of construction.
 - d. Weight.
 - e. Protective coating.

B. Manufacturer's Certificates:

1. Submit manufacturer's certificates of compliance with ANSI, AWWA and other Standards listed herein.

C. Manufacturer's Service Report:

1. Certify that valves are properly installed except as noted.
2. Recommend corrective action for any deficiencies noted.

D. Operation and Maintenance Data:

1. Submit a detailed operation and maintenance manual for all valves and appurtenances provided under this Section including the following information:
 - a. Product name and number.
 - b. Name, address and telephone number of manufacturer and local distributor.
 - c. Instruction bulletins for operation, maintenance, and recalibration.
 - d. Complete parts and recommended spare parts lists.

1.02 Product Delivery, Storage and Handling

- A. Handle all valves and appurtenances with care.
- B. Valves and appurtenances which are cracked, chipped, distorted, or otherwise damaged or dropped will not be acceptable.

- C. Store all valves and appurtenances off the ground in enclosed shelter.

1.03 RELATED SECTIONS

13423 – Analysis and Instrumentation

09800 – Protective Coatings

15042 – Ductile Iron Pipe

15064 – Plastic Pressure Pipe

15102 – Electric Actuators for Motorized Valves

PART 2 – PRODUCTS

A. BUTTERFLY VALVES

1. The butterfly valve shall fully conform to AWWA C504 (latest revision) and as described below, Pressure Class 150B or 250B as shown on the plans or in the valve schedule. The valve shall be NSF-61 certified for contact with drinking water and NSF-372 certified lead free.
2. The valve body have integral flanged connections (wafer or lugged type are not acceptable) conforming to ANSI/ASME B16.1 Class 125 or mechanical joint connections conforming to ANSI/AWWA A21.11/C111, as shown on the plans or in the valve schedule.
3. The valve body shall be made from ductile iron conforming to ASTM A536 Grade 65-45-12. Sizes 24-inch and smaller shall have a permanent, transfer molded and vulcanized EPDM-P rubber seat. Sizes 30-inch and larger shall have an EPDM-P rubber seat that is that is mechanically retained in the body without epoxy and field adjustable or replaceable using common hand tools
4. The valve disc shall be made from ductile iron conforming to ASTM A536 Grade 65-45-12 with a 316 stainless steel seat edge
5. Size 24-inch and smaller valve shafts shall be one-piece, larger sizes shall have upper and lower stub shafts. Shafts shall be made from Type 304 stainless steel in Class 150B valves and ASTM A564 Type 17-4PH stainless steel in Class 250B valves. The valve disc shall be attached to the shaft by multiple, mechanically secured stainless steel pins
6. The valve shall have upper and lower self-lubricating shaft bearings. Sizes 24” and larger shall be provided with an adjustable thrust bearing. The shaft shall be sealed with self-adjusting Buna-N or EPDM packing. The actuator

shall not be used to retain the packing and shaft packing leakage shall be prevented from entering the actuator.

7. Ferrous surfaces of the valve body and disc shall be factory coated with NSF-61 certified epoxy.
8. When shown on the plans or in the valve schedule, butterfly valves shall be operated by an electric motor or pneumatic actuator sized per AWWA C504, as specified elsewhere.
9. External fasteners shall be Type 316 stainless steel .
10. Warranty: The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of two years from date of shipment
11. Manufacturer: AWWA C504 Butterfly Valves shall be GA Industries Series 800 as manufactured by VAG USA, LLC Mars, PA USA, or equal.

B. GATE VALVES:

The following requirements are for gate valve sizes 3"-12"

1. Valves shall comply with ANSI/AWWA C515
2. approved by Factory Mutual Research Corporation (FM
3. listed by Underwriters Laboratories, Inc. (UL). Valves with actuators are not listed.
4. tested and certified to ANSI/NSF Standard 61 & 372.
5. suitable for potable water applications.
6. iron body, fully encapsulated resilient wedge type.
7. manufactured in the U.S.A. at an ISO9001 Certified factory.
8. Working temperature: 33°F minimum to 170°F maximum working temperature
9. Working Pressure: 350psi for AWWA, UL and FM
10. non-rising stem type
11. O-ring stem seals
12. have a 2" square wrench nut complying with AWWA C515. Optional hand wheels are available.

13. Flanged Ends with flange drilling complying to ASME B16.1 Class 125 (ISO PN10/PN16 drilling optional). Per ANSI/AWWA C111, working pressure above 250psi requires the use of a special gasket rated for the higher pressure
14. Mechanical Joint Ends complying with ANSI/AWWA C111/A21.11.
15. Inlet flange machined specifically for mating with Tapping Sleeves and Crosses. Raised ring on flange face complies with MSS SP-60. Drilling complies with ASME B16.1 Class 125 flange
16. Standard Mechanical Joint outlet connection complies with ANSI/AWWA C111/A21.11
17. Materials:
 - a. Cap screw – Stainless Steel Type 316.
 - b. Wrench nut – Ductile Iron, ASTM A-536.
 - c. Handwheel – Cast Iron, ASTM A-126, Class B.
 - d. Stuffing box – Ductile Iron, ASTM A-536.
 - e. Stem O-rings – Nitrile, ASTM D2000.
 - f. Anti-friction washers – Acetal.
 - g. Stem – Manganese Bronze, CDA Alloy C67600.
 - h. Bonnet – Ductile Iron, ASTM A-536.
 - i. Bonnet seal – O-ring, Nitrile, ASTM D2000.
 - j. Stuffing box bolts & nuts – Stainless Steel Type 316.
 - k. Bonnet bolts & nuts – Stainless Steel Type 316.
 - l. Disc nut – Bronze, ASTM B-584 Alloy C89833.
 - m. Guide cap bearings – Acetal.
 - n. Disc – 3” Cast Iron, ASTM A-126, Class B
Ductile Iron, ASTM A-536.
 - o. Disc encapsulated – SBR ASTM D2000.
 - q. Body – Ductile Iron, ASTM A-536.
 - r. Coating – inside and outside of valve fully coated to comply with ANSI/AWWA C550 and valve is certified to ANSI/NSF Standard 61 & 372

C. CHECK VALVES

1. The swing check valve shall conform to the design, materials of construction and testing required by AWWA C508 (latest revision) plus be supplied with an outside lever, adjustable counterweight, and adjustable air-cushion chamber to minimize slam and hammer caused by rapid flow reversal.
2. The valve flow area anyplace through the valve shall be no less than the area of the nominal inlet pipe size when the disc has swung no more than 25 degrees away from the seat

3. The swing check valve shall be NSF-61 certified for contact with drinking water and NSF-372 certified lead free
4. The standard valve shall have the same size flanged inlet and outlet connections faced, drilled and of the thickness required by ANSI/ASME B16.1 Class 125 or Class 250, as shown on plans or in the valve schedule
5. Where shown on the plans or in the valve schedule, “increasing size” valves shall be supplied. Single increasing Class 125 flanged valves in sizes 3-inch to 10-inch shall have the outlet expanded one size and double increasing valves in sizes 4-inch to 8-inch size valves shall have the outlet expanded by two sizes
6. The valve body shall be made from cast iron conforming to ASTM A126 Class B with a bolted cover through which all internal parts can be removed for service. The body shall have a mechanically retained and replaceable Type 316 stainless steel seat ring
7. The hinge shaft shall be made from Type 303 stainless steel and be supported at both ends by non-corrosive, lead free bushings. The shaft shall be sealed where it passes through the body by compression packing retained by a packing gland, gland studs and nuts. Non-adjustable or O-ring shaft packing is not acceptable
8. A ductile iron disc arm shall be keyed to and suspended from the hinge shaft. A non-rotational, cast-iron disc with replaceable Buna-N rubber disc seat ring shall be attached to the disc arm by means of a center pin and nut providing 360-degree oscillation. The disc seat ring shall be retained by a Type 316 stainless steel follower ring and stainless-steel screws.
9. Valve closure shall be cushioned by the action of a bronze piston in a bronze cushion cylinder. The cushion chamber assembly shall be non-pivoting and be mounted to the side of the valve body on machined pads without the need for brackets. The amount of cushioning shall be adjustable. Pivoting and/or commercial pneumatic cylinders are not acceptable
10. Cover bolts, nuts and studs shall be zinc plated carbon steel
11. Manufacturer: Cushioned swing check valves shall be VAG/GA Industries Figure 250 (standard), 251 (single increasing), or 252 (double increasing) as manufactured by VAG USA, LLC Cranberry Township, PA USA

D. WAFER STYLE CHECK VALVES

1. Wafer style check valves shall be of the dual disk type with bodies constructed of ductile iron, ASTM A126, Class B. Disc shall be fabricated of ductile iron, ASTM A536 and shall be electroless nickel plated. Body seat material shall be Buna-N. Spring material shall be Type 316 stainless steel. The ends shall be plain. The valve

shall be by APCO; Val-Matic; GA; Keystone or equal.

E. BALL VALVES

1. All thermoplastic ball valves shall be True Union 2000 Industrial type manufactured to ASTM F 1970 and constructed from PVC Type I, ASTM D1784 Cell Classification 12454 or CPVC Type IV, ASTM D 1784 Cell Classification 23447.
2. All O-rings shall be EPDM or FKM. All valves shall have Safe-T-Shear® stem with double O-ring stem seals.
3. All valve handles shall be polypropylene with built-in lockout mechanism.
4. All valve union nuts shall have Buttress threads.
5. All seal carriers shall be Safe-T-Blocked® .
6. All valve components shall be replaceable.
7. All EPDM valves shall be certified by NSF International for use in potable water service.
8. All 1/2" through 4" valves shall be pressure rated to 235 psi, all 6" and 8" Venturied and all flanged valves shall be pressure rated to 150 psi for water at 73°F.

F. WELL SERVICE AIR VALVES

1. Well Service Air Valves suitable for pressures up to 400 psig (2760 kPa) clean or raw water pump discharge service
2. Well Service Air Valves shall be fully automatic float operated valves designed to exhaust air which is present in the pump column on pump startup and allow air to re-enter the column on pump shutdown or should a negative pressure occur.
3. Well Service Air Valves shall be fully automatic float operated valves designed to exhaust air which is present in the pump column on pump startup and allow air to re-enter the column on pump shutdown or should a negative pressure occur
4. The Dual Port Throttling Device (3 in. and smaller valves) shall provide adjustable control of the exhaust rate and allow free flow into the valve through a separate inlet port. The Regulated Exhaust Device (4 in. and larger valves) shall allow free air flow in and out of the valve, close upon rapid air exchange, and control the air exhaust rate to reduce pressure surges

5. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512
6. Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components – Health Effects
7. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body
8. Valve sizes 3 in. (76 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection
9. Valve sizes 4 in. (100 mm) and larger shall have bolted flange inlets equal to the valve size. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.42 for Class 300 ductile iron flanges
10. Valve sizes 6 in. (150 mm) and smaller shall have NPT outlets; larger valves shall have ANSI B16.1 Class 125 outlet flanges
11. The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining
12. The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair
13. Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle
14. The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of .5 in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig (2760 kPa) shall have metal seats with synthetic seals
15. On valve sizes 4 in. (100 mm) and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions
16. Valves 3 in. (75 mm) and smaller will be equipped with a dual port throttling device to control the discharge of air from the valve and allow full vacuum flow through a separate port. The device shall have an externally adjustable

screw and locknut for adjusting the discharge control disc. The disc shall be sized to allow a 5% flow area when fully throttled. The vacuum port shall be equipped with a spring-loaded disc to allow flow into the valve during negative pressure conditions.

17. Throttling devices with a common exhaust and vacuum port are not acceptable. The material of the body shall be consistent with the Well Service Air Valve. The spring shall be ASTM A313 Type 316 Stainless Steel
18. Valves 4 in. (100 mm) and larger will be equipped with a Regulated Exhaust Device to prevent valve pressure surges due to rapid changes in velocity and pressure
19. The Device shall be mounted on the inlet of the Well Service Air Valve, allow free air flow in and restricted flow out of the valve to reduce valve pressure surges
20. The Device shall be a flanged, globe pattern, with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the flow rate through the valve
21. The material of the body shall be consistent with the Well Service Air Valve. The seat and disc shall be Bronze ASTM B584, alloy C83600
22. The Well Service Air Valve body, cover, and baffle shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 cast ductile iron
23. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N.
24. Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550 when specified
25. Low Durometer seat shall be furnished for low pressure applications
26. All Air (Release, Vacuum, etc.) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers

27. The manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals
28. The exterior of the valve shall be coated with a universal alkyd primer
29. Well Service Air Valves shall be Style #140 as manufactured by APCO or approved equal. Air release valves shall be 1", Style @200A with a 3/32" orifice as manufactured by APCO or approved equal.

G. AIR / VACUUM VALVES

1. Air/Vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs. [NOTE: See Air Release Valves for releasing air during system operation and Combination Air Valves for both air release and air/vacuum functions.]
2. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.
3. Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components - Health Effects.
4. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.
5. Valve sizes 3 in. (76 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection.
6. Valve sizes 4 in. (100 mm) and larger shall have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.5 for Class 150 or Class 300 steel flanges
7. The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining
8. The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair.

9. Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle.
10. The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of .5 in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig (2760 kPa) shall have metal seats with synthetic seals.
11. On valve sizes 4 in. (100 mm) and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.
12. The valve body, cover, and baffle shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Class 300 steel valves shall be constructed of ASTM A216 Grade WCB cast steel.
13. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel valves shall have a 316 stainless steel Seat with Buna-N seal to provide an initial contact to Buna-N with final metal to metal contact to prevent over compression of the resilient seal.
14. An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline
15. The Regulated Exhaust Device shall be mounted on the inlet of the Air/Vacuum Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges
16. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size.
17. The material of the body shall be consistent with the Air/Vacuum Valve. The seat and disc shall be bronze.

18. A flanged or screwed outlet connection shall be provided when specified for vault piping.
19. A stainless-steel screened outlet shall be provided when specified for outdoor Installations.
20. Optional body materials include ASTM A536 Grade 65-45-12 ductile iron, ASTM A351 Grade CF8M stainless steel, and ASTM B584 Alloy 836 cast bronze.
21. An optional threaded hood with screen on 1/2 - 4 in (13-100mm) valves when specified.
22. An optional isolation valve shall be furnished under the Air/Vacuum valve when specified. For sizes with threaded inlets, the isolation valve shall be a fully-ported brass ball valve. For sizes with flanged inlets, the isolation valve shall be an AWWA class 150B or 250B Butterfly Valve with quarter-turn gear actuator and handwheel.
23. Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550 when specified.
24. Low Durometer seat shall be furnished for low pressure application.
25. All Air (Release, Vacuum, etc.) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.
26. The manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
27. The exterior of the valve shall be coated with a universal alkyd primer.
28. Air/Vacuum Valves shall be Series 100 as manufactured by Val-Matic Valve and Manufacturing Corporation, Elmhurst, IL, USA or approved equal.

H. TAPPING SLEEVES AND TAPPING SADDLES

1. Tapping sleeves shall be Mueller mechanical joint Mueller Outlet Seal, Ford Stainless Tapping Sleeve Type 304, American Uniseal or Kennedy Square Seal. All sleeves shall have a minimum of 150 psi working pressure. All

sleeves larger than 12 inches shall be ductile iron. All taps shall be machine drilled; no burned taps will be allowed.

2. Tapping saddles may be used on mains 16 inches and larger. Tapping saddles shall be manufactured of ductile iron providing a factor of safety of two and one-half at a working pressure of 250 psi. Saddles shall be equipped with a standard AWWA C-110 flange connection on the branch. Sealing gaskets shall be O ring type, high quality molded rubber having an approximate 70 durometer hardness, placed into a groove on the curved surface of the tapping saddle. Straps shall be of alloy steel. The American tapping saddle, U.S. pipe ductile non-tapping saddle or an approved equal shall be used. All taps shall be machine cut; no burned taps will be allowed. Saddles may be used for taps one-half the size of the main or less (i.e., eight-inch tapping saddle for use on a 16-inch main). Sleeves shall be used on taps over one-half the size of the main.

I. LINE STRAINERS

1. "Y" Type Strainers

- a. Manual strainers furnished for pipe diameters smaller than 2-in shall be "Y" type, capable of removing solids 0.01-in in diameter and larger. The strainer body shall be of semi-steel construction for steel pipe and brass or bronze for copper pipe and shall conform to the latest revision of ASTM A278, Class 30. Strainer elements, including woven wire mesh, shall be constructed of stainless steel.
- b. The design of the strainer body shall be such that the cleanout plug and screen may be easily removed to permit inspection and cleaning without disassembly of the inlet and outlet piping. End connections shall be ANSI screwed pipe threads.
3. Sufficient spare screen shall be furnished for replacement of all "Y" type units at least once. The strainers shall be designed for a maximum operating pressure of 150 psig. They shall be as manufactured by GA Industries Inc., Pittsburg, PA or equal.

2. Manual Basket Strainer

- a. Manual basket strainers shall be furnished for pipe diameters 2-in in diameter and larger, as shown on the Drawings. The strainer body shall be of cast iron construction. The strainer elements, including woven wire screen, shall be constructed of Type 304 stainless steel. The design of the basket strainer body shall be such that the bolted lid and basket may be easily removed for inspection and cleaning without disassembly of the inlet and outlet piping.

- b. A trap with a blow-off port shall be provided for removing any material that may settle at the bottom. The strainers shall be designed for a maximum operating pressure of 150 psig, and shall be 74-DS as manufactured by GA Industries Inc., Pittsburg, PA or equal.
- c. Proper blowoff piping with valve shall be supplied and run to nearest drain.
- d. Strainer for the biofilter shall be a 2-inch duplex manual basket strainer with three way valves, differential pressure gauge, and toggle-type bolts permitting rapid removal of the baskets. Body shall be constructed of PVC. Screens shall be 304 stainless steel with 200 mesh.

PART 3 - EXECUTION

3.01 Installation

- A. Install all valves and appurtenances in accordance with manufacturer's instructions.
- B. Install suitable corporation stops at all points shown and required where air binding of pipelines might occur.
- C. Unless otherwise approved install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment, or other causes.
- D. Valve boxes shall be set plumb and centered with the bodies directly over the valves. Earth fill shall be carefully tamped around each valve box to a distance of four feet on all sides of the box, or to the undisturbed trench face, if less than four feet

3.02 Field Test and Adjustments

- A. Adjust all parts and components as required correct operation.
- B. A factory-trained representative shall be made available for start-up service, inspection, and necessary adjustments. Representative shall provide operator training class.

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SECTION 15140

PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals and install pipe hangers, supports, concrete inserts and anchor bolts including all metallic hanging and supporting devices for supporting non-buried piping as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete is included in Division 3.
- B. Miscellaneous metal is included in Section 05500.
- C. Field painting is included in Section 09800.
- D. Pipe and fittings are included in the respective sections of Divisions 13 and 15.
- E. Valves and appurtenances are included in Section 15110.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, complete sets of shop drawings of all items to be furnished under this Section. Submittals shall include complete layouts, schedules, location plans and complete total bill of materials for all pipe support systems.
- B. Submittals shall include a representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions, and range of pipe sizes for which that hanger is suitable. Where standard hangers and supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special hanger and support.
- C. Submittals shall include complete piping drawings indicating type of hanger and support, location, magnitude of load transmitted to the structure and type of anchor, guide and other pipe supporting appurtenances. Submittals shall use detail numbers as shown on the Drawings to indicate the type of support proposed wherever possible.
- D. Types and locations of pipe hangers and supports shall also be shown on the piping layouts for each piping submittal as specified in the respective Division 13 and 15 Pipe Sections.
- E. Submit complete design data for pipe support systems to show conformance with this Section.

1.04 REFERENCE STANDARDS

- A. Manufacturer's Standardization Society (MSS)
 - 1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
- B. American Society for Testing and Materials (ASTM)
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- C. American National Standards Institute (ANSI)
1. ANSI B31.1 - Power Piping.
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All hangers, supports and appurtenances shall conform to the latest applicable requirements of ANSI B31.1.0, except as supplemented or modified by the requirements of this Section.
- B. All hangers, supports and appurtenances shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for all supporting equipment, with the exception of springs, shall be five times the ultimate tensile strength of the material, assuming 10-ft of waterfilled pipe being supported.
- C. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, submit certification stating that such requirements have been complied with.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All supports and hangers shall be crated, delivered, and uncrated so as to protect against any damage.
- B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.
- C. Finished iron or steel surfaces not galvanized or painted shall be properly protected to prevent rust and corrosion.

PART 2 PRODUCTS

2.01 GENERAL

- A. All of the equipment specified herein is intended to support the various types of pipe and piping systems. The details shown on the Drawings are intended to indicate the generally desired methods of support under normal conditions. Develop final details and any details associated

with special conditions not already covered to meet the system conditions specified in the respective Division 13 and 15 Pipe Sections.

- B. All pipe and tubing shall be supported as required to prevent significant stresses in the pipe or tubing material, valves, fittings, and other pipe appurtenances and to support and secure the pipe in the intended position and alignment. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces and all probable external forces such as equipment, pipe, and personnel contact. Any structural steel members required to brace any piping from excessive dislocation shall conform to the applicable requirements of Section 05500 and shall be furnished and installed under this Section.
- C. Hangers and supports shall be spaced in accordance with ANSI B31.1 except that the maximum unsupported span shall not exceed 10-ft unless otherwise specified herein.
- D. Where flexible couplings are required for equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc, shall be rigidly supported.
- E. All pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- F. All rods, clamps, hangers, inserts, anchor bolts, brackets and components for interior pipe supports shall be furnished with galvanized finish, hot dipped or electro-galvanized coated, except where field welding is required. Interior clamps on plastic pipe shall be plastic coated. Supports for copper pipe shall be copper plated or shall have a 1/16-in plastic coating. All rods, clamps, hangers, inserts, anchor bolts, brackets and components for exterior pipe and pipe within outdoor structures shall be of Type 316 stainless steel.
- G. Supports shall be sufficiently close together such that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports.
- H. All un-insulated non-metallic piping such as PVC, CPVC, etc, shall be protected from local stress concentrations at each support point. Protection shall be provided by galvanized steel protection shields or other methods as approved by the Engineer. Where pipes are bottom supported 180 degrees, arc shields shall be furnished. Where 360-degree arc support is required, such as U bolts, protection shields shall be provided for the entire pipe circumference. Protection shields shall have an 18-gauge minimum thickness, not be less than 12-in in length and be securely fastened to pipe with stainless steel or galvanized metal straps not less than 1/2-in wide.
- I. All insulated pipes shall be furnished with a rigid foam insulating saddle at each pipe support location as specified under respective pipe insulation. Provide galvanized protection shields as specified in Paragraph 2.01H above at each location.
- J. Where pipe hangers and supports come in contact with copper piping provide protection from galvanic corrosion by; wrapping pipe with 1/16-in thick neoprene sheet material and galvanized protection shield; isolators similar to Elcen, Figure No. 228; or copper plated or PVC coated hangers and supports.
- K. Pipe supports shall be provided as follows:

1. Cast iron and ductile iron piping shall be supported at a maximum support spacing of 10-ft with a minimum of one support per pipe section at the joints.
 2. Steel and stainless-steel piping 2-1/2-in or larger diameter shall be supported at a maximum support spacing of 10-ft with a minimum of one support per pipe section at the joints.
 3. Support spacing for steel and stainless-steel piping 2-in, and smaller diameter and copper tubing shall not exceed 5-ft.
 4. Supports for multiple PVC plastic piping shall be continuous wherever possible. Individually supported PVC pipes shall be supported as recommended by the manufacturer except that support-spacing shall not exceed 3-ft. Multiple, suspended, horizontal plastic PVC pipe runs, where possible, shall be supported by ladder type cable trays such as the Electray Ladder by Husky-Burndy; the Globetray by the Metal Products Division of United States Gypsum or equal. Ladder shall be of mild steel construction. Rung spacing shall be 12-in. Tray width shall be approximately 6-in for single runs and 12-in for double runs. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc, required for a complete support system. 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. Spacing between clamps shall not exceed 9-ft. 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.
 5. All vertical pipes shall be supported at each floor or at intervals of not more than 12-ft by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to insure rigid construction.
 6. Pipe supports shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
 7. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or as specified herein. No piping shall be supported from other piping or from metal stairs, ladders, and walkways, unless specifically directed or authorized by the Engineer.
 8. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
 9. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.
- L. Unless otherwise specified herein, pipe hangers and supports shall be as manufactured by Anvil International, Portsmouth, NH; Carpenter & Patterson, Inc., Woburn, MA; F & S Central, Brooklyn NY; Elcen Metal Products Co., Franklin Park, IL and Unistrut Northeast, Cambridge, MA or equal. 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.
- M. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes, concrete, and anchor

hardware similar to items previously specified herein and shall be subject to the approval of the Engineer.

- N. Anchor bolts shall be equal to Kwik-Bolt as manufactured by the McCulloch Industries, Minneapolis, MN or Wej-it by Wej-it Expansion Products, Inc., Bloomfield, CO. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1-in behind the steel reinforcement.

2.02 SINGLE PIPE HANGERS

- A. Single pipes shall be supported by hangers suspended by galvanized steel rods from structural steel members, concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets.
- B. Hanger rods shall be hot rolled steel, machine threaded and galvanized after fabrication. The strength of the rod shall be based on its root diameter.
- C. Except as otherwise specified herein, pipe hangers shall be adjustable clevis type similar to Anvil, Figure No. 65,260 and 590 as required. Hangers shall be carbon steel with a galvanized finish.
- D. Steam cleaning piping shall be supported by adjustable type pipe roller supports. Roller support shall have cast iron roll and sockets, steel roll rod and continuous threaded galvanized rods and hex nuts similar to Anvil, Figure No. 177.
- E. Hanger rods shall be attached to concrete structures using concrete inserts similar to F&S Figures 180, 571 or 150. Inserts shall be malleable iron, or steel with galvanized finish. Beam clamps, C clamps or welded beam attachments shall be used for attaching hanger rods to structural steel members. Where necessary and approved by the Engineer, double expansion shields shall be used for attaching to concrete structures.
- F. Where pipes are near walls, beams, columns, etc, and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and Patterson, Figure No. 69-68, 84 or 139 shall be used for hanging pipe. Brackets shall be galvanized. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.03 MULTIPLE PIPE HANGERS

- A. Suspended multiple pipes, running parallel in the same horizontal plane, which are adjacent to each other shall be suspended by trapeze type hangers or wall brackets. Trapeze hangers shall consist of galvanized structural steel channel supported from galvanized threaded rod or attached to concrete walls, columns or structural steel support members as required to meet the intent of this Section. Channel shall be similar to F&S, Figure 710, rods, concrete inserts, "C" clamps, beam clamps, welded beam attachments and expansion shields shall be as specified in Paragraph 2.02 above.
- B. Except as otherwise specified herein pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chairs similar to F&S, Figures 158, 419, 160A, 160B as required. Material of construction shall be galvanized steel. Chair "U" bolts shall be tightened to allow freedom of movement for normal expansion and contraction except where pipe must be anchored to control direction of movement or act as a thrust anchor.

2.04 SINGLE AND MULTIPLE PIPE SUPPORTS

- A. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods as shown on the Drawings and as specified herein.
- B. Pipes 3-in in diameter and larger shall be supported by adjustable stanchions similar to F&S, Figure 427, constructed of galvanized steel. Stanchions shall provide at least 4-in adjustment and be flange mounted to floor.
- C. Pipes less than 3-in in diameter shall be held in position by supports fabricated from steel "C" channel, welded post base similar to Unistrut, Figure P2072A and pipe clamps similar to Unistrut, Figures P1109 through P1126. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by horizontal member of sufficient load capacity to support pipe. Wherever possible supports shall be fastened to nearby walls or other structural member to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support. All support, unless specified elsewhere shall be galvanized.
- D. Where shown on the Drawings, pipe shall be supported using concrete anchor posts. Pipe shall be securely fastened to concrete anchor posts using suitable metal straps as required and approved by the Engineer.

2.05 WALL SUPPORTED PIPES

- A. Single or multiple pipes located adjacent to walls, columns, or other structural members, whenever deemed necessary, shall be supported using welded steel wall brackets similar to Carpenter and Patterson, Figure No. 69-78, 84, or 134; or "C" channel with steel brackets similar to Unistrut pipe clamps. All members shall be securely fastened to wall, column, etc, using double expansion shields or other methods as approved by the Engineer. Additional wall bearing plates shall be provided where required.
- B. Pipe shall be attached to supports using methods specified herein to meet the intent of this Section.
- C. All supports shall be galvanized.

2.06 BASE ANCHOR SUPPORT

- A. Where pipes change direction from horizontal to vertical via a bend, a welded or cast base anchor support shall be installed at the bend to carry the load. The bend anchor shall be fastened to the floor and double expansion shields, or other method as approved by the Engineer.
- B. Where shown on the Drawings, pipe bends shall be supported using concrete anchor posts. Pipes shall be securely fastened to concrete supports with suitable metal bands as required and approved by the Engineer.

2.07 VERTICAL PIPE SUPPORTS

- A. Where vertical pipes are not supported by a Unistrut system as specified in Paragraph 2.08 below, they shall be supported in one of the following methods.

1. For pipes 1/4-in to 2-in in diameter, an extension hanger ring shall be provided with an extension rod and hanger flange. The rod diameter shall be as recommended by the manufacturer for the type of pipe to be supported. The hanger ring shall be galvanized steel or PVC clad depending on the supported pipe. The hanger ring shall be equal to Carpenter & Paterson, Figure No. 81 or 81CT. The anchor flange shall be galvanized malleable iron similar to Carpenter and Patterson, Figure No. 85.
2. For pipes equal to or greater than 1/2-in in diameter extended pipe clamps similar to Carpenter and Patterson, Figure No. 267 may be used. The hanger shall be attached to concrete structures using double expansion shields, or to steel support members using welding lugs similar to Carpenter and Patterson, Figure No. 220.
3. Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs. Riser clamps shall be galvanized steel similar to Carpenter and Patterson, Figure No. 126. Copper clad or PVC coated clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser clamps.
4. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding 12-ft shall be supported by approved pipe collars, clamps, brackets, or wall rests at all points required to insure a rigid installation.

2.08 SPECIAL SUPPORTS

- A. Pipe supports shall be provided for closely spaced vertical piping systems as shown on the Drawings or as otherwise required to provide a rigid installation. The support system shall consist of a framework suitably anchored to floors, ceilings and walls and be as manufactured by the Unistrut Corporation; Globe-Strut by the Metal Products Division of U.S. Gypsum or equal.
- B. Vertical and horizontal supporting members shall be U shaped channels similar to Unistrut, Series P1000. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut, Series P1100M and Series P2558. All components shall be of mild steel.
- C. The assemblies shall be furnished complete with all nuts, bolts and fittings required for a complete assembly including end caps for all members.
- D. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings, as specified above, shall be submitted, and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.
- E. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes in accordance with applicable provisions of Section 05500, have anchor hardware similar to items previously specified herein, shall meet the minimum requirements listed below and be subject to the approval of the Engineer.
 1. Pipe support systems shall meet all requirements of this Section and all related Sections.
 2. Complete design details of the entire pipe support system shall be provided for review by the Engineer in the submittals specified in Paragraph 1.03 above.

3. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

2.09 SURFACE PREPARATION AND SHOP PRIME PAINTING

- A. All surfaces shall be prepared, and shop painted as part of the work of this Section. Surface preparation and shop painting shall be as specified in Section 09800.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All pipes, horizontal and vertical, requiring rigid support shall be supported from the building structure by approved methods. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or specified herein. No piping shall be supported from metal stairs, ladders and walkways unless specifically directed or authorized by the Engineer.
- B. All pipe supports shall be designed with liberal strength and stiffness to support the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement and pressure forces, thermal expansion and contraction, vibrations, and all probable externally applied forces. Prior to installation, all pipe supports shall be approved by the Engineer.
- C. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings, and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
- D. Inserts for pipe hangers and supports shall be installed on forms before concrete is placed. Before setting these items, all Drawings and figures shall be checked which have a direct bearing on the pipe location. Responsibility for the proper location of pipe supports is included under this Section.
- E. Continuous metal inserts shall be embedded flush with the concrete surface.

3.02 TESTING

- A. All pipe support systems shall be tested for compliance with this Section. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. If any part of the pipe support system proves to be defective or inadequate, it shall be repaired or augmented under this Section to the satisfaction of the Engineer.

END OF SECTION

SECTION 15183

GAUGES

PART 1 – GENERAL

1.1 - DESCRIPTION

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals required to provide all gauges and appurtenances as shown on the Drawings and as specified herein.

1.2 - QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
- B. Gauges and appurtenances shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service.
- C. All gauges and appurtenances shall be provided by a single supplier.
- D. All gauges and appurtenances shall be new and unused.

PART 2 - PRODUCTS

2.1 - GAUGES

- A. Bosses, connections, or nipples for gauges shall be provided as acceptable to the Engineer. Unbossed tappings shall not be used.
- B. Gauges shall be furnished as part of a complete factory assembly, including gauge, liquid fill, diaphragm seal, isolation valve, and threaded 316 stainless steel connecting piping.
- C. The Contractor shall furnish supports, or attach gauge assemblies to the water piping supports, where applicable.
- D. Gauges shall be as shown in the instrument schedule on the Drawings.
- E. Liquid service pressure gauges shall have a Type 304 stainless steel case that shall be 4½ inch nominal diameter. Pressure gauges shall have a full-sized Type 316 stainless steel Bourdon tube, and a 400 series stainless steel movement. The gauges shall be liquid filled with glycerin, unless otherwise noted, and shall be provided with a filler/breather cap. The socket shall be ½ inch NPT Type 316 stainless steel with a bottom connection, and the dial shall be a white background with black markings. The dial shall have units as shown in the instrument schedule on the Drawings. Gauges shall have a clear crystal window. Gauges

shall be ANSI Grade A plus or minus 1 percent of scale and shall have a blow-out back design.

- F. Gas service gauges shall be as required for liquid service, except that materials and liquid fill shall be as required for the particular gas service. Chlorine gas service shall have Monel tube and socket, with Halocarbon fill.

2.2 - DIAPHRAGM SEALS FOR GAUGES

- A. Diaphragm seals shall be installed for all gauges, for protection from contact with the fluid in the pipeline. Glycerin, unless otherwise noted, shall fill between the diaphragm seal and the gauge.
- B. Diaphragm seals shall be minimum 3½ inch diameter. The diaphragm seal shall have threaded connections for both piping and gauges. A ¼ inch back-flushing threaded connection with plug shall be included. Plug material shall match that of the housing.
- C. Diaphragm seals shall have an upper and lower housing of Type 316 stainless steel. Clamps, bolts, and nuts shall be Type 304 stainless steel. Diaphragms shall be Teflon, unless otherwise noted.
- D. Interconnecting piping size and diaphragm tap size shall match the size of the gauge tap on the equipment or pipe and shall not be less than ½ inch. A Type 316 stainless steel isolation ball valve and union fitting between the pipeline or equipment and the diaphragm seal shall be included.
- E. For chlorine service, diaphragm seals shall be tantalum. Chlorine service housing shall be Monel Type 400 for both lower and upper sections. Chlorine service filling fluids shall be of the inert type that will not oxidize in the presence of chlorine, such as Halocarbon or Flurolube. Chlorine service assembly shall be furnished with Monel 400 bar stock needle valve isolation.
- F. Diaphragm seals shall be as shown in the instrument schedule on the Drawings.

2.3 - PRESSURE TRANSMITTERS

- A. Pressure transmitters shall have the following characteristics and functionality:
 - 1. 4-20 mA HART communication outputs
 - 2. ½ - 14 NPT power conduit entry
 - 3. Pressure range of 0-150 psi
 - 4. Ambient temperature limit -40 to 185 °F
 - 5. 0-100 percent relative humidity
 - 6. 316L Stainless Steel NPT female connection to process piping
 - 7. 316L Stainless Steel isolating diaphragm
 - 8. LCD display with local operator interface

9. Stainless steel mount bracket and bolts
10. Reference accuracy of ± 0.075 percent of calibrated span
11. Vibration effect of less than ± 0.1 percent
12. Power supply effect of less than ± 0.005 percent
13. Enclosure meeting NEMA 4X requirements
14. Buna-N O-rings
15. Silicone fill fluid

B. Pressure transmitters shall be NSF certified (drinking water)

PART 3 – EXECUTION

3.1 - INSTALLATION

The Contractor shall install all gauges and appurtenances in accordance with the manufacturer's instructions.

END OF SECTION

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SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: This section provides basic electrical requirements.

1.02 BASIC ELECTRICAL REQUIREMENTS

- A. Quality Assurance:
 - 1. Workers possessing the skills and experience obtained in performing work of similar scope and complexity shall perform the Work of this Division.
 - 2. Refer to other sections of the Specifications for other qualification requirements.
- B. Drawings and Specifications Coordination:
 - 1. For purposes of clearness and legibility, Drawings are essentially diagrammatic and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.
 - 2. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduit. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.
 - 3. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.
 - 4. Equipment and connection locations shall be coordinated with construction elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity.
 - 5. Coordinate electrical Work with all other Work.
 - 6. The scope of the electrical work includes furnishing, installing testing and warranty of all Electrical work and complete electrical systems shown on the electrical drawings and specified herein.
 - 7. The drawings and specifications complement each other and together complete the contract documents for the electrical work included in this project. Neither the drawings or the specifications are complete without the other. Any item mentioned in either document is binding. Where conflicts arise between the drawings and the specifications, the more stringent requirement shall prevail.
 - 8. The contractor shall provide and install all electrical systems to provide a complete package as indicated by the contract documents. The documents are intended to provide an outline for the required installations. The contractor shall ultimately provide a complete and operational system at the conclusion of the project.

9. Details are provided as they relate to the installation. Contractor shall provide and install all miscellaneous components, parts, materials, fasteners, splices, and any other incidental items necessary to provide a complete installation.
- C. Terminology:
1. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts.
 2. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.
- D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.
- E. Structural Considerations for Conduit Routing:
1. Where conduits pass through or interfere with any structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other elements, contractor shall submit shop drawings to the engineer for approval.
- F. Electrically Operated Equipment and Appliances:
1. Furnished Equipment and Appliances:
 - a. Work shall include furnishing and installing wiring enclosures for, and the complete connection of electrically operated equipment and appliances and electrical control devices which are specified to be furnished and installed in this or other sections of the Specifications, wiring enclosures shall be concealed except where exposed Work is indicated on the Drawings.
 - b. Connections shall be provided as necessary to install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets are of incorrect electrical characteristics or any specified equipment fails to operate properly, repair and/or replace the outlet and/or equipment.
 2. Equipment and Appliances Furnished by Others:
 - a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the Owner," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.
 - b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and

installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for control systems, furnished under other Divisions. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

- c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.
- d. Equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise. If electrical connections exceed the requirements of the specified equipment, it shall be the responsibility of the contractor or vendor supplying the equipment to compensate the electrical contractor for any and all work to make the electrical connections to the equipment being supplied. Any discrepancies shall immediately be brought to the engineers' attention for coordination between all other disciplines. All increased costs shall be the responsibility of the contractors, not the owner or engineer.
- e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

G. Protection of Materials:

- 1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.

H. Cleaning:

- 1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.
- 2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.
- 3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

I. Permits and Regulations:

- 1. Include payment of all permit and inspection fees applicable the work in this Division.
- 2. Work must conform to the National Electric Code, National Electrical Safety Code, and other applicable local, state, and federal laws, ordinances, and

regulations. Where drawings or specifications exceed code requirements, the drawings and specifications shall govern. No work shall be installed which is less than minimum legal standards.

3. All work performed under this Division shall be inspected and approved by the Local Authority having Jurisdiction.

J. Site Inspection:

1. Each and all bidders shall inspect the project site prior to bidding.
2. Existing site conditions shall be compared with the information shown on the drawings. Immediately report any discrepancies to the engineer. After project bid date, no allowances will be made for failure to have made inspections.
3. During construction, the contractor shall exercise care and take appropriate precautionary measures to prevent any damage to the existing structures, sidewalks, utilities, communications, etc. during the project. The Contractor shall correct all damage caused by or during the project. Contractor shall provide not less than (2) and not more than (10) working days advance written, electronic, or telephonic notice of the commencement, extent, location and duration of the excavation work to Louisiana One-Call System and any nonmembers operator(s) of any underground utility lines or underground facilities in and near the excavation area, so that Louisiana One-Call System operator(s) and any non-member operator(s) may locate and mark the location of underground utility lines and underground facilities in the excavation area.

K. Utility Company Coordination and Fees:

1. Contractor shall inspect and verify the existing utilities at the project site prior to bidding.
2. Where applicable, the contractor shall contact the local utility companies to verify service arrangements with each. Install all service entrance conduits, pads, duct banks, etc, to meet the requirements of the respective utility company. In instances where contract documents' requirements are more stringent than utility company requirements, the drawings and specifications shall take precedence.
3. The contractor shall be responsible for and shall include in his bid any and all utility company fees required to provide connections for the project. Contractor shall be responsible for any fees assessed by the utility companies. The Engineer or Owner shall not be responsible for any fees assessed by the utility companies.
4. The Contractor must coordinate with owner during the project for connection of permanent power to the facility, however, the contractor shall not utilize the permanent utilities unless written permission is granted by the owner. The local utility and authority having jurisdiction shall approve when permanent power may be installed in order to provide electrical start-up and check-out of equipment. Upon written permission of use of permanent electrical power, contractors shall pay any charges for power consumption while utilizing permanent power until the building or facility has been accepted by the owner.

L. Temporary Power for Construction:

1. The electrical subcontractor shall provide and install temporary power during the construction period as required to complete the project installation. Contractor shall coordinate with the general contractor, utility company, and/or owner to provide 120/240 volt power for the project. All devices shall be provided with ground fault circuit protection. Power shall be provided in central work area(s). This shall not include any remote power needs for any specific trades. For power requirements at voltages other than those listed above, the contractor shall coordinate connection requirements with the local utility company.
2. All temporary power installations shall meet local and national codes and be approved by the local authority having jurisdiction.
4. Temporary services shall be removed at completion of the project. Permanent utilities shall not be used during the Project except with the written permission of the Owner.

1.03 SUBMITTALS

- A. Where indicated submit to engineer, (7) copies of Shop Drawings including control diagrams, list of materials, catalog cuts, technical data, manufacturer's specifications, and applicable installation details.

1.04 RECORD DRAWINGS

- A. The Electrical subcontractor shall maintain, at the project site, a separate set of prints of the contract documents and shall show all changes and variations, in a neat and clearly discernible manner, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Engineer. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: "2 sets of CDs and prints for Owner's use, one set of CDs, prints for Engineers Records". Delivery of these as-built electronic files and prints are a condition of final acceptance.

1.05 OPERATION AND MAINTENANCE MANUALS

- A. The Electrical subcontractor shall submit to engineer (3) copies each of operating and maintenance manuals for each piece of equipment applicable to the project.
- B. All shop drawings, installation, operation, and maintenance manuals, wiring diagrams, parts lists, and other information including warranties and technical support, shall be obtained from each manufacturer.
- C. Assemble all information into three-ring binders or other suitable binding. Add an index and/or tabbed and labeled sections of all items submitted.
- D. The Electrical subcontractor shall at all times, maintain a clean set of construction document plans on site. Any and all deviations from the construction documents shall be marked, and clearly noted in red ink. All changes shall exactly indicate the revisions or changes to the design documents. Upon completion of the project, (2) clean sets of "red-line" construction as-built documents shall be submitted to the engineer. Unclear, illegible, or inaccurate plans will be returned to the contractor for correction and

resubmission. As-built documents shall be corrected by the Contractor and resubmitted at no additional cost.

1.06 INSPECTIONS AND PUNCH LIST

- A. The Electrical subcontractor shall survey and inspect his work and develop his own punch list to confirm that work is complete and finished. He shall then notify the General Contractor that work is complete and ready for inspection by the Engineer. It is not the Engineers obligation to perform a final inspection until the contractor states his work has been inspected and is complete and ready for final inspection.
- B. Request to the Engineer, or Owner for final inspection may be accompanied by a limited list of known deficiencies with a brief explanation or status of deficiencies and schedule for completion of each. Correction of these items shall be completed within (30) days of inspection or before final acceptance of occupancy.

1.07 WARRANTY

- A. The Electrical subcontractor shall warrant all workmanship, equipment, and materials installed under this contract for a period of (1) year minimum from the date of final acceptance as agreed between the Contractor and the engineer, unless indicated by other sections of these specifications.
- B. Any equipment, materials, etc. proving to be defective during the warranty period shall be corrected or replaced without any expense to the Owner or other parties. This provision shall not be construed to include general maintenance items or luminaire lamps or correcting errors on the part of the owner, owner's personnel, or owner's representative.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and Equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more items of equal and similar materials and construction are required, they shall be of the same manufacturer.
- B. All electrical equipment and materials shall bear the Underwriters Laboratories, Inc. label, and shall comply with the NEC and NFPA requirements as applicable.

2.02 MATERIALS AND EQUIPMENT SELECTION

- A. Selection of Materials and Equipment furnished under this contract shall be determined by the following:
 - 1. Where trade names, brands, and manufacturer's part numbers are listed, the exact equipment listed shall be furnished. Where more than one name is used, the contractor shall have the option of selecting between those specified. All products used shall be equal to that specified and shall be of best quality.
 - 2. When the words "or equal" appear, specific approval must be obtained from the Engineer during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Alternate materials and/or equipment must be submitted for approval a minimum 2 weeks prior to project bid date.
- B. Before bidding, when preparing shop drawings, and prior to rough-in for installation, the contractor shall verify that adequate space is available for entry and installation of the item including any accessories. Also that adequate space is available for servicing equipment and required code clearances are satisfied.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Advise the general contractor or engineer before starting the Work of this Division.
- B. Exposed conduits shall be painted to match the surfaces adjacent to installation. Refer to painting and coating section of specifications.
- C. Salvaged materials, if applicable, removed from buildings shall be removed from the Project site as required by the general contractor.
- D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to nonconstruction personnel.
- E. Where structural components are required to be cored for new conduit runs, separation between cored holes shall be 3 inches edge to edge, unless otherwise required by the Engineer. All coring to be laid out and reviewed by Engineer prior to drilling. Contractor to verify location of structural steel, rebar, stress cabling, or similar prior to lay out.
- F. Electrical equipment shall be braced and anchored as indicated on the Drawings.

3.02 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

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SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Boxes, enclosures, keys and locks.
 - 2. Identifications and signs.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.

PART 2 - PRODUCTS

2.01 BOXES, ENCLOSURES, KEYS AND LOCKS

- A. Outlet Boxes and Fittings:
 - 1. Junction boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
 - 2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting.
 - 3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of defects.
 - 4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting installed.
 - 5. Junction boxes shall be minimum, 4-inch square, 2-1/8 inches deep, depending upon number of conductors or conduits therein.
 - 6. Factory made knockout seals shall be installed to seal box knockouts, which are not intact.
 - 7. Where flexible conduit is extended from flush outlet boxes, provide and install weatherproof universal box extension adapters.
- B. Junction and Pull boxes:
 - 1. Junction and pull boxes, in addition to those indicated, shall only be used in compliance with codes, recognized standards, and Contract Documents.
 - 2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsion and deflecting forces. Boxes shall be furnished with auxiliary angle iron framing where necessary to ensure rigidity.
 - 3. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb. Surfaces of pull and junction boxes and covers shall be labeled in black marker ink designating

system, panelboard and circuit designation contained in box. In exposed Work, designation shall be installed on inside of pull box or junction box cover.

4. Weatherproof NEMA 3R pull and junction boxes shall conform to foregoing for interior boxes with following modifications:
 - a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented to, and trimmed even with, cover all around.
 - b. Surface or semi-flush mounting pull and junction boxes shall be UL, or another Nationally Recognized Testing Laboratory (NRTL) listed as rain-tight and shall be furnished complete with threaded conduit hubs.
 - c. Exposed portions of boxes shall be galvanized and finished with one prime coat and one coat of baked-on gray enamel, unless already furnished with factory baked-on finish.
5. Junction and pull boxes shall be rigidly fastened to structure and shall not depend on conduits for support.
6. Polymer Concrete Boxes (if required):
 - a. Polymer concrete boxes are to be made from aggregates in combination with polymer resin, combined and processed by mixing, molding, and curing, and reinforced with fiberglass.
 - b. Boxes are to be high strength, impact resistant, corrosion resistant, nonflammable, and noncorrosive.
 - c. Enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 "Specification For Underground Enclosure Integrity"
 - d. All components in an assembly (box & cover) are manufactured using matched surface tooling.
 - e. Covers shall be marked as electrical, power, communications, fiber, signal, etc. as required.
 - f. Bottom of box shall be filled with 6" of pea gravel.

C. Keys and Locks:

1. Provide 2 keys with furnished door locks, including cabinet door locks and enclosure or panel locks, and 2 keys with interlocks or other furnished lock switches.

2.02 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Provide identification plates for the following unless otherwise specified, for control panels, push-button stations, time switches, contactors, disconnect switches, motor starters, motor switches, terminal cabinets.
2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. Identification plates shall indicate panel designation, voltage, and phase of equipment. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.

3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.
- B. Markings:
1. Install identification markings to surface-mounted starters, switches, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; self adhesive plastic, or self sticking laminated plastic labels may be installed.

PART 3 - EXECUTION

3.01 INSTALLATION AND SUPPORT OF BOXES

- A. Install boxes plumb and securely fastened to structure, independent of conduit.

3.02 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

- A. Provide descriptive nameplates or tags permanently attached to circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits.
- B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to engineer before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.
- C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.
- D. Provide circuit identification cards and cardholders in all control enclosures. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area and connected load.

3.03 PROTECTION

- A. Protect Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

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SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide and install grounding system as indicated or required.
- C. Related Sections:
 - 1. Refer to related sections for their system grounding requirements.
 - 2. Section 16010: Basic Electrical Requirements.

1.02 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. IEEE 142 Green Book.
 - 2. Underwriter's Laboratories (UL).
 - 3. National Electrical Code.
 - 4. Building Industry Consultant Services International (BICSI) (Signal).
 - 5. EIA/TIA (Signal and power).
 - 6. Nationally Recognized Testing Laboratory (NRTL) or equal.

1.03 SYSTEM DESCRIPTION

- A. Metallic objects on the Project site that enclose electrical conductors, or that are likely to be energized by electrical currents, shall be effectively grounded.
- B. Metal equipment parts, such as enclosures, raceways, and equipment grounding conductors, and earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.
- C. Metallic systems shall be effectively bonded to the main grounding electrode system.
- D. A separately derived AC source shall be grounded to the equipment grounding conductor, and to separate "made" electrode of building grounding electrode system.
- E. Electrical continuity to ground metal raceways and enclosures, isolated from equipment ground by installation of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of required size within each raceway connected to isolated metallic raceways, or enclosures at each end. Each flexible conduit over 6 feet in length shall be provided with a green insulated grounding conductor of required size.
- F. Cold water, or other utility piping systems, shall not be utilized as grounding electrodes due to the installation of insulating couplings and non-metallic pipe in such installations.
- G. Non-current carrying metal parts of enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded. Provide a NEC sized grounding conductor in every raceway.

- H. Neutral of service conductors shall be grounded as follows:
 - 1. Neutral shall be grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service equipment or panelboard, or main switch.
 - 2. Equipment and conduit grounding conductors shall be bonded to that grounding point.

1.04 SUBMITTALS

- A. None.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Electrodes shall be copper-clad steel ground rods, minimum ¾-inch diameter by 10 feet long.
- B. Grounding conductors shall be copper, #12 minimum with green insulation, unless noted otherwise.
- C. Ground tails shall be copper, #12 minimum with green insulation, installed in all metallic junction boxes where devices are being installed. Branch circuit ground, junction box, and devices shall be bonded at each junction box.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All grounding shall be installed in accordance with details on drawings and per NEC 250.
- B. Bond all electrical boxes and enclosures.
- C. All conduits shall have a grounding conductor, minimum #12 copper. Conductor size shall be increased based on ampacity and/or phase conductors of the circuit.
- D. Install grounding conductors at each electrical location as noted on drawings.
- E. Grounding electrodes shall be installed in the nearest suitable planting area, where not otherwise indicated on Drawings.
- F. Grounding electrode conductors shall be installed in conduit from the service disconnecting means and extended to the connection point of the grounding electrode.
- G. Grounding rods shall be driven to a depth of not less than 10 feet. If necessary, permanent ground enhancement material, as manufactured by Erico Electrical Products, or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.
- H. Grounding electrodes shall provide a resistance to ground of not more than 25 ohms.
- I. When installing grounding rods, if resistance to ground exceeds 25 ohms, 2 or more rods connected in parallel, or coupled together shall be provided to meet grounding resistance requirements.

- J. Parallel grounding rods shall be connected together with recognized fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.02 TESTING

- A. Test grounding resistance of electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed as follows:
 - 1. Visually and mechanically examine ground system connections for completeness and adequacy.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 16120 - LOW-VOLTAGE CONDUCTORS (600 VOLT AC)

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Low-voltage wire, splices, terminations and installation.

1.02 SUBMITTALS

- A. None.

PART 2 - PRODUCTS

2.01 WIRES

- A. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations, and 75 degrees C. in wet locations and shall be listed by UL Standard 83 for thermoplastic insulated wires, listed by Underwriter's Laboratories (UL) for installation in accordance with Article 310 of the National Electrical Code (NEC). Conductors shall be solid or stranded copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors. Conductors shall be insulated with PVC and sheathed with nylon. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering is not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN, or THHN.
- B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

2.02 STANDARDS

- A. THWN/THHN wires shall comply with the following standards:
 - 1. UL 83 for thermoplastic insulated wires.
 - 2. UL 1063 for machine tool wires and cables.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed and walls are completed.
- B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors

shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer's recommended values

- C. Pressure cable connectors, pre-insulated Scotchlok, 3M, or equal, Y, R or B spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems; except public address and telephone systems.
- D. All Joints, splices, taps, and connections to neutral, bonding or grounding conductors, conductors to ground busses, and transformer connections for wires 6 gauge and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS.
- E. Connections to any bussing and high-press cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade 5 machine screws secured with constant pressure-type locking devices.
- F. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade 5 machine screws secured with constant pressure-type locking devices.
- G. Wiring in panel cabinets, pull boxes, and other cabinets, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In enclosures and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of 9 current carrying conductors may be bundled together.
- H. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.
- I. Maintain the conductor required bending radius.
- J. Neutral conductors larger than 6 gauge, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in cabinet, gutters or pull boxes. Neutral conductors 6 gauge and smaller shall be white color identified throughout their entire length.
- K. Wiring systems shall be free from short circuits and grounds, other than required grounds.

3.02 COLOR CODES

A. General Wiring:

1. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	120/240V	480V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	N/A	Yellow
Neutral	White	

2. For phase and neutral conductors 6 gauge or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

3.03 FEEDER IDENTIFICATION

- A. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.04 TAPE AND SPLICE KITS

- A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 16130 - RACEWAYS, FITTINGS, AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Raceways and wire ways
 - 2. Conduit installation.
 - 3. Underground requirements.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods
- D. Applicable Standards and Codes
 - 1. EIA/TIA 569 Standards.
 - 2. National American Standards Institute (ANSI)
 - 3. National Electrical Manufacturer's Association (NEMA)
 - 4. Nationally Recognized Testing Laboratory (NRTL)
 - 5. National Electrical Code (NEC)
 - 6. Underwriters Laboratory (UL)

1.02 SUBMITTALS

- A. None.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Conduit Materials:
 - 1. Metallic conduit, and tubing shall be manufactured under the supervision of an UL, or another NRTL factory inspection and label service program. Each 10-foot length of conduit and tubing shall bear the UL or another NRTL label and manufacturer's name.
 - 2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. Couplings, elbows, bends, condulets, bushings and other fittings shall be the same materials and finish as the rigid metallic conduit. Fittings, connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.

3. Rigid aluminum conduit shall be corrosion resistant aluminum and manufactured of 6063 alloy in temper designation T-1. It shall be manufactured in accordance with ANSI C80.5. All fittings shall be of the same materials and finish as the aluminum conduit.
 4. Flexible metallic conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1.
 - a. Connectors and couplings shall be required fittings of the type, which threads into convolutions of flexible conduit.
 - b. Nonmetallic flexible conduit is not allowed.
 5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked metallic strip construction, UV rated, with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.
 6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL, or another NRTL, and shall bear the manufacturer's listed marking.
 7. Conduit size shall be 1/2" minimum for above grade installations and 3/4" minimum for below grade or in-slab installations.
 8. Metal Clad (MC) cable system is not allowed.
- B. Sleeves for Conduits: Sleeves shall be adjustable type, of 26 gage galvanized iron, Adjust-to-crete Co. Adjust-to-crete, or Jet Line Products Inc. Jet-Line, or equal.
- C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, or equal.
- D. Wireways shall be 16 gage galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be UL or another NRTL listed, and shall be Square D Type LDG NEMA-1 enclosure for interior applications, or Type RD NEMA-3R enclosure for exterior applications, or equal by Cooper B-line, Hoffman, Wire Guard, or Circle AW.
- E. Pull Wires: Install 1/8 inch polypropylene cords in empty or spare conduits.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

- A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.
2. EMT conduit is not allowed for this project.
3. Flexible metallic conduit shall be installed for final connection of motor terminal boxes, shop equipment, mechanical equipment, and other equipment, or for frequent interchange, and shall be of sufficient length, not exceeding 36 inches, to permit full travel or adjustment of motor on its base. Flexible metallic conduit shall not be used for equipment not requiring adjustment or frequent interchange.
4. Liquid-tight flexible metallic conduit shall be installed at exterior locations or where subject to liquid or oil exposure, except where otherwise specified, for final connection of equipment and as listed above.
5. Connectors for flexible metal conduit and liquid-tight flexible metallic conduit shall be compatible with the conduit, and of the types which threads into convolutions of conduit. Connectors for watertight flexible metal conduit shall be as required for installation and shall be installed to provide a watertight connection.
6. Exposed conduit shall be installed vertically and horizontally following the general configuration of the structure.
7. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.
8. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view shall be installed parallel or at right angles to structural members.
9. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Refer to underground installation, specified in this section, for radius of bends and offsets required for underground installations.
10. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least 6 inches from covering of hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems.
11. Where conduits are terminated in groups at panelboards, switchboards, and cabinets, etc., provide templates or spacers to fasten conduits in proper position and to preserve alignment.
12. Conduits shall be supported as required by code, but not to exceed 10 feet. Where applicable, conduit needs to be rigidly supported every 5 feet and supported within 3 feet of every junction box.
13. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached.

14. Pipe hangers for individual conduits shall be factory fabricated. Steel rods shall be 3/8 inch for 2-inch conduit hangers and smaller and shall be 1/2 inch for 2-1/2 inch conduit hangers and larger.
15. Factory fabricated pipe straps shall be one or 2-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.
16. One inch and smaller exposed conduits shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits. Do not fasten or support conduits with "tie-wire".
17. Bushings and locknuts for rigid steel conduit shall be steel threaded insulating type. Setscrew bushings are not permitted.
18. Flex conduits shall be cut square and not at an angle.
19. Routing of conduits may be changed providing length of any conduit run is not increased more than 10 percent of the length indicated on Drawings.

B. Underground Requirements:

1. Underground conduits and raceways shall be buried to a depth of not less than 24 inches below finished grade to top of the conduit envelope, unless otherwise specified.
2. Assemble sections of conduit with required fittings. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be provided liquid-tight. Bends at risers shall be completely below surface where possible.
3. The architect or engineer will observe underground installations before and during conduit placement. A mandrel shall be drawn through each run of conduit in presence of the architect or engineer before and after placement. Mandrel shall be 6 inches in length minimum, and have a diameter that is within 1/4 inches of diameter of conduit to be tested.
4. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of required solvent-weld cement supplied by conduit manufacturer. Non-metallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1-1/2 inches inclusive shall not be less than 24 inches. Bends at risers and risers shall be galvanized, rigid steel conduit. Conduits below slab shall be painted with epoxy, resin paint.
5. All below grade non-metallic conduits shall have galvanized, rigid steel 90's painted epoxy, resin paint.
6. Furnish and install a 6-inch wide, polyethylene, red underground barrier type 12 inches above full length of conduits reading, "CAUTION ELECTRIC LINE BURIED BELOW".
7. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies requiring service.
8. Protect inside of conduit and raceway from dirt and rubbish during construction by capping openings.

9. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, and manholes. Under floor standing switchboards and motor control centers provide a 4" galvanized nipple with ground bushing.
10. Underground conduit for systems operating above 600 volts shall be a minimum size of 4 inches.
11. All underground conduits and raceways shall be swabbed prior to wire pull.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. Receptacles
 - 2. Switches
 - 3. Coverplates
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings:
 - a. Include manufacturer's cut sheets for each type device being installed listing description, manufacturer, and part number.
 - b. Include manufacturer's cut sheets for each device coverplate being installed listing description, manufacturer, and part number.
- C. Installation Instructions: Submit manufacturer's written installation instructions including any warning labels and instruction manuals.

1.03 QUALITY ASSURANCE

- A. Receptacles shall comply with NEMA WD 1, NEMA WD 6, and UL 498.
- B. Switches shall comply with NEMA WD 1 and UL 20.

PART 2 - PRODUCTS

2.01 RECEPTACLES AND SWITCHES

- A. Receptacles:
 - 1. Color: Coordinate with architect
 - 2. Duplex receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wired with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be impact resistant nylon. Receptacles shall have triple wipe brass power contacts.

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
NEMA 5-20	PS5362	HBL5362	5362

3. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body in color. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure.

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
(20 amps) NEMA 5-20R	2094	GFR5352	8898

4. Provide weatherproof receptacles, except where otherwise indicated or specified, consisting of GFCI receptacles, as specified herein, and metal plates with die-cast hinged, "in-use" covers and weatherproof mats.

B. Switches:

1. Color: Coordinate with architect

2. Local Switches:

- a. Provide local switches, high strength thermoplastic toggle, specification grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double pole, 3-way, 4-way, non-lock type.

	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
Single pole	PS20AC1	HBL1221	1221-2
Double pole	PS20AC2	HBL1222	1222-2

PART 3 - EXECUTION

3.01 INSTALLATION OF DEVICES

- A. Installation shall be in accordance with the NEC and as shown as on the drawings.
- B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper and also connected to the green equipment grounding conductor.
- C. Ensure that devices and their boxes are protected until completion of project.
- D. Keep outlet boxes free of plaster, mortar, cement, paint, dust, or other materials that may contaminate the devices, conduits, wiring, cables, etc.
- E. Do not install wiring devices until all preparation, painting, finishing, is complete.
- F. Do not strip insulation from wiring until devices are being installed.
- G. Replace any devices that have been damaged or show signs of use during construction phase of project before finishes were complete.
- H. Keep devices in their package or protected until time of installation.

- I. Connect devices using pigtail connections of not less than 6". Where conductors larger than #12 AWG have been installed, use #12 AWG for pigtail connections to devices.
 - J. Remove fiber or plastic washers prior to installation to ensure metal-to-metal contact.
 - K. Test wiring devices for damaged conductors, high circuit resistance, poor connections, inadequate fault current path, defective devices, or similar problems using a portable receptacle tester. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.
 - L. Test GFCI devices for tripping values specified in UL 1436 and UL 943.
- 3.02 COVER PLATES
- A. Provide weatherproof, in-use covers as noted on drawings and as required for use.
- 3.03 PROTECTION
- A. Protect Work of this section until Substantial Completion.
- 3.04 CLEANUP
- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

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SECTION 16150 – MOTORS

PART 1 - GENERAL

1.01 DESCRIPTION AND SCOPE

- A. This section:
 - a. Specifies the furnishing, installation and connection of motors.
 - b. Provides guidelines for design and manufacture of low vertical squirrel cage induction motors on NEMA-size frames (thru 445 frame).
- B. Work governed by these specifications includes manufacture, testing and delivery of equipment constructed in accordance with the requirements presented herein.
- C. Contractor shall be responsible for:
 - a. Unloading and installation of motors and all required appurtenances.
 - b. All external connections.

1.02 RELATED WORK:

- A. Section 16050, BASIC METHODS AND REQUIREMENTS (ELECTRICAL): General electrical requirements that are common to more than one Section of Division 16.
- B. Other sections specifying motor driven equipment.

1.03 SUBMITTALS:

- A. In accordance with Section 16050, BASIC METHODS AND REQUIREMENTS (ELECTRICAL), submit the following:
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting details, materials, horsepower, RPM, enclosure, starting characteristics, torque characteristics, code letter, full load and locked rotor current, service factor, and lubrication method.
 - 3. Required with Proposal
 - a. Preliminary Dimension Print and Frame Size
 - b. Approximate Motor Weight
 - c. Complete Motor Nameplate Information
 - d. Motor Performance Data, including the following:

- i. Guaranteed minimum efficiencies at 100%, 75% and 50% of full load.
 - ii. Average expected efficiencies add 100%, 75% & 50% of full load.
 - iii. Locked Rotor Current
 - iv. Full Load Current
 - v. Starting Torque
 - vi. Full Load Torque
 - vii. Breakdown Torque
 - e. If required long term, job site storage requirements.
- 4. Required within six (6) weeks of Purchase Order Award
 - a. Certified Dimension Prints
 - b. Recommended Spare Parts List Priced
 - c. Connection Diagrams

C. Manuals:

- 1. Submit simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets and application data.
- 2. Submit test reports, as specified, with motor upon shipment.

D. Certification: Two weeks prior to final inspection, unless otherwise noted, submit four copies of the following certification to the Resident Engineer:

- 1. Certification that the motors have been properly applied, installed, adjusted, lubricated, and tested.

1.04 APPLICABLE PUBLICATIONS, CODES, AND STANDARDS:

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. National Electrical Manufacturers Association (NEMA):
 - MG 1-98Motors and Generators
 - MG 2-01Safety Standard and Guide for Selection, Installation and Use of Electric Motors and Generators
- C. National Fire Protection Association (NFPA):
 - 70-02.....National Electrical Code (NEC)
- D. American National Standards Institute (ANSI)
- E. Institute of Electrical and Electronic Engineers (IEEE)
- F. Anti-Friction Bearing Manufacturers' Association (AFBMA)

- G. All materials and equipment shall be labeled or listed as being approved by the Underwriters Laboratories (U.L.) whenever applicable.
- H. Equipment offered as meeting the intent of the U.L. requirements may be acceptable subject to the approval of the Purchaser.

PART 2 - PRODUCTS

2.01 MOTORS:

B. Acceptable Manufacturers:

- 1. Motors shall be U.S. MOTORS® brand or approved equal.

C. Design Requirements:

- 1 Motors shall be capable of withstanding all normal forces which may be imposed upon them during the course of normal operation, including starting and normal stops.
- 2 Motors shall be suitable for across-the-line starting and shall be able to start and accelerate the connected load to full load speed with a balanced 90% of rated voltage at the motor terminals.
- 3 Motors shall be capable of continuous operation at full load and rated frequency with a voltage variation of $\pm 10\%$.
- 4 Motors shall be capable of continuous operation at full load and rated voltage with a frequency variation of $\pm 5\%$.
- 5 Motor starting current shall not exceed NEMA Code G for motors 20 H.P. and higher. Standard NEMA codes for 15 H.P. and lower. NEMA Design A is allowed for special performance characteristics.
- 6 Motor installation in hostile environments subject to dust, moisture and/or corrosive atmospheric conditions shall have TEFC motors with all parts given protective treatment such as U.S. MOTORS "CORRO-DUTY®" or equal.
- 7 The motor shall be rated HP and voltage as noted on the drawings, 60 Hz, NEMA style pump base, squirrel -cage induction design.

D. Enclosure:

- 1. Motors shall be furnished with one of the following enclosure types based on the location of installation and the specific requirements for each motor.
 - a. Weather Protected, Type I (WP-I)
 - b. Totally Enclosed, Fan Cooled (TEFC)
 - c. Totally Enclosed, Class I, Group D, Division 1 Explosion-proof (XP)
- 2. Openings on all Weather Protected designs shall be covered with corrosion resistant metal guard screens having a mesh size no larger than $\frac{1}{2}$ inch square.

- a. Weather Protected Type I motors shall be designed to protect internal components from falling water and debris at angles up to 15 degrees from vertical.
 3. Enclosures shall be of fabricated steel or cast iron construction in accordance with the manufacturer's standard design. Canopy caps shall be of aluminum, cast iron, sheet metal or impact resistance plastic and shall be easily removable for maintenance purposes.
 4. Enclosed motors, to be installed in locations where moisture may collect shall be furnished with drain openings and/or plugs. In the case of Explosion-proof motors, breathers and drains shall be furnished and shall be of the type approved by U.L.
 5. Lifting eye bolts on 210 frame and larger.
- E. Mechanical Design
1. All rotating parts shall be individually dynamically balanced so that the motor vibration will not exceed 0.0008 inch, maximum vibration amplitude peak to peak.
 2. Should non-reverse ratchets be specified, reverse rotation shall be limited to 5° maximum.
- F. Stator Construction
1. Stator laminations shall be of fully processed or insulated electrical grade steel.
 2. Stator windings shall be copper magnet wire. Aluminum magnet wire is not acceptable. Coil extensions shall be blocked and braced sufficiently to minimize movement during normal starting and running conditions at full rated voltage.
 3. Insulation
 - a. Insulation system shall be Class B or better.
 - b. Insulation systems shall receive a treatment using a 100% solids resin and moisture resistant systems shall utilize multiple applications on the treatment resin.
 - c. When specified, a completely encapsulated insulation system shall be supplied. This system shall be capable of passing the NEMA MG1-27.1 and shall be VPI 2000 Encapsulation (320 fame and higher), or equivalent system.
 - d. When specified, motors to be rated for variable frequency drive applications shall meet NEMA MG-1 Part 31 dated 1993 and shall be Inverter Grade® insulation system or equal. The insulation system shall be warranted for a minimum of 3 years operation on VFD power which shall not be limited by maximum cable length restrictions.
 4. Temperature rise shall not exceed the limits defined by NEMA for Class B insulation system while operating at nameplate horsepower, frequency and

voltage (for whatever insulation system provided).

5. When approved, in the case of a particular rating where Class F temperature is required, motors shall be furnished with Class H or better insulation.

G. Rotor Construction

1. Rotors shall be of cast or fabricated aluminum in accordance with manufacturer's standard design.

H. Bearings

1. Bearings supplied shall be of type and size sufficient to satisfy thrust loading requirements for each motor in accordance with manufacturer's standard design. Bearings shall be rated for an in-service B-10 life of 8,800 hours.

2. Thrust Bearings

- a. Thrust bearings shall be deep-groove ball, angular contact ball or spherical roller type. Special bearings mounted back-to-back or in tandem are acceptable and may be furnished when required according to manufacturer's standard design.
- b. Deep-groove ball bearings shall be used only on normal thrust design motors and shall be capable of handling thrust loads in either direction.
- c. High thrust design motors shall be supplied with angular contact ball bearings whenever possible and in accordance with manufacturer's standard design.
- d. Where thrust requirements restrict the use of angular contact bearings, spherical roller bearings shall be furnished.
 - i. When required, motors furnished with spherical roller bearings shall also be provided with a system of coils in the oil reservoir for the circulation of cooling water.
 - ii. Spherical roller bearings shall be spring loaded to keep the lower bearing race in contact and prevent bearing damage during starting and momentary upthrust conditions.

3. Guide Bearings

- a. Guide bearings shall be deep-groove ball type and shall be located at the bottom of the motor.
- b. Guide bearings or bearing assemblies shall be provided with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft.

4. Lubrication

- a. Thrust bearings shall be oil or grease lubricated. Oil lubricated bearings contained in an oil reservoir shall have an oil sight level gauge and oil fill and drain openings with plugs.
- b. Deep-groove ball bearings furnished as thrust and guide bearings for normal thrust motors shall be grease lubricated.

- i. Grease lubricated bearings shall be furnished with provisions for in-service positive lubrication. A drain shall be provided to guard against over lubrication.
 - ii. Smaller motors may be provided with sealed lube for life bearings.
 - c. Lubrication instructions attached to each motor at time of shipment.
 - I. Noise Level
 - 1. Sound pressure levels shall be measured according to NEMA and shall not exceed 90 decibels as measured on the A-Weighted Scale at a distance of three (3) feet from any motor surface under no load, free field conditions.
 - J. Nameplates
 - 1. Motor nameplates shall be of stainless steel and shall be securely fastened to the motor frame with pins of a like material.
 - 2. The following information shall be contained on the motor nameplate as a minimum:
 - a. Rated Horsepower
 - b. Full Load Speed
 - c. Frequency
 - d. NEMA KVA Code and Design Letter (when applicable)
 - e. Rated Voltage
 - f. Manufacturer's Serial Number
 - g. Service Factor
 - h. Insulation Class
 - i. Maximum Ambient
 - j. Full Load Current at Nameplate Voltage
 - k. Frame Size Designation
 - K. Terminal Boxes
 - 1. Terminal boxes shall be of fabricated steel or cast iron construction to be compatible with the motor enclosure specified and when possible, shall be diagonally split and capable of rotation in 90° increments. Boxes not suitable for rotation must be capable of four sided entry.
 - 2. The area in which the main terminal box is connected with the motor frame shall be fully gasketed in order to prevent entrance of foreign matter into the motor and to provide support for the stator leads where they pass through the motor frame. UL explosionproof motors will not have gaskets.
 - 3. A properly sized grounding terminal shall be mounted in the main terminal box when specified.
 - L. Leads

1. Main motor leads shall have EPDM or equal type jackets and shall be permanently tagged for identification.

M. Accessories

1. Space Heaters

- a. When specified, motors shall be furnished with space heaters to provide sufficient wattage to maintain the internal temperature of the motor at a level approximately 10°C above the ambient temperature while the motor is not in operation.
- b. Space heaters shall be of the silicone rubber strip type attached directly to the stator end turns. When specified, the leads shall be brought out to an auxiliary terminal box.
- c. Space heaters shall be rated for operation on a single phase, 60 hertz, 120 volt system.

2. Protective Devices

- a. When specified, stator winding protection shall consist of one or more of the following systems:
 - i. Six (6) 120 ohm nickel resistance-type temperature detectors (RTD's) embedded in the stator windings, two (2) per phase. Each detector shall have its leads wired to an auxiliary terminal box.
 - ii. One (1) positive temperature coefficient (PTC) thermistor temperature sensor embedded in each phase of the stator winding and corresponding solid state electronic control. Thermistor system shall be U.S. MOTORS "THERMA-SENTRY", or equal.
 - iii. Three (3) bi-metallic thermostats of the automatic reset type, with normally closed contacts, mounted one per phase. Each thermostat shall be furnished with leads suitable for connection to the control circuit.
- b. When Specified, bearing protection shall consist of one of the following: (Available for U.S. MOTORS Mod- Max line only (320 - 440 Frame WPI)
 - i. Two (2) 120 ohm nickel resistance-type temperature detectors (RTD's), one (1) per bearing, mounted as closely as possible to the outer surface of each bearing. Each detector shall have its leads wired to a terminal block located in an auxiliary terminal box.
 - ii. Two (2) bearing temperature relays one (1) per bearing, furnished with indicating scale.
 - iii. Two (2) dial type thermometers, one (1) per bearing.
 - iv. Two (2) iron or copper constantan thermo-couples, one (1) per bearing.

N. Testing

1. When specified, one (1) motor shall be given a complete initial test in accordance with IEEE 112 method B and shall include the following items:
 - a. Current Balance
 - b. High Potential Test
 - c. Vibration Test
 - d. Winding Resistance
 - e. Locked Rotor Current
 - f. No Load Running Current
 - g. Full Load Heat Run
 - h. Full Load Percent Slip
 - i. Efficiency at 100%, 75% and 50% Load
 - j. Power Factor at 100%, 75% and 50% Load
2. When specified, noise test shall be performed in accordance with ANSI S 12.51, ANSI S 12.54 and ANSI S12.55 as referenced in NEMA MG1 Part 9.
3. Five (5) copies of certified test reports shall be submitted to the purchaser upon completion of all required tests.
4. Purchaser reserves the right to witness any or all of the tests specified to be performed. Prices for this shall be included as a separate item in the seller's quotation.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install motors in accordance with manufacturer's recommendations, the NEC, NEMA, as shown on the drawings and/or as required by other sections of these specifications.

3.02 FIELD TESTS

- A. Megger all motors after installation, before start-up. All shall test free from grounds.

END OF SECTION

SECTION 16230 – EMERGENCY GENERATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Provide all labor, materials, and equipment necessary for a complete and operable emergency/standby electric generating system. Materials and equipment shall be new, and delivered to the project site completely wired, tested, and ready for installation.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods.
 - 3. Section 16060: Grounding and Bonding.
 - 4. Section 16120: Low Voltage Wires.
 - 5. Section 16415: Automatic Load Transfer Switches.
- D. Applicable Codes and Standards:
 - 1. The emergency generator system shall comply with the following codes and standards: NFPA Codes and related adoptions (amendments) by the Local Authorities Having Jurisdiction, IEEE Standards, Environmental Protection Agency (EPA) Emission Standards, and ANSI/NEMA standards.
 - 2. All products shall be listed and labeled for the application by UL or another Nationally Recognized Testing Laboratory (NRTL).
- E. This Section includes packaged engine-generator sets suitable for use in applications with the features as specified and indicated where the engine generators will be used as the Standby power source for the system.

1.02 DEFINITIONS

- A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.
- B. Prime Power (PRP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the PRP unless otherwise agreed by the RIC engine manufacturer.

- C. Limited Time running Power (LTP): Per ISO 8528: The maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers.
- D. Continuous Operating Power (COP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer.
- E. Data Center Continuous (DCC): The maximum power which a generating set is capable of delivering continuously whilst supplying a variable or constant electrical load when operated for an unlimited number of hours in a data center application under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 100 percent of the DCC rating.
- F. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
 - 3. Sound test data, based on a free field requirement.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Wiring Diagrams: Control interconnection, Customer connections.
- C. Certifications:
 - 1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.04 INFORMATIONAL SUBMITTALS

- A. Source quality-control test reports.
 - 1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.
 - 2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.

3. List of factory tests to be performed on units to be shipped for this Project.
4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit manufacturer's warranty statement to be provided for this Project.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within New Orleans of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).
- E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).
- F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.
- G. Comply with UL 2200.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: 0.0 deg C (32.0 deg F) to 40.0 deg C (104.0 deg F).
 2. Relative Humidity: 0 to 95 percent.
 3. Altitude: Sea level to 100.0 feet (30.48 m).

1.07 WARRANTY

- A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.
- B. Extended Warranty: Manufacturer shall offer extend coverage of 2 years from date of registered commissioning and start-up.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: The basis for this specification is Cummins Power Generation equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.

2.02 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
 - 1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.
- C. Capacities and Characteristics:
 - 1. Power Output Ratings (RIVER OAKS):
 - a. Power Output Ratings: Electrical output power rating for Standby operation of not less than 80.0 KW, at 80 percent lagging power factor, 480V, Three phase, 3 -wire, 60 hertz.
 - b. Alternator shall be capable of accepting maximum 100.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.
- D. Generator-Set Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Not more than 15 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.
 - 6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

7. Sustained Short-Circuit Current: (For engine-generator sets using a PMG-excited alternator) For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.
8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.
9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.03 ENGINE

- A. Fuel: ASTM D975 #2 Diesel Fuel
- B. Rated Engine Speed: 1800RPM.
- C. Lubrication System: The following items are mounted on engine or skid:
 1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
 2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions
- E. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.
 1. Designed for operation on a single 120 VAC, Single phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.
 2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.
 3. Provided with a 12VDC thermostat, installed at the engine thermostat housing.
- G. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions.

The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

- H. Cooling System: Closed loop, liquid cooled
 - 1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.
 - 2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 - 5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 - 6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.
- I. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.
- J. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.
- K. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.
 - 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 - 2. Cranking Cycle: As required by NFPA 110 for level 1 systems.
 - 3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.
 - 4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
 - 5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:
 - a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.
 - f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.04 FUEL OIL STORAGE

- A. Comply with NFPA 30.
- B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:
 1. Capacity: Fuel for 48 Hour(s) continuous operation at 100 percent rated power output.
 2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.
 3. Electrical stub up(s)
 4. Normal & emergency vents
 5. Lockable fuel fill
 6. Mechanical fuel level gauge
 7. High and low level switches to indicate fuel level
 8. Leak detector switch

9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.
10. Fill port with overfill prevention valve (OFPV)
11. 5 gallon fill/spill dam or bucket
12. Tank design shall meet the regional requirements for the Project location

2.05 CONTROL AND MONITORING

- A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.
- B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.
- E. Monitoring shall be fully capable of being integrated with customers SCADA controls.
- F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 1. AC voltmeter (3-phase, line to line and line to neutral values).
 2. AC ammeter (3-phases).
 3. AC frequency meter.
 4. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
 5. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.

6. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
 7. DC voltmeter (alternator battery charging).
 8. Engine-coolant temperature gauge.
 9. Engine lubricating-oil pressure gauge.
 10. Running-time meter.
 11. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.) The voltage and frequency adjustment functions shall be disabled when the paralleling breaker is closed.
 12. Fuel tank derangement alarm.
 13. Fuel tank high-level shutdown of fuel supply alarm.
 14. AC Protective Equipment: The control system shall include over/under voltage, reverse kVAR over current, loss of voltage reference, and over excitation shut down protection. There shall be a overload warning, and overcurrent warning alarm.
 15. Status LED indicating lamps to indicate remote start signal present at the control, existing shutdown condition, existing alarm condition, not in auto, and generator set running.
 16. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
 17. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
 18. Data Logging: The control system shall log the latest 20 different alarm and shut down conditions, the total number of times each alarm or shutdown has occurred, and the date and time the latest of these shutdown and fault conditions occurred.
 19. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
- G. Control Heater: Generator sets that are installed in outdoor enclosures, or are in tropical or coastal environments shall be provided with control heaters for anti-condensation protection.
- H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
 2. Coolant low-temperature alarm.
 3. Control switch not in auto position.
 4. Battery-charger malfunction alarm.
 5. Battery low-voltage alarm.
- I. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.
 - J. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.
- 2.06 GENERATOR OVERCURRENT AND FAULT PROTECTION
- A. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.
- 2.07 GENERATOR, EXCITER, AND VOLTAGE REGULATOR
- A. Comply with NEMA MG 1.
 - B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
 - C. Electrical Insulation: Class H
 - D. Temperature Rise: 120 / Class H environment.
 - E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
 - F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
 - G. Enclosure: Drip-proof.
 - H. Voltage Regulator: SCR type, Separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.
 - I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure, or when the generator set is installed in a coastal or tropical environment.
 - J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
 - K. Subtransient Reactance: 15 percent maximum, based on the rating of the engine generator set.
- 2.08 OUTDOOR GENERATOR-SET ENCLOSURE
- A. Description: Sound Attenuated Aluminum housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.

- B. Construction:
 - 1. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.
 - 2. Exhaust System:
 - a. Muffler Location: Within enclosure.
 - 3. Hardware: All hardware and hinges shall be stainless steel.
 - 4. Wind Rating: Wind rating shall be 150 mph
 - 5. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.
 - 6. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
- C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.
 - 1. Louvers: Fixed-engine, cooling-air inlet and discharge.
- D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 74 dBA measured at any location 7 m from the engine generator in a free field environment.
- E. Site Provisions:
 - 1. Lifting: Complete assembly of engine generator, enclosure, and sub base fuel tank (when used) shall be designed to be lifted into place as a single unit, using spreader bars.

2.09 VIBRATION ISOLATION DEVICES

- A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

2.10 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.
 - 2. Full load run.
 - 3. Maximum power.
 - 4. Voltage regulation.
 - 5. Steady-state governing.
 - 6. Single-step load pickup.
 - 7. Simulated safety shutdowns.
 - 8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.
- B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.
- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.
- G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.02 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:
- B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.
- C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.
- D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.03 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.05 SERVICE AND SUPPORT

- A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of \$3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within New Orleans of the site.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.06 SERVICE AGREEMENT:

- A. The supplier shall include in the base price, a one-year service agreement. The maintenance shall be performed by factory authorized service technicians capable

of servicing both the engine generator set and the transfer switch (es). This agreement shall include the following:

1. Generator supplier must have an in-house rental fleet with equipment sized to back up this project site.
2. All engine maintenance as recommended by the service manual.
3. All electrical controls maintenance and calibrations as recommended by the manufacturer.
4. All auxiliary equipment as a part of the emergency systems.
5. The supplier shall guarantee emergency service.
6. All expendable maintenance items are to be included in this agreement.
7. A copy of this agreement and a schedule shall be given to the Owner at the time of his acceptance, showing what work is to be accomplished and when.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.08 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 16270 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: This specification covers single-phase and three-phase general purpose individually mounted dry-type transformers, 600 V maximum, for power and lighting applications. It includes transformers as specified and as indicated on Drawings.
- C. All work, material or equipment shall comply with the codes, ordinances and regulations of the local government having jurisdiction, including the regulations of serving utilities and any participating government agencies having jurisdiction.
- D. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods.
 - 3. Section 16060: Grounding.
 - 4. Section 16120: Low Voltage Wires (600 Volts AC)
 - 5. Section 16130: Raceways, Boxes, Fittings and Supports.
- E. Codes and Applicable standards: Products and installation shall meet or exceed the latest edition of the following standards.
 - 1. ANSI/IEEE C57.96, Distribution and Power Transformers, Guide for Loading Dry-Type Transformers; Appendix to ANSI C57.12 Standards.
 - 2. Department of Energy, Energy Act of 2005.
 - 3. National Electrical Code.
 - 4. ANSI/IEEE C89.2, Dry-Type Transformers for General applications.
 - 5. IEEE C57.12.91, Test Code for Dry-Type Distribution and Power Transformers.
 - 6. NEMA standard 20, Dry-Type Transformers for General applications.
 - 7. UL 506, Specialty Transformers.
 - 8. UL 1561, Dry-Type General Purpose and Power Transformers.
 - 9. NEMA TP-1, 2002; Guide for Determining Energy Efficiency for Distribution Transformers.
 - 10. NEMA TP-2, Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.
 - 11. NEMA TP-3, Standard for the Labeling of Distribution Transformer Efficiency.

No requirement of these drawings and specifications shall be construed to void any of the provisions of the above standards. Any conflicts or changes required to the contract documents in order to obtain compliance with applicable codes shall be brought to the immediate attention of the Owner Authorized Representative by the Contractor.

1.02 DESIGN REQUIREMENTS

- A. Distribution transformers shall be wound with copper conductors. Performance of transformers shall meet or exceed the requirements of applicable codes and standards.
- B. Transformers shall be self-cooled type with 220 degrees C. insulation and a maximum temperature rise of 150 degrees C. under continuous full load conditions with an ambient of 40 degrees C.
- C. Transformers shall be furnished with four 2.50 percent (2 above and 2 below normal voltage) taps. Windings shall be of fire-resistant type, designed for natural convection cooling through normal air circulation.
- D. Core mounting frames and enclosures shall be of welded and bolted construction with sufficient mechanical strength and rigidity to withstand shipping, installation, and short circuit stresses.
- E. Enclosure cover plates shall be sheet steel, captive bolted to enclosure framework. Enclosure shall provide suitable ventilating openings with rodent-proof screens, NEMA 1 enclosure. Enclosure shall be provided with lifting lugs and jacking plates as required. Transformers installed outdoors shall be provided with weatherproof NEMA 3R enclosure and weather proof kit.
- F. Transformers shall be UL listed.
- G. Equipment shown on drawings to scale is approximate only and based upon a general class of equipment specified. The Contractor shall verify all dimensions and clearances prior to commencement of work.
- H. The Contractor shall verify all points of connection with the manufacturer's requirements, instructions, or recommendations prior to installation. Actual dimensions, weights, clearances and installation requirements shall be verified and coordinated by the contractor.

1.03 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings: Include make, catalog number, dimensions, weight, KVA Rating, % Impedance, finish, type, insulation class, design temperature, sound levels, efficiency and taps provided. Include regulation at 80 percent and 100 percent of full load, no-load loss, full-load loss, percent efficiency, percent impedance, noise level and continuous capacity rating.

1.04 WARRANTY

- A. Transformers shall be warranted to be free from defects in materials and workmanship for a period of three years from the date of substantial completion.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Transformers shall be Square D, General Electric, PowerSmiths, Cutler Hammer, Siemens, or owner approved equal.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

- A. Deliver, storage, protect and handle products in accordance with the manufacturer's recommendations.

3.02 INSTALLATION

- A. Transformer core frame shall be installed level on shock absorbing pads within enclosure.
- B. Mounting bolts on floor mounted transformers shall be extended into pads only and shall not be in direct contact with building structural members.
- C. Flexible jumpers shall be installed for grounding continuity from enclosure to conduits or bus ducts where required.
- D. Transformers installed outdoors or below grade shall be mounted on concrete pads as specified in: Cast-In-Place Concrete.
- E. Install transformer ventilation openings not closer than 6 inches from wall surfaces.
- F. Do not install transformers in corrosive environments such as swimming pool pump and boiler rooms, or similar areas.

3.03 VOLTAGE CHECK

- A. Set taps on transformers to provide satisfactory operating voltages with present loads energized, including new loads and existing loads. A check shall be performed in the presence of the Engineer at a panel fed from each transformer, which is farthest from transformer. Voltages at transformers ranging from 118 to 122 volts inclusive, for 120 volt systems and proportionately equivalent for higher voltage systems are permitted.
- B. Provide instruments and accessories required to perform checks. Voltmeters shall be accurate within .075 percent or one percent and shall have scales permitting voltage readings to be performed on upper half of scale.
- C. Adjust transformer taps under full load operating conditions, to provide normal operating voltages at the loads.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.05 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.
- B. Repair scratched or marred surfaces affected during the execution of work. Repair surfaces shall match original finish.

END OF SECTION

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SECTION 16415 - AUTOMATIC LOAD TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide complete and operable automatic load transfer switches, including devices and equipment specified herein, indicated on Drawings, or required for service. Materials and equipment shall be delivered to the Project site completely wired, tested, and ready for installation.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods.
 - 3. Section 16230: Emergency Generators.

1.02 DESIGN REQUIREMENTS

- A. Transfer switches shall be designed, built, tested, furnished and warranted by manufacturer for installation with emergency generator specified under Section 16230: Emergency Generators. The transfer switch manufacturer shall have been regularly engaged in production of the products of this section for 10 years in accordance with Underwriter's Laboratories (UL) Standard 1008. Transfer switches shall comply with NFPA 110 and NEMA ICS 2-447 requirements.

1.03 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Submit literature containing diagrams, parts lists and descriptions as required to install, operate and perform normal maintenance on equipment.
- C. Materials List: Submit a materials list for system with catalog cuts, technical data and manufacturer's specifications.
- D. Installation Instructions: Submit manufacturer's written installation instructions, including recommendations for handling, protection and storage.

1.04 QUALITY ASSURANCE

- A. Equipment shall be manufactured by a single manufacturer who has been regularly engaged in the production of automatic load transfer switches. Transfer switches shall be factory built, factory tested, and shipped by this single manufacturer, so there is one source of supply and responsibility for warranty, parts, and service. Manufacturer shall have a local representative who can provide factory trained technicians, required stock of replacement parts, and technical assistance.

1.05 WARRANTY

- A. Manufacturer shall provide a 5 year material warranty.

PART 2 - PRODUCTS

2.01 AUTOMATIC TRANSFER SWITCHES

- A. Manufacturers: The basis for this specification is Cummins Power Generation equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.
- B. Transfer switches shall be UL, or other Nationally Recognized Testing Laboratory listed Transfer switches shall be suitable for installation on emergency and legally required standby systems, in accordance with ANSI-C1 and NFPA-99, rated for total system load. These loads shall include motors, electrical discharge lamps, resistive loads, and tungsten lamps as described in Section 1 of UL Standard 1008.
- C. Transfer switches shall be 60 Hz with a switched neutral pole. Refer to Drawings for locations of transfer switches, number of phases, voltage, and ampere ratings. Neutral pole shall be of same design and have same values of steady state, close and withstand ratings of phase poles. Neutral pole shall be mounted on common shaft with phase poles and shall switch simultaneously with phase poles.
- D. Transfer switches shall be rated to carry 100 percent of their rated current continuously when in an enclosure. Transfer switches shall be rated for continuous operation in ambient temperatures of -40 degrees C. to 67 degrees C.
- E. Transfer switches shall be over center operation, double-throw construction, positively electrically and mechanically interlocked by a mechanical beam to prevent simultaneous closing (for break-before-make operation), and mechanically held in both normal and emergency positions. Interlocked circuit breaker arrangements are not permitted.
- F. Transfer switches shall be quick-break, quick-make operation. Transfer switches shall provide a center programmed transition for manual switching. Transfer switches shall be as required for manual operation under full load by integral mounted, permanently attached, high dielectric, manually operated handles.
- G. Electrical operating means shall be a direct-acting, constant force in both directions, bi-directional linear induction motor to provide minimum friction, straight-line switch action. Motor shall be attached directly to switching mechanism without use of gears, cams, or other complex mechanical linkage methods. Transfer switches shall not contain integral over-current devices in main power circuit, including molded case circuit breakers or fuses. Transfer switch electrical actuator shall have an independent disconnect means to disable electrical operation during manual switching.
- H. Manual operating handles and controls, other than key-operated switches, shall be accessible to authorized personnel only by opening key-locking cabinet door.
- I. Transfer switches shall have transparent protective covers to protect operating personnel during manual operation, and to allow an operator to visually determine that main contacts are open or closed.
- J. Controls shall be installed in a separate smaller cabinet mounted on inside of main cabinet door.
- K. Control circuit disconnect plugs shall be provided to de-energize control circuits to avoid hazards of electrical shock to personnel while making adjustments.

- L. Electric control, under-voltage and time delay modules, shall be a printed circuit board for ease of service. Solid-state under-voltage sensors shall simultaneously monitor all phases of normal power sources to provide field adjustable range sensors for specific applications. Voltage pickup settings shall be adjustable from a minimum of 85 percent to a maximum of 100 percent of nominal voltage. Voltage dropout settings shall be of temperature compensated type, for maximum deviation over temperature range of -32 degrees C. to 79 degrees C. Voltage Sensors shall allow for adjustment to sense partial loss of voltage on any phase of normal or emergency power source, even where motor feedback voltages exist.
- M. Over-voltage and frequency sensing control, over-voltage and frequency sensing module, shall be a printed circuit board for ease of service. Solid-state over-voltage sensors shall simultaneously monitor all phases of normal power sources to provide field-adjustable ranges of voltage pickup and dropout and time delays.
- N. Relay control, normal source phase loss relays, shall be conventional plug-in industrial control electromechanically, non-adjustable, normal source loss relays, plus time delays as follows.
 - 1. Start: adjustable, 0.5 to 5.0 seconds.
 - 2. Re-Transfer: adjustable, 3.0 to 30 minutes.
 - 3. Stop: non-adjustable, 5 minutes.
 - 4. Transfer: non-adjustable, 0.5 seconds.
- O. Controls shall signal emergency power system to start upon signal from normal source voltage sensors. Solid-state time delay start shall avoid nuisance engine-generator set start-ups on momentary voltage dips or interruptions.
- P. Transfer switch shall transfer load to emergency power system after engine-generator set reaches proper voltage and frequency and has stabilized.
- Q. Transfer switch shall control engine-generator set to allow set to start and transfer load within 10 seconds after a normal source power failure.
- R. Transfer switch shall retransfer load to normal source after normal source power is restored, allowing normal source to stabilize before re-transfer.
- S. Controls shall signal engine-generator set to stop after load re-transfer to normal source, but shall maintain availability of emergency source in event that normal source fails shortly after re-transfer. Controls shall allow engine-generator set to run unloaded for a cool-down period prior to shutdown.
- T. Controls shall provide an automatic re-transfer of load from emergency source to normal source if emergency source fails when normal source is available.
- U. Transfer switch operating power for transfer and re-transfer shall be obtained from source to which load is being transferred.
- V. Indicators shall allow operator to determine that controls are properly sequencing and shall assist in determining sequence of any malfunctions that might occur.

- W. Main cabinet front door mounted controls and indicator lamps shall consist of oil-tight, position indicator lamps and key-operated test and selector switches to provide the following functions:
1. Test Switches:
 - a. Test: Simulated normal source power loss to control unit for testing engine-generator set capability, including transfer of load if so furnished. Control system shall provide for system test without load transfer when specified.
 - b. Normal: Normal operating position, also restoring system to standby operation and, if load was transferred, re-transfers load from emergency to normal source after test and time delays.
 - c. Re-transfer: Spring-loaded momentary position of switch, which overrides re-transfer time delay to cause immediate return to normal source after a test or actual power outage.
 2. Position Indicator Lamp Colors:
 - a. Normal: White.
 - b. Emergency: Amber.
 - c. Normal source available: Green.
 - d. Emergency source available: Red.
- X. Provide exercise clock to set day-of-week with one week dial minimum, time-of-day, and duration-of-time of engine-generator set exercise. A period with or without load selector switch shall be provided.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install automatic load transfer switches as indicated on Drawings and in accordance with installation instructions.

3.02 TESTING

- A. To provide proven reliability of system, transfer switches shall be completely tested as follows:
1. Representative production samples of transfer switches supplied, shall be demonstrable, through tests, ability to withstand at least 3,000 mechanical operating cycles. An operating cycle shall consist of one electrically operated transfer from normal to emergency and back to normal.
 2. Transfer switches supplied shall be UL, or other NRTL listed in accordance with Standard 1008.
 3. A manufacturer's representative shall conduct a complete system operational test at the Project site, in presence of the architect or engineer, after installation.

3.03 TRAINING

- A. Before Substantial Completion, provide the services of a representative of the transfer system manufacturer to instruct designated Owner personnel in the operation and maintenance of system. Instruction time shall be 1 day, unless directed by owner.
- B. Coordinate training with architect to arrange a 4 hour minimum training session, a minimum of 4 sets of manuals and training literature shall be made available for the owner.
- C. A training guide shall be included as part of project's final deliverables and close out package.

3.04 AS-BUILT DOCUMENTATION

- A. Submit service manuals including the following:
 - 1. Detailed explanation of the operation of the system.
 - 2. Instructions for routine maintenance.
 - 3. Detailed instructions for repair of major components of the system.
 - 4. Pictorial parts list and part numbers.
 - 5. Pictorial and schematic electrical drawings of wiring systems, including operating and safety devices, and major components.
 - 6. Installation instructions for system components.
 - 7. Final test report.
 - 8. Reproducible set of record drawings showing the system exactly as it was installed including exact location of components.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 16440 - DISCONNECTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Safety Switches / Disconnects.
- C. Related Sections:
 - 1. Section 16050: Basic Electrical Materials and Methods.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings: Include dimensions, make, capacity of equipment, size, rating, and catalog number. Vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.
- C. Installation Instructions: Submit manufacturer's written installation instructions.

1.03 DESIGN REQUIREMENTS

- A. Disconnect Switches:
 - 1. In accordance with UL 98, NEMA KS1, and NEC.
 - 2. Shall be service entrance rated with grounding lug kit.
 - 3. Fusible Switch, 600 amp and smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses or recommended fuses, lockable handle; interlocked with cover in closed position.
 - 4. Non-Fusible Switch, 600 amp and smaller: NEMA KS 1, Type HD, lockable handle; interlocked with cover in closed position.
 - 5. Shall have the following features:
 - a. Switch mechanism shall be the quick-make, quick-break type.
 - b. Copper blades, visible in the OFF position.
 - c. An arc chute for each pole.
 - d. External operating handle shall indicate ON and OFF position and have lock-open padlocking provisions.
 - e. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable to permit inspection.
 - f. Fuse holders for the sizes and types of fuses specified.
 - g. Electrically operated switches shall only be installed where shown on the drawings.
 - h. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
 - i. Ground lugs for each ground conductor.
 - j. Enclosures:
 - i. Shall be the NEMA types shown on the drawings for the switches.

- ii. Where the types of switch enclosures are not shown, they shall be the NEMA types most suitable for the ambient environmental conditions. Unless otherwise indicated on the plans, all outdoor switches shall be NEMA 4X stainless steel.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Disconnect switches shall be manufactured by General Electric, Eaton, Square D, Siemens, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Disconnects/Safety switches shall be installed in the vertical position with "ON" at the up position and top of the switch and securely fastened to structural members.
- B. Unused openings in cabinets and disconnects shall be effectively closed as required by the manufacturer.
- C. Cabinets shall be grounded as specified in Article 250 of the National Electrical Code.
- D. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.
- E. Lugs shall be suitable and listed for installation with the conductor being connected.
- F. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach terminal location in a manner that avoids strain on the lugs. Maintain required bending radius of conductors inside cabinet.
- G. Clean the cabinet of foreign material such as cement, plaster, and paint.
- H. Distribute and arrange conductors neatly in the wiring gutters.
- I. Use the manufacturer's torque values to tighten lugs.
- J. Before energizing disconnect switches, the following steps shall be taken:
 - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.
 - 2. Remove shipping blocks from component devices and interiors.
 - 3. Remove debris from switch interior.
- K. Follow manufacturer's instructions for installation.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 16445 - PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Lighting and power distribution facilities, including panelboards.
- C. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements.
 - 2. Section 16050: Basic Electrical Materials and Methods.
 - 3. Section 16550: Lighting.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings: Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.
- C. Installation Instructions: Submit manufacturer's written installation instructions.

1.03 DESIGN REQUIREMENTS

- A. Panelboards:
 - 1. Panelboards shall be wall-mounted, enclosed safety type with 480 volt, 3-phase 3-wire or 120/208 volt, 3-phase, 4-wire or 120/240 volt, 1-phase, 3-wire solid neutral mains as indicated on Drawings or specified. First panelboard shall be provided with main circuit breakers where indicated.
 - 2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be fully rated, with ampere rating marked on handle and shall indicate on/off and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL, or other NRTL as ground fault devices. Provide appropriate lug kit of sufficient size to accommodate the feeders.
 - 3. Two-pole and 3-pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, tamper-proof, ambient compensated, single handle, internal common trip, and quick-make, quick-break mechanism with silver alloy contacts. Circuit breakers shall be fully rated or as otherwise indicated on the Drawings.
 - 4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion-resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Voltage rating shall be as indicated on Drawings. Branch mounted mains are not acceptable.

5. Circuit breakers shall be fully rated and of one-piece, bolt-on type and shall meet short-circuit interrupting capacity requirements indicated on Drawings.
 6. Internal connections shall be fabricated with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. Terminals shall be furnished with copper conductors. Panelboards fed by conductors having over-current protection greater than 200 amperes shall be protected on supply side by over-current devices having a rating not greater than that of panelboards. Copper bussing shall be fully rated. Heat rated bussing is not acceptable
 7. Except where otherwise indicated, circuit breakers shall be in 2 vertical rows connected to bus bars in a distributed phase arrangement. Two-pole branches shall be balanced on busses. Single pole branches shall be numbered adjacent to its circuit breaker, with odd numbers on left and even numbers on right.
 8. Specified circuit breaker spaces shall be furnished with hardware required for future installation of circuit breakers.
 9. Provide locking devices for individual circuit breakers. Padlocking devices shall be secured to circuit breakers and by panel dead front plates.
- B. Surge Suppressors: Where indicated on Drawings, provide transient voltage surge suppressors as separately installed of panelboards. Panelboards shall be complete with 200 percent rated copper neutral bus, ground bus and isolated ground bus in addition to requirements of this section. Surge suppressors shall be as follows:
1. Surge Capacity:
 - a. Service Entrance SPDs shall be ANSI/UL listed type 1 SPD with a 160 KA surge rating per mode, with field replaceable surge modules.
 - b. Distribution or Branch panels shall be UL listed type 1 SPD with a 80 KA surge rating per mode.
 2. UL 1449 3rd Edition Suppressed Voltage Rating:

Voltage Configuration	L-N	N-G	L-G	L-L
120/240V	800V	700V	900V	1200V
120/208V	800V	700V	900V	1200V
240V			1200V	1200V
277/480V	1200V	1200V	1200V	2000V
480V			2000V	2000V

3. EMI/RFI High-Frequency Noise Power Filter (Characteristics):
 - a. 100 KHz at 44 dB.
 - b. 100 MHz at 44 dB.
 - c. 10 MHz at 44 dB.
 - d. 100 MHz at 444 dB.

4. MOVs shall be thermally protected for low current faults and shall be fused with surge-rated fuses. The surge-rated surge current passes and clears the circuit safely if the surge capacity is exceeded. Enhanced diagnostics shall continuously monitor the unit's status and shall include LEDs to signal a reduction in surge capacity or the loss of a suppression circuit. An audible alarm, with test and silence features, shall be furnished in diagnostic package.
5. Each phase or the entire unit shall be replaceable and have bolted-on, tin-plated copper connections. Unit to have UL witnessed fault current rating of 65,000 symmetrical amperes.
6. Surge suppression units shall comply with the following:
 - a. UL certified.
 - b. UL 1283 5th Edition.
 - c. UL 1449 3rd Edition.
 - d. IEEE C 62.45.
 - e. IEEE C 62.41.
 - f. Nationally Recognized Testing Laboratory (NRTL) or equal

C. Panelboard Cabinets:

1. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall be furnished with at least 6-inch high gutters at top and bottom where feeder cable size exceeds 4 gage or where feeder cable passes through cabinet vertically. Cabinets shall be furnished with top and bottom gutters sized as required by inspection department having jurisdiction, but never less than 6 inches where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than 4 inches wide. Width of cabinets shall be 20 inches, unless otherwise indicated on Drawings.
2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim.
3. Outdoor cabinets shall be NEMA Type 3R or 4X type 316 Stainless Steel where noted. Construction shall be formed from code gage galvanized steel with ANSI No. 61 gray enamel finish. Provide heavy-duty, 3-point latching, vault type door handles with padlocking provisions. Provide stainless steel or galvanized butt hinges on doors.
4. Self-tapping screws and bolts not permitted.

- D. Panelboard Schedule: Provide a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names shall be determined at the Project site and shall not necessarily be those indicated on the Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be installed in a frame under transparent plastic on inside of each panelboard door.

- E. Panelboard Standards: Panelboards shall be UL, or other NRTL listed and labeled. Panelboards shall meet latest revisions of following standards:
 - 1. National Electric Code, Article 408.
 - 2. UL 67, Panelboards.
 - 3. UL 50, Cabinets and Boxes.
 - 4. UL 943, GFCI.
 - 5. UL 489, Molded Case Circuit Breakers.
 - 6. NEMA PB1.
 - 7. Federal Specifications W-P- 115C and WC-375B.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Equipment shall be manufactured by General Electric, Cutler Hammer, Square D, Siemens, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Equipment shall be located so it is readily accessible and not exposed to physical damage.
- B. Equipment installed outdoors shall be specifically listed for wet locations and shall be weatherproof in NEMA 4X, type 316 Stainless Steel cabinets.
- C. Equipment locations shall provide sufficient working space around panels to comply with the National Electrical Code.
- D. Panelboards shall be securely fastened to structure and mounted on surface by at least 4 points.
- E. Unused openings in cabinets and disconnects shall be effectively closed as required by the manufacturer.
- F. Cabinets shall be grounded as specified in Article 250 of the National Electrical Code.
- G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.
- H. Lugs shall be suitable and listed for installation with the conductor being connected.
- I. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.
- J. Maintain the required bending radius of conductors inside the cabinet.
- K. Clean the cabinet of foreign material such as cement, plaster, and paint. Repaint to manufacturers original finish any blemishes that occur during construction.
- L. Distribute and arrange conductors neatly in the wiring gutters.
- M. Use the manufacturer's torque values to tighten lugs.

- N. Before energizing panelboards, the following steps shall be taken:
 - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.
 - 2. Remove shipping blocks and debris from component devices and panelboard interiors.
 - 3. Manually exercise circuit breakers to verify they operate freely.
- O. Follow manufacturer's instructions for installation.
- P. Do not install in highly corrosive environments, unless rated for the application.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 16500 – PUMP CONTROL PANEL

PART I: GENERAL

1.01 The Requirement

- A. General: The CONTRACTOR shall furnish, install, and place into service a pump control panel furnished by the System Supplier through the pump supplier.
- B. System Supplier: Due to the critical nature of the system, the complete pump system and controls panel shall be furnished and warranted by a single supplier.

One Responsible Supplier (System Supplier): The system described herein, shall be furnished by a single supplier designated as the System Supplier. The System Supplier shall be regularly engaged in the business of system integration for municipal water projects, and be familiar with all aspects of fully automated process control systems. The responsibility for performance to the specification in its entirety shall not be split up amongst individual suppliers of components comprising the system, but must be assumed solely by the supplier of the system. The System Supplier shall furnish the Owner with program implementation and customization. In addition, the System Supplier shall furnish schematics, wiring diagrams for the system components, interconnection schematics, and field point to point wiring diagrams showing all connections to each individual piece of equipment within the system. The System Supplier shall be a Certified Member of the Control Systems Integration Association (CSIA) and evidence of certification shall be provided.

1.02 Submittals

The Pump Control Panel manufacturer shall provide the following documents to the engineer for review.

- Bills of Material
- Elevation and Base Plan drawings
- Wiring diagrams
- Catalog cut-sheets
- Pump Control Panel heat calculations
- Certified Factory Test results
- Spare parts list
- 10-year Warranty for Programmable Pump Controller and printed circuit boards
- 1-year warranty for all electrical components, from date of pump station acceptance
- Certification that all printed circuit boards have conformal coating
- Certification the Programmable Pump Controller and all printed circuit boards have passed a 5-day burn-in test. Testing requirements are as noted in the PPC hardware specification
- CSIA Certified Member certification

PART II: MATERIALS

2.01 Pump Control Panel

A. General Requirements

Furnish and install all equipment as shown on drawings in a U.L. 508 listed control panel, as indicated on drawings. Doors shall be hinged on the same side and shall open to greater than 90 degrees. Enclosure exterior shall be painted "ANSI 61 Gray". Interior color including front and back of all hinged dead front doors, separation barriers and mounting backpans shall be white. The painting process shall include five stages of metal preparation using dip tanks as follows: 1) Alkaline cleaner, 2) Clear water rinse, 3) Iron phosphate application, 4) Clear water rinse, and 5) Inhibitive rinse to seal phosphated surfaces. Finish shall be polyester dry powder, electrostatically applied and baked on at 400 degrees Fahrenheit for a minimum of 15 minutes.

The enclosure shall be compartmentalized such that the Programmable Pump Controller shall be isolated from the power sections. The main circuit breaker, pump circuit breakers, and all wiring shall be located behind an interior dead front doors. Interlocks and circuit breaker operation shall be possible without opening the dead front door. Breaker cutouts for breaker toggle protrusion shall be supplied, to eliminate exposure to hazardous potentials. A physical lockout device shall be supplied on each motor circuit breaker. Lightning/surge protection and PFR power fail relay shall be furnished to protect the panel equipment from lightning, loss of power or utility power surges. Provide GFCI receptacle, intrusion switch and LED light with door activated switch in each panel section. All bussing and wire shall be copper. All wire shall be stranded with locking spade pressure connectors and labeled with clip-on permanent plastic wire markers. All circuit breakers and dead-front mounted devices (lights and switches) shall be equipped with custom engraved phenolic nameplates.

B. Terminal and Distribution Blocks

Distribution blocks shall be furnished and installed as required for "fan-out" of control power and other 120V sources within the enclosure. The blocks shall be rated 300V at a minimum of 20 amperes and sized for the conductors served.

C. Circuit Breakers

All 480 volt circuit breakers shall have minimum interrupting capacities at 35,000 amperes. All 120 volt breakers shall be minimally rated at 4,000 amperes interrupting capacity. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic action, except when protecting motor feeders where motor circuit protector (MCP) breakers may be used. Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single- pole space to provide the number of poles or spaces specified is not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open. Circuit breakers shall meet the requirements of UL and NEMA AB 1.. All

circuit breakers shall be heavy duty molded case circuit breakers conforming to Federal specification W-C-375B and shall be UL listed.

D. Motor Control

Provide each motor with a suitable controller and devices that will perform the functions as specified for their respective motors. Controllers shall conform to the applicable requirements of NEMA ICS, ANSI C19.1, the NEC, and UL. Anticipated horsepower ratings are shown on the contract documents. This information is for guidance only and does not limit the equipment size. When motors furnished differ from the expected ratings indicated, make the necessary adjustments to wiring, conduit, disconnect devices, branch circuit protection, and other affected material or equipment to accommodate the motors actually installed, at no additional cost to the Owner.

Each motor control system shall be equipped with a hand-off-auto control switch, indicating lights, elapsed time meter, motor starter and 3-phase pump current monitoring. Control switches and indicating lights shall be U.L. listed oil-tight devices rated heavy duty.

Elapsed running time meter for recording total elapsed running time for each motor shall be six digit, non-reset, recording in hours and tenths. Meters shall be mounted to dead front door with stainless steel machine screws. Sheet metal screws will not be acceptable.

E. Nameplates

Nameplates shall be black phenolic with custom white lettering. Nameplates shall be stainless steel screw mounted. Sheet metal screws will not be acceptable. Glue type will not be acceptable.

F. Control Power Transformer

Transformer shall be furnished with primary and secondary fusing. Transformer shall be encapsulated with electrical grade epoxy and silica sand to completely seal the core and coils from moisture and contaminants. Transformer shall be designed for quiet operation, 180 deg. C insulation system standard with 115 deg. C temperature rise for longer, more reliable life. Transformer shall be made in U.S.A. and meet or exceed all applicable NEMA, ANSI, OSHA, UL and CSA requirements.

G. Panelboard

Where applicable, Panelboard shall be circuit breaker type custom constructed to utilize minimum enclosure space with breakers as shown. Circuit breakers shall be bolted on type. The panelboard shall be furnished with custom phenolic nameplates. The panelboard transformer shall be dry type construction sized as shown on the plans with primary breaker protection.

H. Panel Lights

Furnish and install push-to-test lights to indicate status and alarm conditions locally as shown on drawings. Custom engraved phenolic nameplates shall specify each light's function. Lights shall be wired as shown on drawings. Panel lights shall be full voltage.

I. Push-buttons and Selector Switches

Furnish and install push-buttons and selector switches as shown on drawings. Custom engraved phenolic nameplates shall specify each switches function. Switches shall be wired as shown on drawings. Switches shall be full voltage.

J. Receptacles, Duplex

Where applicable, Receptacles shall be of specification grade and of NEMA configuration and rated 2 pole, 3 wire grounding, 20 amperes, 125 volts. Bases shall be of ivory phenolic composition. Wire terminals shall be suitable for 10 AWG wire and shall be screw type. Receptacles shall be U.L. listed. The receptacles shall have corrosion resistant conducting parts of nickel-plated brass and other metal parts of stainless steel. All external and dead front receptacles shall be installed on ground fault interrupter circuits "GFCI".

K. Relays, Control

Control relays shall have two form-C contacts (minimum) on each relay. Provide relay energized neon lamp (inside relay case).

L. Relays, Power Fail

The power fail relay shall continuously monitor the three phases for power loss, low voltage, phase loss, phase reversal and have automatic reset. The power fail monitor shall have a drop-out voltage adjustment and a failure indicating LED.

M. Relays, Time Delay

Time delay relays shall be solid state relays with a timer adjustable over the range 1 to 60 seconds unless other ranges are indicated or required. Provide LED relay energized indicator lamp.

2.02 Programmable Pump Controller (PPC)

A. General Requirements

The Programmable Pump Controller shall have all the characteristics and features listed herein. All sites shall be similar in nature, (operator interface, configuration and options, back pan layout, etc., except for I/O count), so all RTUs can be interchangeable with one another. The use of any third party hardware or software add-on products to meet this specification is not acceptable.

B. Manufacturer

The Programmable Pump Controller shall be procured from a manufacturer that has at least 30 years experience manufacturing its own Programmable Pump Controllers

designed specifically for the water and waste water industry. The manufacturer shall not have discontinued any line of Programmable Pump Controllers manufactured. The PPC itself and support for the controller shall be available directly from the manufacturer. Programming services shall be available direct from the manufacturer as a normal practice. The PPC shall be the L3000™ by Tesco Controls.

C. Warranty

The manufacturer shall provide a factory-standard 10 year warranty with the unit. The replacement controller shall be available within 24 hours, installed and running at the station, without requiring that the original unit first be removed and returned to the factory.

D. Support

The manufacturer shall provide 24/7/365 support for questions related to any aspect of the controller, including general use, application-specific issues, programming, and use of the programming software. This support shall be available directly from the manufacturer at no extra charge with the purchase of a controller.

E. Construction

1) Operating Conditions

The Programmable or Integrated Controller shall operate correctly under an ambient temperature range of -40 to +185 degrees F. Coatings on connectors, component leads, and other materials used in the construction of the Programmable Pump Controller shall be substantially resistant to atmospheres containing significant amounts of Hydrogen Sulfide gas and Chlorine gas.

2) Other

The Pump Controller shall be provided with a complete operations and maintenance manual. At minimum, each Programmable Pump Controller shall be subjected by the manufacturer to a 5 day burn-in procedure at 165 degrees F.

F. Card Architecture

1) Processor Card

The Programmable Pump Controller shall be microcontroller-based, using a microcontroller that, at minimum, supports the following:

- a. 1GHz clock rate
- b. 512Mbytes RAM
- c. 64Gbytes secure digital Flash
- e. Watchdog timer
- f. 4 configurable timers with interrupt capability
- g. 3 serial ports with separate baudrate generators
- h. 1 10/100Mbs Ethernet port
- i. 4 USB 2.0 ports

- j. 1 HDMI Video port
- k. Write-protect enable/disable

The Programmable Pump Controller shall use a real-time, preemptive, multitasking operating system, contained in Flash memory. The Flash memory shall also contain all firmware that is not specific to a particular job or application, such as operator interface and communications firmware.

2) Input/Output Characteristics

The Programmable Pump Controller shall provide built-in digital filtering of analog inputs. The filter constants shall be adjustable from the keyboard and through the communications ports.

G. Field Wiring Terminal Blocks

The terminal blocks shall support the following listed characteristics:

- pull-apart two piece wiring blocks for fast and easy wiring/re-wiring
- separate wiring blocks for each I/O type and each wire point fully labeled
- versatile internal or external analog power source
- digital outputs have LED “ON” indicators and socketed 10A relays
- entire terminal block shall snap on/off standard track mount
- onboard passive circuit protection to protect programmable controller shall be available with a built-in isolated current loop power supply, powered from the 12V DC main power. The current loop power supply shall be capable of producing at least 24V DC and 161 mA.
- three levels of lightning/surge protection

H. Power Supply

The Programmable Pump Controller shall be powered by a 12V/5V DC power supply, with an allowed operating range of at least +/- 10%. A 12V battery backup of the 12V DC shall be available such that the 5V DC is also maintained by the 12V battery.

I. Operator Interface Unit

The Programmable Pump Controller shall be available with an operator interface that is an integral part of the unit. The same operator interface shall be remotely mountable.

1) Keyboard

The Programmable Pump Controller shall be available with either a minimal keyboard, containing no more than 4 keys, or a full 32 keyboard with keys for direct access to functions. The keyboard construction shall be sealed membrane type, using a stainless steel backing plate, and shall be impervious to wash-down environments and atmospheres containing Hydrogen Sulfide and Chlorine gases. The keys shall provide tactile feedback. Both keyboard

options shall provide a menu-based operator interface, allowing the operator to perform at least these functions, without process interruption:

- a) Examine and change setpoints
- b) Examine analog input and output registers
- c) Examine and change timers and counters
- d) Examine and change analog input filter constants
- e) Calibrate analog inputs and outputs
- f) Force digital outputs on and off
- g) Override analog inputs and outputs
- h) Examine control program

2) LED Character Display

The Pump Controller shall be available with an alphanumeric LED display capable of displaying at least 8 characters at a time using at least 15 segments per character. The LED character display shall be used for showing the values of registers, inputs, outputs and other data.

3) Color Touch Screen OIT

The PPC shall have the ability to communicate Modbus to other OIT's through the Ethernet port.

4) HDMI Touch Screen

The PPC shall have the ability to interface to a HDMI OIT using the HDMI port. The HDMI Touch Screen must be rated at least with a NEMA 3 rating or better.

5) Operating Modes

The Pump Controller shall have two basic modes of operation as described below:

a) RUN:

- Actively controlling, running application-specific control program
- Sensing input signals
- Generating outputs under program control
- Peer-to-peer message initiation is enabled
- Polling is enabled

b) STANDBY:

- Not actively controlling
- Continues to sense input signals
- Analog outputs held at current level or set to zero
- Digital outputs go to off state
- Initiation of peer-to-peer messages is disabled
- Polling is disabled

J. Programming

1) Language

The Programmable Pump Controller shall be programmable using the ability to execute a higher-level BASIC-like programming language which is native to the controller. The Programmable Pump Controller must also support IEC 61131-3 for additional programming languages.

2) Registers

The Programmable Pump Controller shall have at least the following preformatted register types arranged in a global system database, with the quantity of each register type selectable to at least the numbers given:

- a) Setpoint (for storing constants, at least 1000)
- b) Analog input (physical or internal, at least 1000 total)
- c) Analog output (physical or internal, at least 1000 total)
- d) Digital input (physical or internal, at least 1000 total)
- e) Digital output (physical, at least 128)
- f) Index (for indirection and general purpose use, at least 1000)
- g) Timer/counter (at least 1000 total)
- h) Seconds timer (times in seconds with 10 mS or better resolution, up to 497 days)
- i) Hours timer (times in hours with 2 second or better resolution, up to 272 years)
- j) HMS timer (hours, minutes, seconds format, with 0.5 second or better resolution, upto 68 years)
- k) Event counter (integer value register supporting increment/decrement, range 0 - 4,294,967,295)

The Programmable Pump Controller shall support a pulse counting frequency of at least 1 kHz on a single input.

3) PID Function

The Programmable Pump Controller shall provide built-in PID (Proportional/Integral/Derivative) control without requiring any procedural programming or subroutine writing. The Programmable Pump Controller shall support the ability to simultaneously execute at least 16 independent PID control loops.

K. Configuration

The Programmable Pump Controller shall be configurable via a configuration table, which shall be changeable both by downloading through a communication port and through the full and limited keyboards. The configuration table shall allow the operator to change virtually all significant operating parameters of the system.

L. Web Server

The Programmable Pump Controller shall include an integrated web server for secured remote customized visualization of process data including a web server disable feature if not desired. The web server must be able to store all types of documentation and values, and all information must be available using a web browser. The web server must have colorful well designed screens that clearly show data in real time. The web server must also be able to email alarm notifications to operators and facilities.

M. Communications

The Programmable Pump Controller shall have the ability to simultaneously support at least 3 serial communication ports 1 Ethernet/IEEE 802.3 RJ45 port. Any of these serial ports shall be usable for both communications of telemetry data and control program/configuration upload/download and support baud rates of 230,400 bps or higher. The ports shall be configurable to support the following media:

- Full handshake RS-232 (at least 3 ports must be configurable this way)

In addition to the three (3) RS-232 serial ports, the Programmable Pump Controller shall have one (1) Ethernet port, for a total of four (4) communications channels. All four (4) communications channels shall have the capabilities of independent operation. Each channel shall have the following capabilities:

- Poll/Response
- Quiescent (Unsolicited)
- Master Polling
- Message Store and Forward
- Automatic Port Escalation with Recovery
- Message Retries
- Communication Statistics and Diagnostics

The Programmable Pump Controller design shall incorporate Ethernet design using 100BASE-T interface and TCP/IP industry standard network protocol with the following features:

- Redundant hot-standby Ethernet (Primary Network and Secondary Fail Over Communications)
- Standard 100BaseT Interface (100Mbps data transmission, over twisted-pair cable with RJ45 connectors)
- Complies to IEEE 802.3 Specifications (Local Area Networks or Wide Area Networks)
- Separate LED Line Status Indicators (Each port to confirm Frame Transmit, Receive, Link, Collision, and Interference)
- Individual IP Configuration (Multi Network Configurations)
- Built-in PING Response (Test connectivity and verification of IP Address)

- Multi Protocol Support (Modbus TCP/Modbus Serial, Data Express, Data Express Plus)
- Telemetry Message Routing (Communicate across all channels, i.e. RS232 to Ethernet and Ethernet to RS232)

The Programmable Pump Controller must also have USB ports to support uploading/downloading of programs, external USB Drives and the ability to configure ports for additional communications channels.

1) Protocols

The Programmable Pump Controller shall implement the Ethernet/IEEE 802.3 protocol. When the PPC wishes to transmit, it will check for activity on the LAN. When the LAN becomes silent for a specified period, the PPC will begin transmission. During transmission, the PPC will continually check for a collision on the LAN. If a collision is detected, the Programmable Controller will cease transmission. The Programmable Pump Controller will then wait a random period of time before attempting to transmit again.

The Programmable Pump Controller shall support serial communications using at least 3 different protocols. The de facto standard ModBus protocol shall be supported. These protocols shall be able to coexist simultaneously on the same port. The Programmable Pump Controller shall support poll/response, polling master, quiescent, report-by-exception and message routing communications, as described in the following sections. Any of these communications modes shall be usable alone or simultaneously in any combination.

2) Polled Slave Communications

The Programmable Pump Controller shall respond as a slave unit in response to polling messages from a master SCADA system or other unit. In this mode the Programmable Pump Controller shall only respond to requests for data and not initiate messages on its own.

3) Polling Master Communications

The Programmable Pump Controller shall initiate polls as a master unit and wait for the response from the slave device.

4) Quiescent Communications

Using quiescent (peer-to-peer) communications, the Programmable Pump Controller shall provide the ability to initiate messages transmitting register values under operator definable conditions.

5) Report by Exception Communications

The Programmable Pump Controller shall support a means of report-by-exception communications, where only those registers of interest that have changed since the last reporting are transmitted.

6) Message Routing

The Programmable Pump Controller shall provide the ability to route received messages that are destined for another unit. The routed message can be received and sent in any combination of communication ports and physical media.

7) Failure Recovery

The Programmable Pump Controller shall have the ability to switch to alternate communications paths in the event of failure of the primary path. There shall be no practical limit on the number of different paths that the Programmable Controller may try in order to deliver the information.

8) Redundant Message Elimination

The Programmable Pump Controller shall automatically provide redundant message elimination when peer-to-peer and polled communications are used in combination.

9) Other

The Programmable Pump Controller shall provide a means of enabling/disabling quiescent/polling master message initiation from the keyboard.

N. Engineering Unit Representation

The Programmable Pump Controller shall have the capability to represent all analog input and analog output values directly in engineering units. Engineering units are defined to be "real world" IEEE 754 standard floating point numbers corresponding to physical measurements, such as level, pressure, depth and flow. Telemetry communications shall use engineering unit representation in all messages.

O. Calibration and Multipoint Calibration

A simple menu-driven procedure shall be provided that allows the operator to calibrate an analog input or output to an engineering unit measurement scale. This procedure shall be usable from both the full and minimal keyboards. The calibration information shall be uploadable and downloadable via a communication port.

P. Single and Multi-Point Test Override

The Programmable Pump Controller shall provide the ability to override I/O and register values for test and other purposes. When in override, the operator shall be able to control the register (set any value or on/off state) independent of the control program or physical input. The value seen by the control program shall be the override value. The operator shall also be able to release all override points at once. When any register is in override,

there shall be a visible indication to the operator, regardless of what mode the Programmable Pump Controller is in.

Q. Alarms

The Programmable Pump Controller shall provide alarm flags to be used to indicate application-specific alarm conditions. The Programmable Pump Controller shall provide a common alarm digital output, that can be configured to be any digital output and can be displayed anywhere on the LED annunciators.

R. Fault Tolerance and Reliability Features

1) Event Logging

The Programmable Pump Controller shall provide a mechanism that reports and logs unusual events and items of interest. The Programmable Pump Controller shall also support viewing of the RAM event log data by transmission via the serial port.

2) Fault Relay

The Programmable Pump Controller shall contain a normally closed fault relay that under normal operation shall be energized by the Programmable Controller to indicate a non-fault state. The fault relay shall go to a fault condition (non-energized) under the following circumstances:

- 12 V DC power failure
- Memory error or other internal operating error

3) Power Up Self Test

The Programmable Pump Controller shall perform a brief self test upon application of power, including:

- ROM checksum
- RAM write-protection circuit check
- Write-protected RAM CRC check

4) On Going Self Test

During normal operation (run or standby modes) the Programmable Controller shall run an ongoing self test process. The frequency with which the ongoing self test performs these checks shall be configurable by the operator.

5) Diagnostic Functions

The Programmable Pump Controller shall have the capability to perform self-test diagnostic functions under operator control to verify the integrity of the RAM and ROM inside the unit.

6) Activity Monitoring

The Programmable Pump Controller shall provide a mechanism for selectively viewing activity of certain integral subsystems. Text messages indicating activity shall be directable under operator control to the LED or a communication port.

7) Power Fail/Brownout Detector

The Programmable Pump Controller shall have an integral hardware device that detects a brownout or imminent power fail condition. Upon detection of the 12V DC power supply voltage dropping below an adjustable threshold, this device shall generate an immediate interrupt signal to the microcontroller.

8) Watchdog Timer

The Programmable Pump Controller shall contain a hardware watchdog timer circuit that will reset the microcontroller within 1 second of detecting a firmware failure.

9) Security

The Programmable Pump Controller shall be capable of being configured to require password entry before access to functions that would change the control characteristics or basic operating mode (run/standby) of the Programmable Pump Controller. Multiple passwords shall be supported, with at least 100 allowed. If the operator does not operate the keyboard within a selectable time period, the Programmable Pump Controller shall log him out automatically. The Programmable Controller shall also support uploading and downloading of password configuration information via the communications ports.

10) Data Archiving

The Programmable Pump Controller shall provide a means of archiving I/O and register values into storage arrays. The Programmable Pump Controller shall also provide direct read access through any communications port to the contents of each data archive. Each sample shall consist of a date and time stamp and the register value. The Programmable Pump Controller shall also provide functions available through the communications port that allow an external SCADA or other system to reset specific archives and obtain other necessary information about the data archives in use.

11) Remote Control

The Programmable Pump Controller shall have the ability to remotely control other controllers of the same make using any of the communication ports. The operator shall be able to perform at least the following functions on the remote unit by using the local keyboard:

- Examine and change setpoints
- Examine analog input and output registers
- Examine and change timers and counters
- Force digital outputs on and off
- Override analog inputs and outputs

- Change operating mode between Run and Standby

S. Programming Software

1) General

A free copy of the necessary programming software shall be provided with each Programmable Pump Controller purchased. The software shall be produced, provided and supported directly by the Programmable Pump Controller manufacturer. No third party tools are acceptable.

2) QuickLoad Software

A fast and easy to use software program shall be available free of charge to Upload and Download from a laptop computer to the controller all calibration points, setpoints and control programming. A complete user's manual shall be provided which describes the use of all programming software. The latest version of TESCO's WinBench™ programming software shall be used.

3) OPC Communications Server Software

OPC (OLE for Process Control) communications server program shall be available to poll the programmable controller and serve real-time data values to any OPC compliant client, such as spreadsheets, databases and SCADA systems. This software shall operate on a computer and shall poll the controller through any maintenance port to gather real-time data of any type and number. Also, the program shall operate remotely to poll for any real-time data in the controller. The program shall have the ability to operate in a multipoint controller environment, up to 100 controllers, with full hardware handshaking to the communications media. The program shall have the ability to display all telemetry message transactions for the communications port and shall utilize protocol disciplines such as retries, comm. failures and automatic comm. recovery methods.

The program shall have the ability to display all telemetry message transactions for the communications port and shall utilize protocol disciplines such as retries, comm. failures and automatic comm. recovery methods.

2.03 Battery Backup

Battery back up system shall correctly sized to power the Controller, radio and I/O system for a minimum of 8 hours. Batteries shall be sealed gel cell type lead acid.

PART III: QUALITY ASSURANCE

3.01 Pump Control Panel Supplier Responsibility

In order to assume electrical and control system responsibility, the above specified Pump Control Panel shall be furnished by the pump supplier.

3.02 Warranty

Pump Control Panel components shall carry a full one (1) year replacement warranty from date of owner acceptance. Programmable Pump Controller shall carry a ten (10) year replacement warranty.

SECTION 16550 - LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of the General and Supplementary Conditions and Division 01 apply to this section.
- B. Section Includes: Furnishing and installing lighting fixtures, including lamps, ballasts/drivers, wiring, and lighting controls.
- C. Light fixtures model numbers were determined at the time this specification was written; model numbers may need to be modified, or may require the addition or deletion of options to fully meet specification requirements.
- D. Related Sections:
 - 1. Section 16010: Basic Electrical Requirements
 - 2. Section 16050: Basic Electrical Materials and Methods.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. List of Materials: Submit a complete list of materials proposed for this section.
- C. Shop Drawings: Provide detailed and dimensioned Shop Drawings or manufacturer's data sheet with specific model and part numbers indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and fastening fixtures in place.
- D. Submittals must comply with contract general provisions.

1.03 MOUNTING REQUIREMENTS

- A. Design of lighting fixtures, accessories, supports, and method of fixture installation shall comply with requirements of ceiling type which fixture is installed.
- B. Provide suspension points at no more than 2 feet from fixture ends. Spacing between supports shall not exceed 8 feet.
- C. Site lighting fixtures shall be pole mounted where noted on drawings.

1.04 QUALITY ASSURANCE

- A. Components and fixtures shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL).
- B. Owners approval shall be obtained for any equipment or materials substitutions.

1.05 GUARANTEE

- A. Provide a 1 year labor warranty.
- B. Provide material warranty as specified:

1. Lamps: 1 years
 2. Ballasts/Drivers: 5 years
 3. Standards: 1 years
- C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Lighting fixtures shall be the type indicated on Drawings and as specified. Fixtures of same type shall be of one manufacturer.
- B. Fixtures shall be of the types and manufacturers described in the Luminaire Schedule of the Drawings, with lamps, wattage and voltage as indicated. Alternate fixtures must be submitted for approval minimum 2 weeks prior to project bid date.
- C. All fixtures shall be baked-on enamel or powder-coated, unless otherwise specified in subsections below.

2.02 LAMPS AND BALLASTS/DRIVERS

- A. LED Fixtures, Driver, and Characteristics
 1. LED Fixture
 - a. Cast aluminum heat sink integrated directly with housing.
 - b. Replaceable PC board with quick connects.
 - c. High lumen output LED's with 50,000 hours life expectancy.
 - d. No lead or mercury.
 2. Optics System
 - a. Computer-optimized internal reflector with specular finish with diffusing lens to conceal the LED's for uniform luminance.
 - b. Low glare, lumens as noted on drawings.
 3. LED Driver
 - a. Non-dimming and/or optical 0-10V dimming driver accommodating 120 or 277 volts AC at 60 Hz.
 - b. Power factor 0.9 minimum.
 - c. Driver to accept 120 or 277 volts AC.

2.03 POLES

- A. Area poles:
 1. Fabricated from high grade, structural material.
 2. Shaft supplied with hand hole and cover.

3. Base fabricated from structural quality, material, circumferentially welded to shaft
4. Base cover shall be 2-piece, heavy wall construction and shall entirely conceal the anchor base.
5. Anchorage shall be by 3/4" fully galvanized anchor bolts, each supplied with (2) nuts and (2) washers. Anchor bolt lengths shall be as recommended by manufacturer, minimum 30".
6. Polyester powder coat finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install a lighting fixture for each lighting outlet indicated and mark new ballasts/drivers with day of installation.
- B. Fixture voltage shall be as indicated on Drawings.
- C. Install fixture rigidly supported to structural frame members.
- D. Align rows of fixtures to form straight lines at uniform elevations.
- E. Where emergency battery packs are installed, provide constant hot for emergency fixtures. Unless noted otherwise, when powering unit inverter power packs, use the same circuit that powers the switched ballast/driver to power the inverter.
- F. Where emergency ballast(s)/driver(s) are specified within the fixture, provide constant hot for the ballast(s)/driver(s). Nonemergency ballasts/drivers within the same fixture shall be switched as indicated, unless noted otherwise.
- G. Surface mount fixtures shall be attached to structure. Toggle bolts are NOT permitted. Provide backing where required.
- H. Pole mounted fixtures shall be installed on concrete base foundation. Unless noted otherwise, base shall be 24" diameter with 36" above grade, 72" below grade. Vertical rebar shall be #4 and #3 tie rings shall be spaced at 12" OC. Concrete shall be 3000PSI, rubbed smooth finish.

3.02 TESTING

- A. Check and adjust fixtures for required illumination.
- B. Replace defective lamps and ballasts/drivers.
- C. Test and adjust lighting control equipment for proper operation.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials from all areas of work each day.
- B. Clean fixture surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

3.05 HAZARDOUS WASTE DISPOSAL

- A. All hazardous waste disposal shall be handled and disposed of by an approved, licensed contractor.
- B. Any and all ballasts are assumed to contain PCB unless clearly marked “NO PCB.”
- C. Place ballasts and lamps in appropriate containers provided by hazardous waste contractor labeled clearly with:
 - 1. Project Name
 - 2. Quantity of lamps
 - 3. Date lamps became waste
- D. Store, remove, transport and dispose of hazardous materials in all accordance with state and federal regulations.
- E. Provide Owner with copy of manifest and certificate of destruction.

END OF SECTION

ST TAMMANY PARISH GOVERNMENT
DEPARTMENT OF UTILITIES

**RIVER OAKS
BUILDING & WELL IMPROVEMENTS**

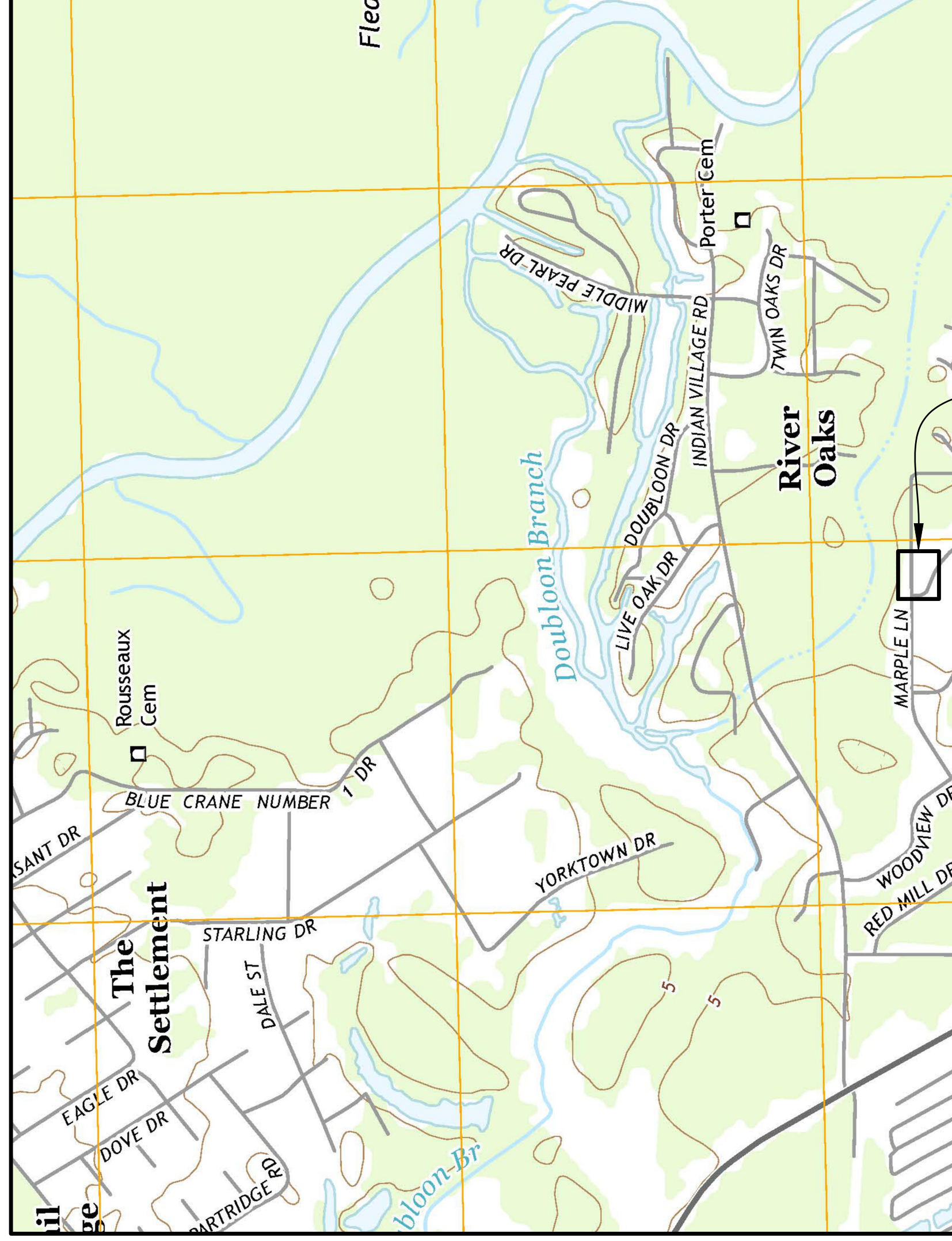
JULY 2024

BID NO. 24-47-2

INDEX TO SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES, LOCATION MAP, AND CONTACTS
3	RIVER OAKS SURVEY
4	RIVER OAKS DEMO PLAN
5	RIVER OAKS SITE PLAN
6-7	SITE DETAILS
8	FENCE DETAILS
9-10	ELEVATED TANK PLAN, ELEVATIONS, & DETAILS
11	RIVER OAKS FOUNDATION PLAN
12	RIVER OAKS DECK PLAN
13	RIVER OAKS BUILDING PLAN & ELEVATIONS
14	RIVER OAKS BUILDING SECTIONS & DETAILS
15	BUILDING DETAILS
16	STAIR PLAN & ELEVATIONS
17-18	RIVER OAKS PROCESS SCHEMATIC & SCHEDULES
19-20	MECHANICAL PLANS & SECTIONS
21-23	MECHANICAL DETAILS
24	DISINFECTION
25	WATER WELL DETAILS
E1	ELECTRICAL RISER DIAGRAM & DETAILS (RIVER OAKS)
E2	ELECTRICAL SITE DEMOLITION PLAN (RIVER OAKS)
E3	NEW ELECTRICAL SITE PLAN (RIVER OAKS)
E4	ENLARGED ELECTRICAL PLAN (RIVER OAKS)
A1	CP001
A2	CP002

STANDARD PLANS	NO. OF SHEET(S)	REVISION DATE
CB-01	1 SHEET	11.02.00
EC-01	2 SHEETS	10.01.08



LDH/OPH PERMIT NO:
P 23-09-103-147

PROJECT LOCATION
(RIVER OAKS 150K TANK)

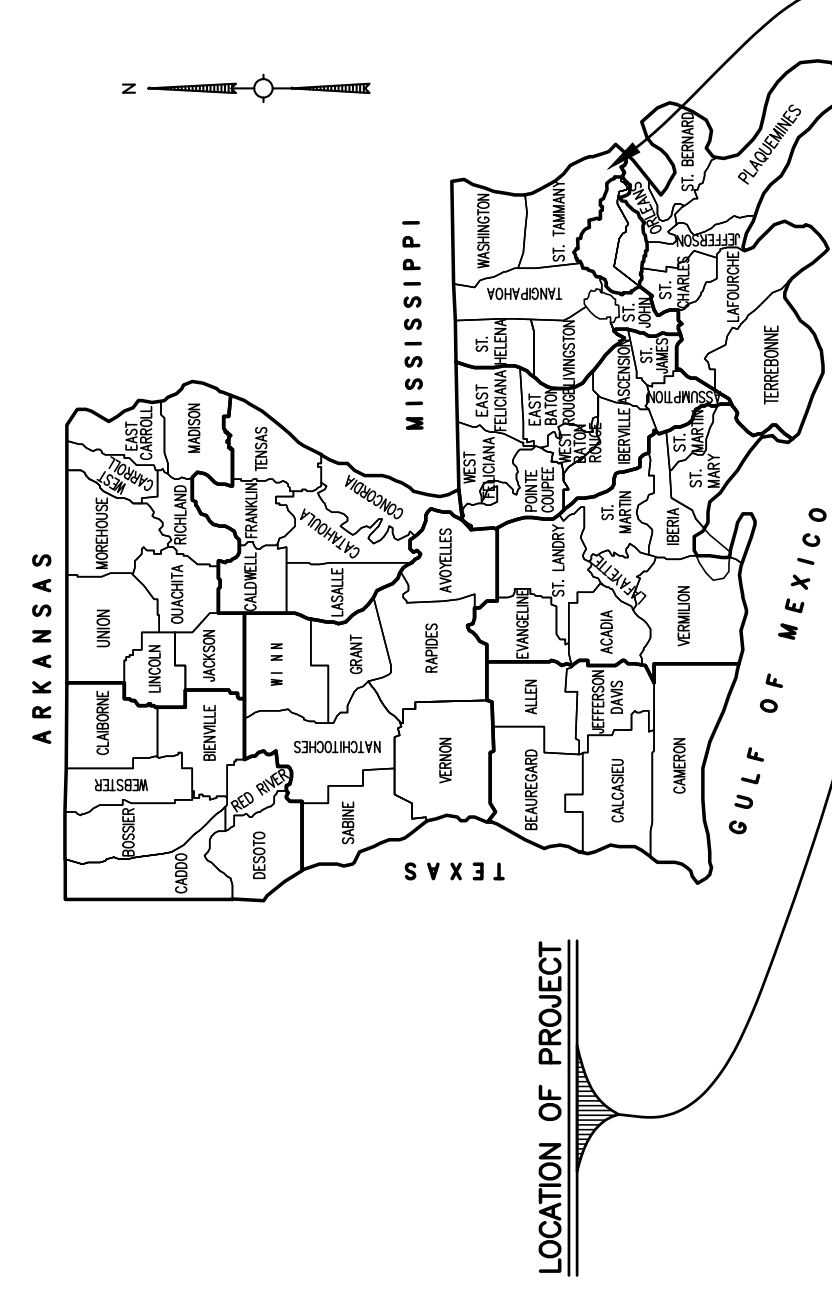
LOCATION MAP
SCALE: 1 INCH = 1000 FEET



THE 2016 EDITION OF THE LOUISIANA DOTD STANDARD SPECIFICATION FOR ROADS AND BRIDGES, AS AMENDED BY THE PROJECT SPECIFICATIONS, SHALL GOVERN THIS PROJECT.



CLASSIFICATION: MUNICIPAL & PUBLIC WORKS OR BUILDING CONSTRUCTION



PLANS PREPARED BY AND
RECOMMENDED FOR APPROVAL:

Thomas M. Schreiner
PRINCIPAL ENGINEERING, INC.
THOMAS M. SCHREINER
VICE PRESIDENT

7/27/2024
DATE

ACCEPTED FOR CONSTRUCTION BY:

Christopher P. Tissue
DEPARTMENT OF UTILITIES
CHRISTOPHER P. TISSUE, P.E.
DIRECTOR

09/23/2024
DATE

PARISH PRESIDENT
HON. MIKE COOPER

COUNCIL MEMBERS

RICHARD SMITH	DISTRICT I
LARRY ROLLING	DISTRICT II
MARTHA CAZAUBON	DISTRICT III
KATHY SEIDEN	DISTRICT IV
PAT PHILLIPS	DISTRICT V
CHERYL TANNER	DISTRICT VI
JOSEPH IMPASTATO	DISTRICT VII
PATRICK BURKE III	DISTRICT VIII
DAVID COUGLE	DISTRICT IX
MAUREEN "MO" O'BRIEN	DISTRICT X
ARTHUR LAUGHLIN	DISTRICT XI
JERRY BINDER	DISTRICT XII
JEFFREY CORBIN	DISTRICT XIII
JIMMY STRICKLAND	DISTRICT XIV



DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: ACM
DRAWN BY: LMR
CHECKED BY: TMS
SUBMITTED BY: PRINCIPAL ENG
PROJECT No.: TU23000160
ISSUE DATE: JULY 2024
APPROVED BY: ---
SHEET SIZE: ANSI D
SCALE:

RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
TITLE SHEET

SHEET NO.
1
SHEET 1 OF 29



DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

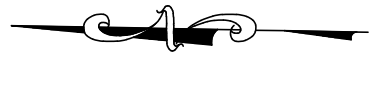
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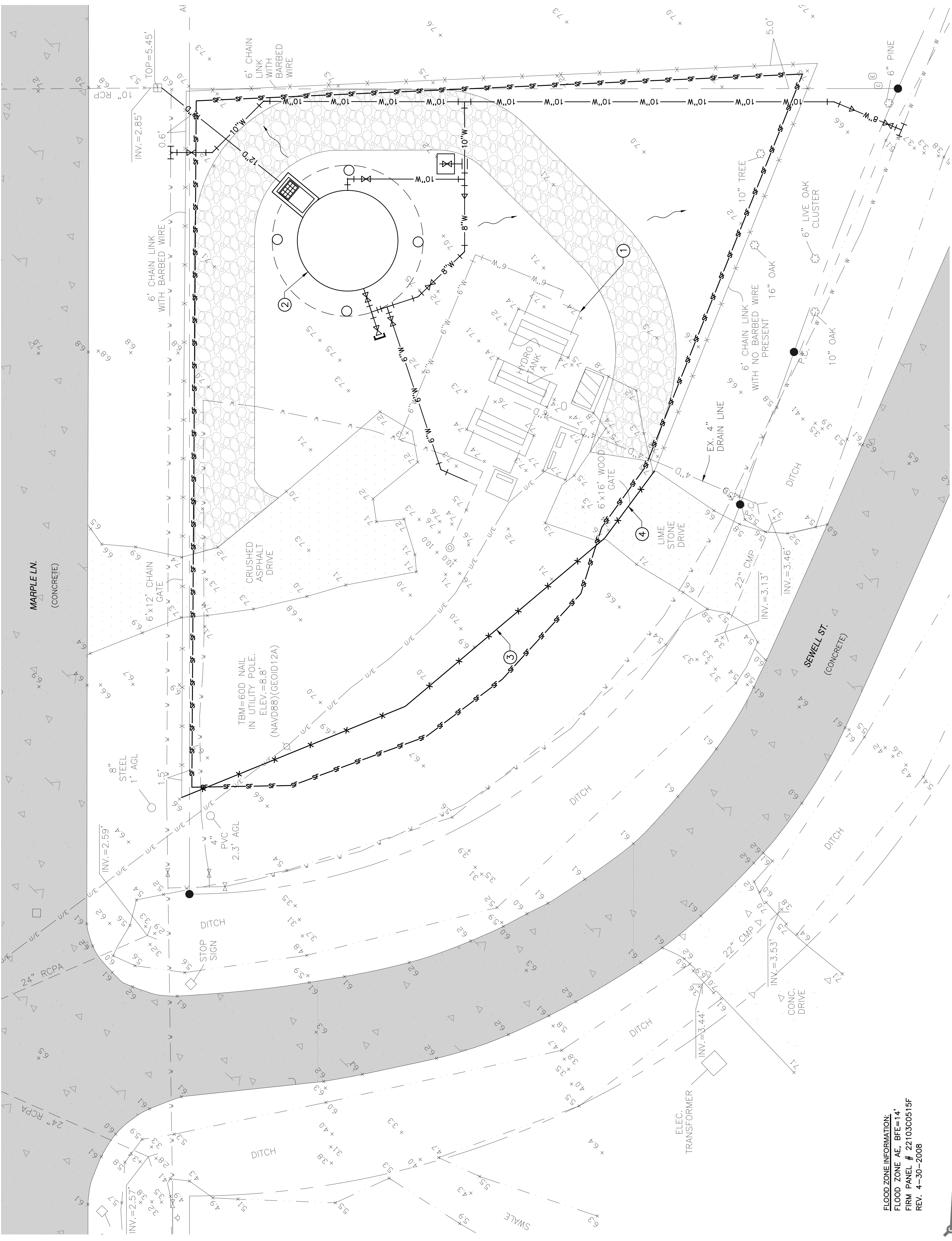
PROJECT No.: TU23000160
RIVER OAKS
BUILDING & WELL IMPROVEMENTS
RIVER OAKS DEMO PLAN

SHEET NO. 4
SHEET 4 OF 29



- DEMO PLAN KEYNOTES:**
- EXISTING HYDRO-PNEUMATIC TANK A
 - 150K GALLON ELEVATED TANK (TO REMAIN)
 - REC'D FENCE REMOVAL
 - REC'D GATE REMOVAL

- NOTES:**
- EXISTING WATER WELL AND HYDRO-PNEUMATIC TANK A SHALL REMAIN IN OPERATION DURING CONSTRUCTION. THIS TANK SHALL BE REMOVED FOLLOWING CONSTRUCTION, TESTING, AND ACCEPTANCE OF ALL IMPROVEMENTS.
 - CONTRACTOR SHALL ALLOW ST. TAMMANY DEPARTMENT OF UTILITIES (DU) AND THE ENGINEER ACCESS TO THE SITE AT ALL TIMES.
 - CONTRACTOR SHALL COORDINATE ANY SHUTDOWNS OF THE WELL AND EQUIPMENT OR WATER MAIN WITH DU AND THE ENGINEER. ALL VALVES SHALL BE OPERATED BY DU PERSONNEL.
 - CONTRACTOR SHALL BE ALLOWED A MAXIMUM OF 4 HOURS OUTAGE FOR TIE-IN OF WELL, NEW TANK & EQUIPMENT.
 - REMOVE AND DELIVER THE FOLLOWING EXISTING EQUIPMENT TO A LOCATION DESIGNATED BY THE OWNER (CONTRACTOR SHALL PAY SPECIAL ATTENTION AS TO NOT DAMAGE THE ITEMS DURING REMOVAL AND DELIVERY):
 - HYDRO-PNEUMATIC TANK
 - WELL PUMP & MOTOR
 - PIPING, VALVES, FITTINGS, AND GAGES (AS DETERMINED BY DU)
 - TRANSFORMER
 - CHEMICAL TANKS
 - CHEMICAL FEED SYSTEM
 - SHED
 - A LOCATION FOR THE DELIVERY OF THE SALVAGED EQUIPMENT WILL BE WITHIN A 50-MILE RADIUS OF THE PROJECT SITE AND WILL BE LOCATED WITHIN ST. TAMMANY PARISH. CONTRACTOR SHALL INCLUDE ALL RIGGING, EQUIPMENT, AND LABOR COSTS TO LOAD, TRANSPORT, AND UNLOAD THE TANK AND OTHER EQUIPMENT IN HIS BID.



FLOOD ZONE INFORMATION:
FLOOD ZONE AE, BFE=14'
FIRM PANEL # 221030015F
REV. 4-30-2008



DEMO PLAN
SCALE: 1" = 10'
0 5 10
1" = 10 FEET



DEPT. OF UTILITIES
ST. TAMMANY PARISH
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620 N. TYLER STREET
COVINGTON, LA 70433

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DESIGNED BY: ACM	CHECKED BY: PRINCIPAL ENG	PROJECT No.: TU23000160	ISSUE DATE: JULY 2024	APPROVED BY: ---	SHEET SIZE: ANSI D	SCALE: ---
DRAWN BY: LMR	SUBMITTED BY: ---					

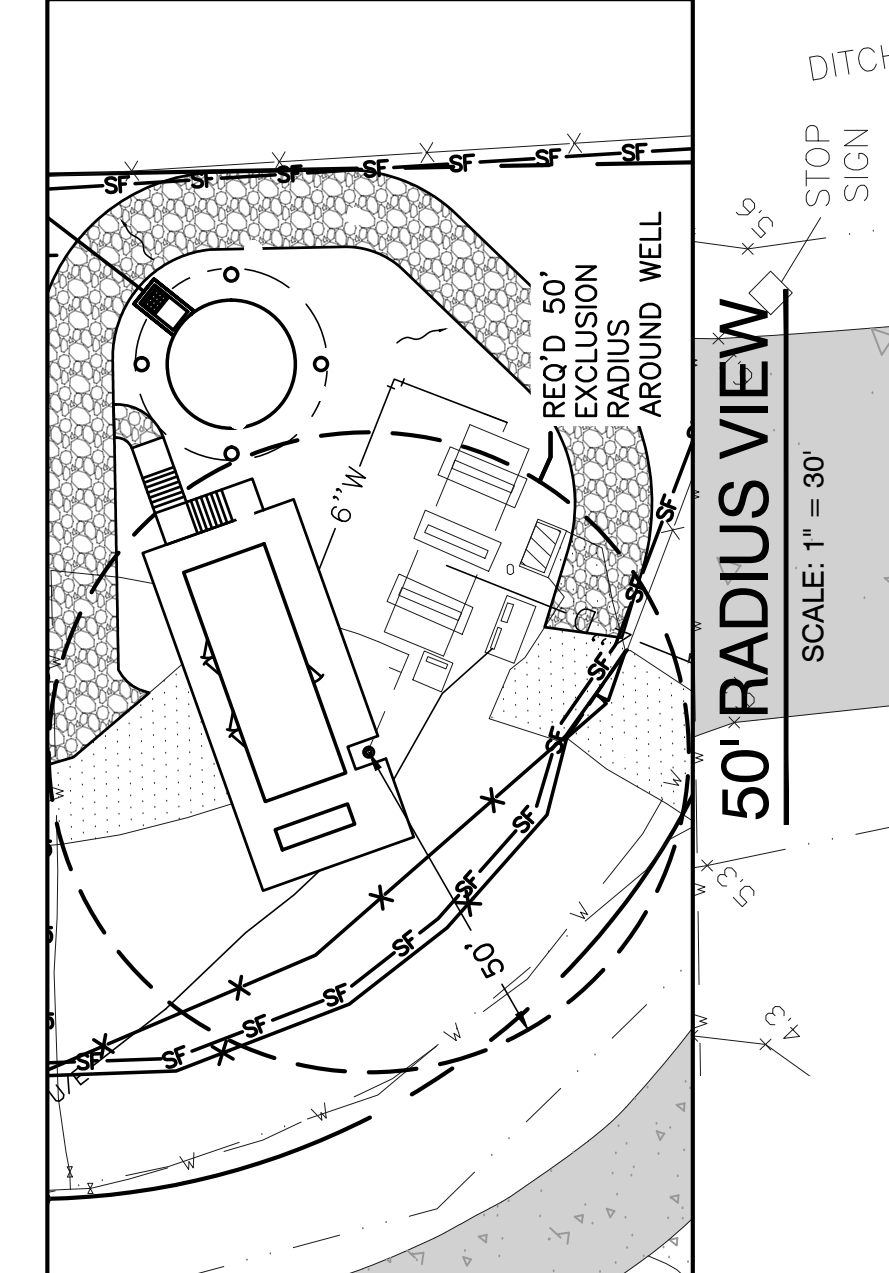
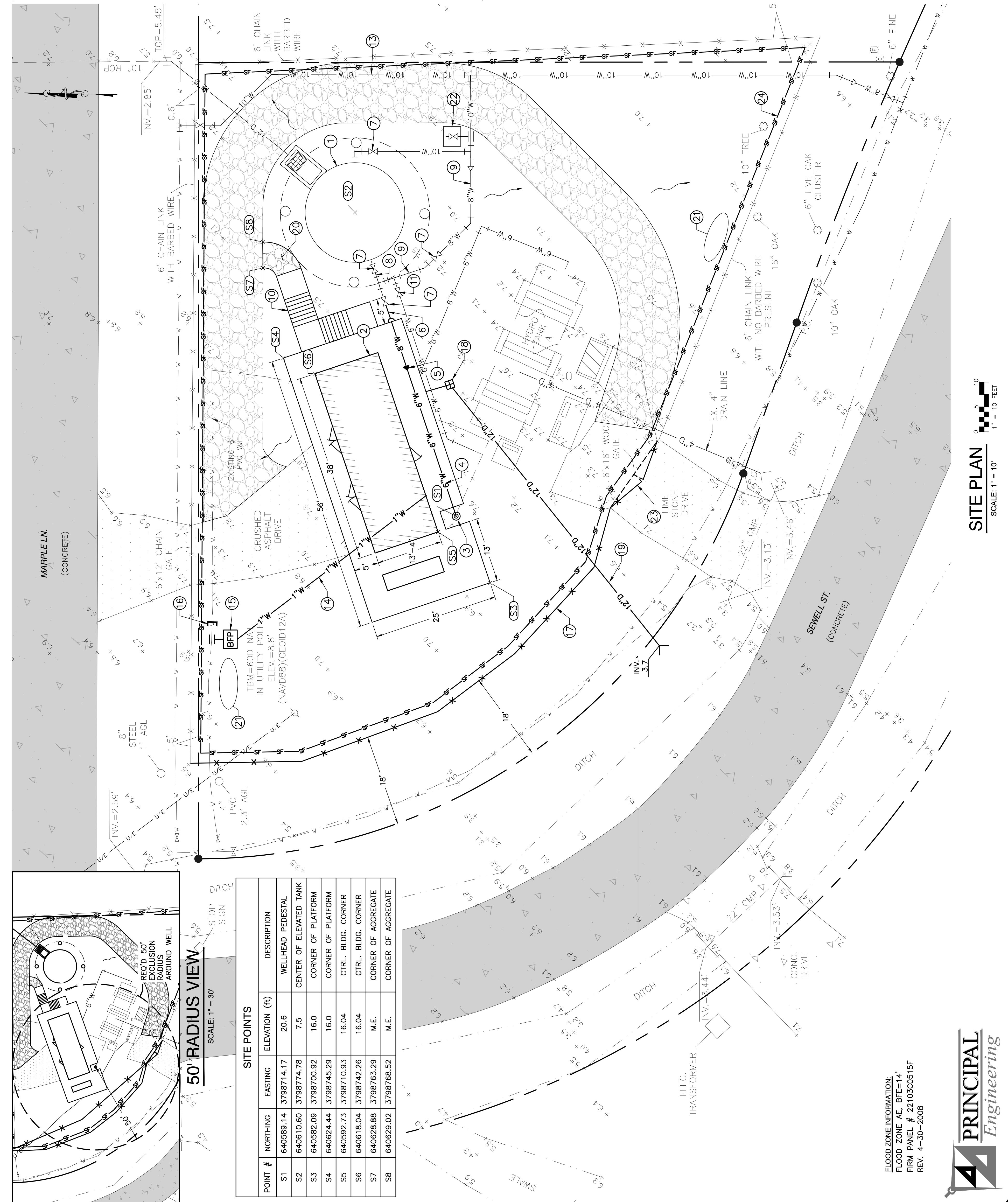


RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
RIVER OAKS SITE PLAN

SHEET NO. 5
SHEET 5 OF 29

- SITE PLAN KEYNOTES:**
- ELEVATED STORAGE TANK (BY OTHERS)
 - REQ'D CONTROL BUILDING
 - REQ'D WELL UPGRADE
 - REQ'D 6" D.I. LINE
 - REQ'D 6"x8" INCREASER
 - REMOVE EXIST. PLUG & CONNECT NEW 8" TO EXIST. 8" VALVE
 - 8" GATE VALVE (BY OTHERS)
 - 8" PVC FILL LINE (BY OTHERS)
 - 8" PVC BYPASS LINE (BY OTHERS)
 - REQ'D STAIR AND LANDING
 - 6" GATE VALVE (BY OTHERS)
 - WATER SAMPLE STATION (BY OTHERS)
 - 10" PVC DISTRIBUTION LINE (BY OTHERS)
 - REQ'D 1" WATER SERVICE
 - REQ'D BACKFLOW PREVENTER
 - REQ'D CAP EXISTING 6" WL. AFTER NEW CONTROL BLDG. EQUIPMENT & TANK ONLINE
 - REQ'D 6' POLYMER COATED CHAIN LINK W/ BARBED WIRE
 - REQ'D DRAIN INLET, I.C.=7.3, INV.=4.0
 - REQ'D 12" RCP DRAIN LINE
 - REQ'D AGGREGATE SURFACE, 3.9 SQ. YD (APPROX.)
 - REQ'D VIBRATION MONITORING LOCATION
 - 10" GATE VALVE (BY OTHERS)
 - REQ'D 2'-6" HIGH, 8' LONG CHAIN LINK GATES
 - REQ'D SILT FENCE

- NOTES:**
- EXISTING WATER WELL, HYDROPNEUMATIC TANK A AND ELEVATED STORAGE TANK SHALL REMAIN IN OPERATION DURING CONSTRUCTION.
 - CONTRACTOR SHALL ALLOW ST. TAMMANY DEPARTMENT OF UTILITIES (DU) AND THE ENGINEER ACCESS TO THE SITE AT ALL TIMES.
 - CONTRACTOR SHALL COORDINATE ANY SHUTDOWNS OF THE WELL AND EQUIPMENT OR WATER MAIN WITH DU AND THE ENGINEER. ALL VALVES SHALL BE OPERATED BY DU PERSONNEL.
 - CONTRACTOR SHALL BE ALLOWED A MAXIMUM OF 8 HOURS OUTAGE FOR TIE-IN OF NEW WELL & EQUIPMENT.
 - ALL DRAINAGE PIPES SHALL BE REINFORCED CONCRETE PIPE.
 - RESTRAIN ALL BURIED JOINTS ON WATERLINES.
 - CONTRACTOR SHALL CONFIRM LOCATION, SIZE, AND TYPE OF EXISTING WATERLINES BY EXCAVATION BEFORE CONSTRUCTION.
 - SEPARATION DISTANCES BETWEEN SOURCES OF CONTAMINATION MEET REQUIREMENTS OF LAC 51:X11:217
 - ALL BURIED WATERLINES SHALL BE PVC-C900, DR18.
 - CONTRACTOR SHALL MAINTAIN EXISTING AGGREGATE ACCESS LANE DURING CONSTRUCTION, RESTORE TO LEVEL & GRADED SURFACE AT COMPLETION OF CONSTRUCTION. MATERIAL SHALL BE MINIMUM 4" 610 CRUSHED LIMESTONE (GRAY). REQ'D THICKNESS OF NEW AGGREGATE DRIVE IS 8".
 - RESTORE AGGREGATE ACCESS AFTER HYDROPNEUMATIC TANK IS DECOMMISSIONED AND REMOVED.



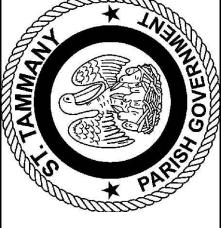
SITE POINTS

POINT #	NORTHING	EASTING	ELEVATION (ft)	DESCRIPTION
S1	640589.14	3798714.17	20.6	WELLHEAD PEDESTAL
S2	640610.80	3798774.78	7.5	CENTER OF ELEVATED TANK
S3	640582.09	3798700.92	16.0	CORNER OF PLATFORM
S4	640624.44	3798745.29	16.0	CORNER OF PLATFORM
S5	640592.73	3798710.93	16.04	CTRL. BLDG. CORNER
S6	640618.04	3798742.26	16.04	CTRL. BLDG. CORNER
S7	640628.88	3798763.29	M.E.	CORNER OF AGGREGATE
S8	640629.02	3798788.52	M.E.	CORNER OF AGGREGATE

SITE PLAN
SCALE: 1" = 10'
0 5 10
1" = 10 FEET

FLOOD ZONE INFORMATION:
FLOOD ZONE AE, BFE=14'
FIRM PANEL # 221030015F
REV. 4-30-2008

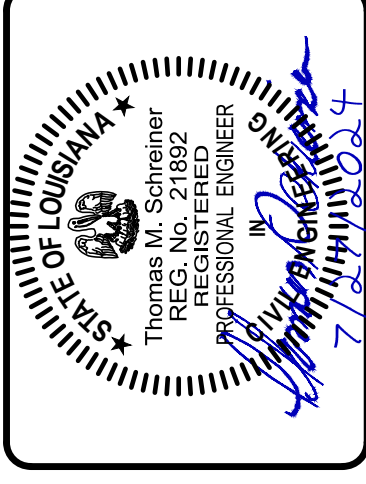




DEPT. OF UTILITIES
ST. TAMMANY PARISH
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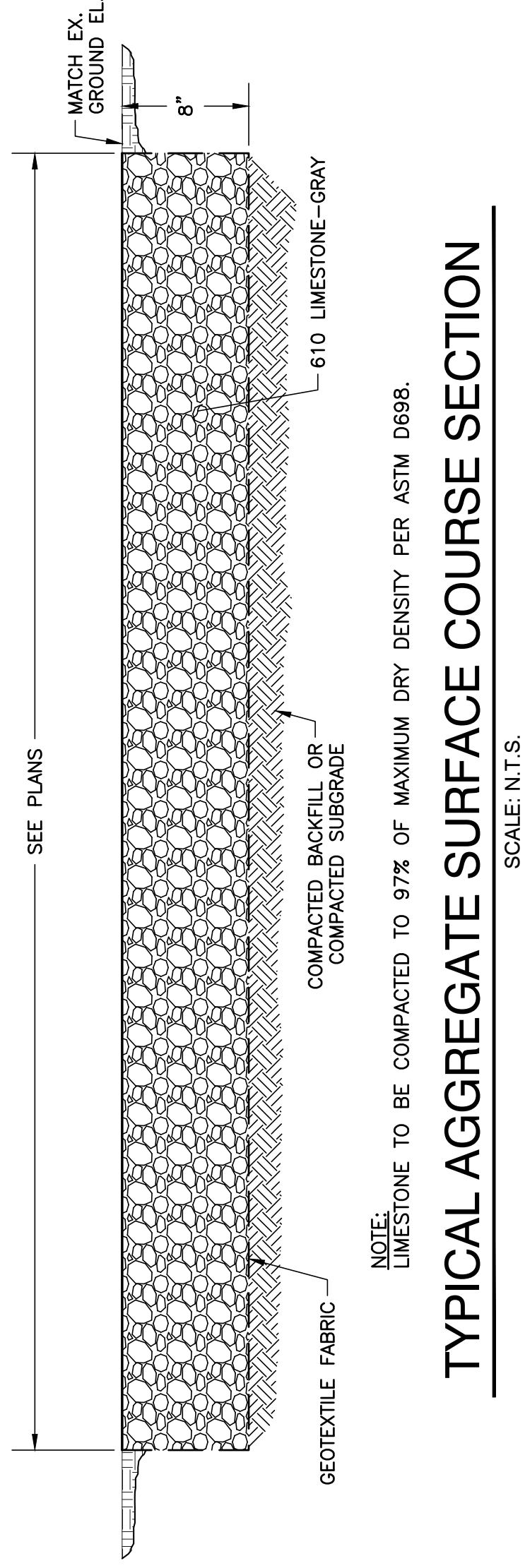
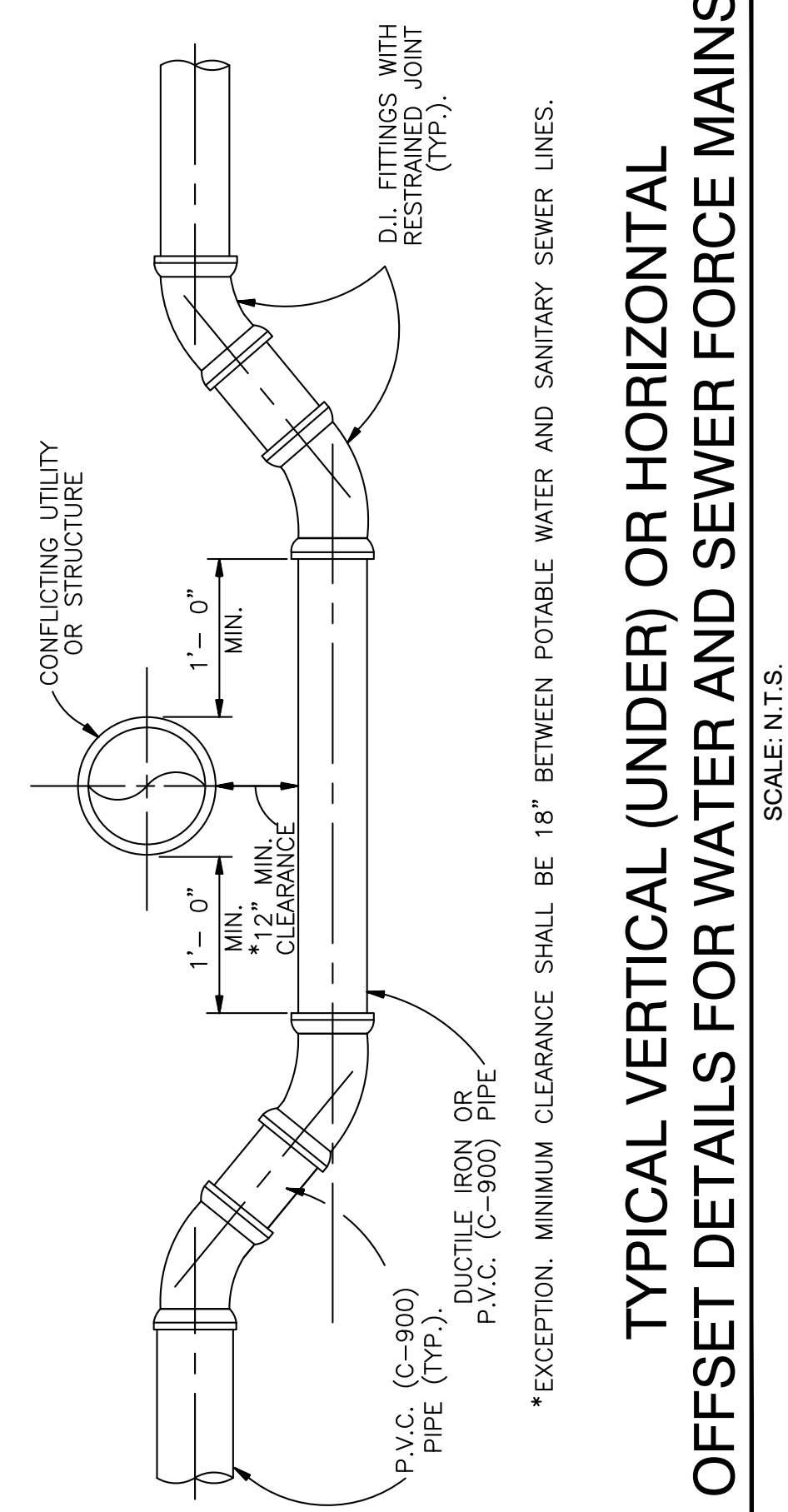
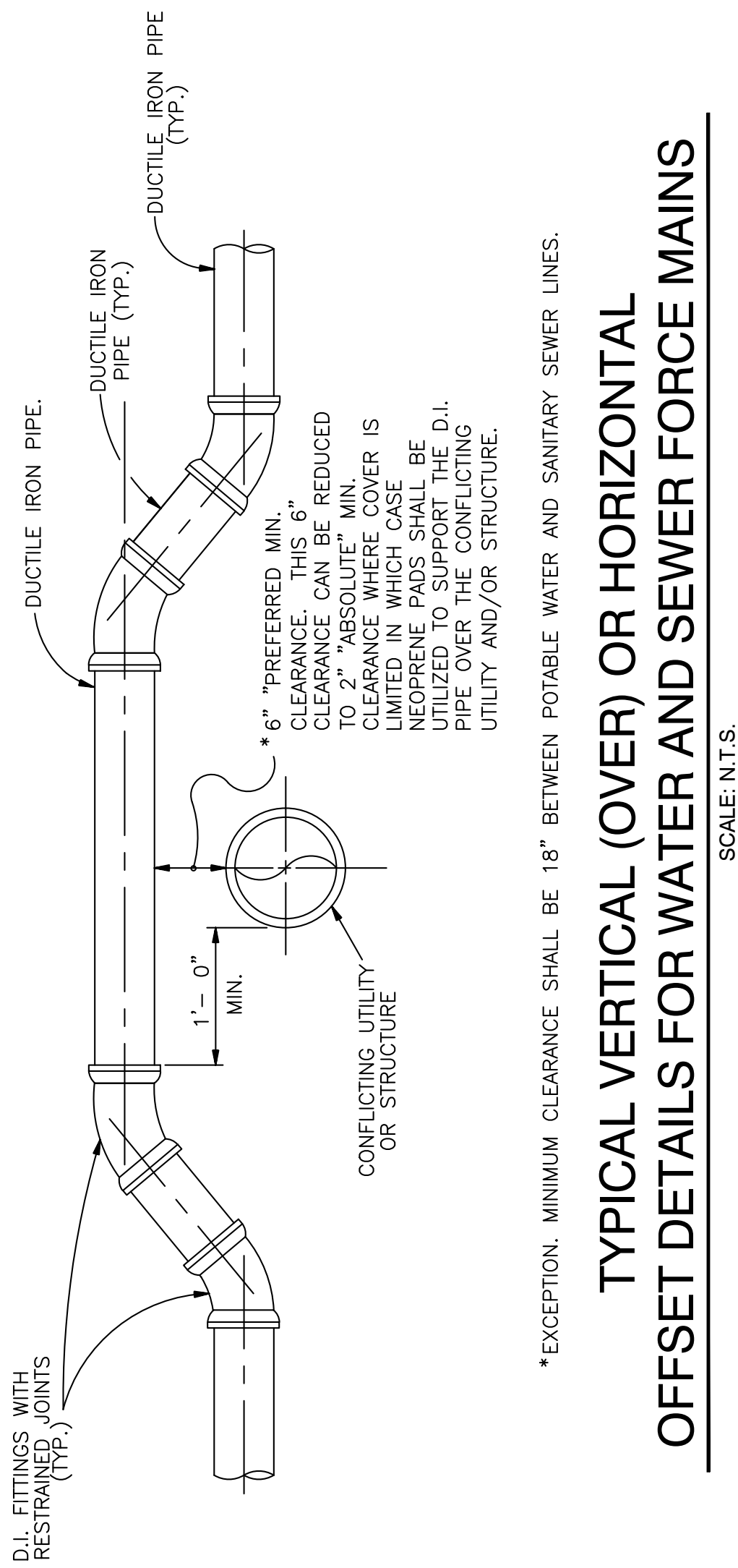
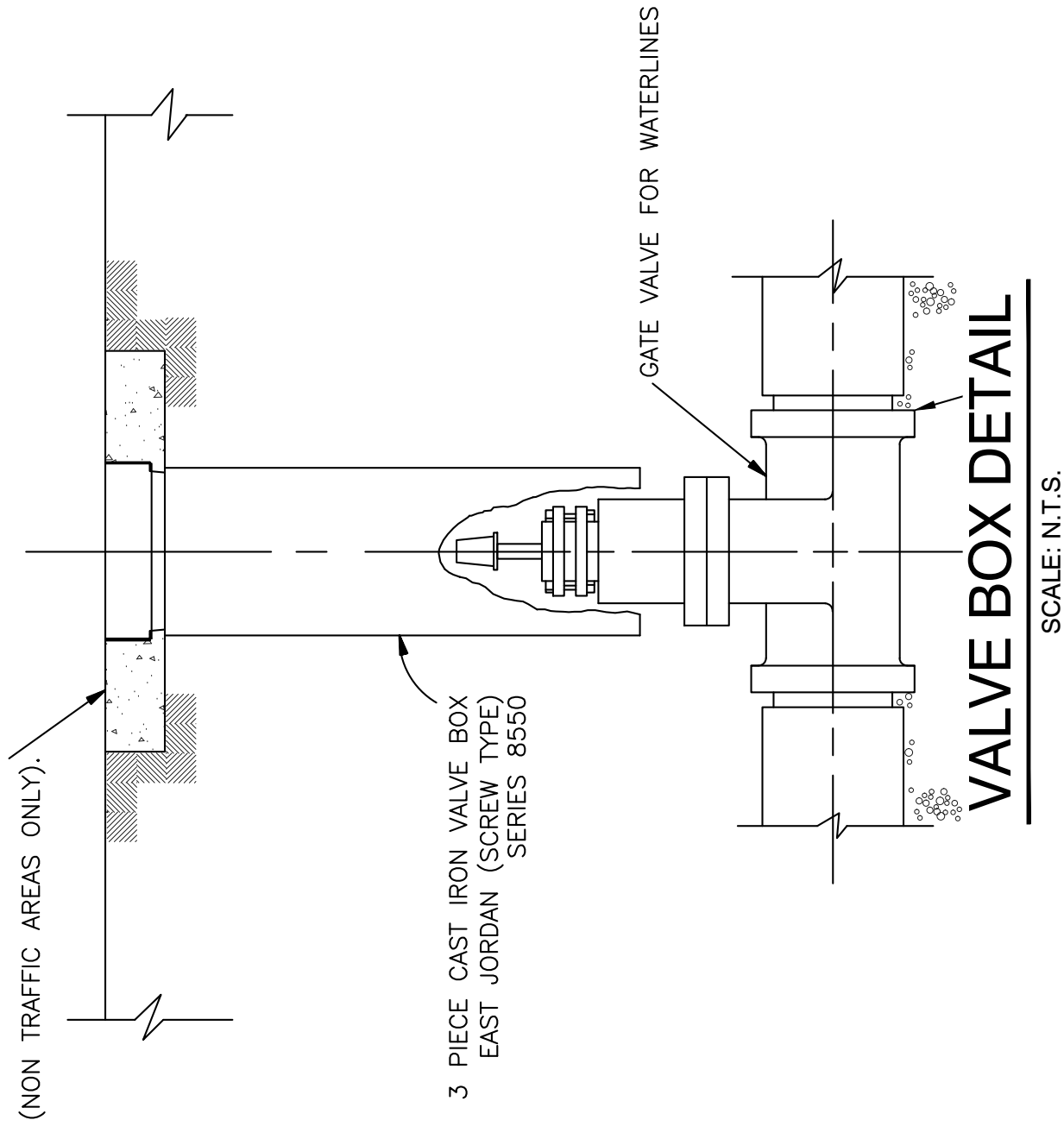
No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: ACM	DRAWN BY: ADF	CHECKED BY: ACM	SUBMITTED BY: PRINCIPAL ENG	PROJECT No.: TU23000160	ISSUE DATE: JULY 2024	APPROVED BY: ---	SHEET SIZE: ANSI D	SCALE:
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RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
SITE DETAILS

SHEET NO. 7
SHEET 7 OF 29





DEPT. OF UTILITIES
 TAMMANY PARISH
 GOVERNMENT
 620 N. TYLER STREET
 COVINGTON, LA 70433

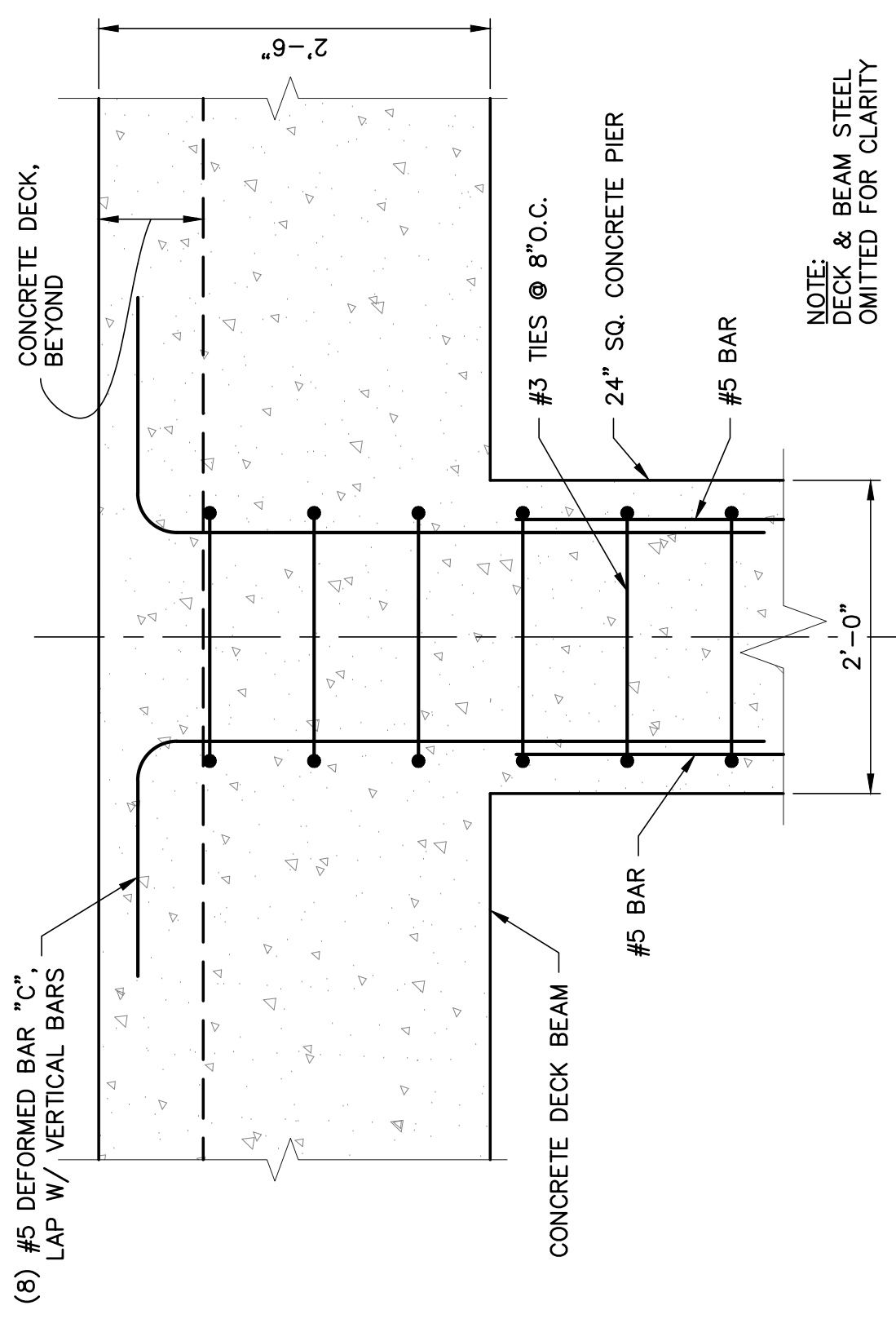
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DESIGNED BY: DAM	CHECKED BY: TMS	PROJECT No.: TU23000160	ISSUE DATE: JULY 2024	SHEET SIZE: ANSI D	SCALE: AS SHOWN
DRAWN BY: MPM	SUBMITTED BY: TMS	PROJECT No.: TU23000160	ISSUE DATE: JULY 2024	APPROVED BY: ---	

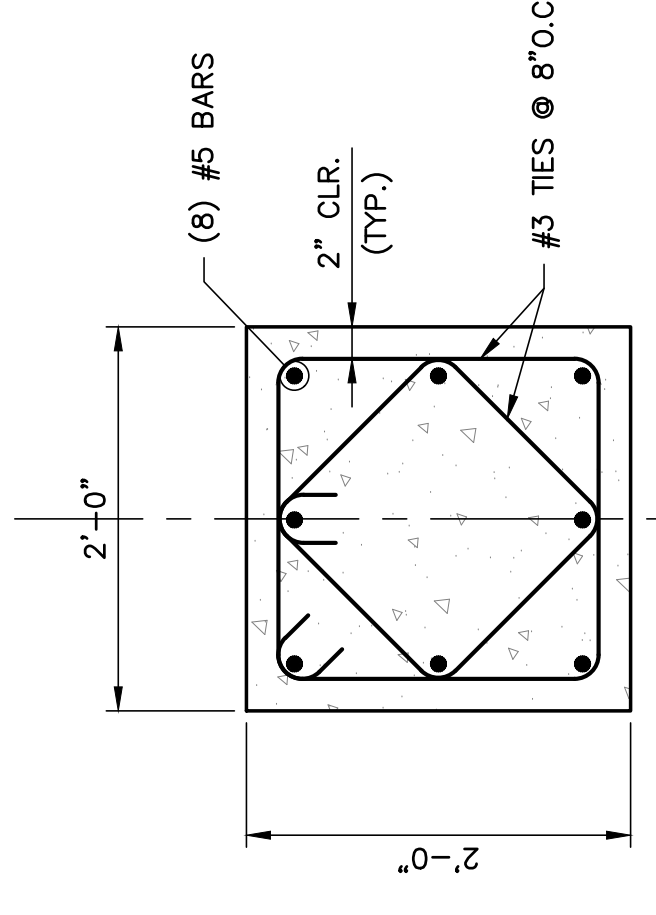


RIVER OAKS
 BUILDING & WELL IMPROVEMENTS
 PROJECT No.: TU23000160
 RIVER OAKS FOUNDATION PLAN

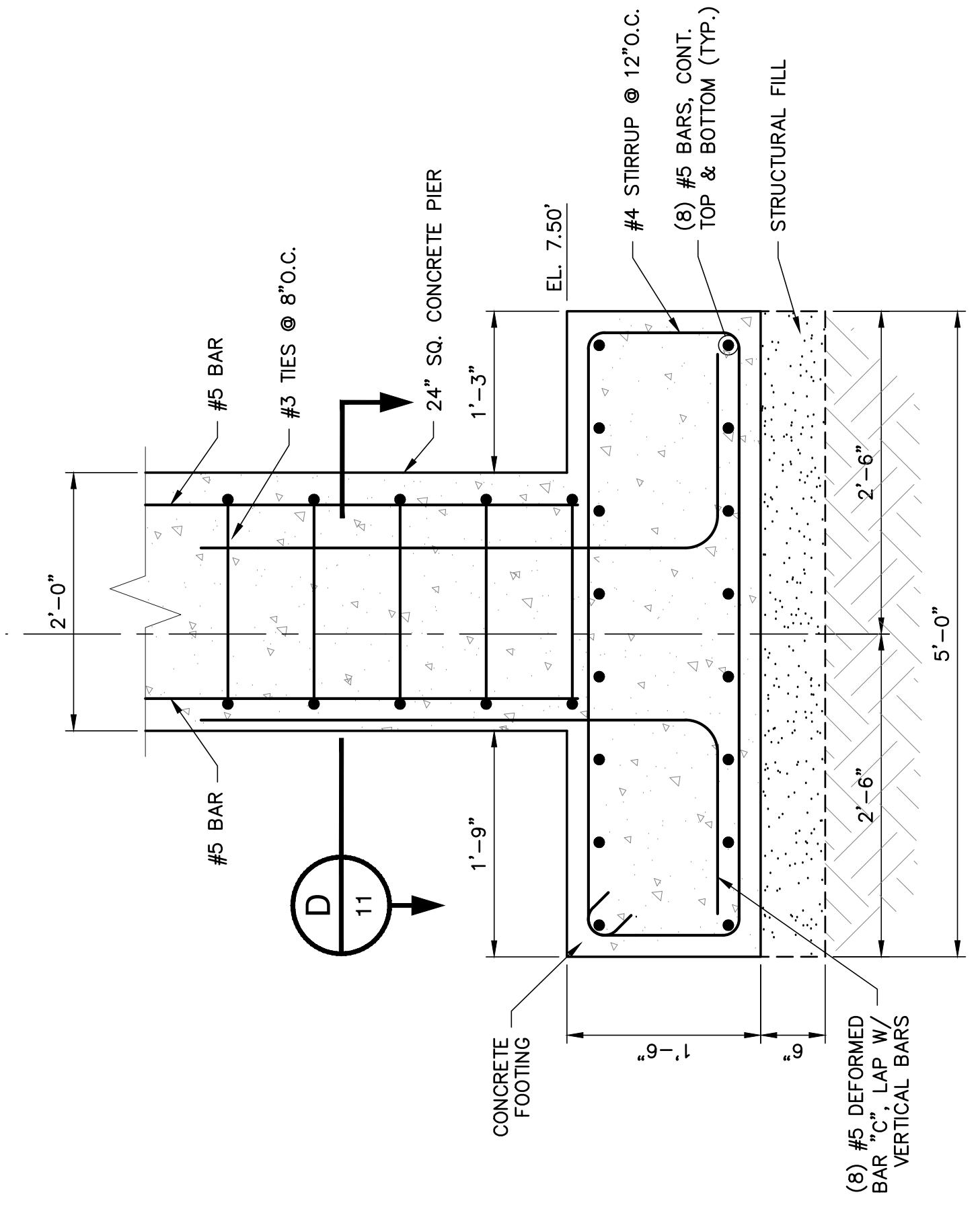
SHEET NO. 11
 SHEET 11 OF 29



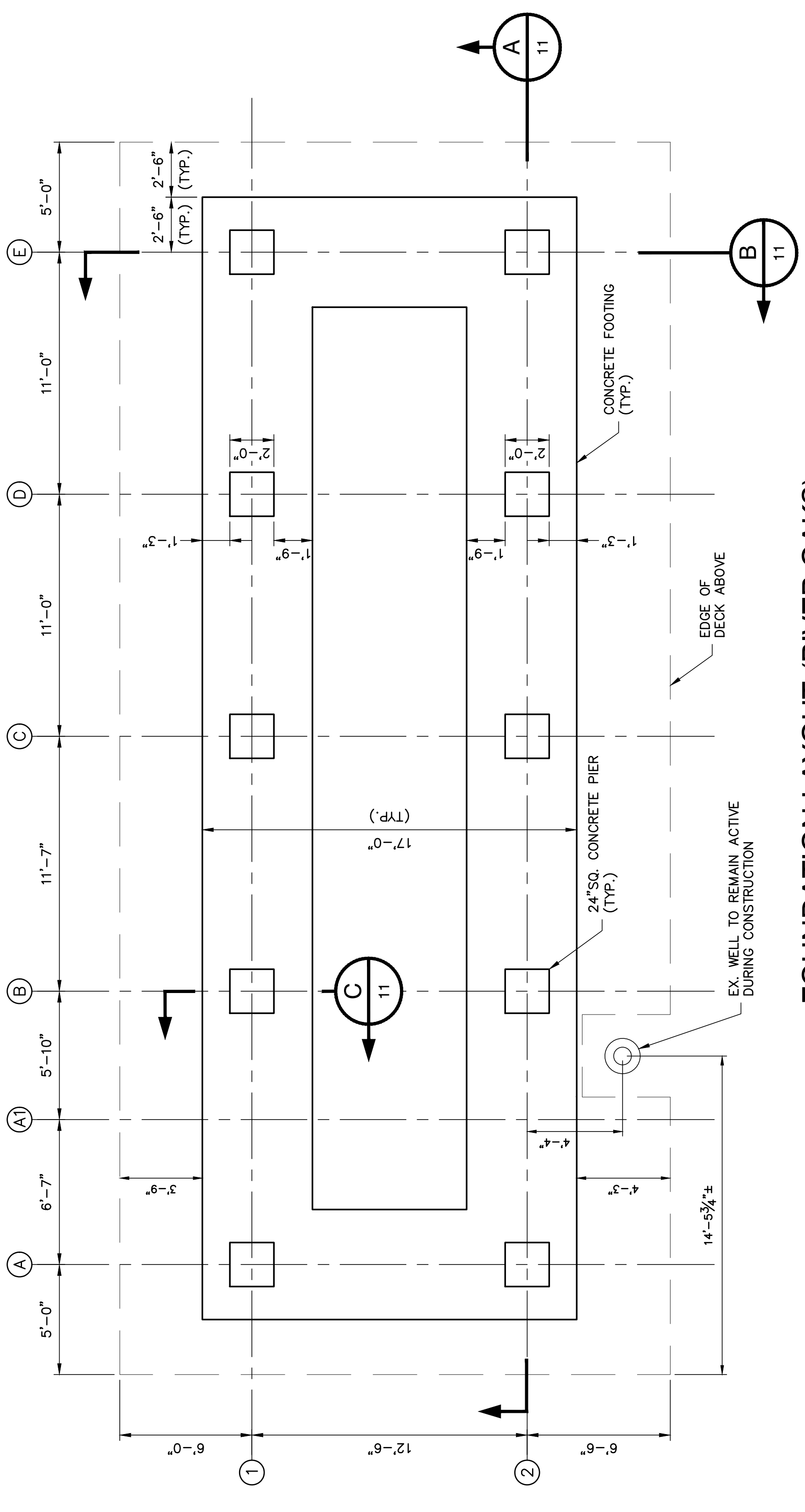
PIER TO BEAM CONNECTION SECTION
 SCALE: 1" = 1'-0"



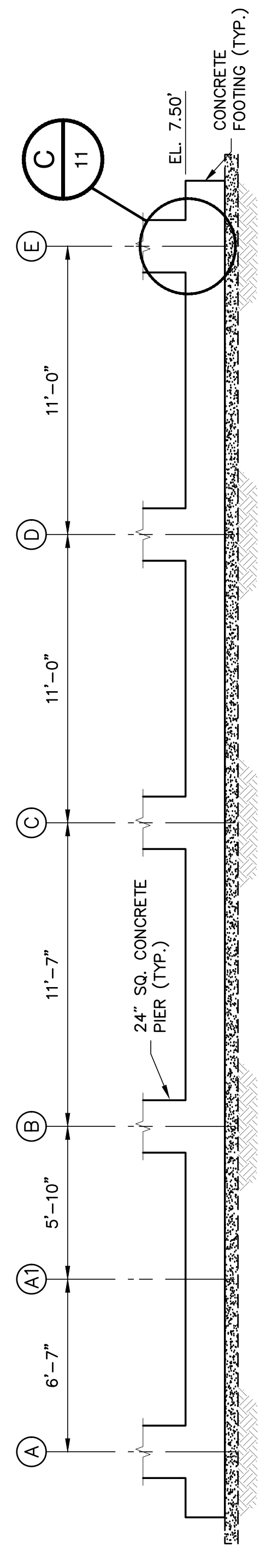
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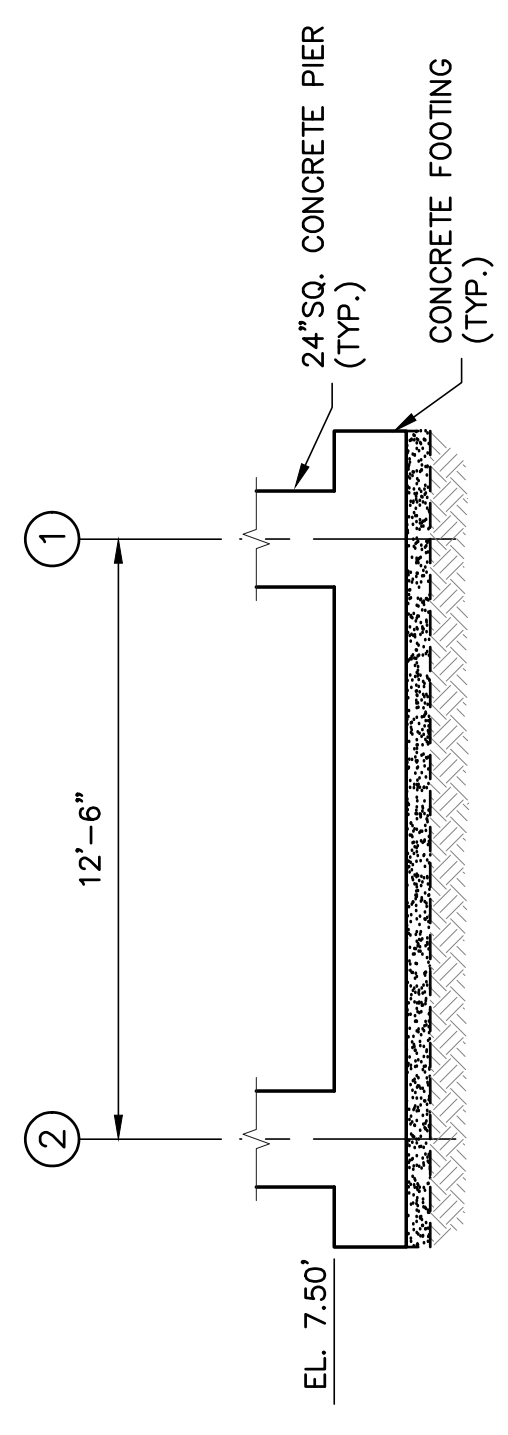
PIER TO FOOTING CONNECTION SECTION
 SCALE: 1" = 1'-0"



FOUNDATION LAYOUT (RIVER OAKS)
 SCALE: 1/4" = 1'-0"



FOUNDATION SECTION
 SCALE: 1/4" = 1'-0"



FOUNDATION SECTION
 SCALE: 1/4" = 1'-0"

FOUNDATION PREPARATION NOTES:

1. PRIOR TO CONSTRUCTION, THE FOUNDATION AREA SHALL BE STRIPPED OF ALL VEGETATION, DEBRIS, SOFT OR LOOSE SURFACE SOILS, DELETERIOUS MATERIALS, ETC. AND SHALL BE WELL DRAINED. SOFT SPOTS SHALL BE UNDERCUT TO SOUND MATERIAL AND BACKFILLED WITH STRUCTURAL FILL.
2. FOUNDATION EXCAVATIONS SHALL BE THOROUGHLY INSPECTED TO ASSURE THAT THE FOOTINGS ARE SEATED IN FIRM AND WELL-DRAINED SOIL.
3. FILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL FREE FROM DEBRIS OR ORGANIC MATTER. FILL MATERIAL SHALL BE CLEAN SAND WITH LESS THAN 10% PASSING THE U.S. No. 200 SIEVE.
4. STRUCTURAL FILL SHALL BE COMPACTED TO A DRY DENSITY AT LEAST EQUAL TO 95% OF ITS MAXIMUM DENSITY AS DETERMINED BY THE STANDARD PROCTOR, OR TO A MINIMUM RELATIVE DENSITY OF 75% IN ACCORDANCE WITH ASTM D4253 AND D4254. THE SAND OR STONE MAY BE PLACED AND COMPACTED IN MAXIMUM 6 INCH LOOSE LIFTS.

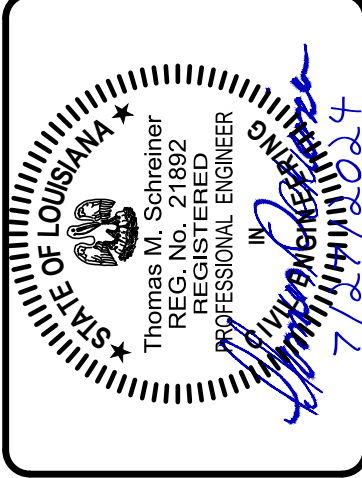




DEPT. OF UTILITIES
ST. TAMMANY PARISH
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COVINGTON, LA 70433

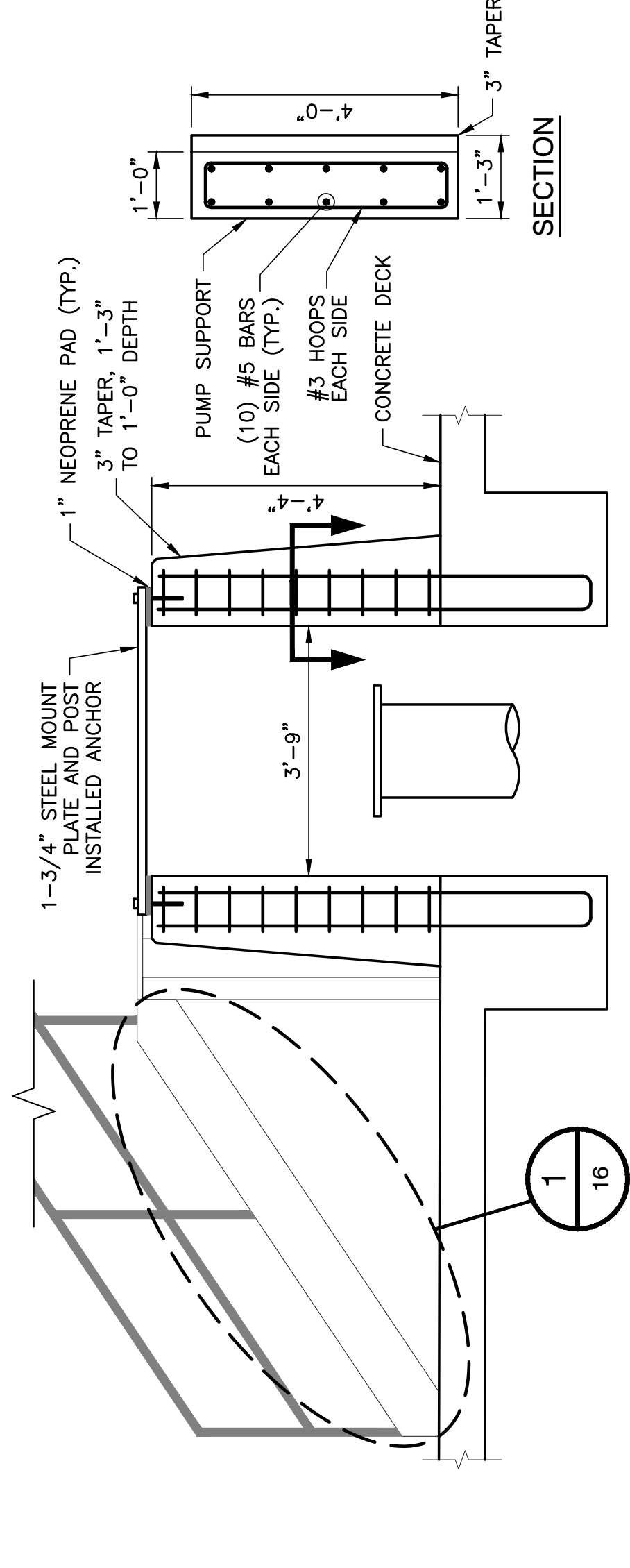
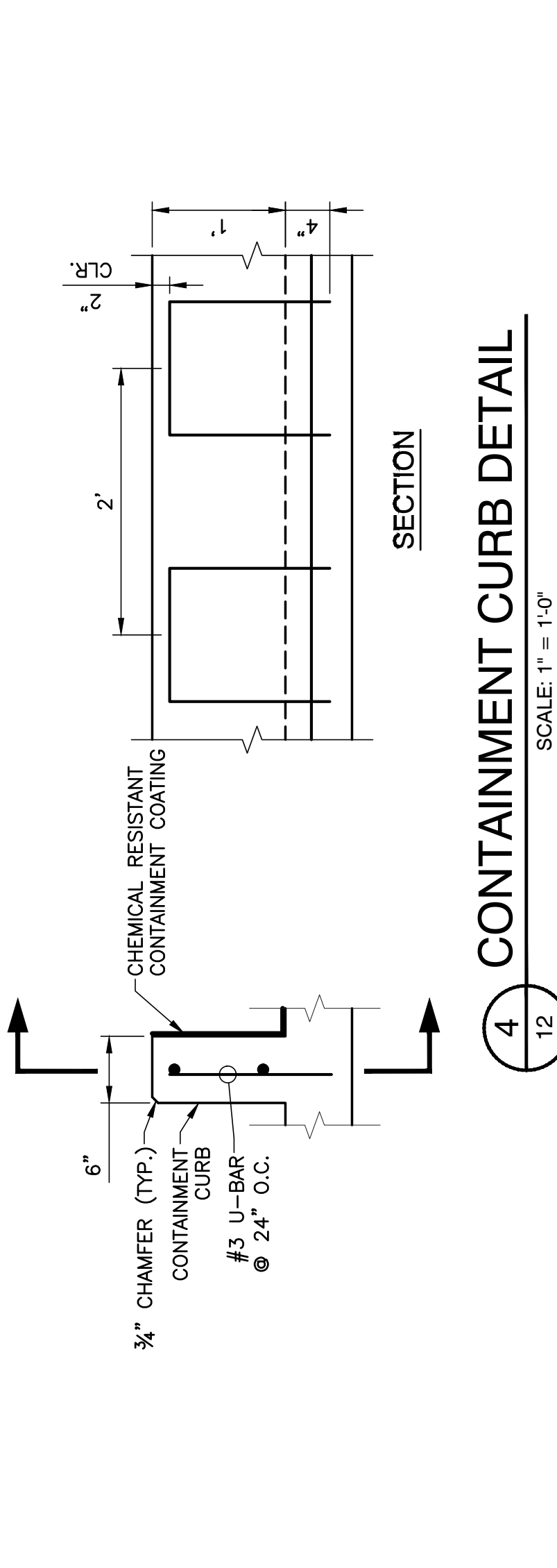
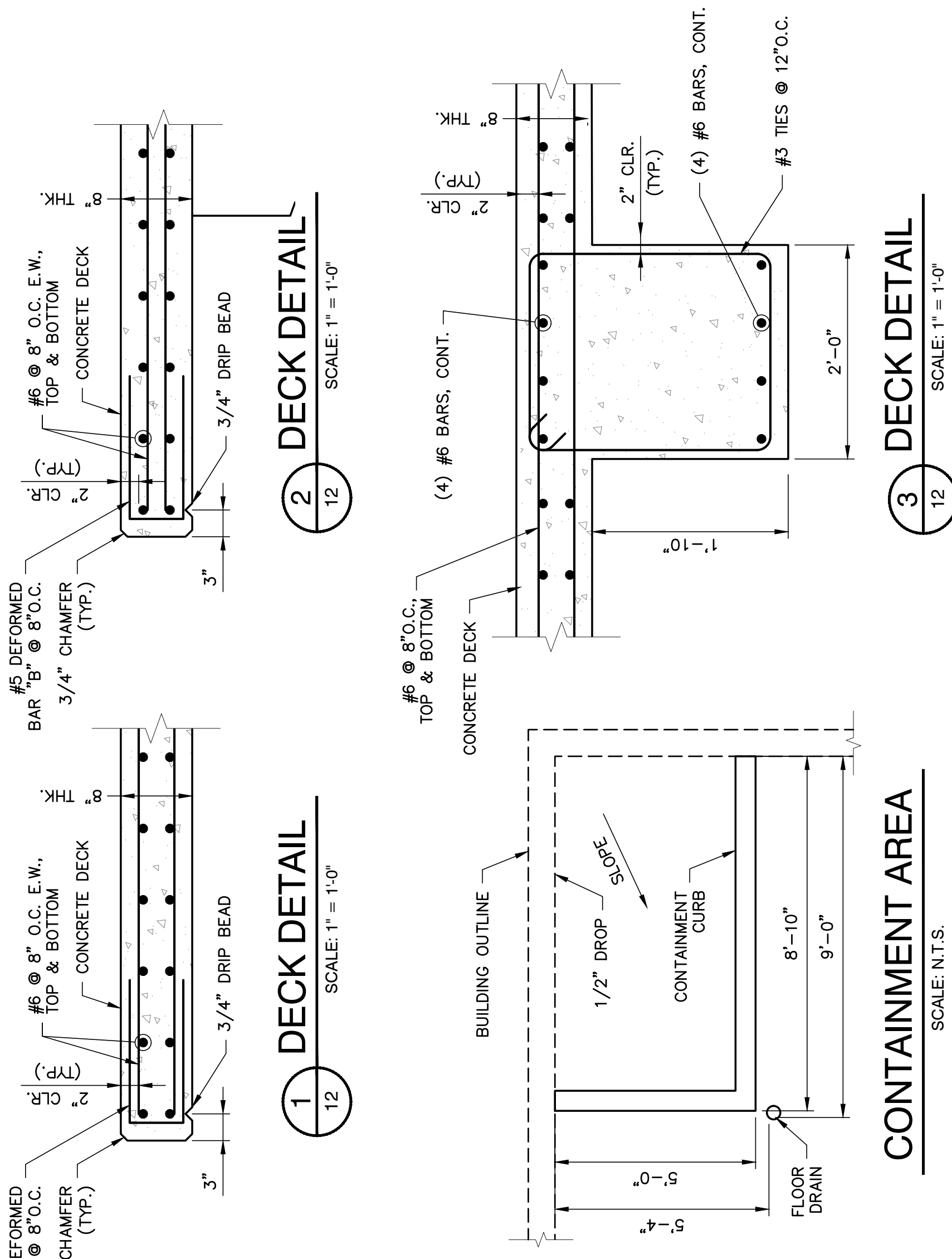
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DESIGNED BY:	DAM
DRAWN BY:	MPM
CHECKED BY:	TMS
SUBMITTED BY:	PRINCIPAL ENG
PROJECT No.:	TU23000160
ISSUE DATE:	JULY 2024
APPROVED BY:	---
SHEET SIZE:	ANSI D
SCALE:	AS SHOWN

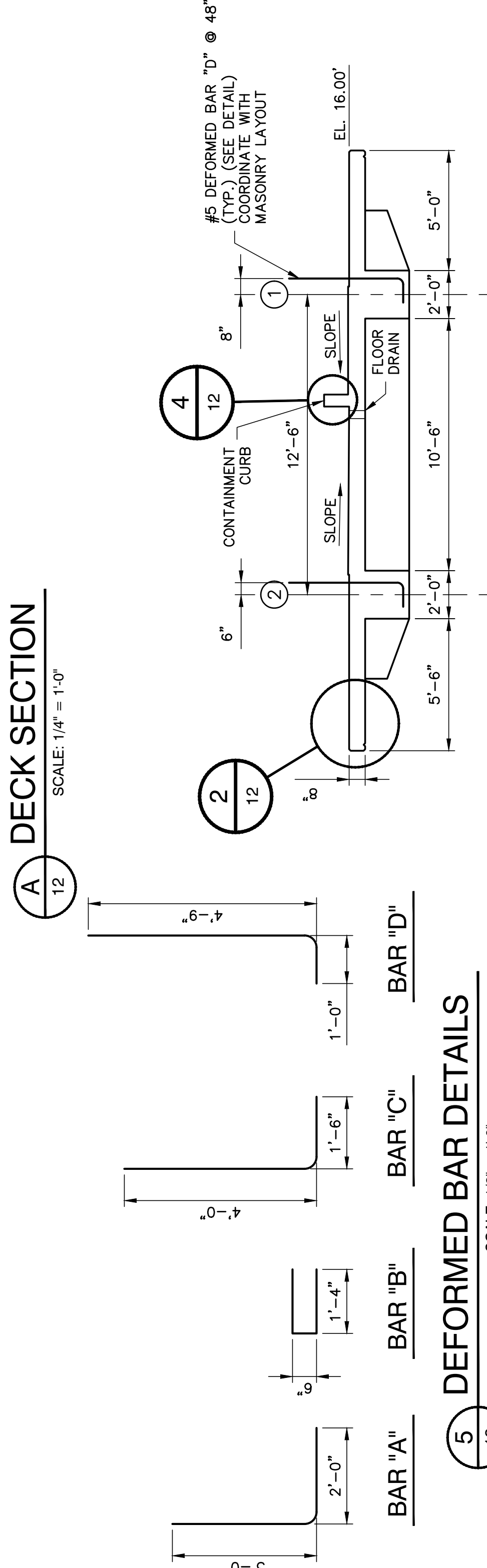
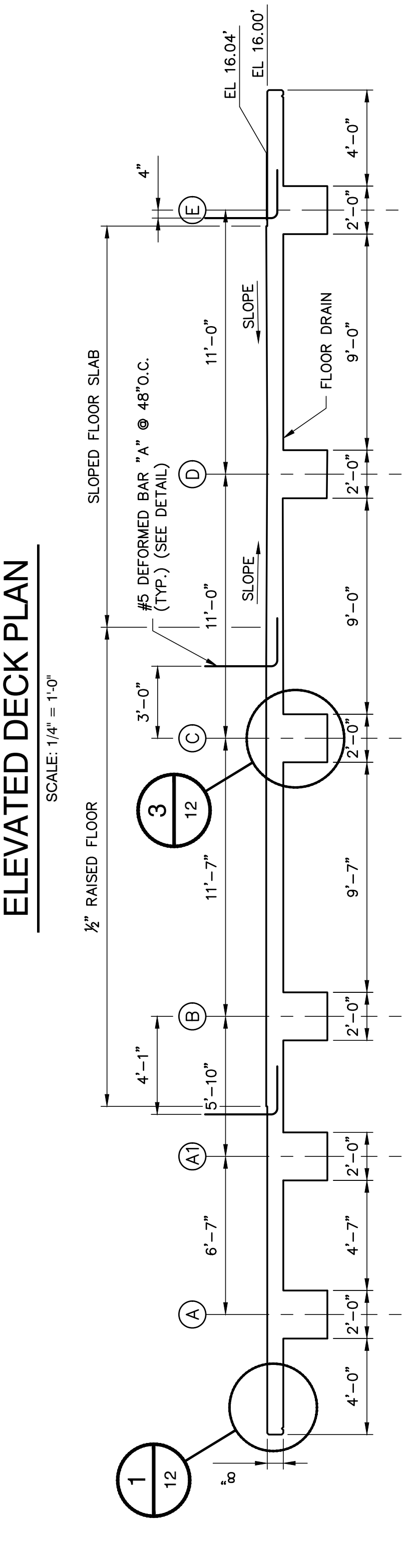
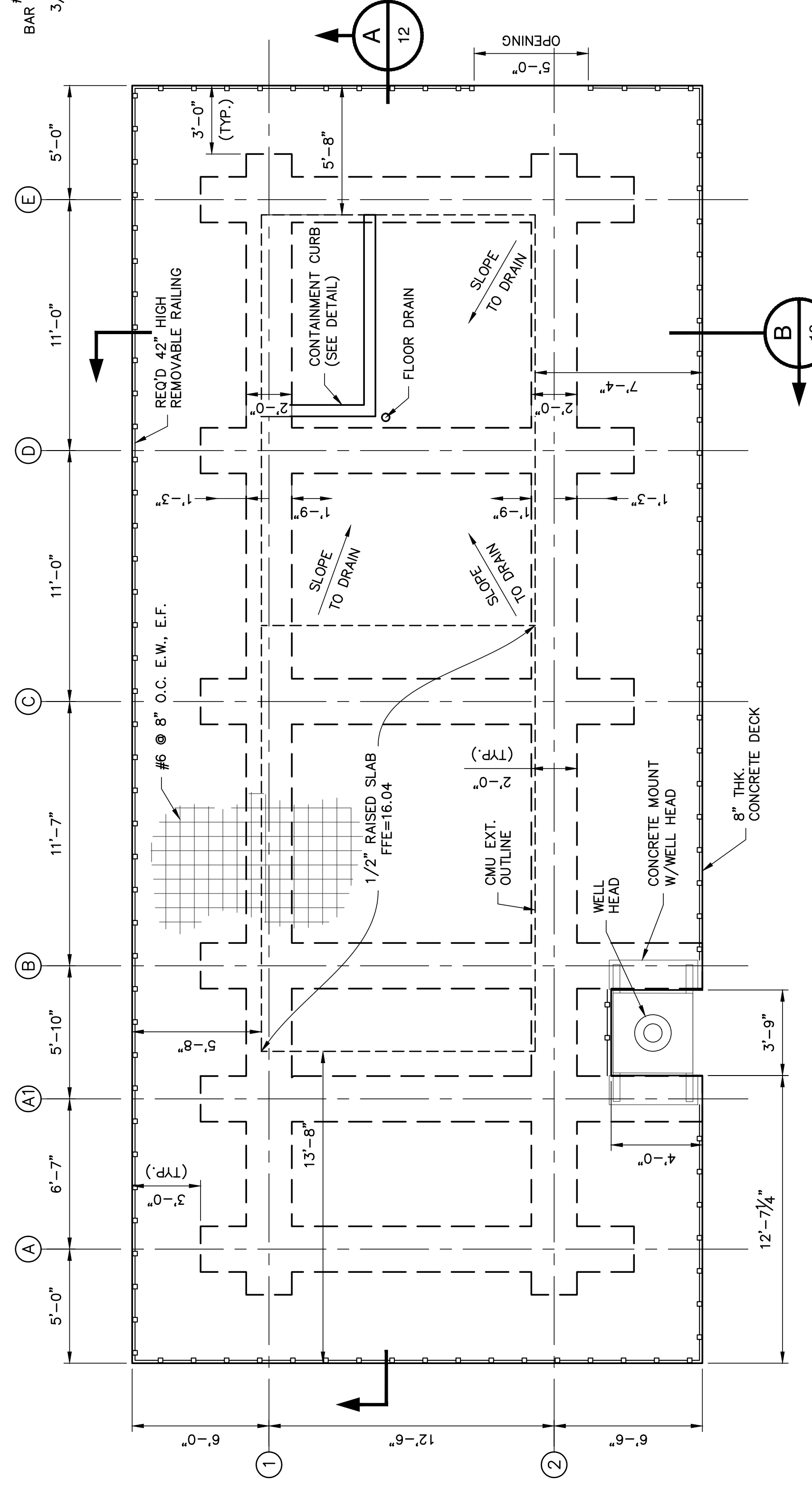


RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
RIVER OAKS DECK PLAN

SHEET NO.
12
SHEET 12 OF 29



WELL SUPPORT DETAILS
SCALE: 1/2" = 1'-0"



DECK SECTION
SCALE: 1/4" = 1'-0"

5 DEFORMED BAR DETAILS
SCALE: 1/2" = 1'-0"





DEPT. OF UTILITIES
TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: ACM	CHECKED BY: TMS	PROJECT No.: TU23000160
DRAWN BY: LMR	ISSUE DATE: JULY 2024	APPROVED BY: ---
SUBMITTED BY: PRINCIPAL ENG	SHEET SIZE: ---	ANSI D

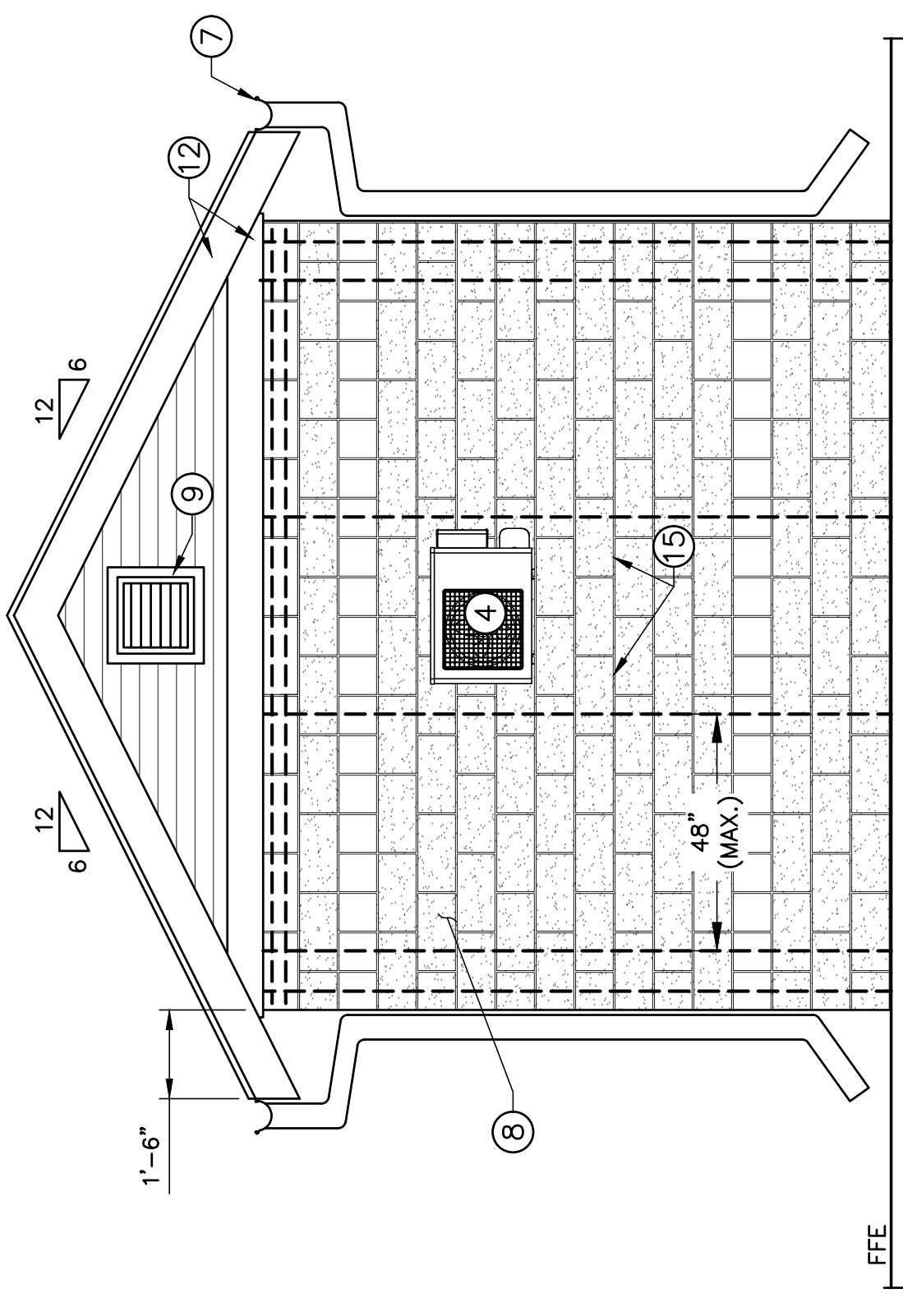


RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
RIVER OAKS BUILDING
PLAN & ELEVATION

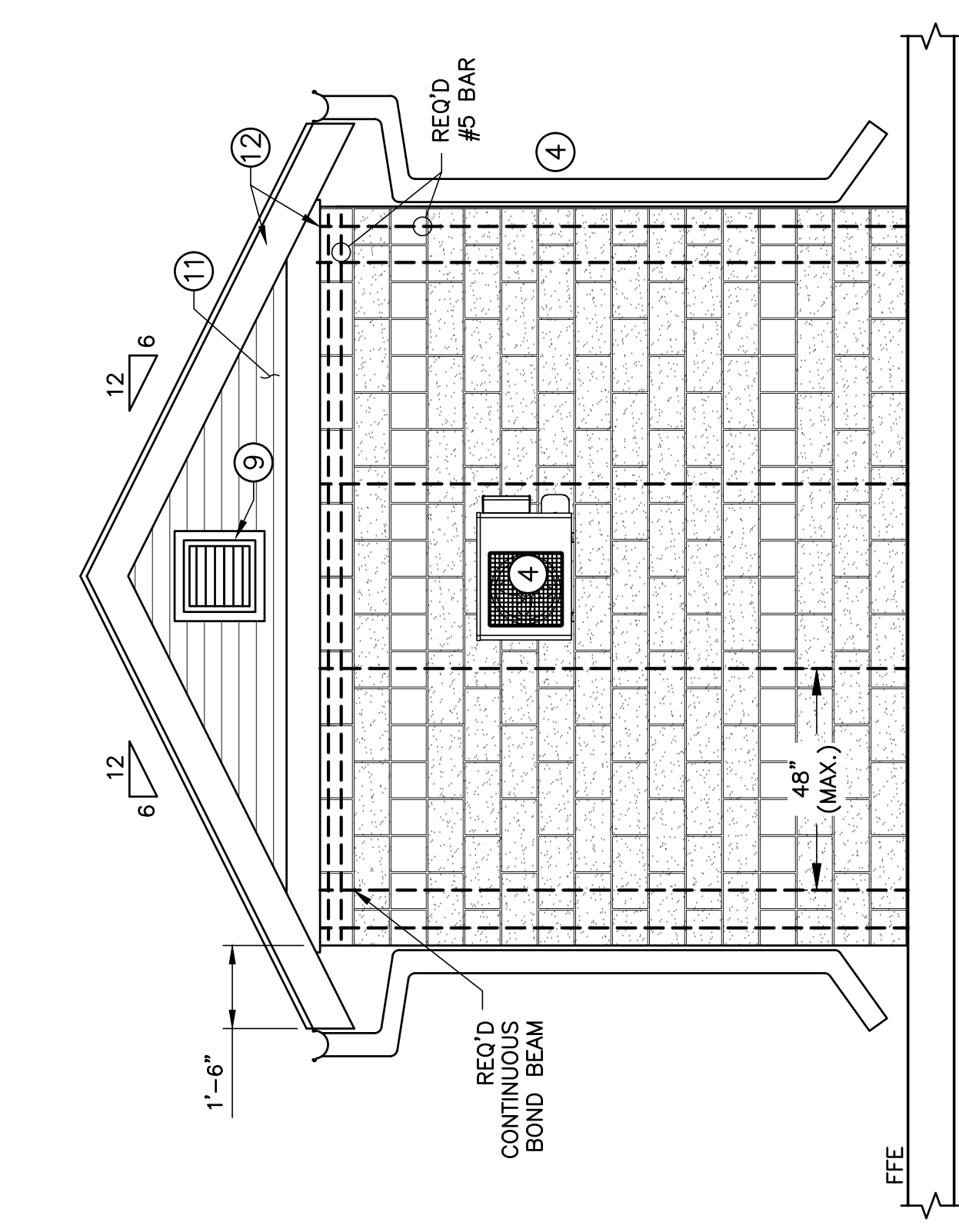
SHEET NO.
13
SHEET 13 OF 29

- OPENING AND ACCESSORY KEY:**
- 3070 INSULATED METAL DOUBLE DOORS WITH 12"x12" WINDOW AND 24"x24" S.S. WEATHER PROOF FIXED BLADE LOUVER WITH S.S. INSECT SCREEN. 1/2 PR. BUTTS.
 - 2'-4"x2'-0" FIXED SAFETY GLASS WINDOW WITH CONCRETE SILL (TYP.)
 - 3070 INSULATED METAL DOOR WITH 12"x12" WINDOW AND 24"x24" S.S. METAL WEATHER PROOF FIXED BLADE LOUVER WITH S.S. INSECT SCREEN. 1/2 PR. BUTTS.
 - MINI-SPLIT AIR/HEAT UNIT
 - WEATHERPROOF EXHAUST FAN & LIGHT SWITCH
 - EXHAUST FAN WITH S.S. INSECT SCREEN
 - 6" GALVALUME HALF-ROUND GUTTER & ROUND DOWNSPOUT
 - ASTM C90 CONCRETE MASONRY BLOCK
 - ATTIC VENT AND TRIM BOARD
 - 2'-4"x2'-0" FIXED SAFETY GLASS WINDOW, GAS-TIGHT SEAL REQ'D BETWEEN CHLORINE & ELECTRICAL ROOM
 - HARDI BOARD SIDING (4")
 - HARDI TRIM BOARD
 - 5VEE METAL ROOF PANELS
 - NFPA HAZARD PLACARD
 - PROVIDE GROUND FACE FINISH FOR EXTERIOR MOUNTING, COORDINATE WITH APPROVED EQUIPMENT.
 - BRONZE BENCHMARK DISK

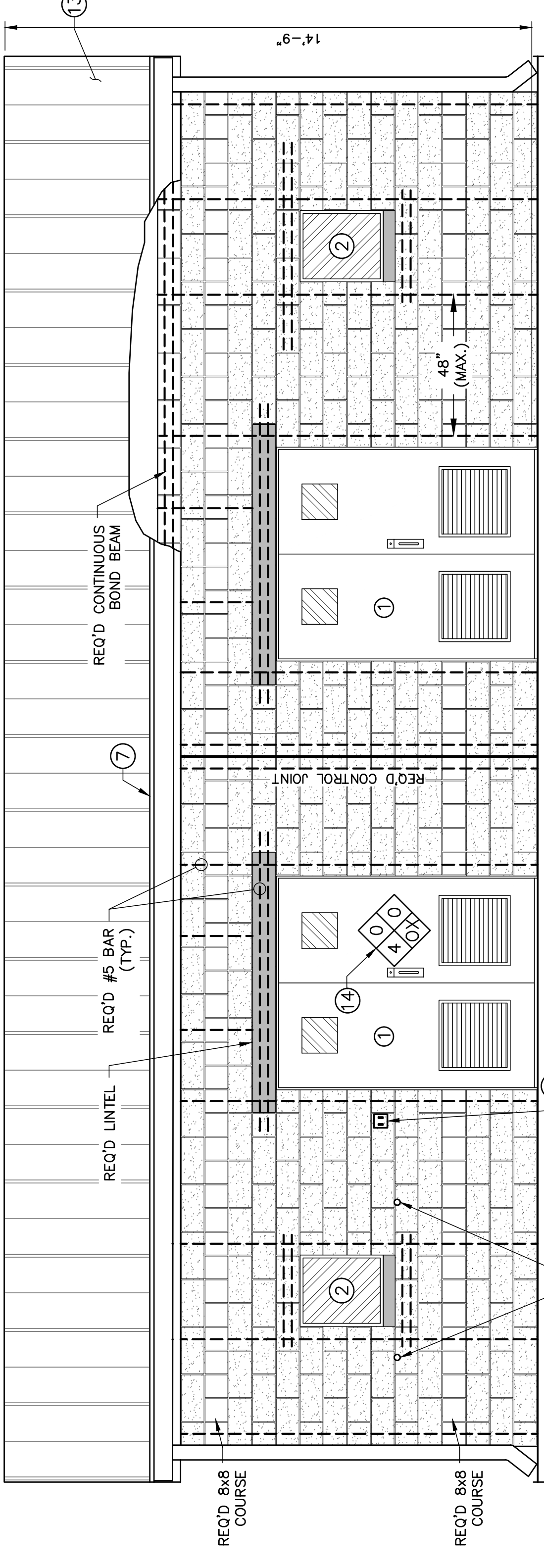
- CMU LEGEND:**
- SPLIT FACE ASTM C90 CMU
 - GROUND FACE ASTM C90 CMU
 - PRECAST CONC. LINTEL/SILL
- *ALL CMU INTERIOR FACES STANDARD PRECISION FINISH
- BENCHMARK NOTES:**
- DURING CONSTRUCTION, ALUMINUM BENCHMARK DISK TO BE CAST IN CONCRETE IN THE CORNER OF THE CONTROL ROOM.
 - THE BENCHMARK DISK MUST DISPLAY THE DATE OF INSTALLATION AND ACTUAL NAVD83 ELEVATION IN FEET.
 - ELEVATION MUST BE SET BY SURVEYOR LICENSED IN THE STATE OF LOUISIANA.



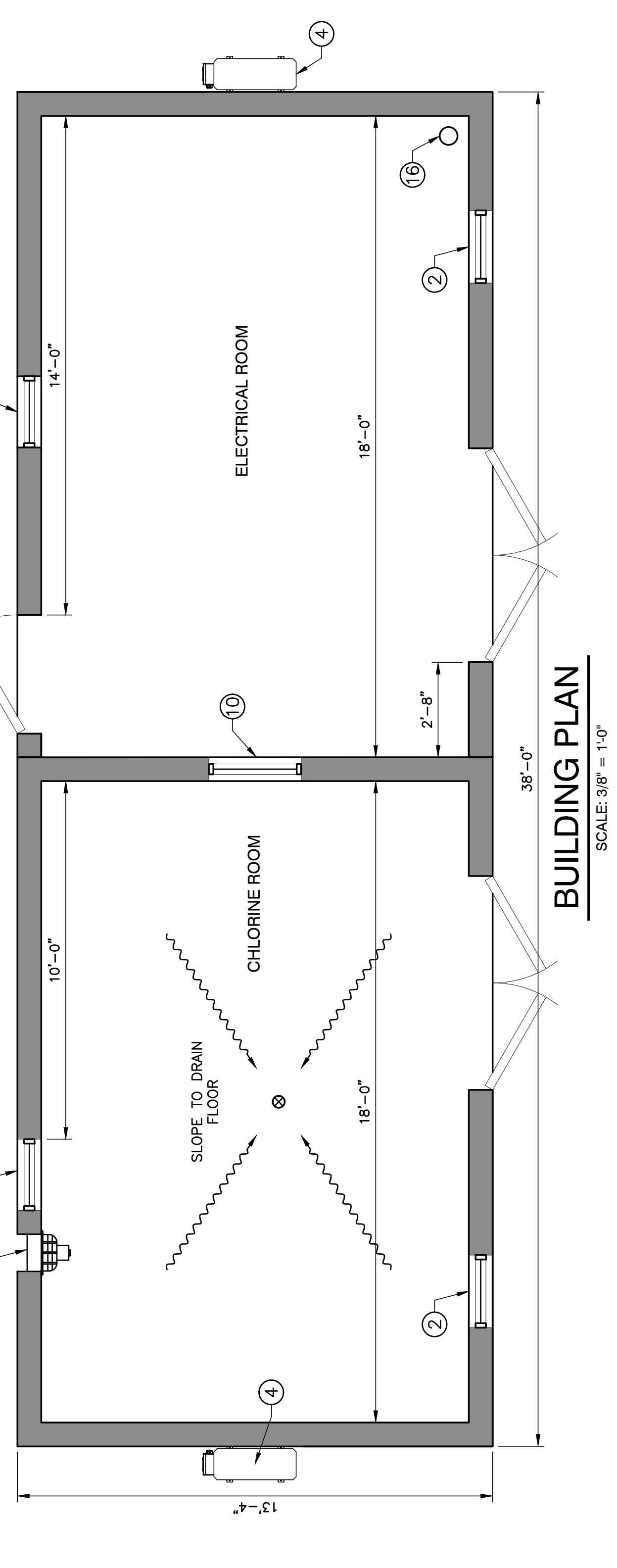
RIGHT SIDE ELEVATION
SCALE: 3/8" = 1'-0"



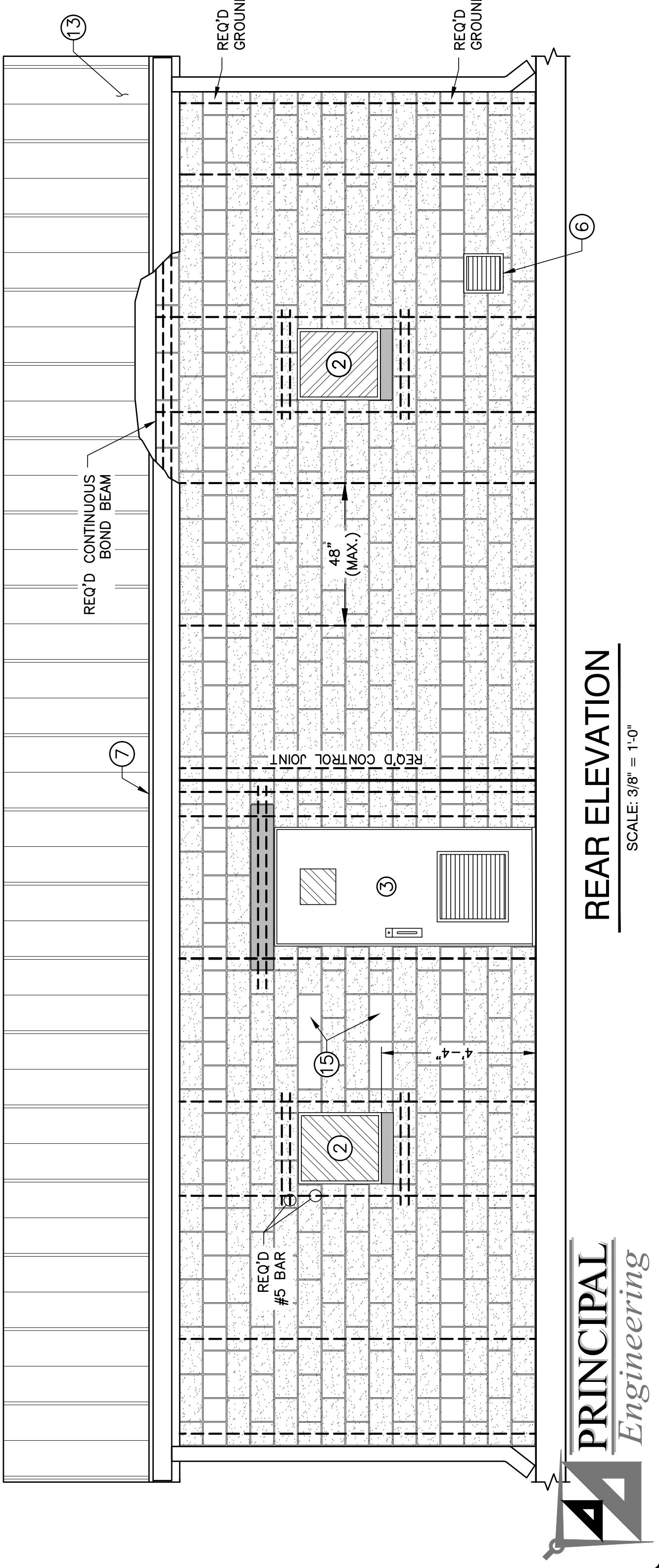
LEFT SIDE ELEVATION
SCALE: 3/8" = 1'-0"



FRONT ELEVATION (RIVER OAKS)
SCALE: 3/8" = 1'-0"



BUILDING PLAN
SCALE: 3/8" = 1'-0"



REAR ELEVATION
SCALE: 3/8" = 1'-0"

DOOR NOTES:

- DOOR FRAMES SHALL BE 16 GAUGE STAINLESS STEEL DOUBLE DOOR OPENINGS SHALL HAVE REMOVABLE STAINLESS STEEL MULLIONS, SS ADA THRESHOLD.
- INTERIOR HARDWARE: PANIC SET, VON DUPRIN, OR EQUAL (ACTIVE LEAF).
- EXTERIOR HARDWARE: PULL HANDLE AND NIGHT LATCH.
- ACCESSORIES: DOOR CLOSER WITH HOLD-OPEN, SURFACE BOLTS (INACTIVE LEAF).
- ALL HARDWARE AND ACCESSORIES SHALL BE STAINLESS STEEL.

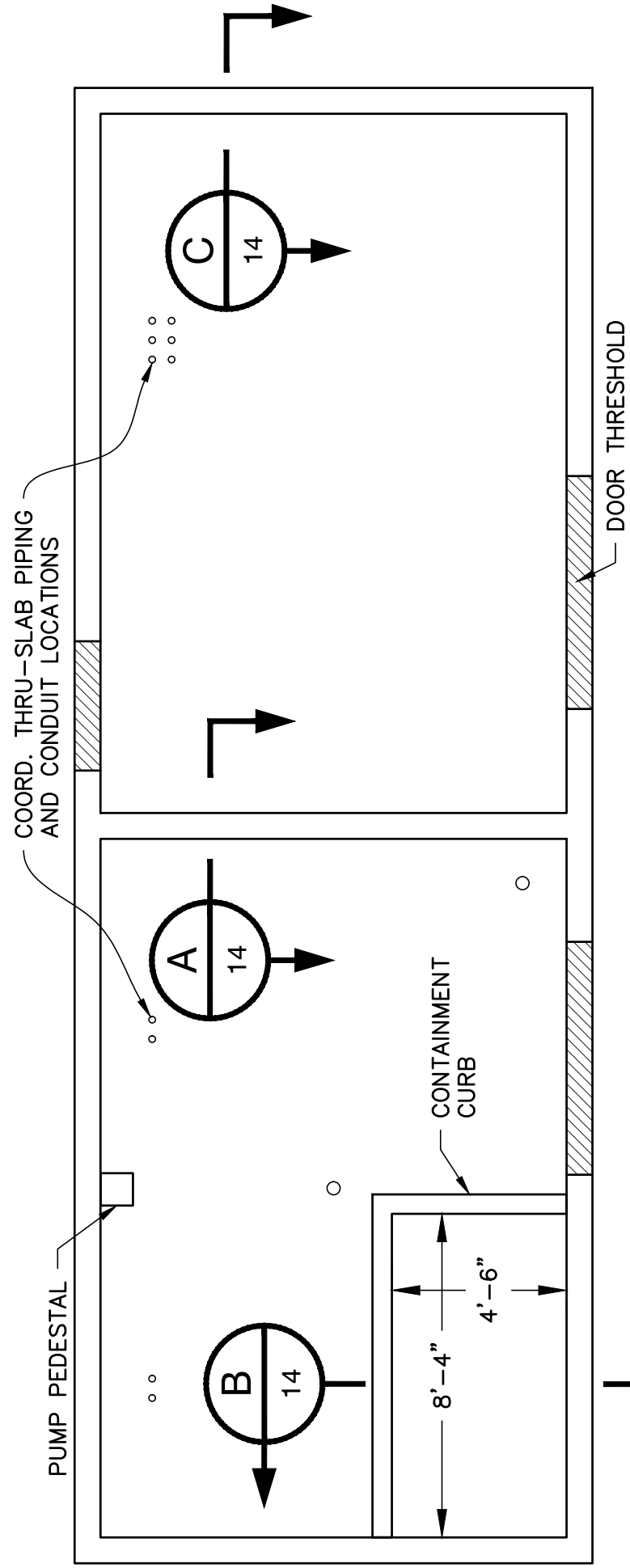
BUILDING FINISH SCHEDULE:

EXT. CMU	- CLEAR POLYMER WATER-BASED SEALER
EXT. WOOD & CEMENT SLIDING, EXPOSED RAFTERS & DECK	- ONE COAT PRIMER, 2 COATS EXTERIOR URETHANE ALKYD ENAMEL PAINT
INT. CMU	- ONE COAT BLOCK SEALER, TWO COATS INTERIOR URETHANE ALKYD ENAMEL PAINT
DOORS	- PAINTED, SEE SECTION 09800
INT. WOOD	- ONE COAT PRIMER, 2 COATS INTERIOR URETHANE ALKYD ENAMEL PAINT
CONCRETE	- TWO COATS CLEAR POLYMER WATER-BASED SEALER
CONTAINMENT	- CHEMICAL RESISTANT COATING, SEE SECTION 09963

CODE: LSUCC 2023/JBC 2021
FLOOR LIVE LOAD: 200 PSF
WIND SPEED: 162 MPH
RISK CATEGORY: IV
EXPOSURE: C

RIVER OAKS	
BFE	14.0
FFE	16.0

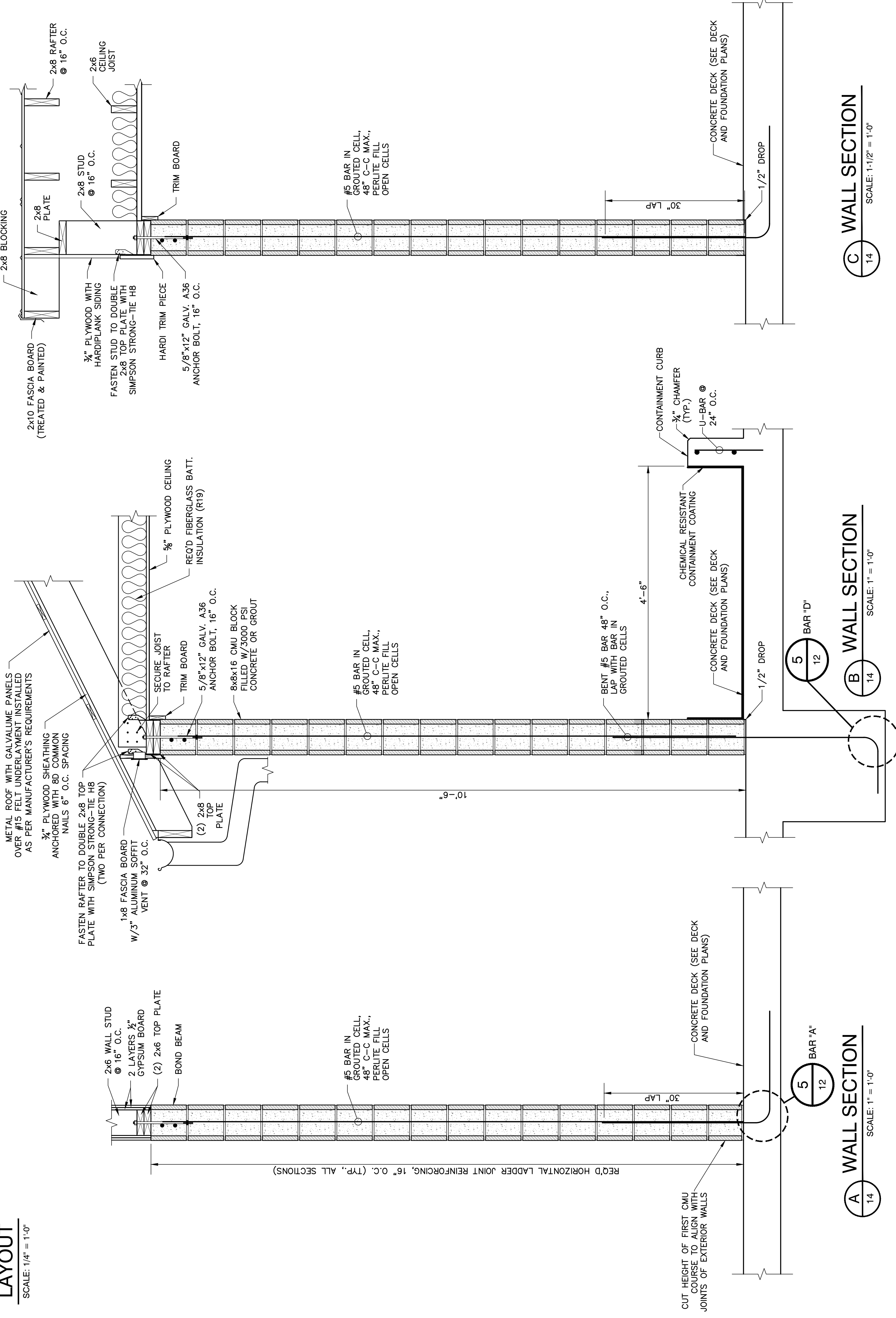




LAYOUT
SCALE: 1/4" = 1'-0"

REINFORCED CONCRETE NOTES:

1. CONCRETE COMPRESSIVE STRENGTH SHALL BE NO LESS THAN 4500 PSI AT 28 DAYS, AND CONCRETE SHALL COMPLY WITH THE 2016 EDITION OF THE LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES FOR CLASS A1. WET CURE REQUIRED.
2. REINFORCING STEEL SHALL BE GRADE 60.
3. CONCRETE SHALL HAVE A RUBBED OR BURLAP FINISH.





A WALL SECTION
SCALE: 1" = 1'-0"

B WALL SECTION
SCALE: 1" = 1'-0"

C WALL SECTION
SCALE: 1-1/2" = 1'-0"



	<p>DEPT. OF UTILITIES ST. TAMMANY PARISH GOVERNMENT 620 N. TYLER STREET COVINGTON, LA 70433</p>	<p>DESIGNED BY: ACM DRAWN BY: LMR CHECKED BY: TMS SUBMITTED BY: PRINCIPAL ENG PROJECT No.: TU23000160 ISSUE DATE: JULY 2024 APPROVED BY: --- SHEET SIZE: ANSI D</p>		<p>PROJECT No.: TU23000160 RIVER OAKS BUILDING & WELL IMPROVEMENTS SLIDELL, LOUISIANA</p>	<p>PROJECT No.: TU23000160 RIVER OAKS BUILDING & WELL IMPROVEMENTS SECTIONS & DETAILS</p>	<p>SHEET NO. 14 SHEET 14 OF 29</p>
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DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

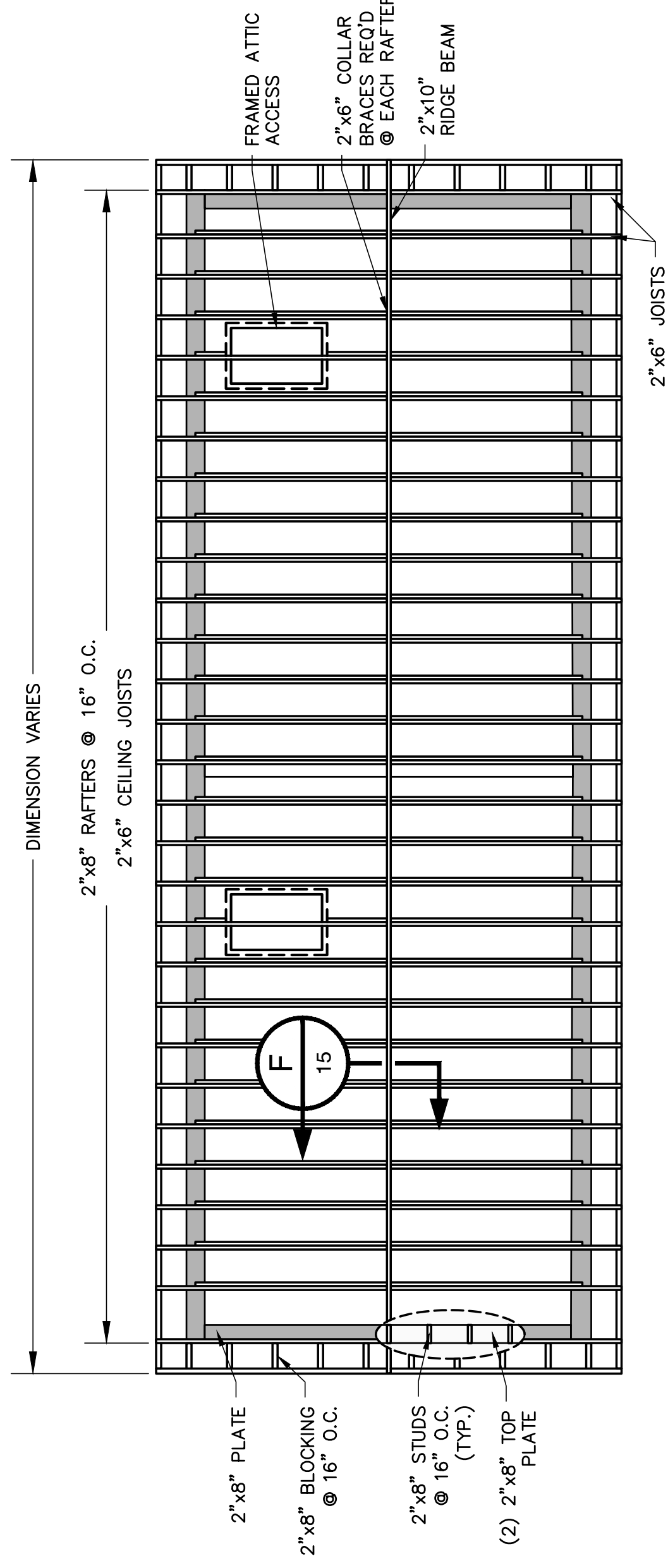
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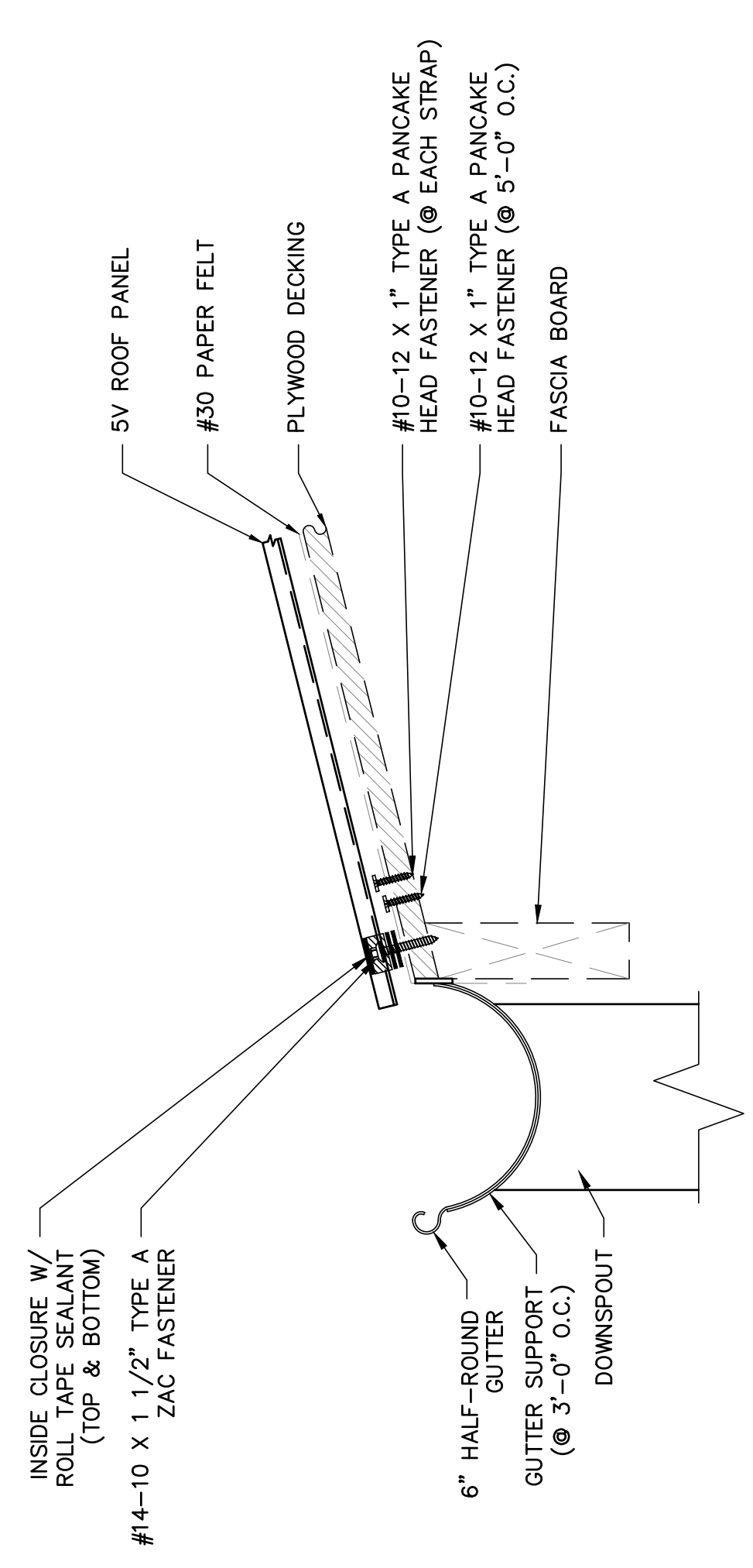


RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
BUILDING DETAILS

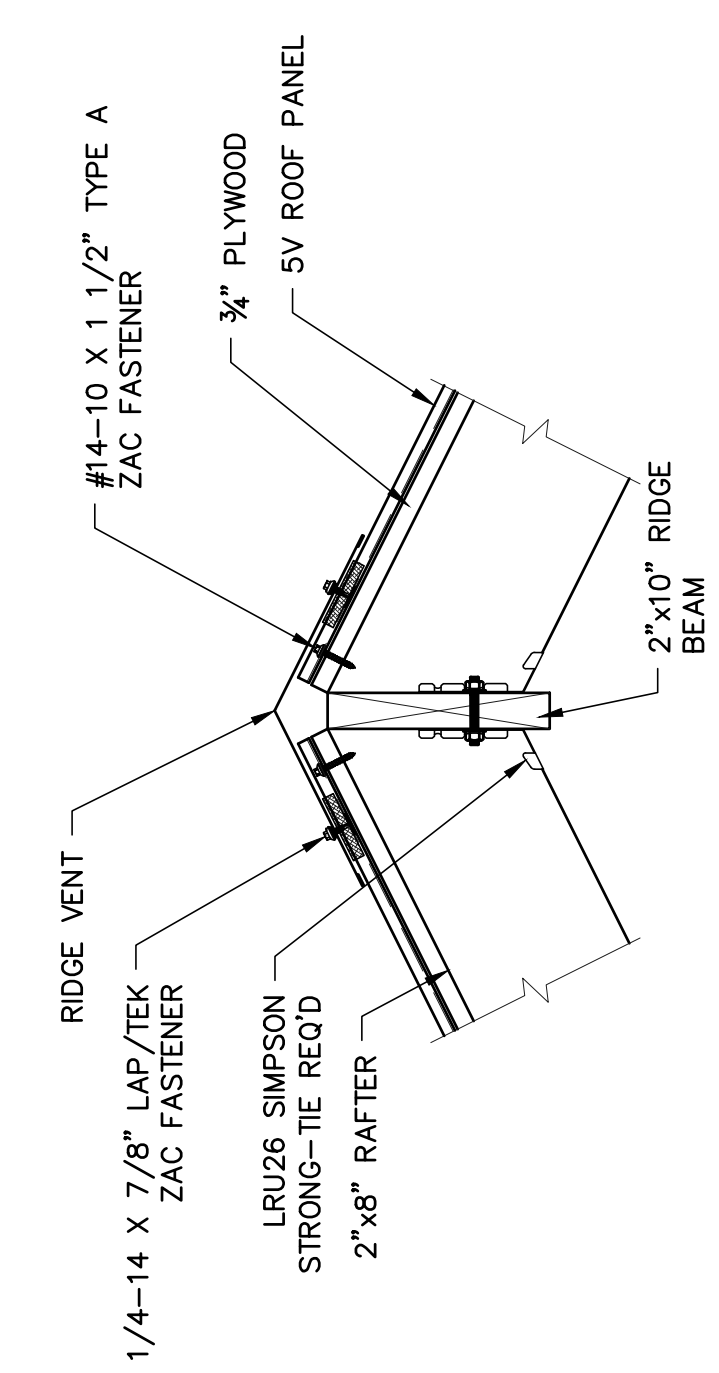
SHEET NO. 15
SHEET 15 OF 29



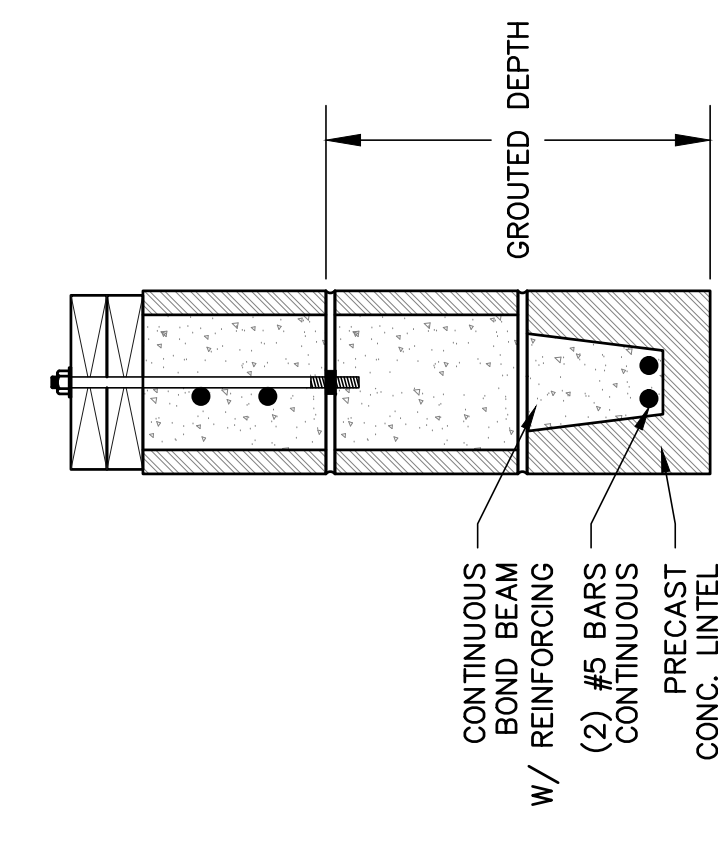
CEILING/ROOF FRAMING PLAN
SCALE: 1/4" = 1'-0"



EAVE W/ GUTTER DETAIL
SCALE: 3" = 1'-0"
*ALL ROOF FASTENERS SHALL BE S.S.



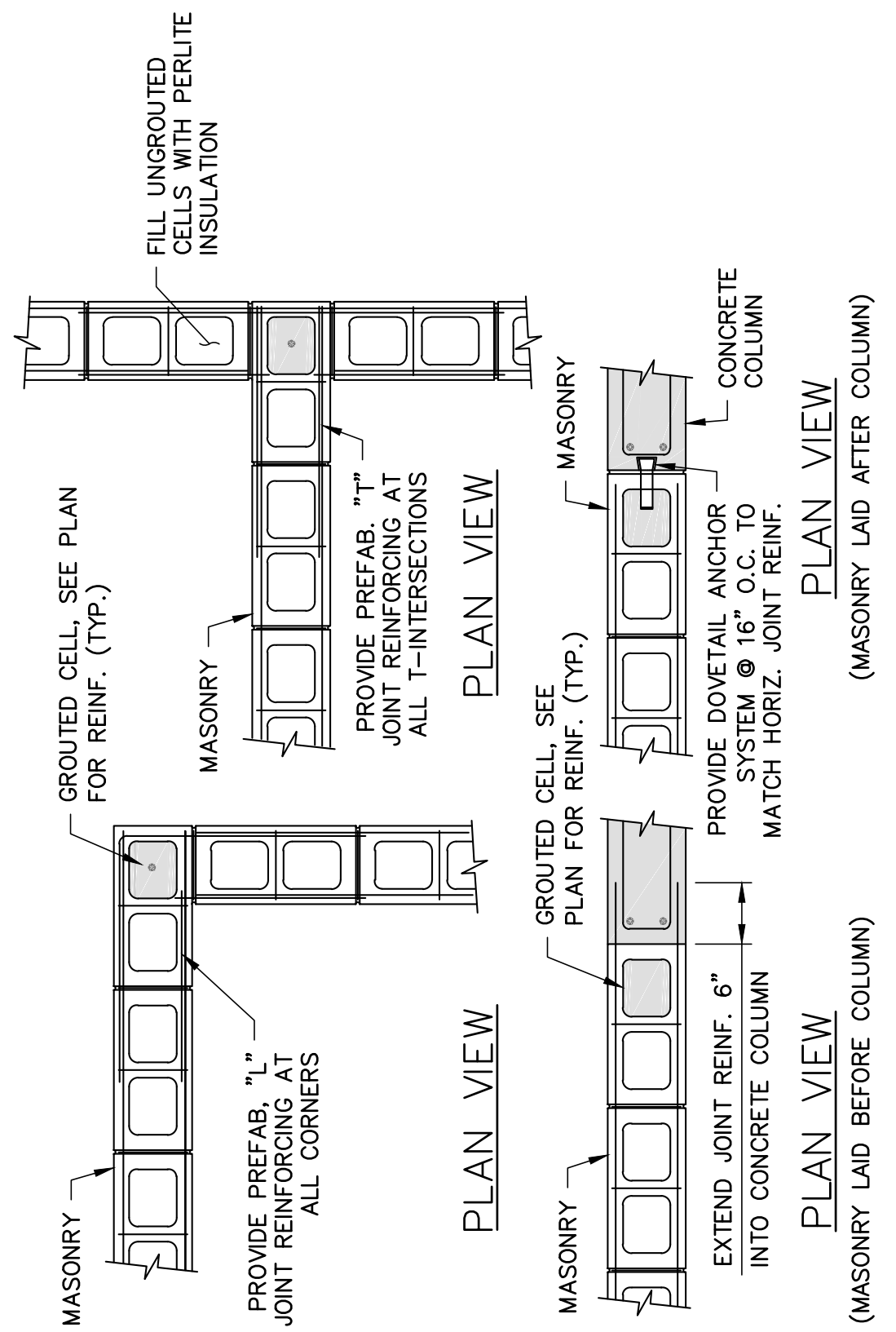
RIDGE SECTION
SCALE: 1-1/2" = 1'-0"
*ALL ROOF FASTENERS SHALL BE S.S.



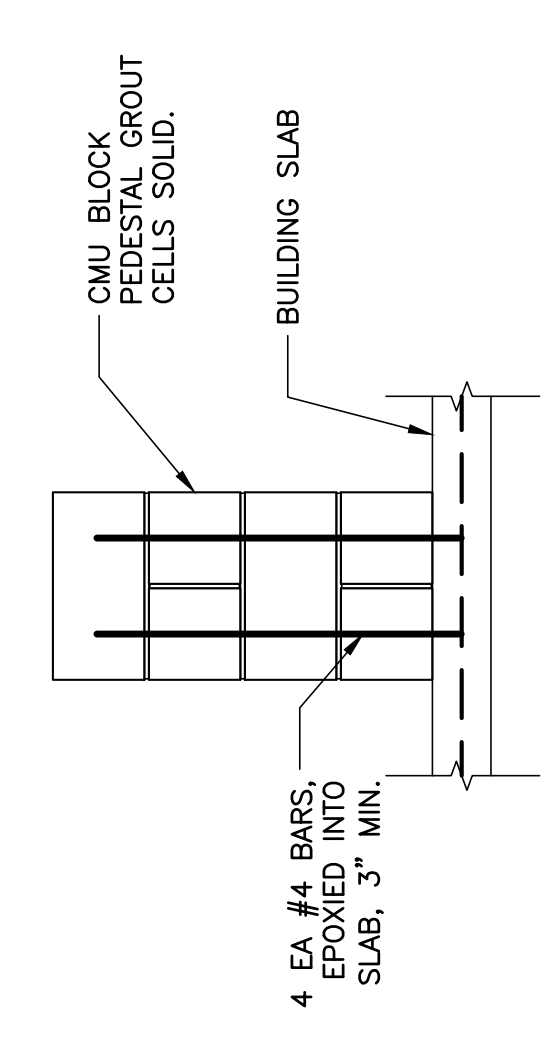
TYP. LINTEL SECTION
SCALE: 1-1/2" = 1'-0"

- NOTES:**
1. INSTALL WINDOW IN ACCORDANCE WITH WINDOW MANUFACTURER INSTALLATION RECOMMENDATIONS.
 2. COORDINATE WINDOW ORDER SIZE WITH APPROVED CONCRETE SILL AND MASONRY OPENING DIMENSIONS.

TYP. WINDOW SECTION
SCALE: 1-1/2" = 1'-0"



BLOCK DETAILS
SCALE: N.T.S.



PUMP PEDESTAL
SCALE: N.T.S.





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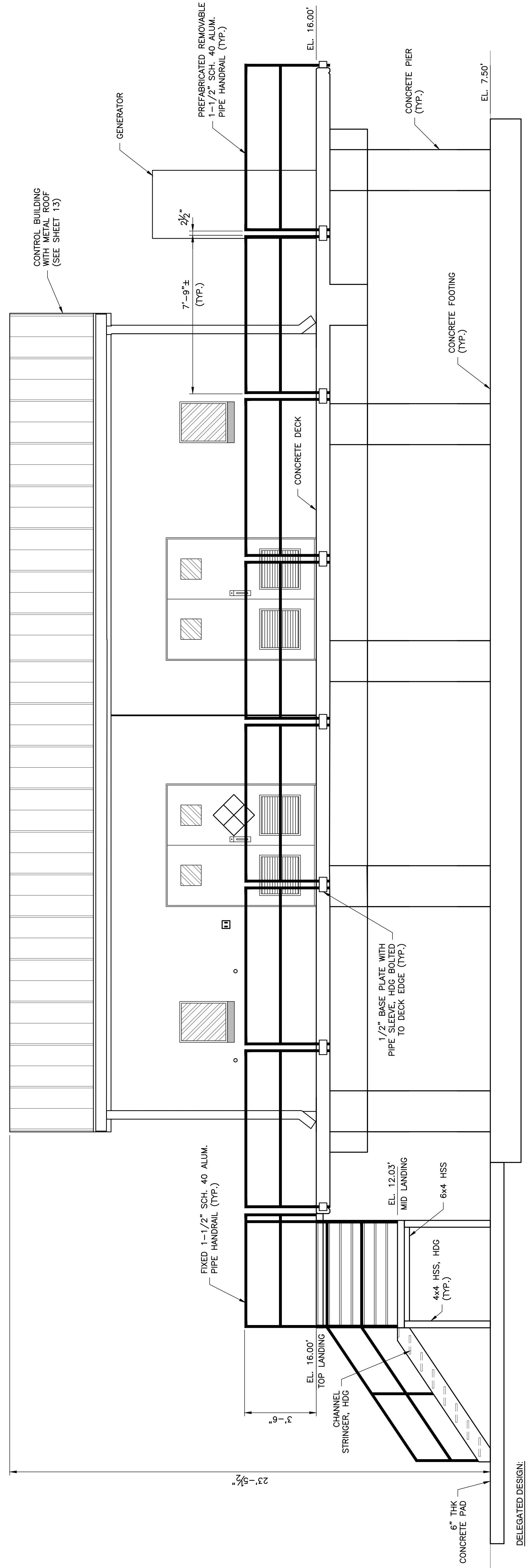
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DRAWN BY: LMR	SUBMITTED BY: TMS	PRINCIPAL ENG				



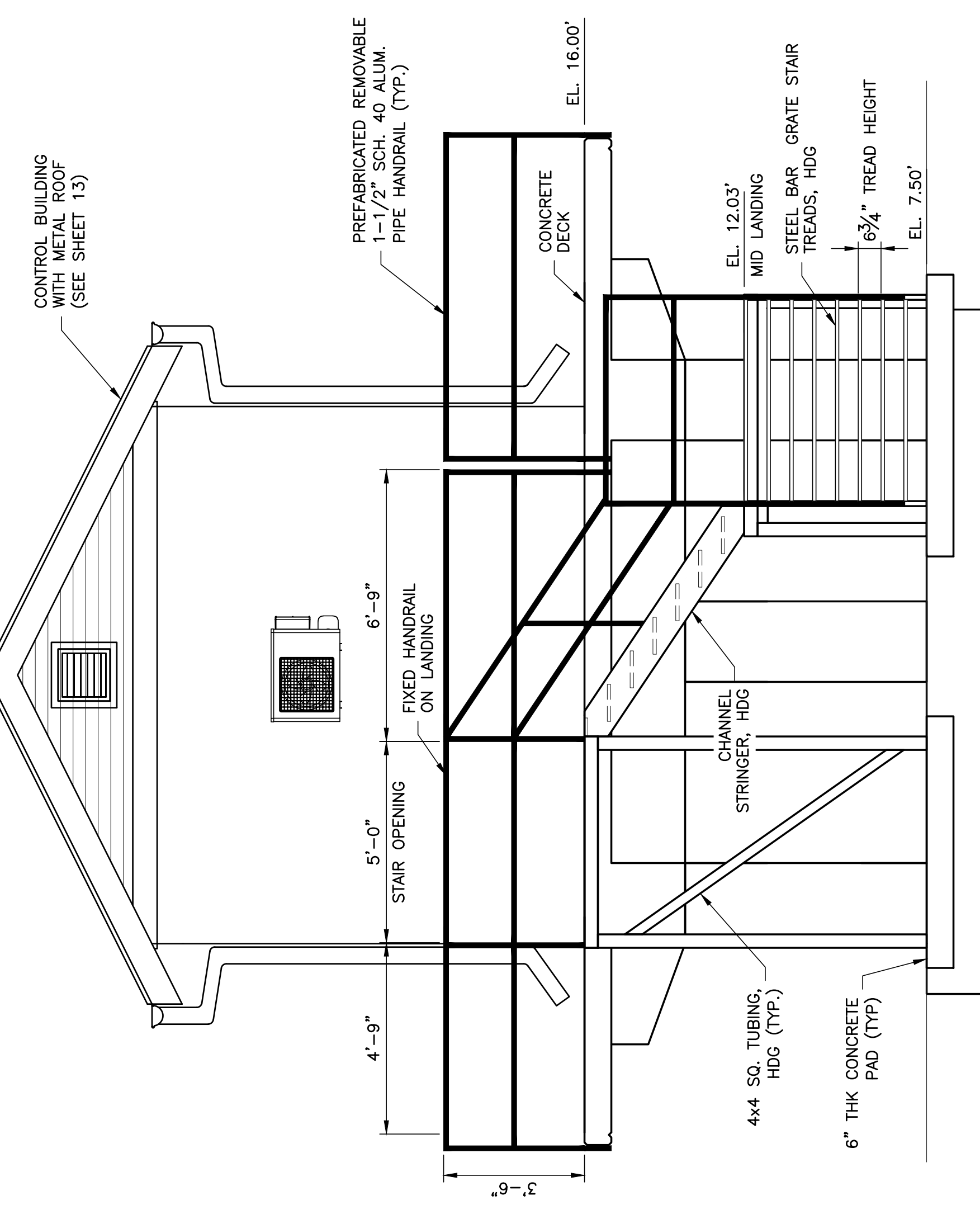
RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
RIVER OAKS
STAIR PLAN & ELEVATION

SHEET NO.
16
SHEET 16 OF 29

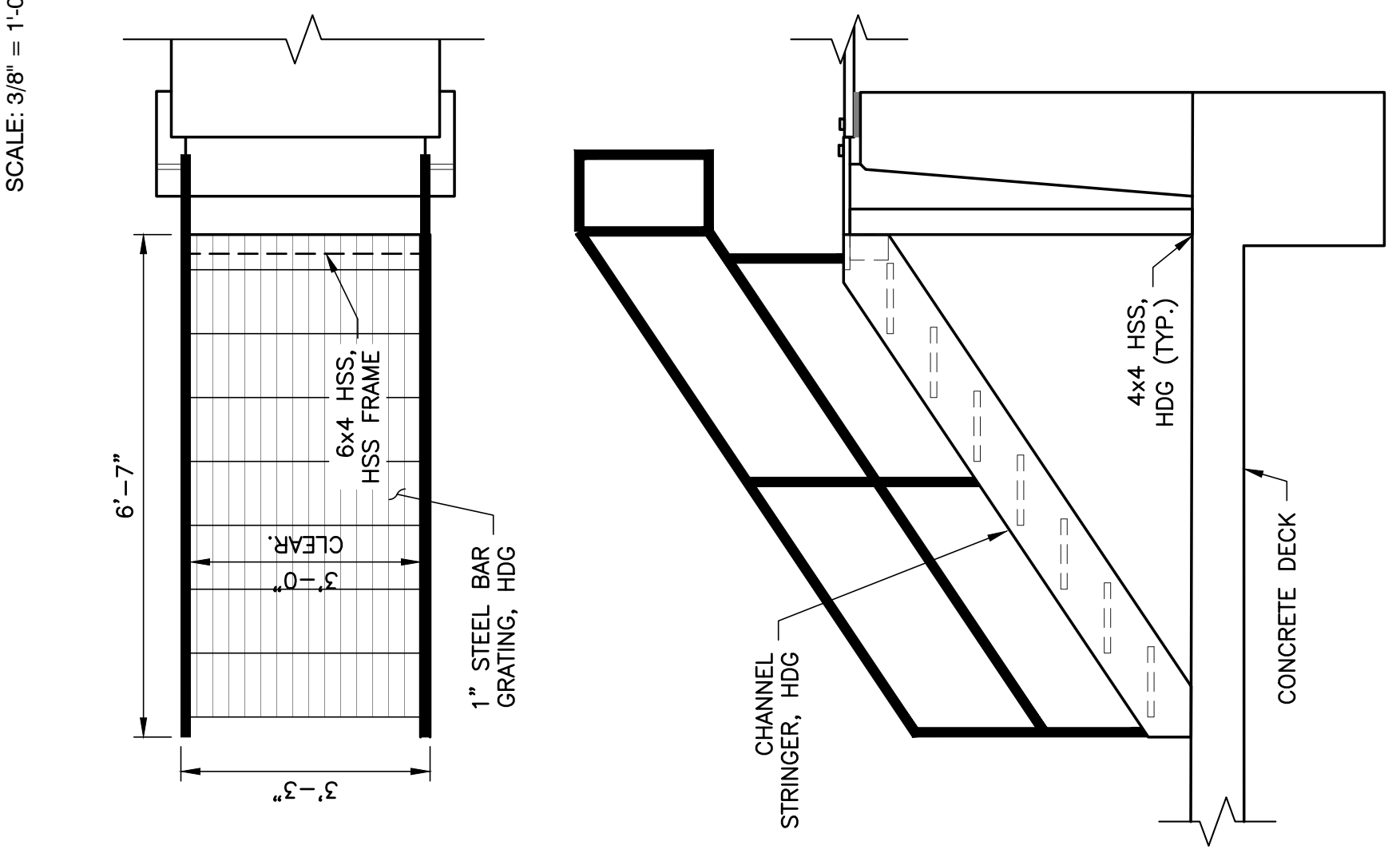


FRONT ELEVATION (RIVER OAKS)
SCALE: 3/8" = 1'-0"

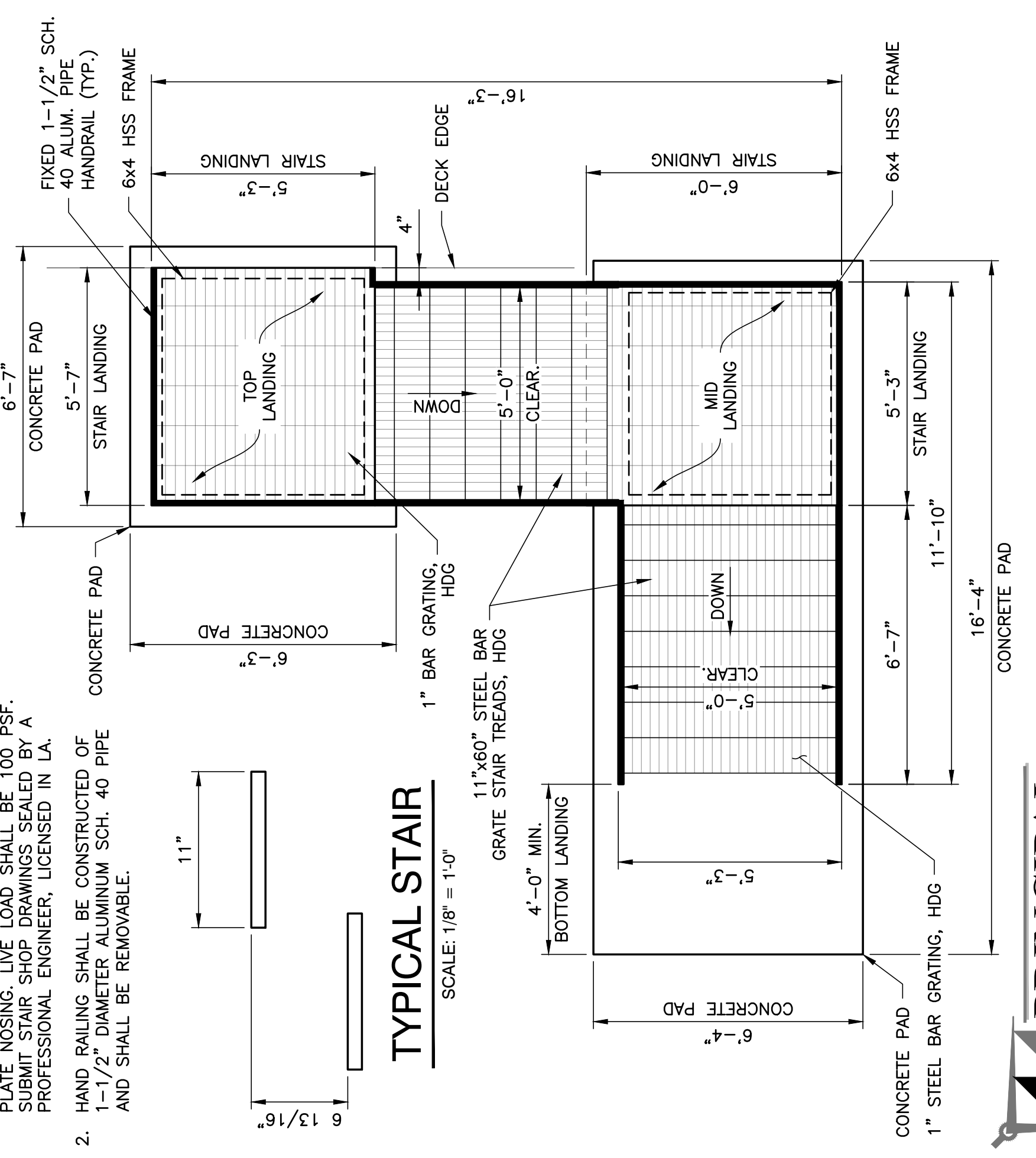
- DELEGATED DESIGN:
- STAIRS AND LANDING SHALL BE PREFABRICATED OF GALVANIZED STEEL COMPLY WITH LSUCC. STAIR TREADS SHALL BE GALVANIZED, WITH CK PLATE NOSING. LIVE LOAD SHALL BE 100 PSF. SUBMIT STAIR SHOP DRAWINGS SEALED BY A PROFESSIONAL ENGINEER, LICENSED IN LA.
 - HAND RAILING SHALL BE CONSTRUCTED OF 1-1/2" DIAMETER ALUMINUM SCH. 40 PIPE AND SHALL BE REMOVABLE.



SIDE ELEVATION
SCALE: 3/8" = 1'-0"



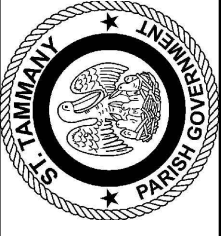
1 WELL ACCESS STAIR PLAN
SCALE: 1/2" = 1'-0"



TYPICAL STAIR
SCALE: 1/8" = 1'-0"

STAIR PLAN
SCALE: 1/2" = 1'-0"

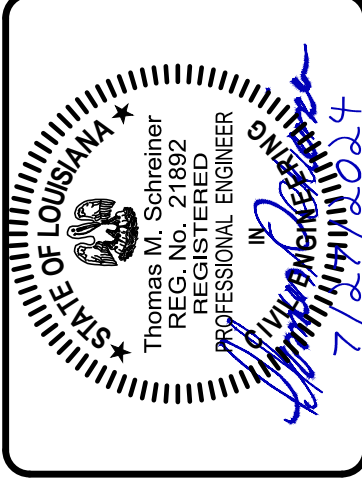




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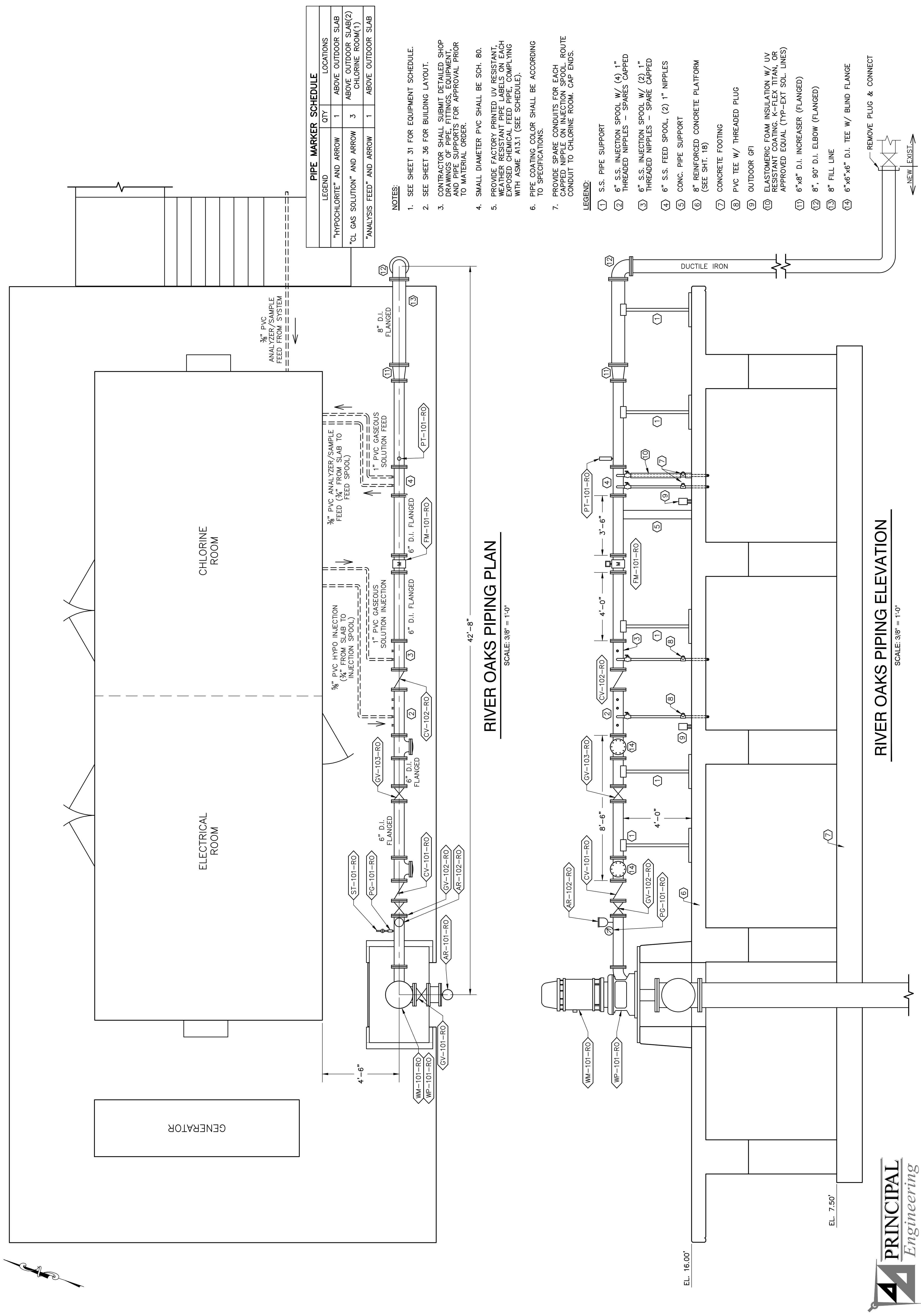
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RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
SLIDELL, LOUISIANA
MECHANICAL PLAN
(RIVER OAKS)

SHEET NO.
19
SHEET 19 OF 29



LEGEND	QTY	LOCATIONS
"HYPOCHLORITE" AND ARROW	1	ABOVE OUTDOOR SLAB
"CL GAS SOLUTION" AND ARROW	3	ABOVE OUTDOOR SLAB(2) CHLORINE ROOM(1)
"ANALYSIS FEED" AND ARROW	1	ABOVE OUTDOOR SLAB

- NOTES:**
- SEE SHEET 31 FOR EQUIPMENT SCHEDULE.
 - SEE SHEET 36 FOR BUILDING LAYOUT.
 - CONTRACTOR SHALL SUBMIT DETAILED SHOP DRAWINGS OF PIPE, FITTINGS, EQUIPMENT, AND PIPE SUPPORTS FOR APPROVAL PRIOR TO MATERIAL ORDER.
 - SMALL DIAMETER PVC SHALL BE SCH. 80.
 - PROVIDE FACTORY PRINTED UV RESISTANT, WEATHER RESISTANT PIPE LABELS ON EACH EXPOSED CHEMICAL FEED PIPE, COMPLYING WITH ASME A13.1 (SEE SCHEDULE).
 - PIPE COATING COLOR SHALL BE ACCORDING TO SPECIFICATIONS.
 - PROVIDE SPARE CONDUITS FOR EACH CAPPED NIPPLE ON INJECTION SPOOL. ROUTE CONDUIT TO CHLORINE ROOM. CAP ENDS.

- LEGEND:**
- S.S. PIPE SUPPORT
 - 6" S.S. INJECTION SPOOL W/ (4) 1" THREADED NIPPLES - SPARES CAPPED
 - 6" S.S. INJECTION SPOOL W/ (2) 1" THREADED NIPPLES - SPARE CAPPED
 - 6" S.S. FEED SPOOL, (2) 1" NIPPLES
 - CONC. PIPE SUPPORT
 - 8" REINFORCED CONCRETE PLATFORM (SEE SHT. 18)
 - CONCRETE FOOTING
 - PVC TEE W/ THREADED PLUG
 - OUTDOOR GFI
 - ELASTOMERIC FOAM INSULATION W/ UV RESISTANT COATING, K-FLEX TITAN, OR APPROVED EQUAL (TYP-EXT SOL. LINES)
 - 6" x8" D.I. INCREASER (FLANGED)
 - 8" 90° D.I. ELBOW (FLANGED)
 - 8" FILL LINE
 - 6" x6" x6" D.I. TEE W/ BLIND FLANGE

RIVER OAKS PIPING PLAN
SCALE: 3/8" = 1'-0"

RIVER OAKS PIPING ELEVATION
SCALE: 3/8" = 1'-0"

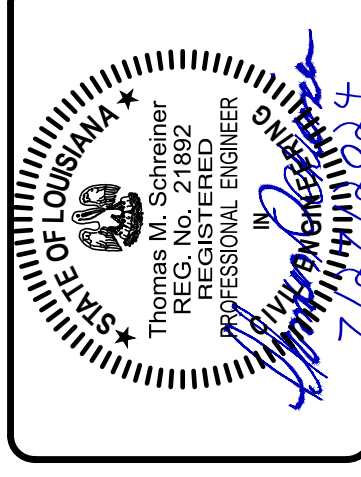




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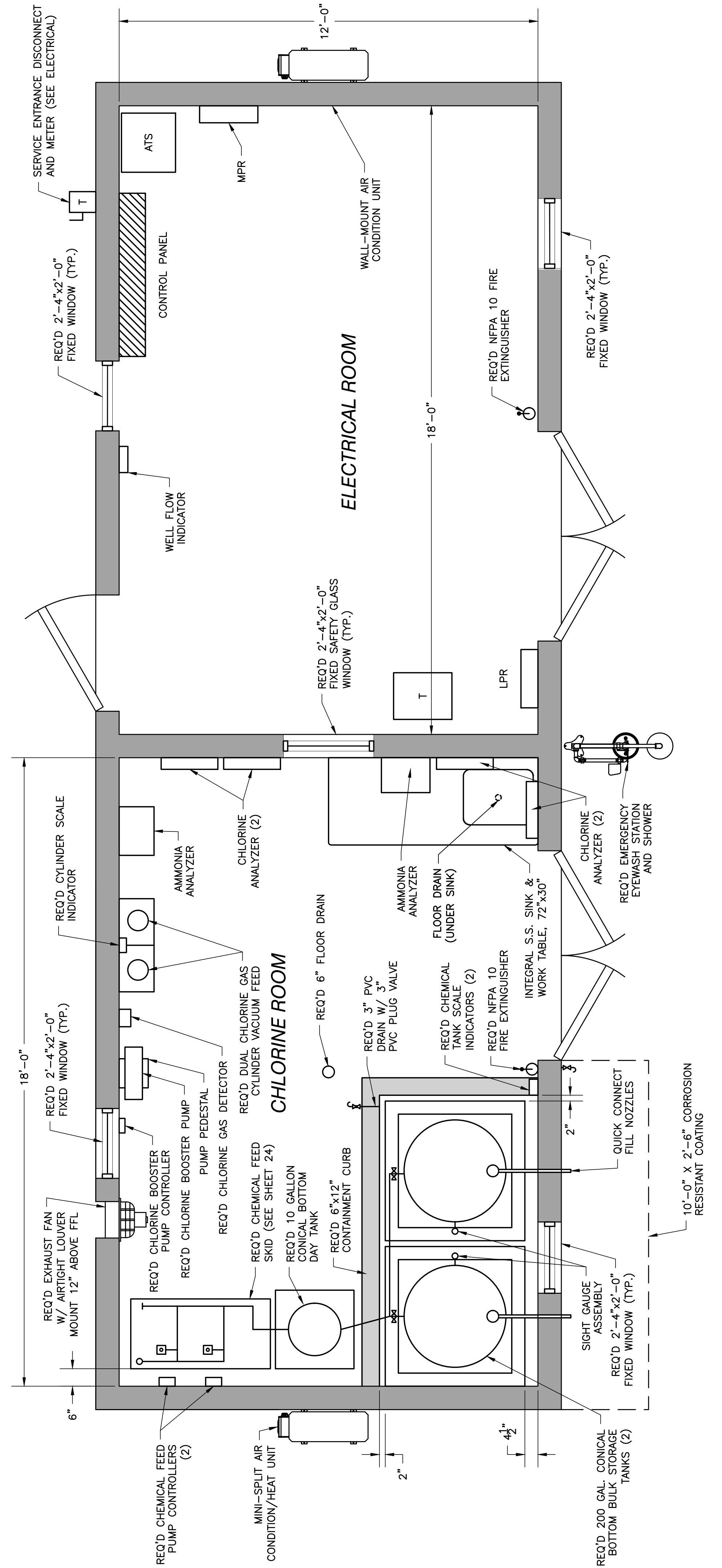
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		SHEET SIZE: ANSI D
		SCALE: ---



RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
MECHANICAL PLANS
& SECTIONS

SHEET NO.
20
SHEET 20 OF 29



RIVER OAKS CONTROL BUILDING LAYOUT
SCALE: 1/2" = 1'-0"

- NOTES:**
- COAT INSIDE SURFACES OF BULK STORAGE TANK CONTAINMENT AREA. SEE SPECIFICATION SECTION 09963.
 - ALL ELECTRICAL EQUIPMENT TO BE INSTALLED 2' ABOVE FFE.
 - FLOOR DRAINS TO BE JONES STEPHENS 4" DRAIN W/ C.I. GRATE & RING.
 - SLOPE CONTAINMENT AREA TO 3" DRAIN AND BALL VALVE.
 - 4" PVC DRAIN LINES SHALL BE SLOPED @ 0.008 FT/FT. SEE SITE PLAN FOR DRAIN AND WATERLINE ORIENTATION.
 - SLOPE FLOOR IN CHLORINE ROOM TO FLOOR DRAIN.
 - PIPING SHALL BE LABELED IN ACCORDANCE WITH ASME A13.1. SEE SCHEDULES (SHEET 17).
 - COORDINATE SIZE, COUNT, AND LOCATION OF THRU-SLAB AND THRU-WALL POWER AND CONTROL CONDUITS WITH ELECTRICAL EQUIPMENT, AND INSTRUMENT REQUIREMENTS.

PROCESS: CLOSED SYSTEM
CHEMICAL STORAGE SUMMARY:
2-200 GAL. TANKS, 12.5% SODIUM HYPOCHLORITE LIQUID (CORROSIVE)
1-10 GAL TANK, 12.5% SODIUM HYPOCHLORITE LIQUID (CORROSIVE)
2-150 LB. CYLINDERS, CHLORINE GAS (TOXIC)
BUILDING CLASSIFICATION: F-1, NOT NORMALLY OCCUPIED, CHECKED ONCE DAILY
GROSS FLOOR AREA: 432 SF
GAS DETECTION PROVIDED, EXHAUST FAN PROVIDED, FAIL-SAFE GAS FEED (VACUUM REGULATED), SECONDARY CONTAINMENT PROVIDED





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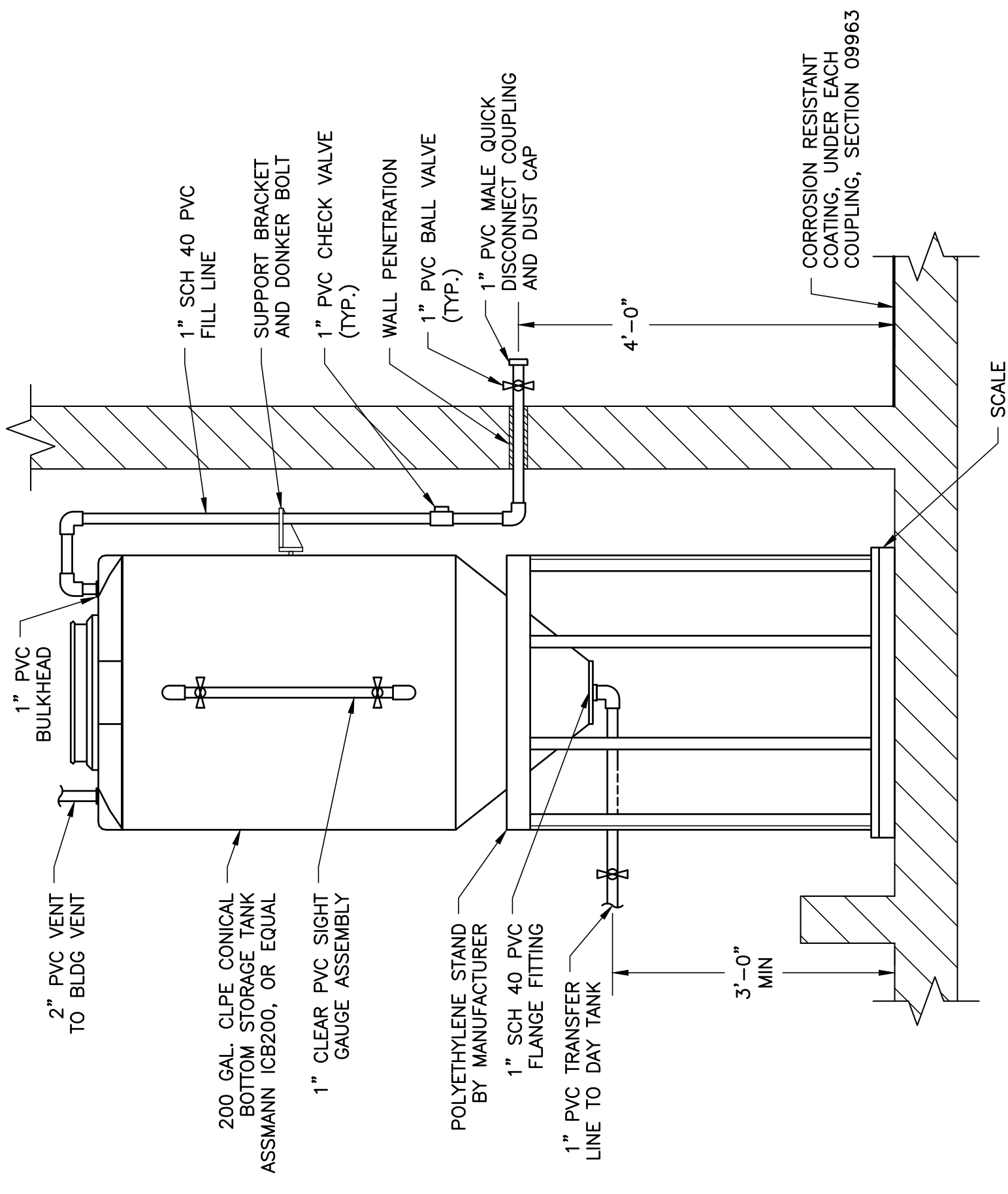
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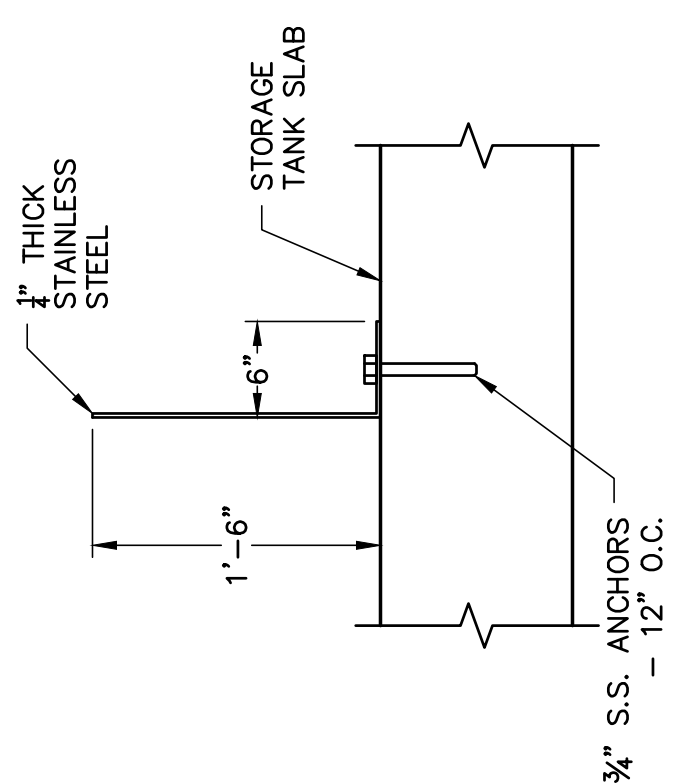
RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
MECHANICAL PLANS
& SECTIONS

SHEET NO.
21
SHEET 21 OF 29



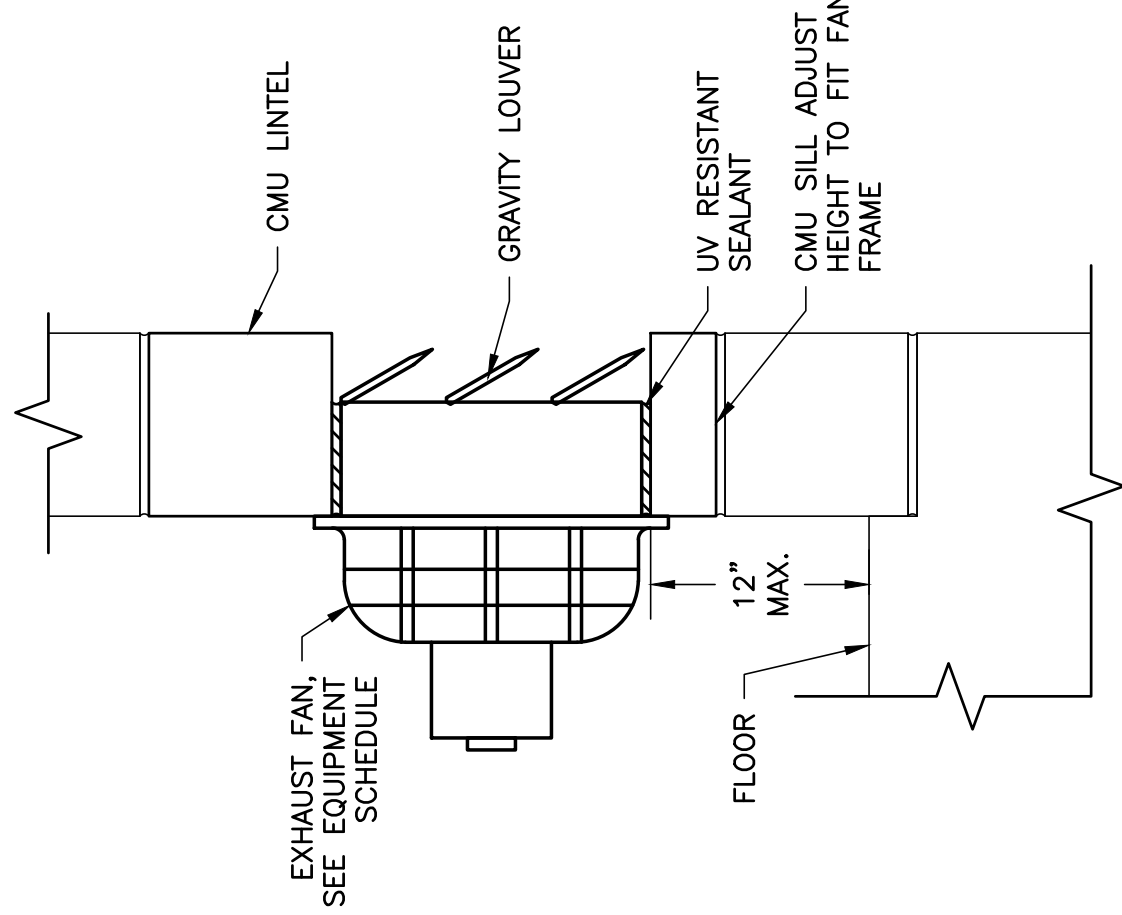
CHEMICAL BULK TANK & FILL LINE ASSEMBLY

SCALE: 3/4" = 1'-0"



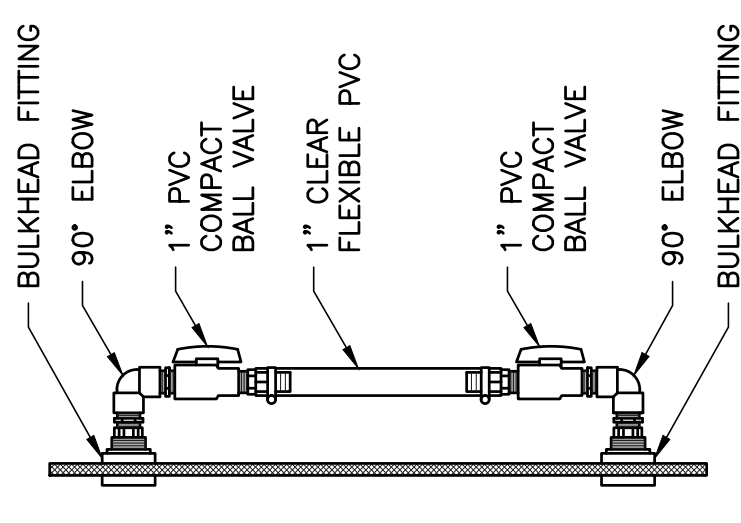
BAFFLE DETAIL

SCALE: N.T.S.



EXHAUST FAN DETAIL

SCALE: N.T.S.



SIGHT GAUGE ASSEMBLY

SCALE: N.T.S.

NOTE:
CORROSION RESISTANT SHUTTER MOUNT EXHAUST FAN MOTOR, 1/2 HP, 1725 RPM, 115V, 1 PHASE, 60 HZ
MODEL AX12-4 AS MANUFACTURED BY CANARM OF APPROVED EQUAL





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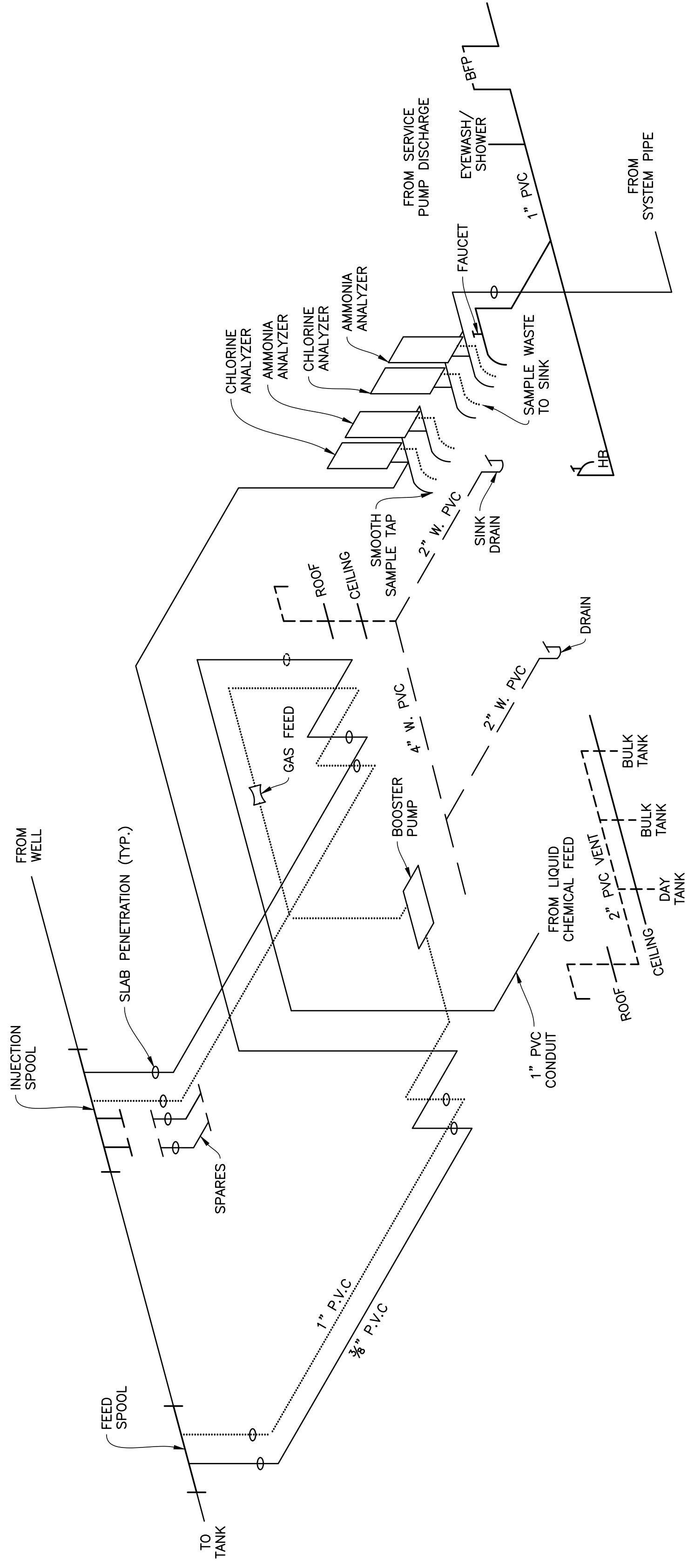
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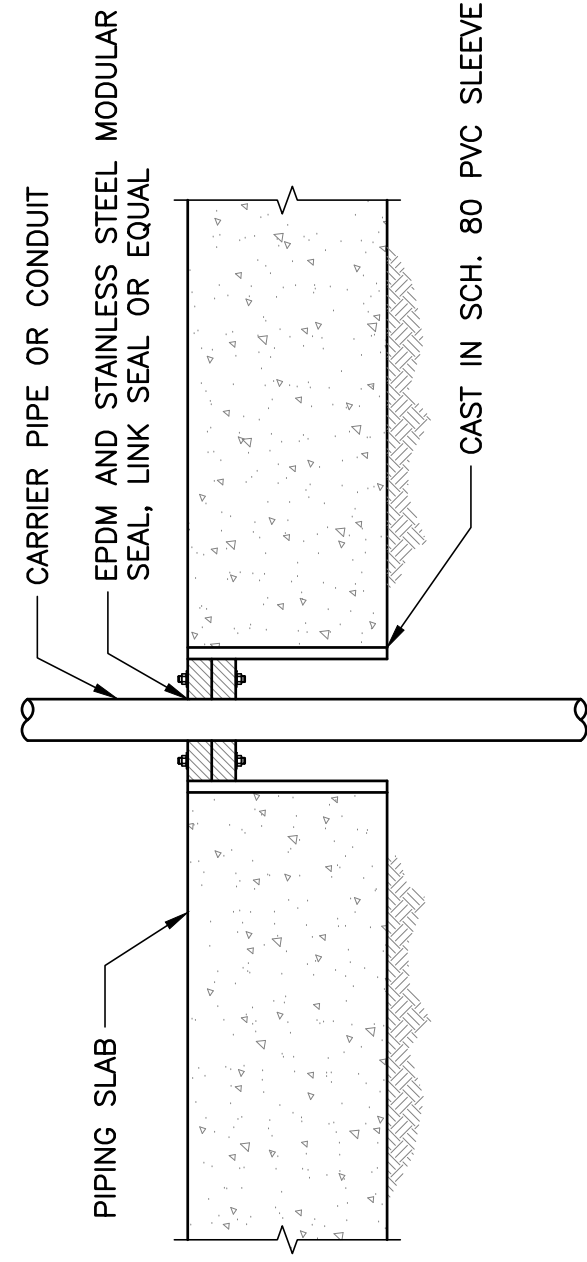
RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
MECHANICAL DETAILS

SHEET NO. 22
SHEET 22 OF 29



RIVER OAKS PIPING RISER

SCALE: N.T.S.

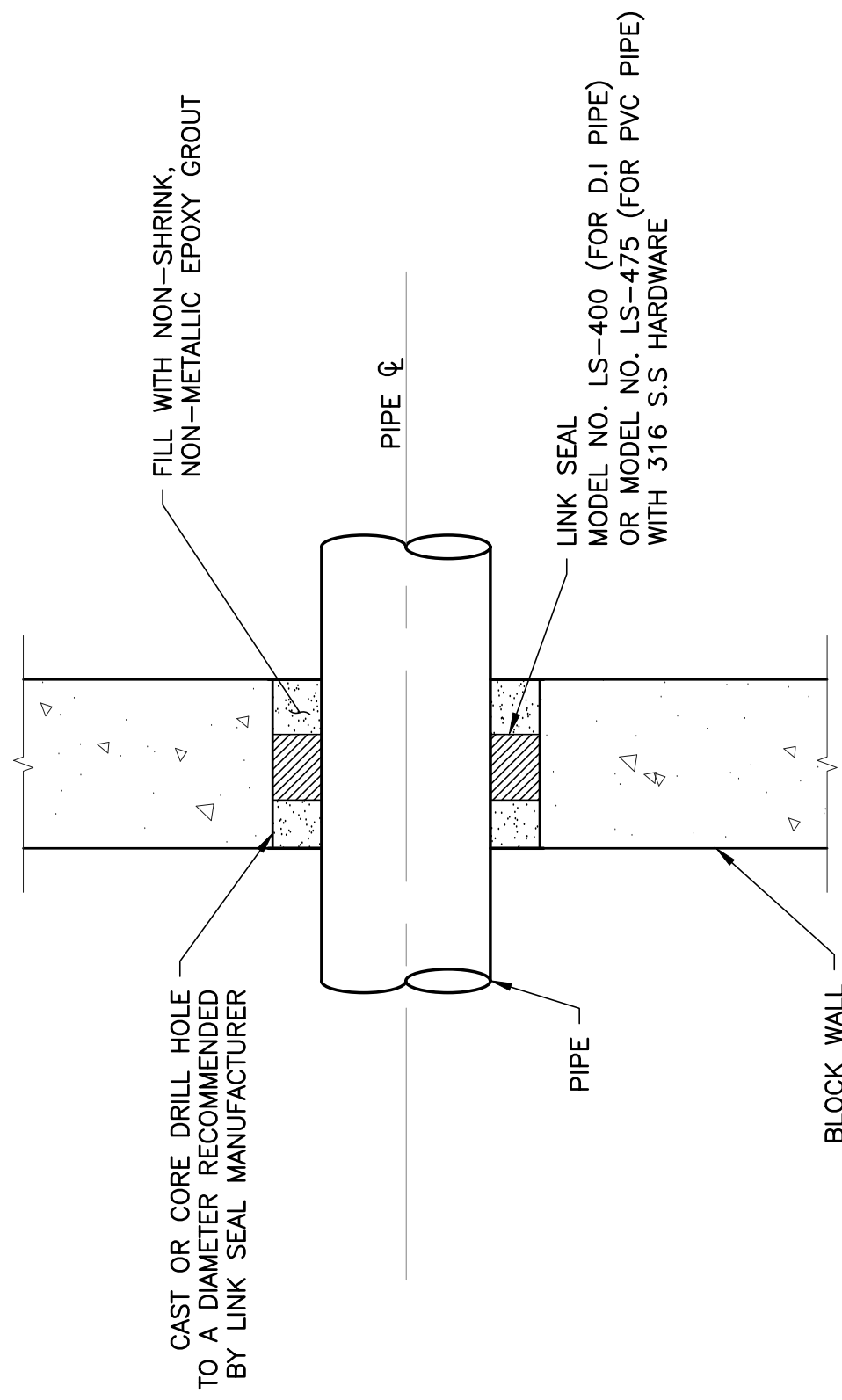


NOTES:

1. ALL INTERIOR PIPING SHALL BE SCHEDULE 80 PVC.
2. UNDERGROUND PIPING MAY BE SCHEDULE 80 PVC OR DR11 HDPE OF EQUIVALENT I.D.

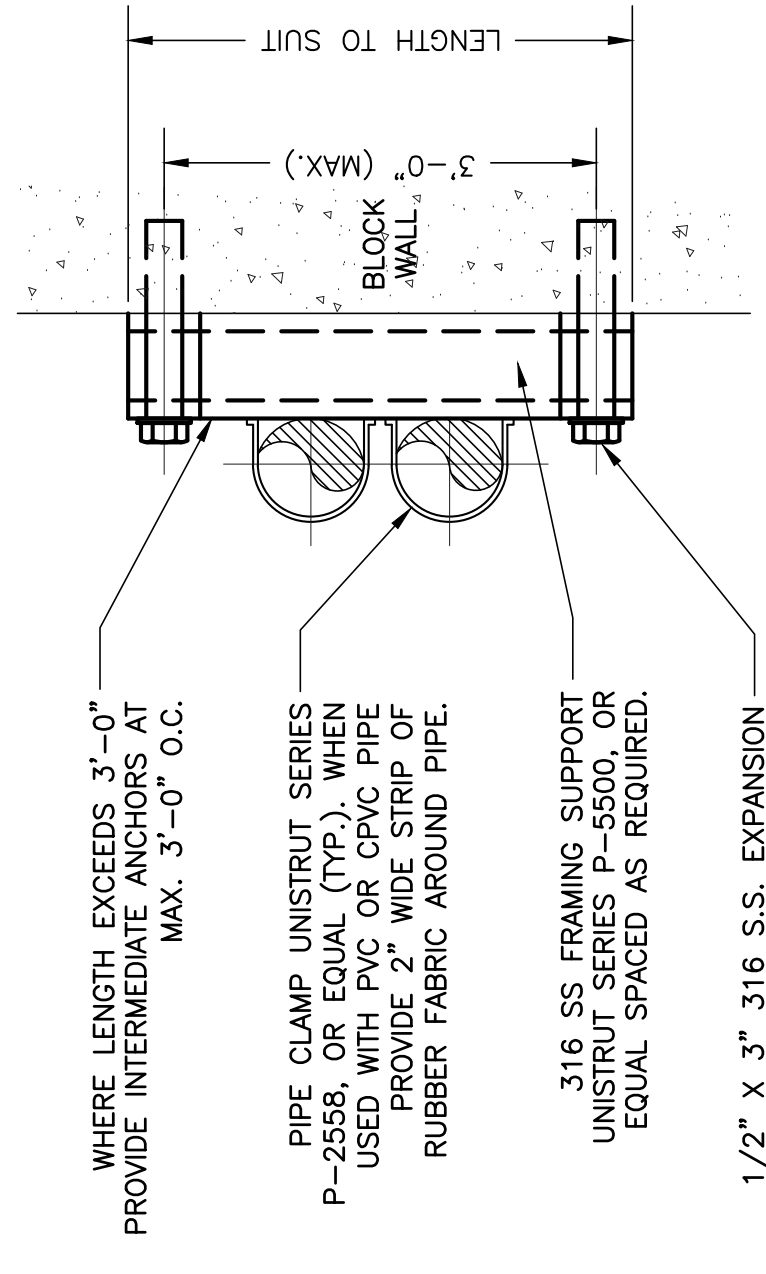
SLAB PENETRATION DETAIL

SCALE: N.T.S.



WALL PENETRATION DETAIL

SCALE: N.T.S.



NOTES:

1. THIS PIPE SUPPORT IS LIMITED FOR PIPES UP TO 6" DIAMETER INCLUSIVE. FOR ADDITIONAL REQUIREMENTS SEE SPECIFICATION SECTION 15009.
2. FOR ADDITIONAL REQUIREMENTS SEE SPECIFICATION SECTION 15009.
3. ALL MATERIALS SHALL BE TYPE 316 SS.

WALL PIPE SUPPORT

SCALE: N.T.S.





DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

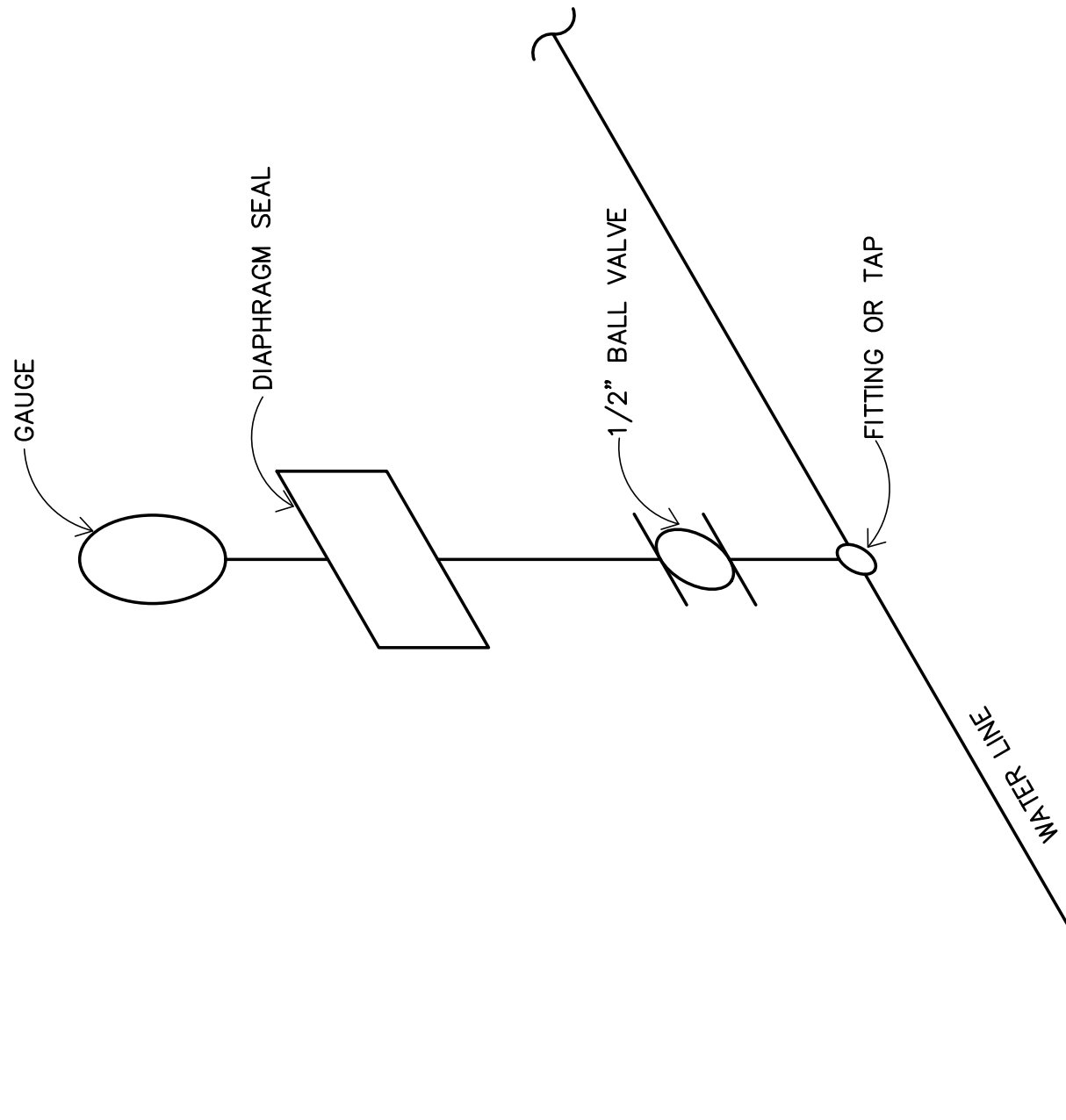
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ISSUE DATE: JULY 2024	APPROVED BY: ---	SHEET SIZE: ---	SCALE: ---
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RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
MECHANICAL DETAILS

SHEET NO. **23**
SHEET 23 OF 29

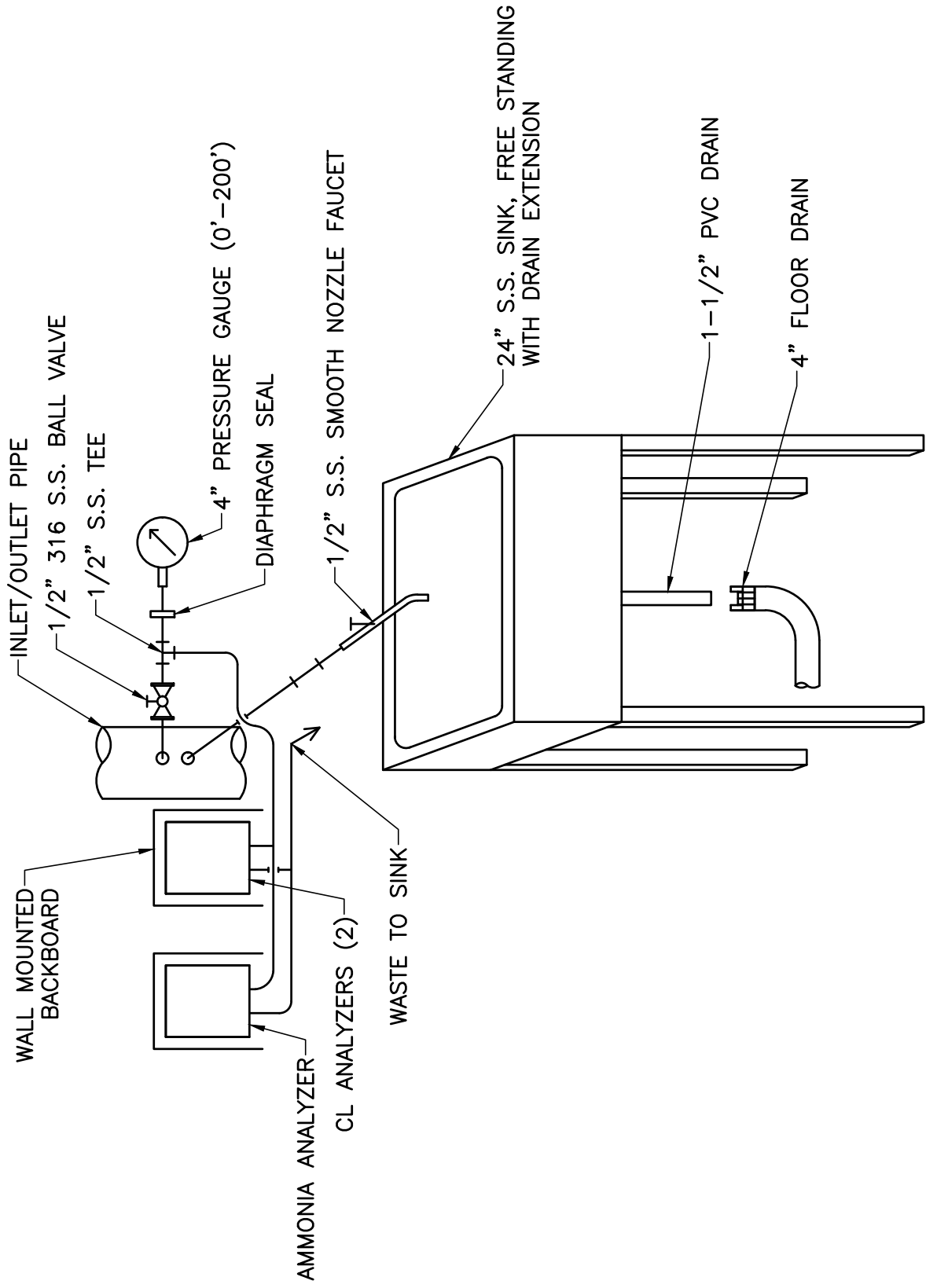


NOTES:

1. ALL INTERCONNECTING PIPE SHALL BE SCH. 40, TYPE 316 SS, THREADED JOINTS.
2. BALL VALVE SHALL BE TYPE 316 SS.
3. SEE SECTION 15183 FOR REQUIREMENTS.
4. SEE INSTRUMENT SCHEDULE SHEETS 18.
5. GAUGE, DIAPHRAGM SEAL AND ISOLATION VALVE SHALL BE FACTORY ASSEMBLED AS A UNIT.

PRESSURE GAUGE ASSEMBLY

SCALE: N.T.S.

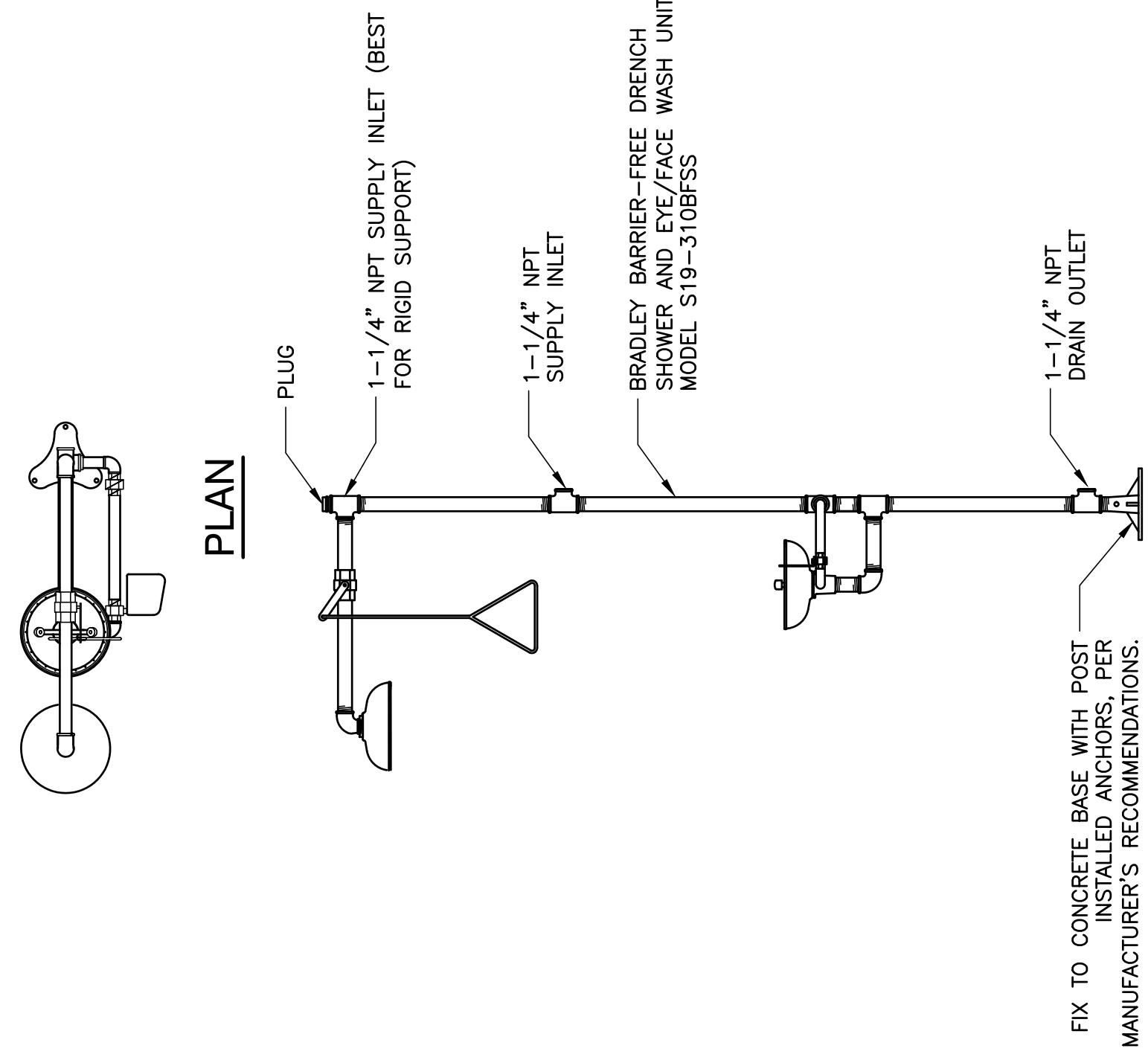


NOTE:

1. REQUIRED IN CONTROL BUILDING.
2. IF PEDESTAL TANK IS CONSTRUCTED, ADDITIONAL SINK AT BASE OF TANK WILL BE PROVIDED.

SINK DETAIL

SCALE: N.T.S.

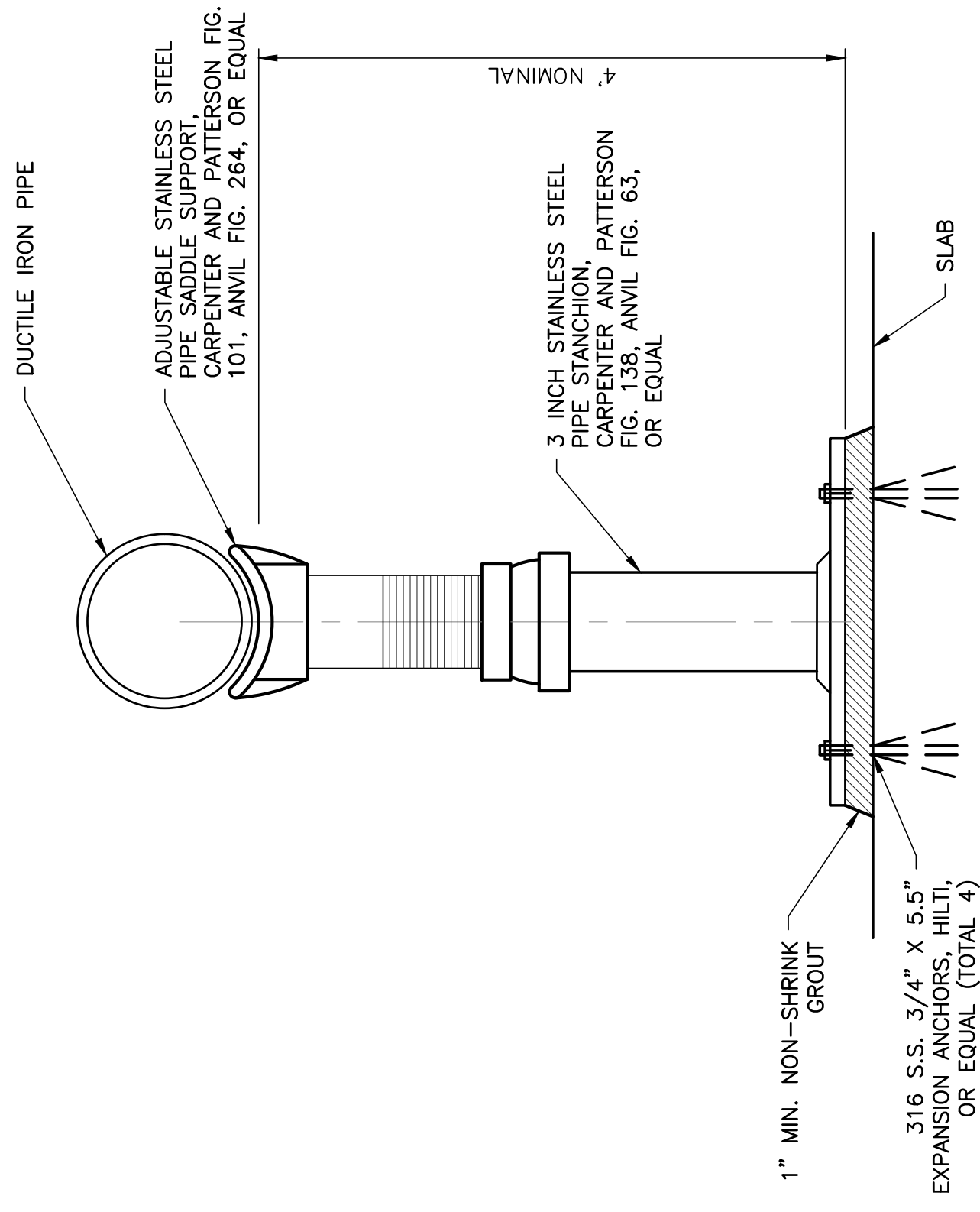


FIX TO CONCRETE BASE WITH POST INSTALLED ANCHORS, PER MANUFACTURER'S RECOMMENDATIONS.

ELEVATION

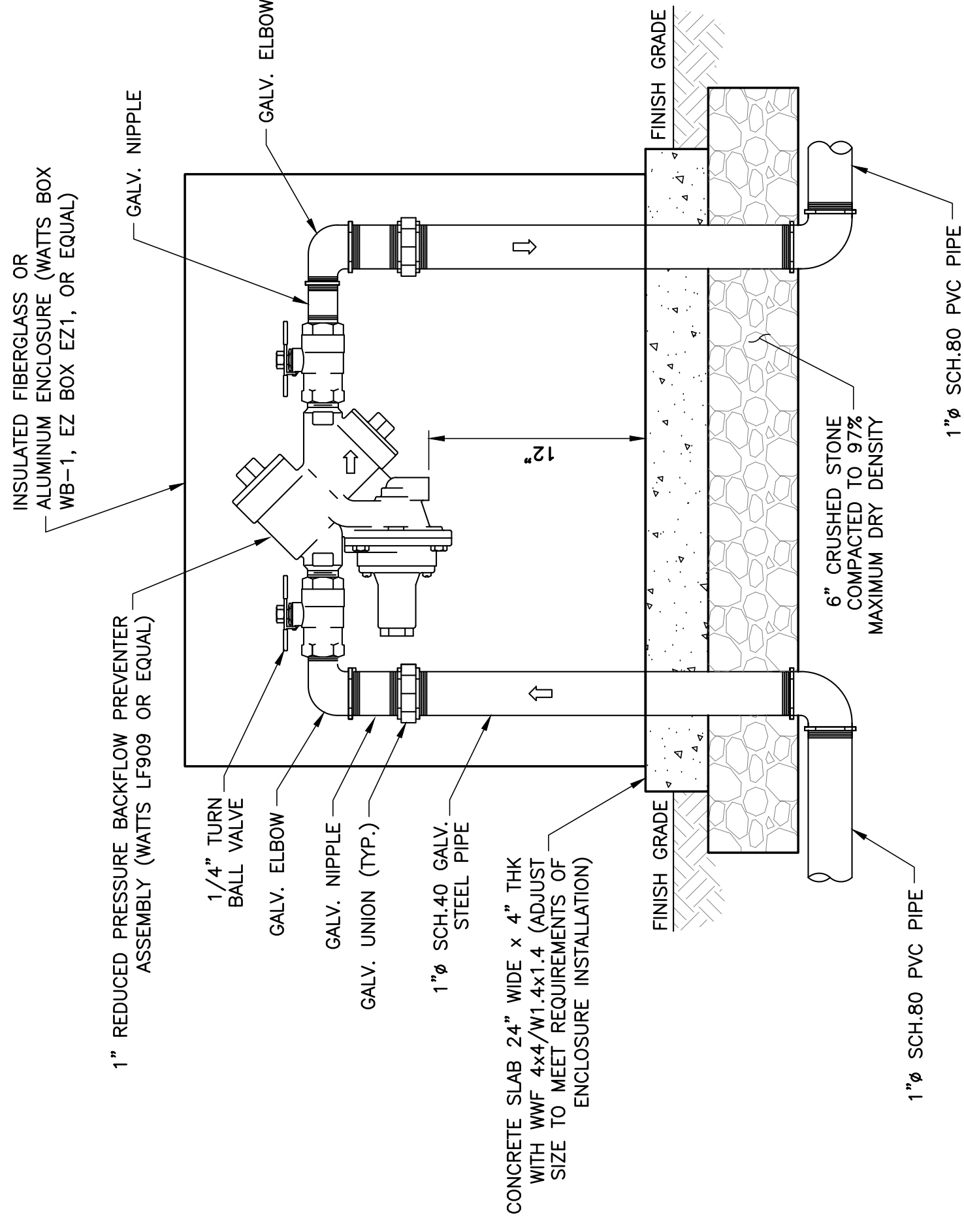
SCALE: N.T.S.

EMERGENCY SHOWER & EYEWASH STATION DETAILS



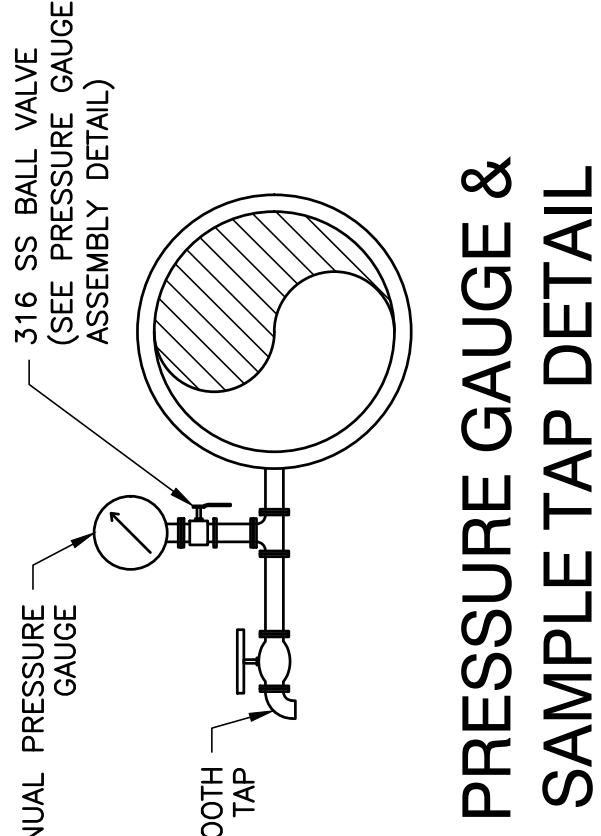
STANCHION PIPE SUPPORT

SCALE: N.T.S.



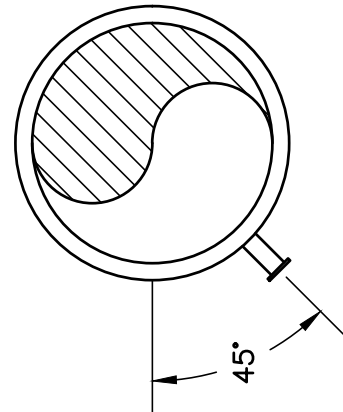
SCALE: N.T.S.

BACKFLOW PREVENTER DETAIL



PRESSURE GAUGE & SAMPLE TAP DETAIL

SCALE: N.T.S.



INJECTION SPOOL ORIENTATION

SCALE: N.T.S.

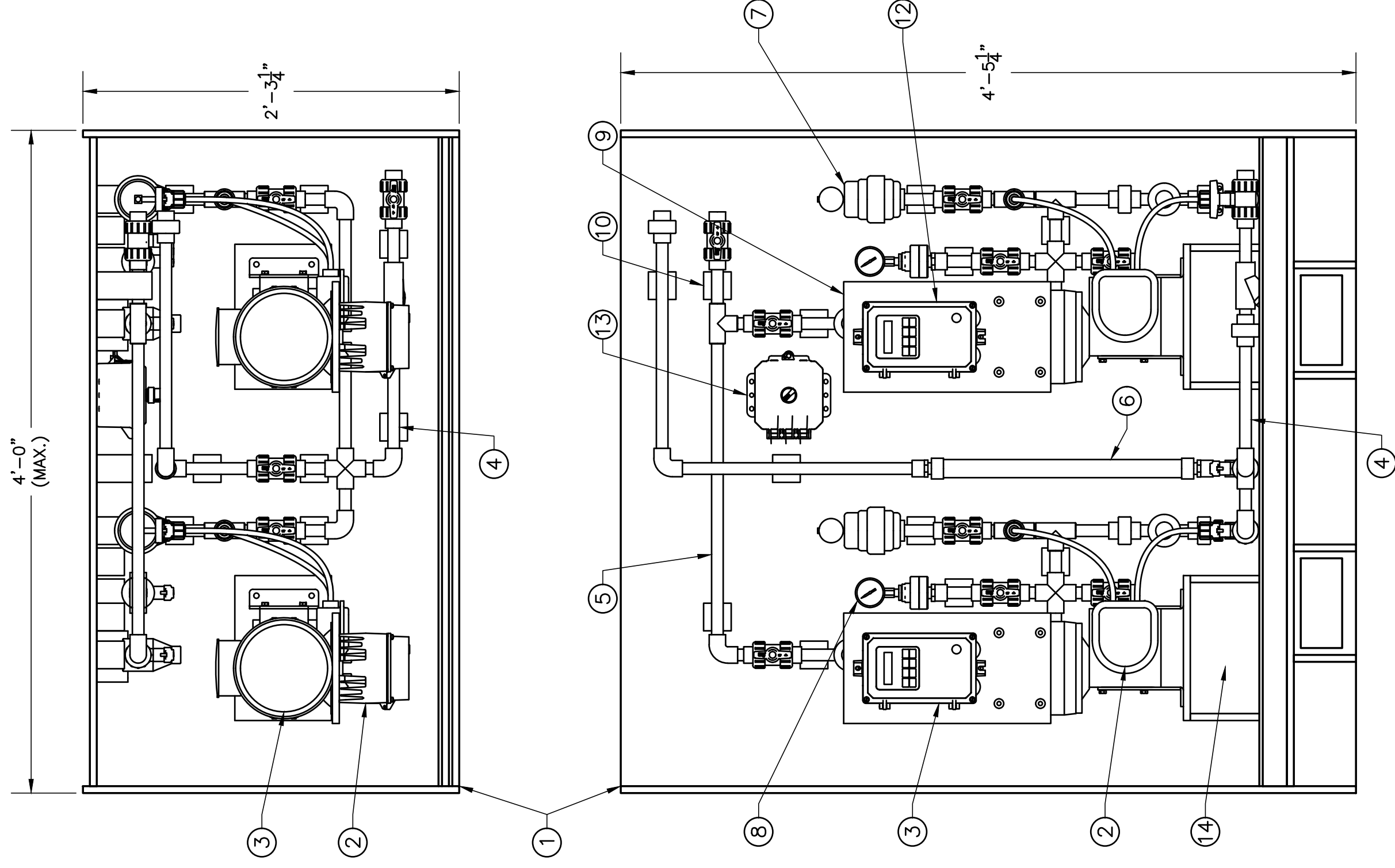


HYPOCHLORITE FEED SKID COMPONENTS

ITEM NO.	DESCRIPTION	QTY.
1	HDPE SKID WELDMENT	1
2	PERIDOS SERIES PERISTALTIC PUMP	2
3	INVERTER DUTY MOTOR, 1/3HP, 208VAC, 60HZ, 3Ø	2
4	SUCTION PIPING ROUTE	1
5	DISCHARGE PIPING ROUTE	1
6	CALIBRATION COLUMN, 200mi, PVC	1
7	PULSATION DAMPENER, 10CU-IN, CPVC/VITON, 1/2" SKT, 0-160, PSI PREMIUM GAUGE	2
8	PRESSURE GAUGE AND GUARD, 1/2" 2-PORT SKT, CPVC, PTFE/	2
9	PRESSURE RELIEF VALVE, 1/2", CPVC, SOCKET, PTFE/VITON DIAPHRAGM	2
10	BACK PRESSURE VALVE, 1/2", CPVC, SOCKET, PTFE/VITON DIAPHRAGM	2
11	DEGASSING VALVE, 1/2" FNPT, CPVC	2
12	INVERTER CONTROLLER	2
13	LEAK DETECTION INTERFACE DEVICE (BOX ONLY)	2
14	PUMP INFORMATION TAG	2

NOTES:

1. FRAME MATERIAL: 1/2" THICK THERMAL WELDED BLACK HDPE.
2. PIPING MATERIAL: SCHEDULE 80 PVC, FKH/FPM (VITON) & PTFE (TEFLON) ELASTOMERS.
3. CONNECTIONS: SOCKET, NPT OR TUBING TYPE. ALL EXPOSED AREAS MUST HAVE EROSION PREVENTATIVE CONTROLS PROPERLY INSTALLED INCLUDING UNFINISHED SLOPES, ROADS, DRIVES AND SIDEWALKS.
4. SOLVENT CEMENT: WELD-ON 724
5. DISCHARGE PIPING SHALL BE LOCATED SUCH THAT IT DOES NOT INTERFERE WITH O & M OF THE PUMPS AND EQUIPMENT.
6. MANUFACTURER SHALL BE LUTZ-JESCO AMERICA CORP. OR APPROVED EQUAL.



HYPOCHLORITE FEED PUMP PERFORMANCE REQUIREMENTS:

PUMP TYPE	PERISTALTIC
MOTOR TYPE	NEMA 56C
PUMP HEAD MATERIAL	STAINLESS STEEL
RATED CAPACITY	5.56 GPH @ 100 PSIG
STROKES PER MINUTE	1.8 - 220
TUBING NO.	#120
TUBING BORE SIZE	1/8"
ML/REV	1.88
MOTOR/VFD	1/3 HP INVERTER RATED

RIVER OAKS WELL	
WELL FLOW	500 gpm
PEAK DAILY PRODUCTION	392,000 gal
SOURCE WATER AMMONIA	0.5 mg/L NH3
SOURCE WATER Ph	> 8.0
CHLORINE DEMAND	7.1 mg/L
SYSTEM RUN TIME	784 mins/day
MONOCHLORAMINE SYSTEM	
TARGET FREE CHLORINE RESIDUAL	0.50 mg/L
CHLORINE DOSAGE	7.6 mg/L
NdOCI (12.5%) FEED RATE	100 mL/min 20.7 gal/day
MIN. STORAGE VOLUME (10 DAYS)	200 gal
FREE CHLORINE SYSTEM (CHLORINE GAS)	
TARGET FREE CHLORINE RESIDUAL	5.0 mg/L
CHLORINE DOSAGE	12.1 mg/L
CHLORINE GAS FEED RATE	39.5 lbs/day

HYPOCHLORITE FEED SYSTEM NOTES:

1. ACTUAL CHEMICAL FEED SKID ASSEMBLY DETAIL IS TO BE DESIGNED AND PROVIDED BY A SINGLE MANUFACTURER.
2. CALIBRATION TUBE SHALL ALLOW FOR THE DIRECT PHYSICAL CHECKING OF ACTUAL LIQUID CHEMICAL FEED RATE.
3. BACK PRESSURE VALVE SHALL PREVENT THE SIPHONING OF LIQUID CHEMICAL INTO THE SYSTEM.
4. LIQUID CHEMICAL TANKS AND ALL OTHER CHEMICAL FEED PRODUCTS SHALL BE NSF COMPLIANT, AND EQUIPMENT LABELS SHALL INCLUDE A SEAL OF NSF CERTIFICATION.
5. CHEMICAL FEED SYSTEM SHALL CONFORM TO ALL REQUIREMENTS OF SECTIONS 11151, 11259, AND 13423.
6. CHEMICAL FEED SYSTEM SHALL NOT BE PLACED INTO SERVICE UNTIL TESTING AND STARTUP SERVICES HAVE BEEN PROVIDED BY THE MANUFACTURER.

GASEOUS CHLORINE SYSTEM NOTES:

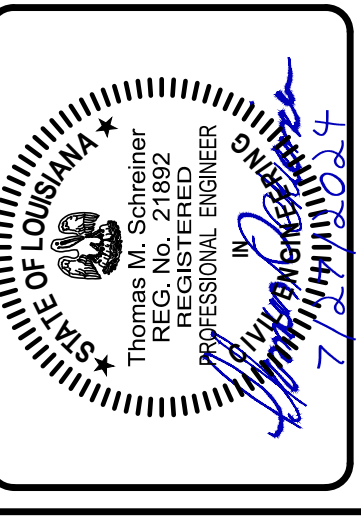
1. GASEOUS CHLORINE EQUIPMENT SHALL BE SUBMITTED AND PROVIDED PER SECTION 11281 - CHLORINE GAS FEED SYSTEM.
2. CONTRACTOR SHALL INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.
3. CONTRACTOR SHALL FURNISH THE SERVICES OF THE EQUIPMENT MANUFACTURER'S QUALIFIED REPRESENTATIVE TO INSTRUCT OPERATING PERSONNEL IN THE IN THE PROPER OPERATION AND MAINTENANCE OF THE EQUIPMENT.



DEPT. OF UTILITIES
TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: ACM
DRAWN BY: LMR
CHECKED BY: TMS
SUBMITTED BY: PRINCIPAL ENG
PROJECT No.: TU23000160
ISSUE DATE: JULY 2024
APPROVED BY: ---
SHEET SIZE: ANSI D
SCALE:



RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
SLIDELL, LOUISIANA
DISINFECTION

SHEET NO.
24
SHEET 24 OF 29

NOTES:

1. ALL WORK SHALL COMPLY WITH ANWA A100-20, AS AMENDED BY THE CONTRACT DOCUMENTS.
2. WATER WELL SCOPE OF WORK: MODIFY EXISTING MUNICIPAL WATER WELL AS SHOWN, COMPLETE AND USABLE UNDER THE PRICES BID. CONTRACTOR SHALL REMOVE EXISTING PUMP, EXTEND EXISTING CASING AT RIVER OAKS, PERFORM OPERATIONAL PUMP TEST, DISINFECT, SUBMIT RESULTS AND RECOMMENDATIONS, SUBMIT EQUIPMENT SELECTION FOR APPROVAL, AND COMPLETE WELL HEAD CONSTRUCTION IN ACCORDANCE WITH THE DRAWINGS. SEE SPECIFICATIONS.
3. LINESHAFT TURBINE PUMP SHALL BE MULTI-STAGE WATER LUBRICATED, CAST IRON IMPELLER BOWL AND DISCHARGE BODY, ASTM A53 STEEL COLUMN, 416 STAINLESS STEEL SHAFT, WITH SILICON BRONZE IMPELLERS AND BEARING RETAINERS. STRAINER SHALL BE OF STAINLESS STEEL. LINESHAFT BEARINGS SHALL BE EPDM. PUMP SHALL BE GOULDS OR NATIONAL.

WELL PUMP DATA

RIVER OAKS	
NUMBER OF PUMPS	1
TAG NUMBER	MP-01-RO
PUMP TYPE	LINESHAFT TURBINE
PUMP COLUMN DIA., IN.	6
PUMP COLUMN HT., FT.	60
FLOW, GPM	500
TDH, FT.	187
MOTOR SIZE, HP	40
MOTOR SPEED, RPM	1800
VOLTAGE, V	480
POWER	3PH, 60HZ

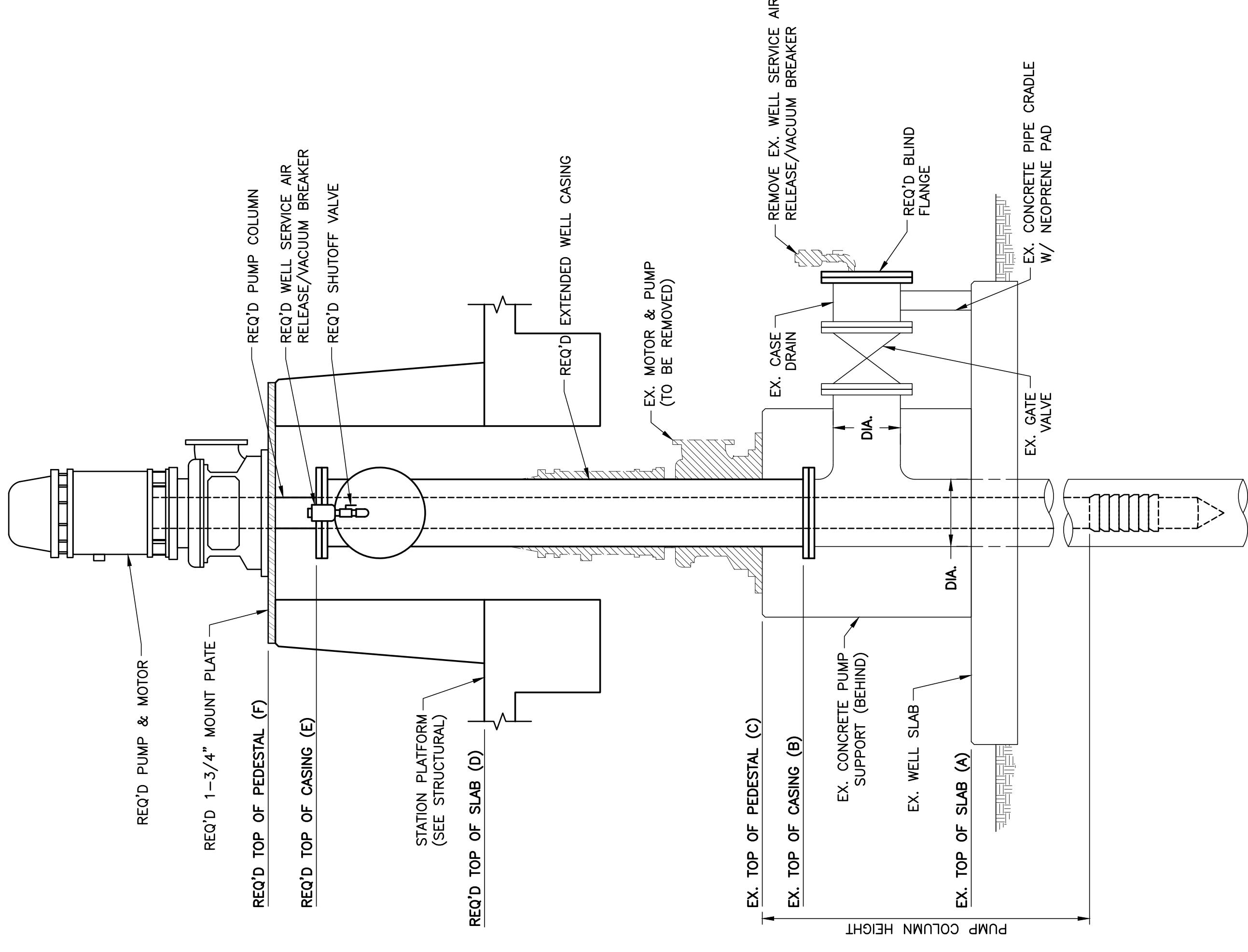
*VALUES ARE BASIS OF BID, AND SHALL BE CONFIRMED OR MODIFIED AFTER WELL PUMP TEST.

4. DISINFECTION OF WELLS SHALL BE ACCORDING TO ANWA C654.
5. PRIOR TO PLACEMENT IN SERVICE, THE WELLS SHALL BE SAMPLED FOR THE NATIONAL PRIMARY DRINKING WATER CONTAMINANTS, AND FOR TOTAL COLIFORM.

WELLHEAD DATA

RIVER OAKS	
A (NAVD)	7.6
B (NAVD)	8.2*
C (NAVD)	10.0
D (NAVD)	16.0
E (NAVD)	19.6
F (NAVD)	20.6
G (NAVD)	7.4
DIA. (INCHES)	10
BASE FLOOD EL. (NAVD)	14.0
STATIC WATER LEVEL (FT AGL)	46.2

*CONTRACTOR SHALL VERIFY ELEVATIONS.



WELL HEAD DETAIL (RIVER OAKS)

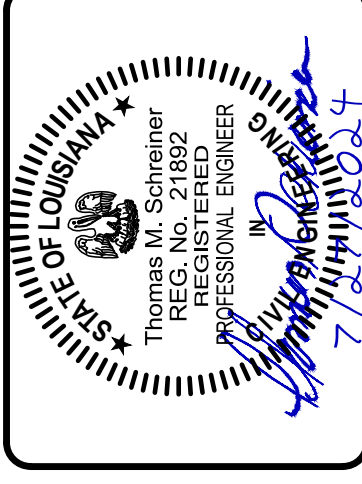
SCALE: N.T.S.



DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

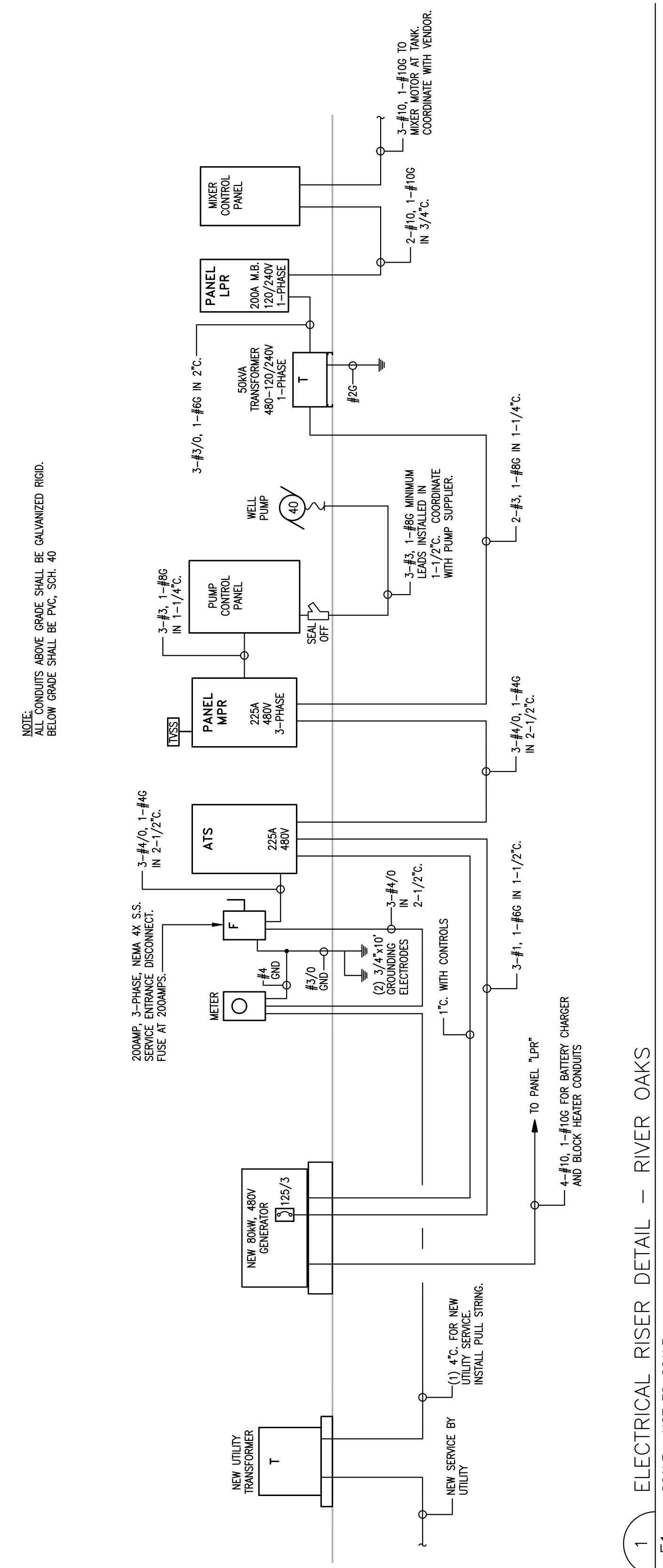
DESIGNED BY: ACM	CHECKED BY: TMS	PROJECT No.: TU23000160	ISSUE DATE: JULY 2024	APPROVED BY: ---	SHEET SIZE: ANSI D	SCALE:
DRAWN BY: LMR	SUBMITTED BY: PRINCIPAL ENG					



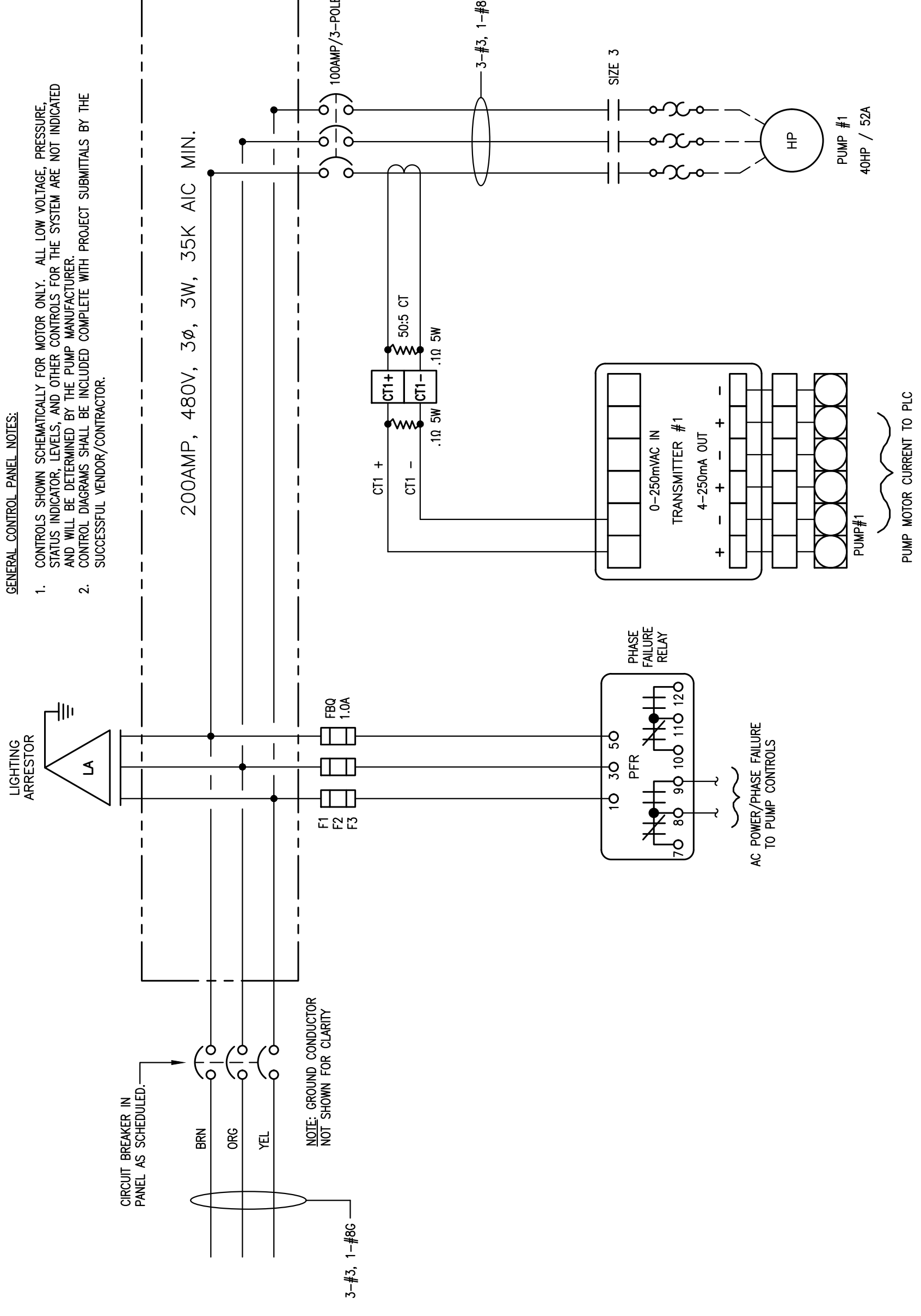
RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
WATER WELL DETAILS

SHEET NO.
25
SHEET 25 OF 29

ELECTRICAL LEGEND	
LIGHTING	CONDUIT AND WIRE
<ul style="list-style-type: none"> SURFACE MOUNT, STRIP FIXTURE WALL MOUNTED FIXTURE POLE AND POLE MOUNTED FIXTURE 	<ul style="list-style-type: none"> FLEXIBLE CONDUIT, SEALTITE AT WET LOCATIONS CONDUIT CONCEALED IN WALL OR ABOVE CEILING CONDUIT BELOW GRADE OR CONCEALED IN WALL CONDUIT EXPOSED CIRCUIT CONDUCTORS IN CONDUIT MULTIPLE CIRCUIT CONDUCTORS IN CONDUIT WITH NEUTRALS GROUND CONDUCTORS IN CONDUIT CIRCUIT HOMERUN TO PANEL BOARD. XX-XX DENOTES PANEL NAME AND CIRCUIT NUMBER CONTINUATION OF CONDUIT RUN
SWITCHES	DEVICES
<ul style="list-style-type: none"> SINGLE POLE SWITCH - 20A, 120/277V, 4-8" AFF, UNLESS NOTED MANUAL MOTOR STARTERS, MOUNT NEXT TO EQUIPMENT SERVED, UNLESS NOTED SINGLE POLE SWITCH W/ WEATHERPROOF COVER - 20A, 120/277V, 4-8" AFF, UNLESS NOTED 2-POLE SWITCH, MOUNT NEXT TO EQUIPMENT SERVED, UNLESS NOTED 	<ul style="list-style-type: none"> QUADRAPLEX RECEPTACLE - 20A, 120V GFI DUPLEX RECEPTACLE - 20A, 120V GFI WEATHER RESISTANT DUPLEX RECEPTACLE - 20A, 120V WITH IN-USE WEATHERPROOF COVER MOUNT ALL DEVICES AT +18" AFF, UNLESS NOTED OTHERWISE. * - DEVICES MOUNTED ABOVE COUNTER HEIGHTS SHALL BE 6" ABOVE BACKSPASH.
SWITCHGEAR	
<ul style="list-style-type: none"> JUNCTION BOX NEW FUSED SAFETY SWITCH, NEMA XX S.S. AT WET LOCATIONS FUSED SAFETY SWITCH, NEMA XX S.S. AT WET LOCATIONS LIGHT AND POWER PANELBOARD DISTRIBUTION PANELBOARD TRANSFORMER AUTOMATIC TRANSFER SWITCH METER MOTOR - HORSEPOWER NOTED SPECIAL ELECTRICAL CONNECTION WATER HEATER ELECTRICAL CONNECTION EX. FAN ELECTRICAL CONNECTION AC AIR-HANDLER UNIT ELECTRICAL CONNECTION PUMP PUMP ELECTRICAL CONNECTION 	

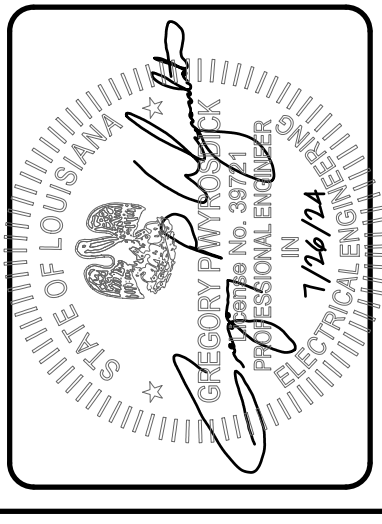


1 ELECTRICAL RISER DETAIL - RIVER OAKS
SCALE: NOT TO SCALE



2 ONE-LINE DIAGRAM - RIVER OAKS
SCALE: NOT TO SCALE

DESIGNED BY:	JWH
DRAWN BY:	JWH
CHECKED BY:	GPV
SUBMITTED BY:	PRINCIPAL ENG.
PROJECT No.:	TJ23000160
ISSUE DATE:	JULY 2024
APPROVED BY:	
SHEET SIZE:	ANSI D
SCALE:	AS SHOWN



RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TJ23000160
ELECTRICAL RISER DIAGRAM & DETAILS

SHEET NO. E1
SHEET 26 OF 29

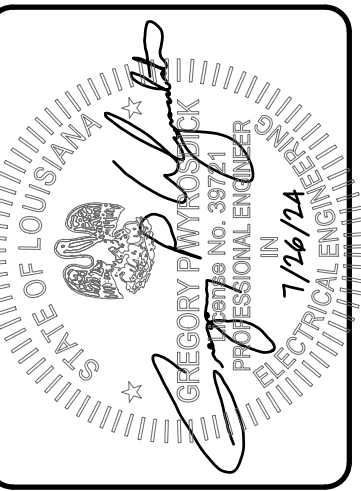




DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: JWH	PROJECT No.: TU23000160
DRAWN BY: JWH	ISSUE DATE: JULY 2024
CHECKED BY: GPV	APPROVED BY:
PRINCIPAL ENG.	SHEET SIZE: ANS I D
	SCALE: AS SHOWN

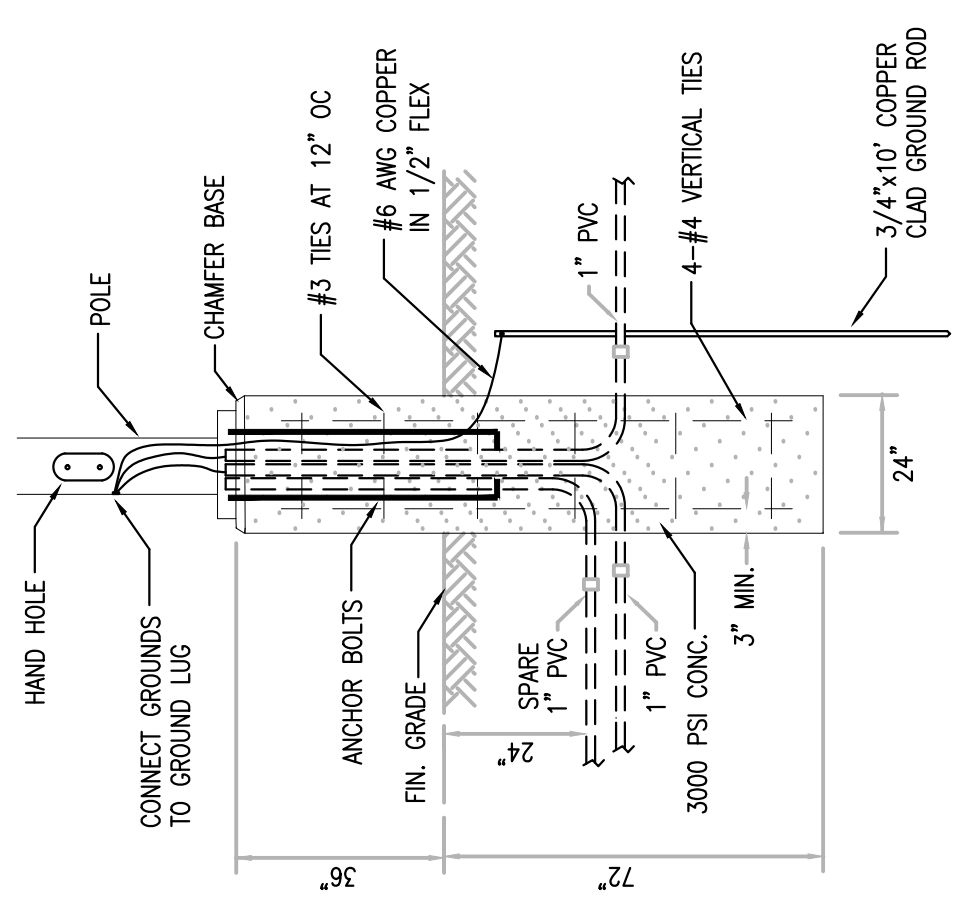


RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU23000160
NEW ELECTRICAL SITE PLAN
RIVER OAKS

SHEET NO. E-3
SHEET 28 OF 29

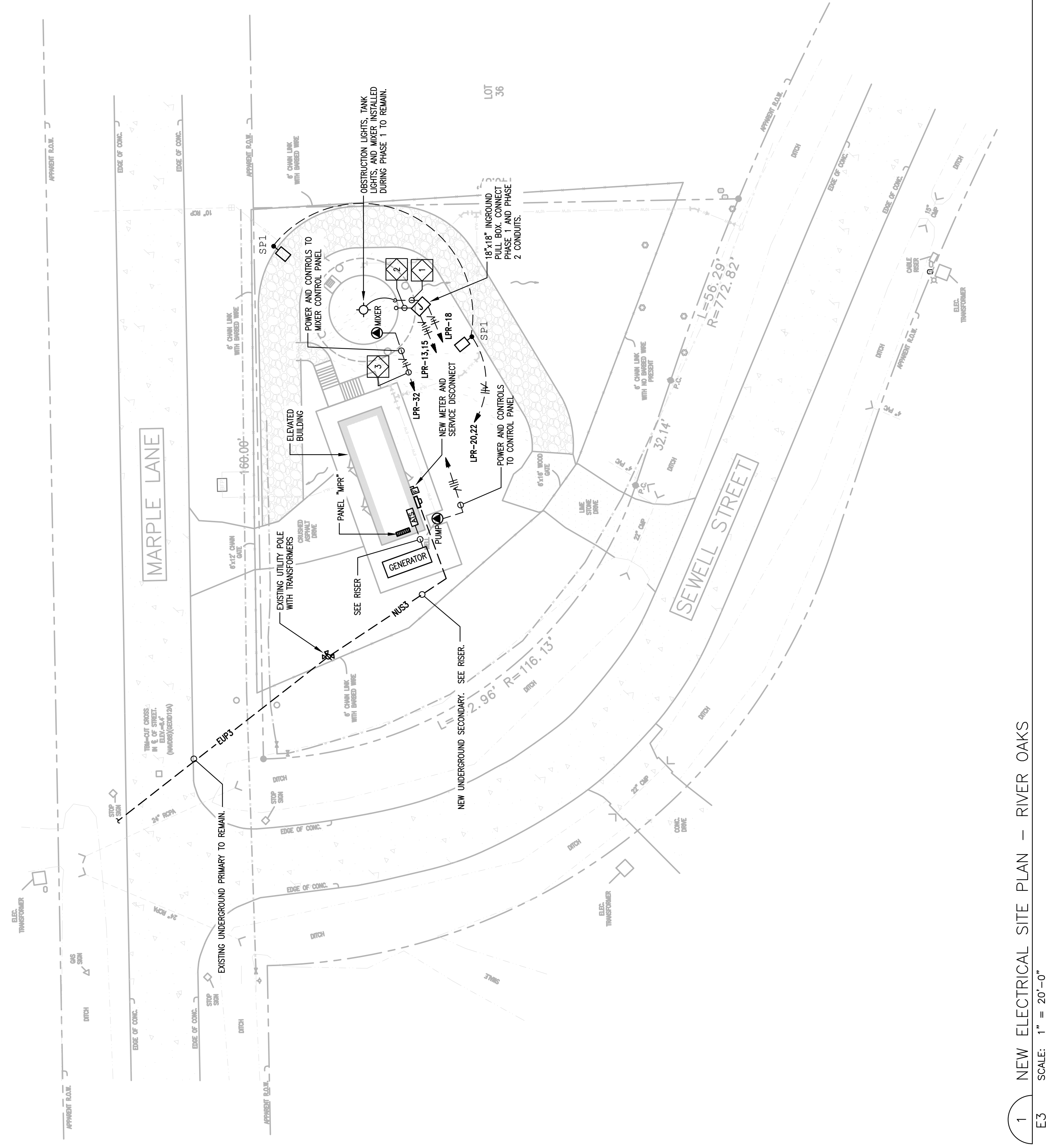


- POLE FOUNDATION NOTES:**
- INSTALL POLES LEVEL AND PLUMB. UTILIZE LEVELING NUTS ON ANCHOR BOLTS AS REQUIRED.
 - ANCHOR BOLTS TO BE SIZED PER MANUFACTURER'S RECOMMENDATION.
 - PROVIDE AND INSTALL NONSHRINK GROUT AND BASE OF POLYURETHANE ANCHOR BOLTS TO BE SLOPED SLOPED FINISH AT BASE OF POLE.
 - PROVIDE "RUBBERED" FINISH ON ALL EXPOSED CONCRETE AT POLE FOUNDATION.
 - INSTALL ANCHOR BOLTS TO MATCH BOLT PATTERN DIAMETER GIVEN BY POLE MANUFACTURER.
 - INSTALL (1) 1" PVC SPARE CONDUIT STUBBED OUT OF POLE BASE.



2 POLE BASE DETAIL
E3 SCALE: NOT TO SCALE

- SPECIFIC ELECTRICAL NOTES:**
- 2-#10, 1-#10G. INTERCEPT EXISTING CIRCUIT INSTALLED DURING PHASE 1. EXTEND TO NEW ELECTRICAL PANEL AS NOTED.
 - 2-#10, 1-#10G. FOR EACH CIRCUIT. INSTALL NEW WIRING THROUGH EXISTING 1" CONDUIT THAT WAS STUBBED OUT DURING PHASE 1. EXTEND TO NEW ELECTRICAL PANEL AS NOTED.
 - 2-#10, 1-#10G. FOR WIRING INTERCEPT EXISTING CIRCUIT INSTALLED DURING PHASE 1. EXTEND TO NEW ELECTRICAL PANEL AS NOTED. ROUTE CIRCUIT THROUGH WIRING PANEL CONTROLLER. COORDINATE WITH VENDOR.



1 NEW ELECTRICAL SITE PLAN - RIVER OAKS
E3 SCALE: 1" = 20'-0"





DEPT. OF UTILITIES
TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

No.	DESCRIPTION OF REVISION	DATE:

DESIGNED BY: JWH	PROJECT No.: TU2300160
DRAWN BY: JWH	ISSUE DATE: JULY 2024
CHECKED BY: GPW	APPROVED BY:
SUBMITTED BY: PRINCIPAL ENG.	SHEET SIZE: ANSI D
	SCALE: AS SHOWN



RIVER OAKS
BUILDING & WELL IMPROVEMENTS
PROJECT No.: TU2300160
ENLARGED ELECTRICAL PLAN
RIVER OAKS

SHEET NO. E-4
SHEET 29 OF 29



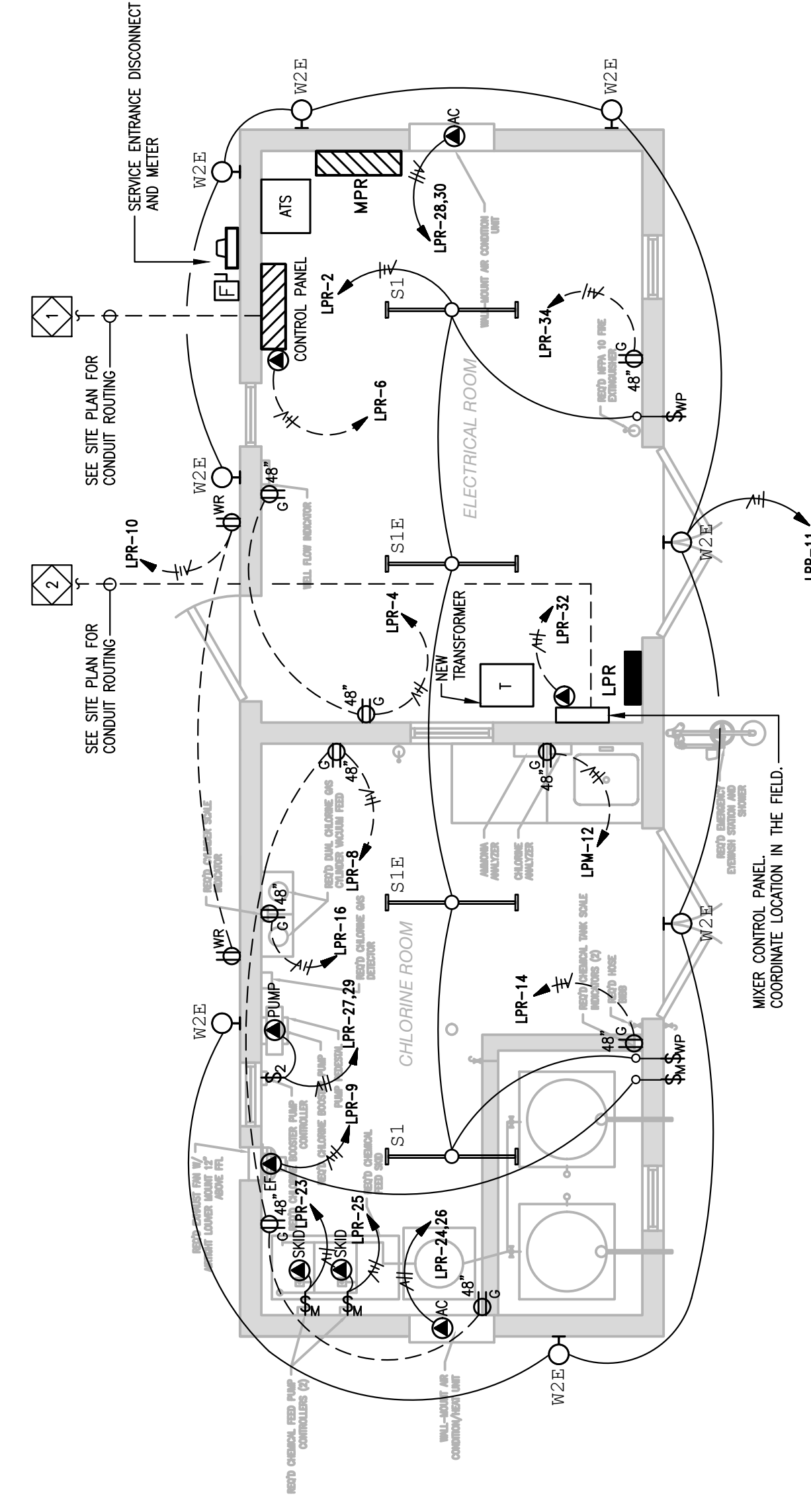
LUMINAIRE SCHEDULE

MARK	LAMPS	MOUNTING	DESCRIPTION	MANUFACTURER	EQUALS
S1	LED	SURFACE/STRUCTURE	LED, 4" VAPORITITE STRIP FIXTURE	LITHONIA FEML48-4000LM/LPQL-MD-MVOLT-GZ10-40K-80CRI	OR APPROVED EQUAL
S1E	LED	SURFACE/STRUCTURE	LED, 4" VAPORITITE STRIP FIXTURE, W/ EMERGENCY	LITHONIA FEML48-4000LM/LPQL-MD-MVOLT-GZ10-40K-80CRI-E/0W/MCP	OR APPROVED EQUAL
SP1	LED	POLE	LED, SITE POLE FIXTURE, SINGLE FIXTURE, W/ PHOTOCELL, W/ HOUSE-SIDE SHIELD	LITHONIA DSX1 LED-P1-40K-T4M-20B-SPA-PER-DBLXD-G1-DLL1Z7F-1-4-JUL-DSX1HS-30C U G1	OR APPROVED EQUAL
			16" SQUARE ALUMINUM POLE	LITHONIA SSA-16-4G-DM19-DBLXD	OR APPROVED EQUAL
W2E	LED	WALL: ABOVE DOOR	LED, EXTERIOR WALL PACK, W/ PHOTOCELL, W/ EMERGENCY	LITHONIA WDG2E2 LED-P3-40K-80CRI-VF-MVOLT-SRM-PBWB-E/0WH-PE-DBLXD	OR APPROVED EQUAL

NOTE: LUMINAIRES WITH "E" DESIGNATION SHALL HAVE INTEGRAL EMERGENCY BALLAST. CONNECT EMERGENCY BALLAST ONLY AHEAD OF ANY SWITCHING. NORMAL BALLAST TO BE SWITCHED AS INDICATED. UNLESS NOTED OTHERWISE.

PANEL	BUSS: 225 AMP	VOLT: 480V, 3 PHASE, 3 WIRE	LOAD (AMPS)			AIC RATING: 22,000	LOCATION: ELEC. ROOM (RIVER OAKS)
			A	B	C		
MPR	MAINS: M.L.O.	MOUNT: SURFACE, NEMA 1					
CKT. BKR.	DESCRIPTION	FEEDER	LOAD (AMPS)				
1	100/2						
3	PANEL "LPR" THRU TRANSFORMER	2-3, 1-8G	49.1	52	52	3-3, 1-8G	CONTROL PANEL
5							
7							
9							
11							
13							
15							
17							
19							
21							
23							
CONNECTED LOADS PER PHASE							
							A phase
							B phase
							C phase
							101.1
							101.0
							52.0
							amps
							amps
							amps

PANEL	BUSS: 200 AMP	MAINS: 200A M.B.	DESCRIPTION	FEEDER	LOAD (AMPS)			AIC RATING: 10,000	LOCATION: ELEC. ROOM (RIVER OAKS)
					A	B	C		
LPR									
CKT. BKR.	DESCRIPTION	FEEDER	LOAD (AMPS)						
1	60/2								
3	SPARE								
5	SPARE								
7									
9	EXHAUST FAN	2-12, 1-12G	9.8						
11	LIGHTS (EXTERIOR)	2-12, 1-12G							
13	CL2 ANALYZER (TANK)	2-10, 1-10G	6						
15	AMMONIA ANALYZER (TANK)	2-10, 1-10G	6						
17	BATT. CHARGER (GENERATOR)	2-10, 1-10G	15						
19	BLOCK HEATER (GENERATOR)	2-10, 1-10G	15						
21	CHLORINE SKD	2-12, 1-12G	15						
23	CHLORINE SKD	2-12, 1-12G	6						
25									
27									
29	BOOSTER PUMP	2-12, 1-12G	10						
31	SPARE								
33	SPARE								
35	SPARE								
37	SPARE								
39	SPARE								
41	SPARE								
CONNECTED LOADS PER PHASE									
									A phase
									B phase
									C phase
									113.3
									113.0
									amps
									amps



1 ENLARGED ELECTRICAL PLAN - RIVER OAKS (CONTROL BUILDING)
E4 SCALE: 1/4" = 1'-0"

- SPECIFIC ELECTRICAL NOTES (THIS SHEET):
- 1 EXTEND CONDUITS TO WELL PUMP AND VALVE LOCATIONS FOR POWER AND CONTROLS. (2) 1". FOR POWER AND (2) 1-1/2". FOR CONTROLS. COORDINATE WITH CONTROLS VENDOR. EXTEND TO LOCATION OF CONDUITS INSTALLED DURING PHASE 1. CONNECT ALL CONDUITS INTO A 18"x18" INGROUND PULL BOX. INSTALL PULL STRINGS IN ALL UNUSED CONDUITS.
 - 2 EXTEND CONDUITS TO WATER TANK MIXER LOCATION FOR POWER AND CONTROLS. (1) 1". FOR POWER AND (1) 1/2". FOR CONTROLS. MIXER CONTROL PANEL REQUIRES 120 VOLT, 1-PHASE OUTPUT TO MOTOR. COORDINATE WITH CONTROLS VENDOR.

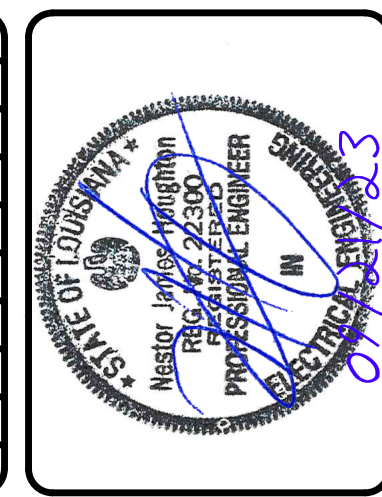




DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

NO.	DESCRIPTION OF REVISION	DATE
1	UPS AND BATTERY ADDED	04/25/24

DESIGNED BY:	RR
DRAWN BY:	RR
CHECKED BY:	SH
ISSUE DATE:	09-21-2023
APPROVED BY:	---
SHEET SIZE:	ANSI D
SCALE:	NONE



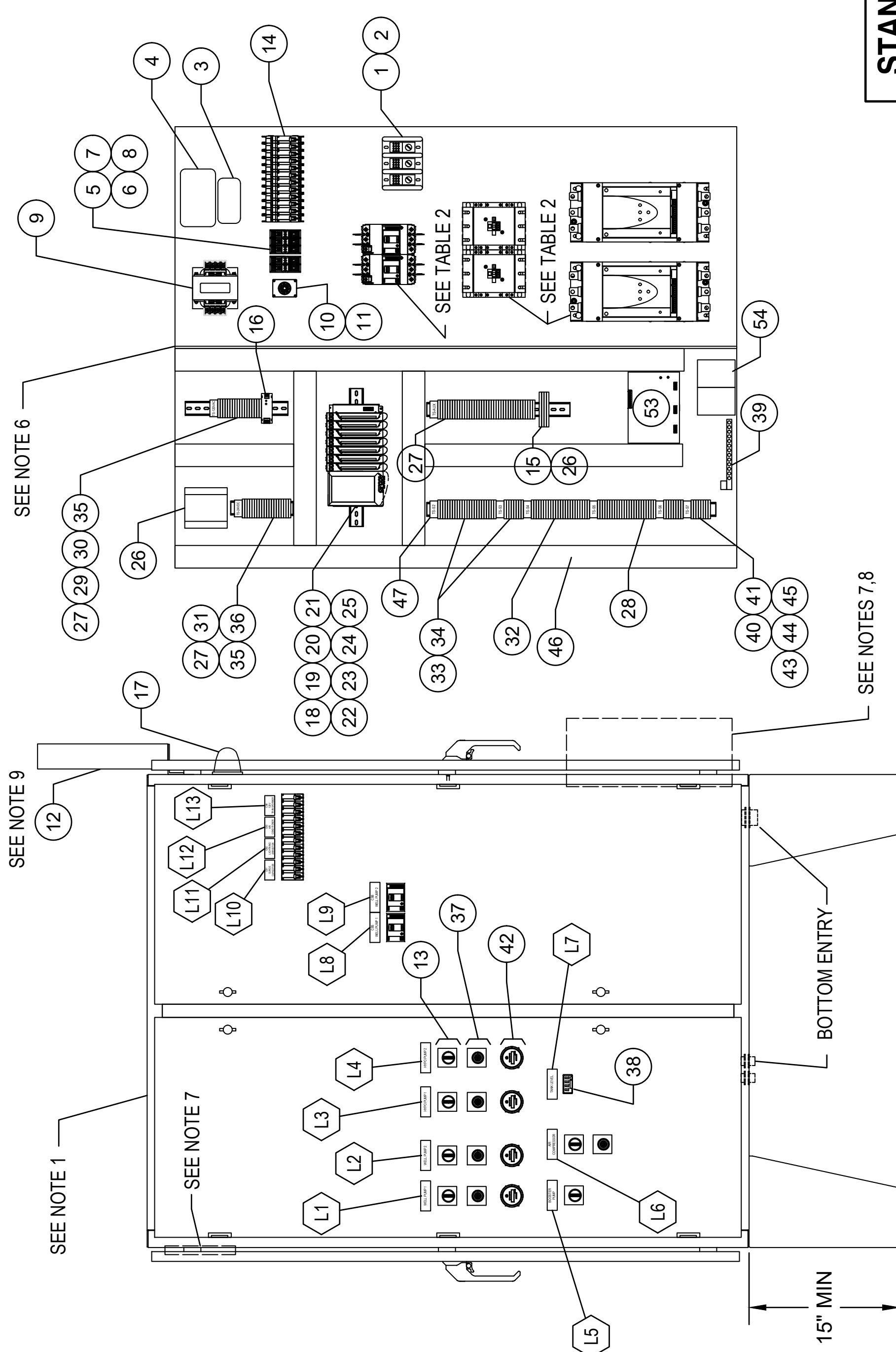
WATER PRODUCTION SITE
ST. TAMMANY PARISH, LOUISIANA
CONTROL PANEL SPECIFICATION
PANEL LAYOUT

SHEET NO.
CP-001
SHEET 1 OF 2

TABLE 1

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER
1	1	POWER DISTRIBUTION BLOCK	BUSSMAN	16378-3
2	1	POWER DISTRIBUTION COVER	BUSSMAN	163CPDB-3
3	1	LIGHTNING ARRESTOR	DELTA	LA-303
4	1	SURGE CAPACITOR	DELTA	CA-603
5	1	3 POLE FUSE BLOCK	BUSSMANN	BCM603-35
6	1	2 POLE FUSE BLOCK	BUSSMANN	BCM603-25
7	3	1A FUSE	BUSSMANN	KTk-R-1
8	2	8A FUSE	BUSSMANN	KTk-R-8
9	1	CONTROL POWER TRANSFORMER 300VA	SCHNEIDER	9070T500D95
10	1	PHASE MONITOR RELAY	AUTOMATION DIRECT	PMRU-1C-480A-TL
11	2	RELAY SOCKET	AUTOMATION DIRECT	70169-D
12	1	ANTENNA	SURECALL	SC-588W
13	6	3-POSITION, MAINTAINED, SELECTOR SWITCH	EATON	M225-WRK3-K20
14	4	MINIATURE CIRCUIT BREAKER 3P 15A, 480/277VAC	EATON	FAZ-C15-3-NA
15	3	24VDC RELAY 1 CHANGEVER CONTACT	PHOENIX CONTACT	2966171
16	1	24VDC POWER SUPPLY 150W OUTPUT	PHOENIX CONTACT	2904376
17	1	ENCLOSURE WARNING LIGHT - AMBER	FEDERAL SIGNAL	LP22LED-090-240A
18	1	PLC PROCESSOR WITH TOUCHSCREEN	OPTO 22	GRV-EPIC-PR2
19	1	24V POWER ADAPTER	OPTO 22	GRV-EPIC-P5DC
20	1	8-SLOT CHASSIS	OPTO 22	GRV-EPIC-CH58
21	1	4-CHANNEL SERIAL COMMUNICATION MODULE	OPTO 22	GRV-CSERI-4
22	2	24-CHANNEL DISCRETE INPUT MODULE	OPTO 22	GRV-IDC-24
23	2	8-CHANNEL RELAY OUTPUT MODULE	OPTO 22	GRV-OMRIS-8
24	1	24-CHANNEL ANALOG INPUT MODULE	OPTO 22	GRV-IMA-24
25	1	8-CHANNEL ANALOG OUTPUT MODULE	OPTO 22	GRV-OVMALC-8
26	1	CELLULAR ROUTER	PEPWAVE	MAX-BR1-MINI
27	46	FEED THROUGH TERMINAL BLOCK UT 4	PHOENIX CONTACT	3044102
28	16	FEED THROUGH 2-LEVEL TERMINAL BLOCK UTTB 4	PHOENIX CONTACT	3044814
29	6	GROUND TERMINAL BLOCK UT 4-PE	PHOENIX CONTACT	3044128
30	6	FUSED TERMINAL BLOCK (5x20) 250VAC	PHOENIX CONTACT	3046100
31	10	FUSED TERMINAL BLOCK (5x20) 24VDC	PHOENIX CONTACT	3046090
32	48	FUSED 2-LEVEL TERMINAL BLOCK (5x20) 24VDC	PHOENIX CONTACT	3214366
33	32	FUSED 2-LEVEL TERMINAL BLOCK W/GND (5x20) 24VDC	PHOENIX CONTACT	3214321
34	72	0.5A FUSE 5MM X 20MM	BUSSMANN	GMA-5
35	15	2A FUSE 5MM X 20MM	BUSSMANN	GMA2
36	1	4A FUSE 5MM X 20MM	BUSSMANN	GMA4
37	5	INDICATING LIGHT RED LED	EATON	E22HL2X8
38	1	ANALOG SIGNAL DISPLAY	AUTOMATION DIRECT	DPW1-A-IP
39	1	GROUND BAR	EATON	GBK1420CS
40	A/R	TERMINAL BLOCK END CLAMP	PHOENIX CONTACT	0800886
41	A/R	TERMINAL MARKER STRIP	PHOENIX CONTACT	1051029
42	4	HOUR METER 120VAC	AUTOMATION DIRECT	722-0003
43	A/R	PLUG IN BRIDGE FBSR 5-6	PHOENIX CONTACT	3030349
44	A/R	DIN RAIL PERFORATED NS35/7.5 2M	PHOENIX CONTACT	804278
45	A/R	DIN RAIL SUPPORT BRACKET - ISOLATED	PHOENIX CONTACT	1201141
46	A/R	WIRING DUCT, PVC NARROW SLOTTED WITH COVER	PANDUIT	TYPE F
47	A/R	TERMINAL GROUP MARKERS	PHOENIX CONTACT	800307
48	A/R	AIR CONDITIONER 2000BTU 240V	HOFFMAN	N210226G051
49	A/R	AIR CONDITIONER 2000BTU 460V	HOFFMAN	N210246G051
50	A/R	THERMOSTAT RELAY	STEGO	011160-01
51	A/R	ENCLOSURE FAN	HOFFMAN	HF1016514
52	A/R	ENCLOSURE EXHAUST GRILLE	HOFFMAN	HG1000404
53	1	120V UPS 500VA	PHOENIX CONTACT	1067327
54	2	BATTERY 12V 7AH	POWERSONIC	PS-1270

STANDARD DRAWING
THIS STANDARD DRAWING SHOWS COMBINED COMPONENTS AND CAPABILITY FOR A VARIETY OF WATER PRODUCTION SITE REQUIREMENTS. CONTRACTOR SHALL PROVIDE CONTROL PANEL WITH COMPONENTS AND CAPABILITY EDITED TO PROJECT SPECIFIC REQUIREMENTS, AND SHALL COMPLY WITH APPLICABLE PROVISIONS OF THIS STANDARD.



DEAD FRONT PANELS

BACK PANEL

TABLE 2

VOLTAGE(V)	MOTOR SIZE (HP)	BREAKER (SCHNEIDER #)	CONTACTOR (SCHNEIDER #)	SOFT STARTER (SCHNEIDER #)	CABLE SIZE
480	60 TO 100	JDL36175	LC1G185EHEA	ATS22C1756U	1/0
480	30 TO 59	BDL36100	LC1D80667	ATS22D8856U	3
240		JDL36200	LC1G185EHEA	ATS22C1756U	3/0
480	15 TO 29	BDL36050	LC1D50AG7	ATS22D4756U	8
240		BDL36100	LC1D80667	ATS22D8856U	3

TABLE 3

LABEL	LINE 1	LINE 2	LINE 3	SIZE	LETTER SIZE	LABEL COLOR	LETTER COLOR
L1	WELL PUMP 1			1" X 3"	1/4"	WHITE	BLACK
L2	WELL PUMP 2			1" X 3"	1/4"	WHITE	BLACK
L3	HYPO PUMP 1			1" X 3"	1/4"	WHITE	BLACK
L4	HYPO PUMP 2			1" X 3"	1/4"	WHITE	BLACK
L5	BOOSTER	PUMP		1" X 3"	1/4"	WHITE	BLACK
L6	AIR COMPRESSOR			1" X 3"	1/4"	WHITE	BLACK
L7	TANK LEVEL	WELL PUMP 1		1" X 3"	1/4"	WHITE	BLACK
L8	CB5	WELL PUMP 2		1" X 3"	1/4"	WHITE	BLACK
L9	CB6			1" X 3"	3/16"	WHITE	BLACK
L10	CB1	CAPACITOR		1" X 2"	3/16"	WHITE	BLACK
L11	CB2	ARRESTOR		1" X 2"	3/16"	WHITE	BLACK
L12	CB3	CONDITIONER	AIR	1" X 2"	3/16"	WHITE	BLACK
L13	CB4	TRANSFORMER	120V	1" X 2"	3/16"	WHITE	BLACK

- ENCLOSURE SHALL BE 48"W X 60"H X 12"D MIN. SELF-SUPPORTING NEMA 4X TYPE 304 STAINLESS STEEL, POWDER COATED (WHITE), WITH PADLOCKING HASP, WHITE STEEL BACKPLANE, 2 DOORS WITH DEAD FRONT INNER DOORS WITH 1/4 TURN HANDLE FASTENING, BOND BOTH DOORS TO ENCLOSURE GROUND BAR.
- ALL PANEL ITEMS SHALL BE MOUNTED ON THE BACKPLANE EXCEPT AS NOTED OTHERWISE. ITEMS TO BE MOUNTED ON THE INNER SWING PANEL: INDICATOR LIGHTS, SELECTOR SWITCHES, PUSHBUTTONS, AND CIRCUIT BREAKER HANDLE OPENINGS.
- PANEL TO BE RACK MOUNTED, OR LEG MOUNTED, ADJACENT TO MEANS OF DISCONNECT, CABLING TO BE BOTTOM ENTRY.
- PRIOR TO ORDER, CONTRACTOR SHALL PROVIDE COMPLETE CONTROL AND WIRING DIAGRAMS IN SHOP DRAWING SUBMITTAL FROM PANEL MANUFACTURER FOR APPROVAL BY OWNER/ENGINEER.
- CONTROL PANEL TO BE CONFIGURED FOR OPERATION OF 15-100HP WELL PUMP MOTORS. SEE TABLE 2 FOR REQUIRED HARDWARE BASED ON MOTOR SIZE AND INCOMING VOLTAGE.
- FULL DEPTH INTERIOR PANEL DIVIDER FOR 480/240V SECTION ISOLATION.
- FOR TEMPERATURE CONTROLLED INDOOR INSTALLATIONS (<85DEG F), PANEL TO INCLUDE THERMOSTAT RELAY, CIRCULATION FAN ON LOWER RIGHT PANEL, AND EXHAUST VENT ON UPPER LEFT PANEL. SEE TABLE 1, ITEMS 50-52.
- FOR OUTDOOR INSTALLATIONS, PANEL TO INCLUDE 1/2" INSULATION SHEETS ON INTERNAL SURFACES AND AIR CONDITIONER. SEE TABLE 1, ITEMS 48-49.
- INDOOR INSTALLATIONS REQUIRE REMOTE ANTENNA MOUNTING OUTDOORS
- SEE TABLE 3 FOR NAMEPLATE ITEMS

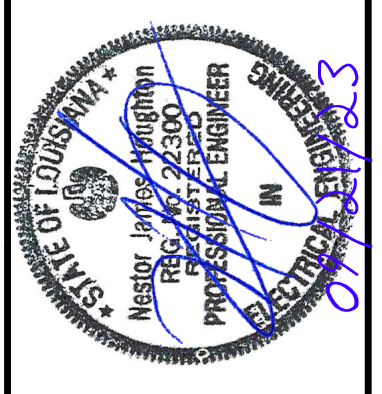




DEPT. OF UTILITIES
ST. TAMMANY PARISH
GOVERNMENT
620 N. TYLER STREET
COVINGTON, LA 70433

DATE:	04/25/24
DESCRIPTION OF REVISION	
No.	1
	UPS AND BATTERY ADDED

DESIGNED BY:	RR
DRAWN BY:	RR
CHECKED BY:	SH
ISSUE DATE:	09-21-2023
APPROVED BY:	
SHEET SIZE:	ANSI D
SCALE:	NONE



WATER PRODUCTION SITE
ST. TAMMANY PARISH, LOUISIANA
CONTROL PANEL SPECIFICATION
PANEL WIRING

SHEET NO.
CP-002
SHEET 2 OF 2

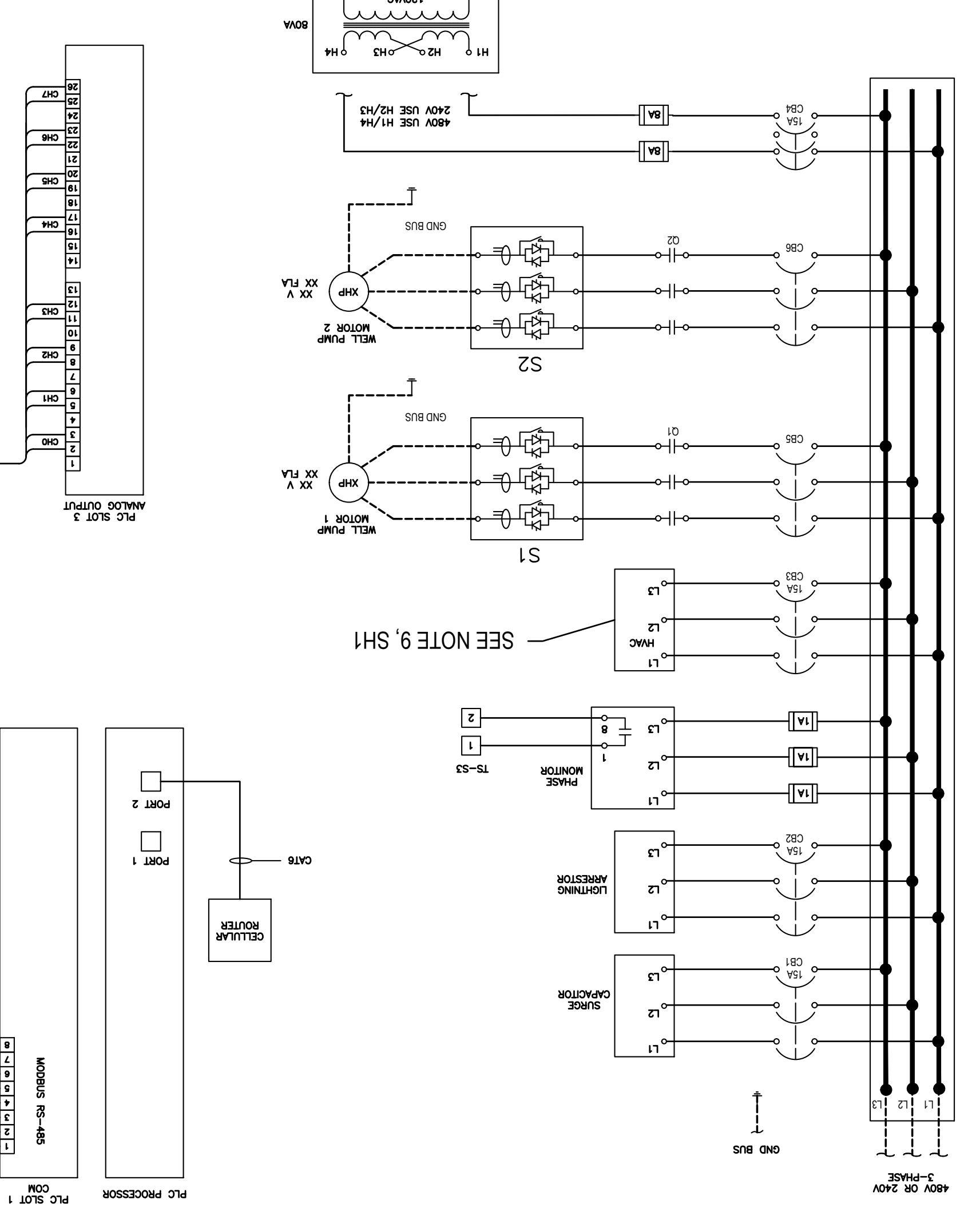
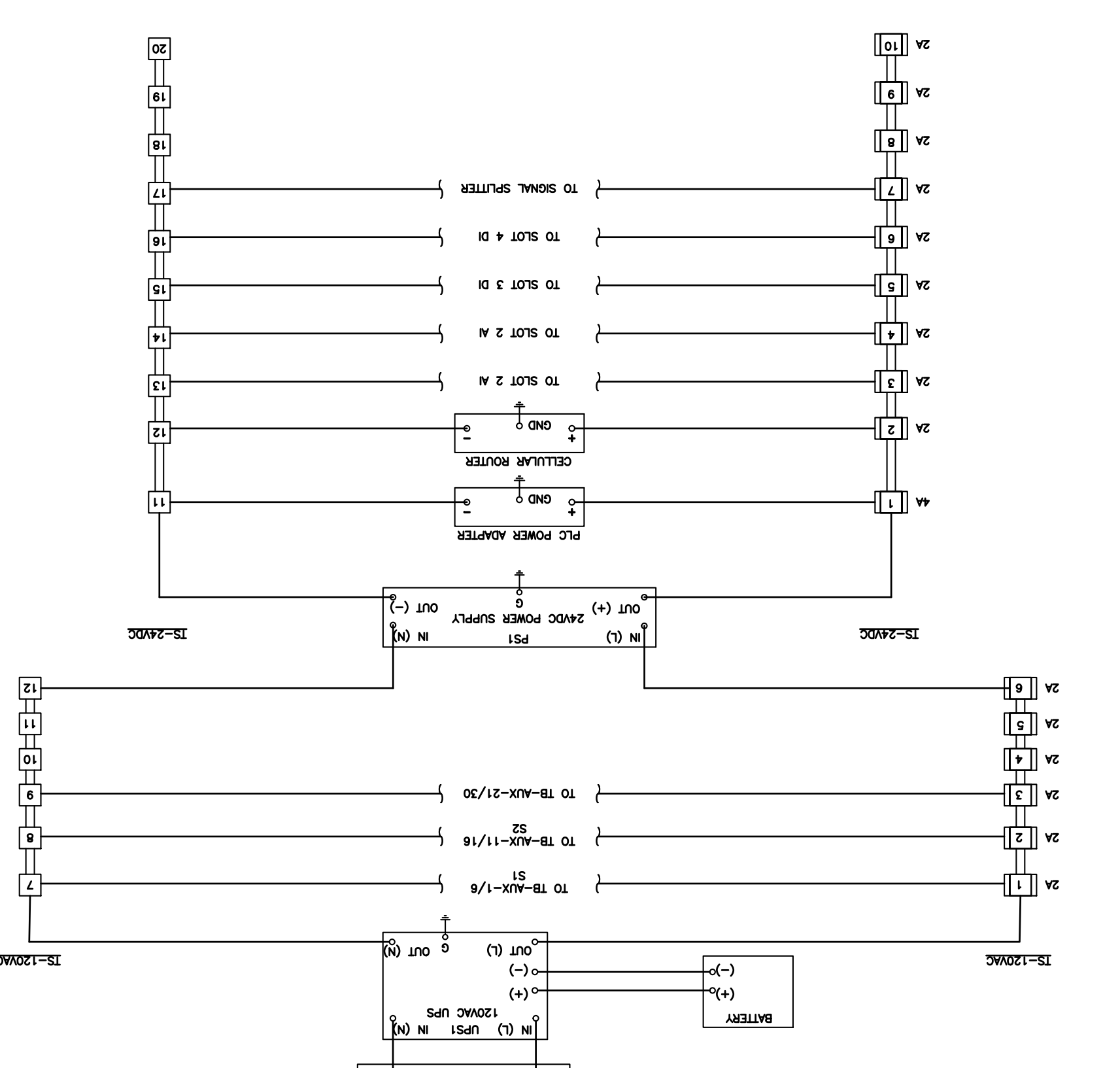
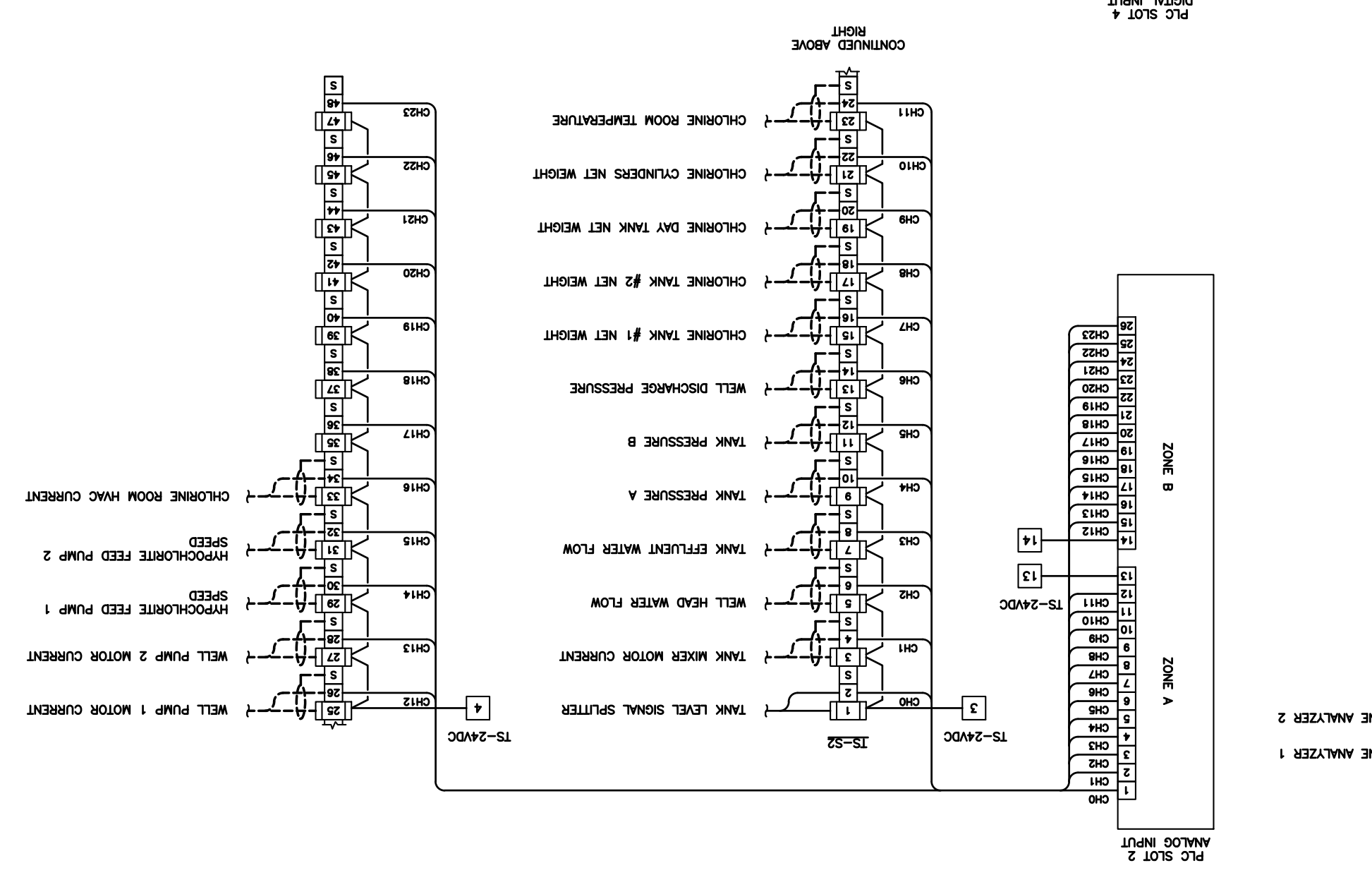
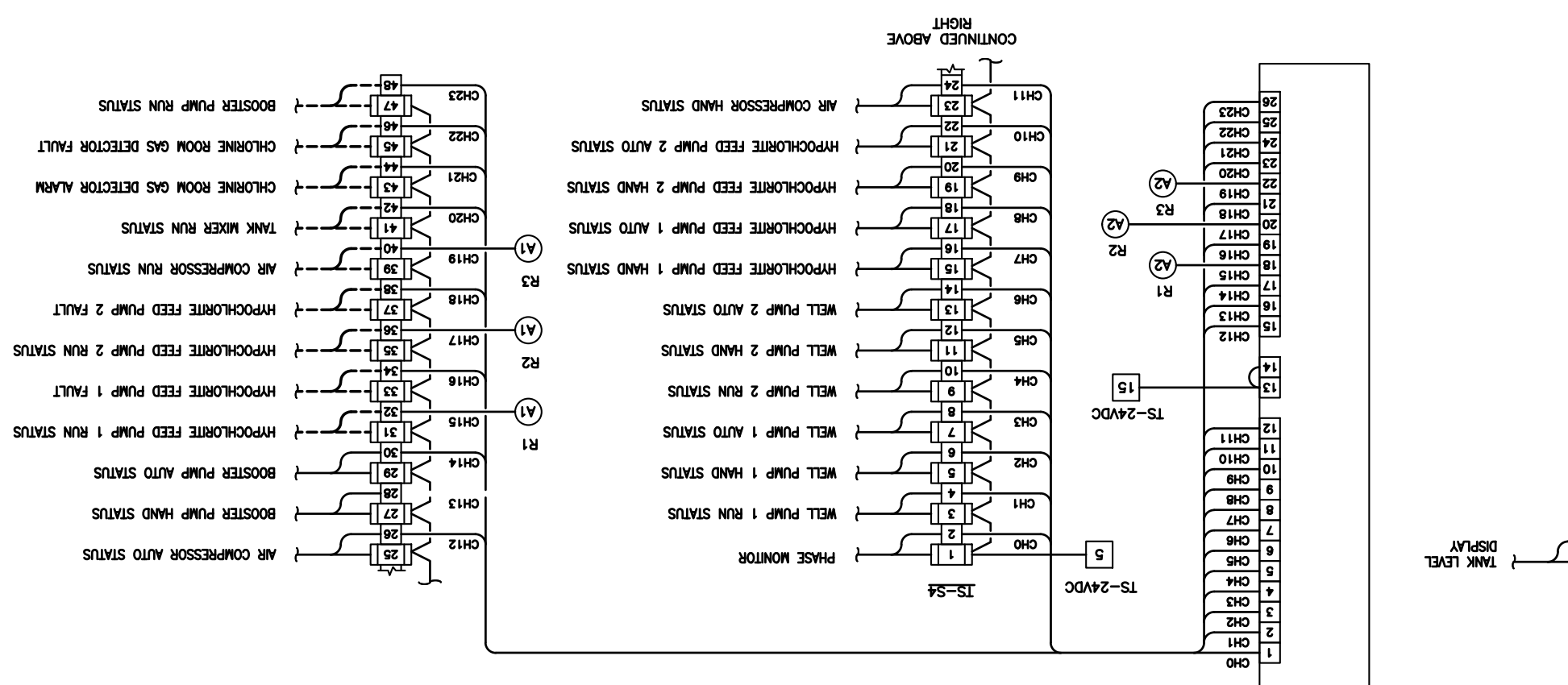
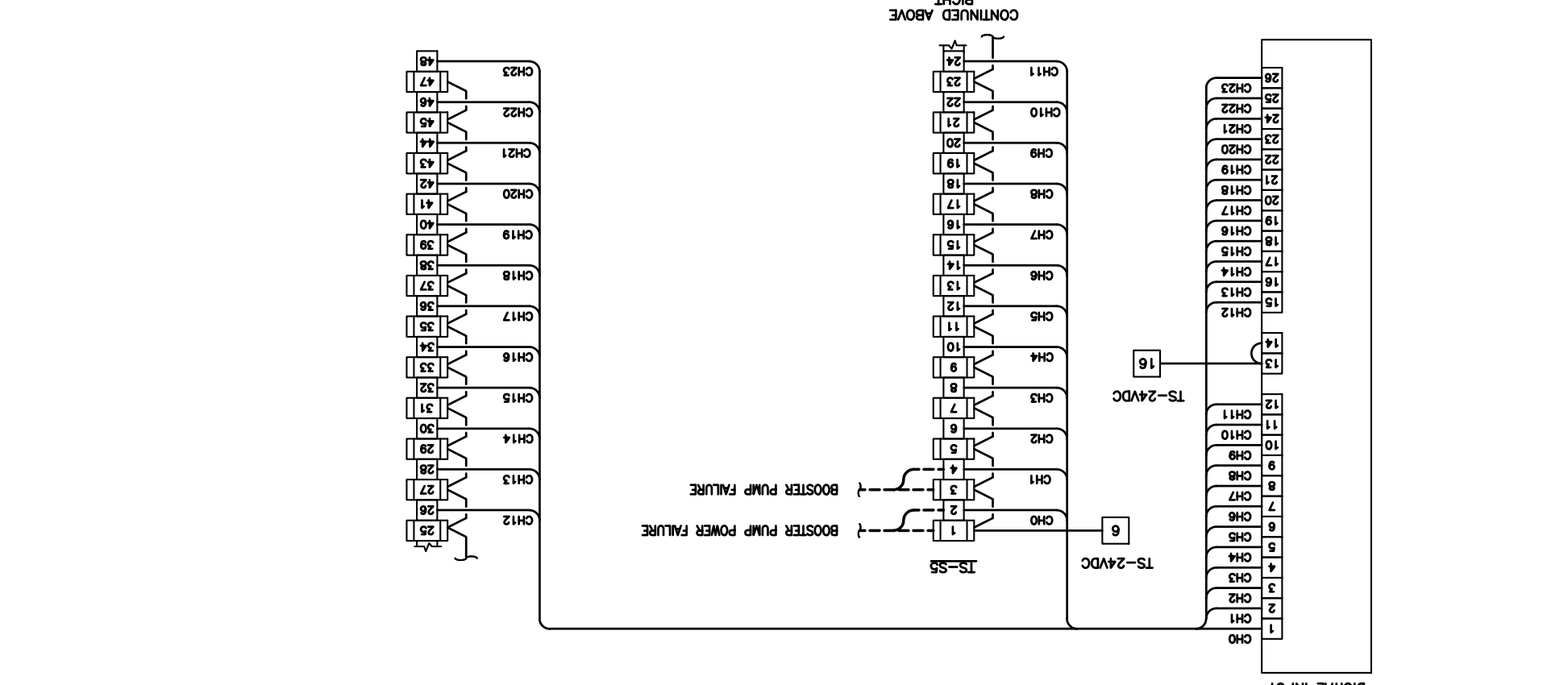
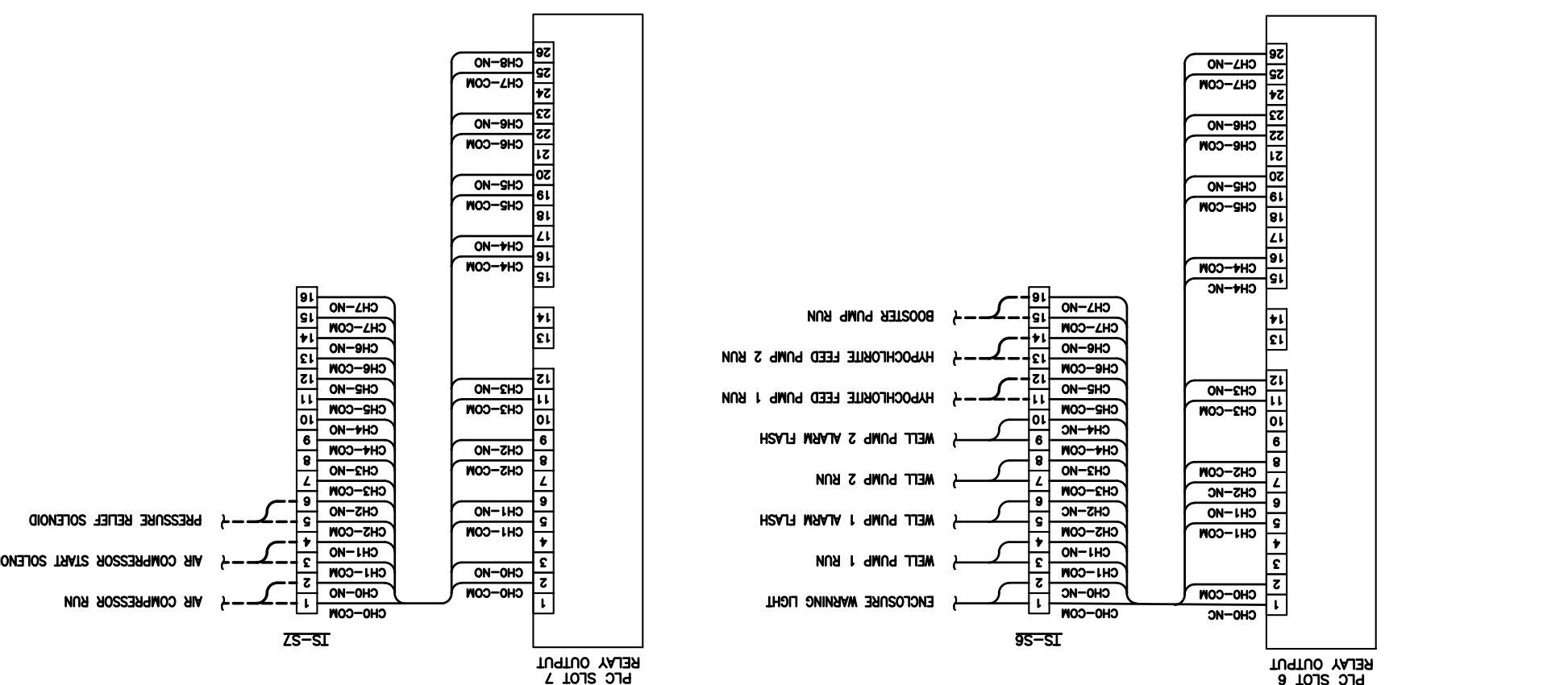
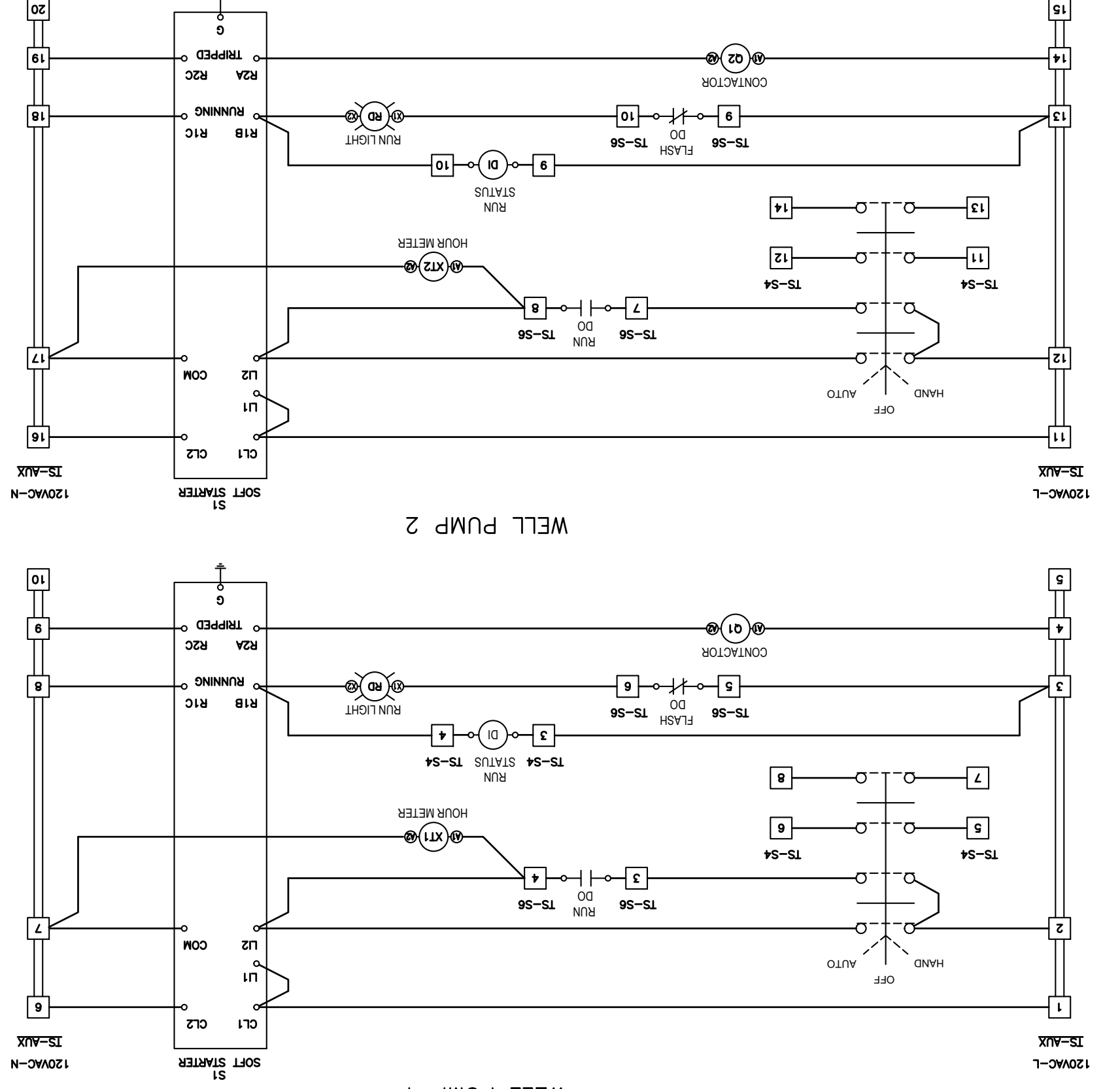
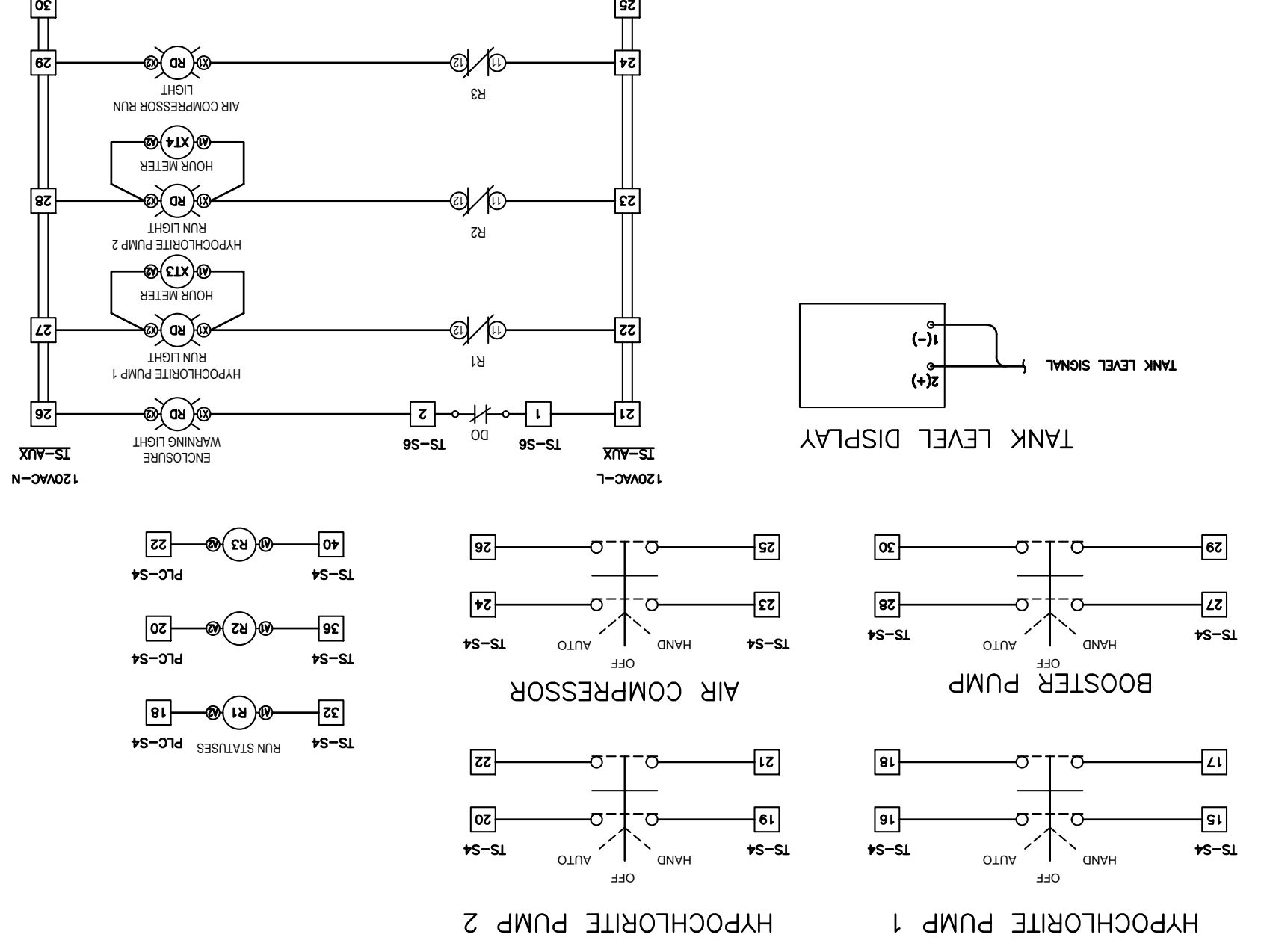


LEGEND

— PANEL WIRING
- - - FIELD WIRING
— DISTRIBUTION BLOCK

NOTE
WIRE SIZES UNLESS OTHERWISE NOTED:
120VAC - #14AWG
24VDC - #16AWG
24VDC - #18AWG
LINE - BLACK (BK)
NEUTRAL - WHITE (WH)
GROUND - GREEN (GN)
GROUND - GREEN (GN)
SIGNAL - YELLOW (YL)

COLOR CODE
24VDC - BROWN (BN)
0VDC - BLUE (BU)
GROUND - GREEN (GN)
NEUTRAL - WHITE (WH)
GROUND - GREEN (GN)
SIGNAL - YELLOW (YL)



Section 15



July 31, 2023

PRINCIPAL Engineering, Inc.
1011 N. Causeway Boulevard, Suite 19
Mandeville, Louisiana 70471

Attn: Mr. Andre Monnot, P.E.

Re: Geotechnical Engineering Report
Proposed New Elevated Water Tanks
Meadow Lake & River Oaks
Slidell, Louisiana
SE Project No. G23-063

Dear Andre:

Stratum Engineering, LLC (SE) is pleased to submit our Geotechnical Engineering Report for the above referenced project. The report includes the field data and laboratory test results, as well as foundation recommendations and soil parameters to be used in the design.

We appreciate the opportunity to perform this geotechnical study and look forward to working with you during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please do not hesitate to call.

Respectfully submitted,
STRATUM ENGINEERING, LLC

A handwritten signature in blue ink, appearing to read 'WDM - Dean', written over a circular blue scribble.

William "Dean" McInnis, P.E.
Senior Project Manager

WDM/TYM

A handwritten signature in blue ink, appearing to read 'Tony Y. Maroun', written over a circular blue scribble.

Tony Y. Maroun, P.E.
Principal

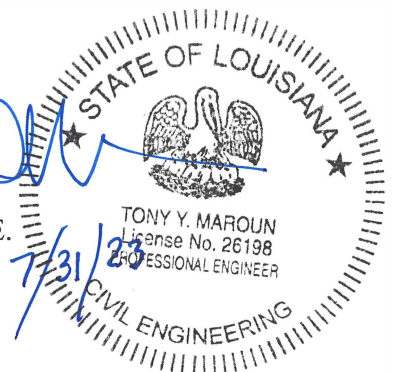


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PROJECT INFORMATION

Project Authorization

Stratum Engineering, LLC (SE) has completed a geotechnical exploration for the proposed new Elevated Water Tanks to be constructed at two (2) existing wastewater treatment plants (WWTP) in Slidell, Louisiana. The exploration was accomplished in general accordance with SE Proposal No. G23-108, dated May 31, 2023.

Project Description

We understand that the Parish is planning to install two (2) new elevated water tanks, one at the Meadow Lake WWTP site and one at the River Oaks WWTP site. Based on the limited information available to date, we understand that the new tanks will have maximum storage capacities of 250,000 gallons and will likely be elevated up to 160 feet to provide adequate discharge pressure.

While the exact site layouts and equipment setups have not been finalized, the current plans also include construction of a new single story control building and installation of miscellaneous subsurface utilities at each site. Small grade supported slabs may also be provided for lightly loaded ancillary equipment.

Detailed structural loading information was not provided at the time this report was prepared, but based on conversations with Andre Monnot with Principal Engineering and his experience with previous water tank projects, we have assumed that the unfactored working single pile load could be on the order of 160 to 220 kips for the elevated tanks.

The geotechnical recommendations presented in this report are based on the available project information, water tank locations, and the subsurface materials described in this report. If any of the noted information is incorrect, please inform SE in writing so that we may amend the recommendations presented in this report, if appropriate and if desired by the client. SE will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to provide the design team foundation recommendations and soil parameters necessary for the design of suitable foundation systems for the proposed new Water Tanks. The scope of services included drilling one (1) boring to a depth of 100 feet and one (1) boring to a depth of 20 feet at each site. The borings were located in the field by a Stratum Engineering representative using geospatial coordinates and a handheld GPS unit. The approximate boring locations are indicated on the boring location plans included in the Appendix.

Our scope of services included a reconnaissance of the project sites, drilling the soil borings, select laboratory testing, and preparation of this geotechnical report. The report briefly outlines the testing procedures, presents available project information, describes the sites and subsurface conditions, and provides recommendations regarding the following:

- Foundation types, allowable pile capacities, allowable bearing capacities, and estimates of settlement;
- Seismic site classification;
- Site preparation, including subgrade preparation and fill compaction requirements;
- Factors influencing construction and performance of the proposed construction.

The scope of geotechnical services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

SITE AND SUBSURFACE CONDITIONS

Site Locations

The current plans include construction of a new water tank at the Meadow Lake WWTP site located at the south end of Meadow Lake Drive East. Another tank will be constructed at the River Oaks WWTP facility situated on the southeast corner of the Marple Lane and Sewell Street intersection in Slidell.

The Meadow Lake site encompasses approximately 1.5 acres which is currently occupied by a wastewater treatment plant (WWTP) at the south end and a small horizontal storage tank at the north end. The remainder of the site is covered with grass with the exception of some sparse trees along the perimeter and an aggregate surfaced access drive. The property abuts an existing detention pond on the west side.

The River Oaks facility occupies around 1.2 acres consisting of two (2) small horizontal tanks surrounded by grass. A gravel access drive extends into the property from Sewell Street.

Both sites are located within residential subdivisions and are surrounded by fences. Detailed grading information was not available at the time this report was prepared, but we have assumed that up to 2 feet of fill may be required to grade the sites and reach the design grades.

Drilling, Sampling, and Laboratory Testing Procedures

The borings were drilled with an All-Terrain Vehicle (ATV) mounted drill rig. Wet rotary drilling techniques were used to advance the borings. Samples were generally obtained continuously from the ground surface to a depth of ten feet and at maximum five foot intervals thereafter. Drilling and sampling techniques were accomplished in general accordance with ASTM Standards.

Undisturbed samples of cohesive soils were generally obtained using thin-wall tube sampling procedures in general accordance with the procedures for “Thin-Walled Tube Geotechnical Sampling of Soils” (ASTM D1587). These samples were extruded in the field with a hydraulic ram and were wrapped in aluminum foil prior to placement in a plastic wrapping to preserve moisture. The samples were transported to the laboratory in containers to prevent disturbance.

For cohesionless soils and semi-cohesive soils, Standard Penetration Tests (SPT) were performed to obtain standard penetration values of the soil. The standard penetration value (N) is defined as the number of blows of a 140 pound hammer, falling 30 inches, required to advance the split-barrel sampler one (1) foot into the soil. Samples of granular soils were obtained utilizing a two (2) inch O.D. split-barrel sampler in general accordance with procedures for “Penetration Test and Split-Barrel Sampling of Soils” (ASTM D1586). To perform the test and obtain a sample, the sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three (3) successive increments of six (6) inches penetration. The “N” value is obtained by adding the second and third incremental numbers. The results of the standard penetration test indicate the relative density of cohesionless soils and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The split spoon samples were identified according to the project number, boring number and depth, and were also placed in polyethylene plastic wrapping to protect against moisture loss.

The laboratory testing program included supplementary visual classification and water content tests on all of the soil samples. In addition, selected samples were subjected to unconfined compression testing, percent passing the #200 sieve and Atterberg Limits determination. Additional estimates of unconfined compressive strength were made using a hand penetrometer. The laboratory testing was performed in general accordance with ASTM Standard Procedures.

Subsurface Conditions

Based on the borings drilled at the Meadow Lake site, approximately 12 inches of silty topsoil with organics covered the surface. Below the surficial material, the subsurface conditions varied between the two (2) boring locations with very soft to firm lean clay noted to a depth of 12 feet in boring B-1 and firm to very stiff fat clay with sand or sandy clay encountered to a depth of 8 feet in boring B-2. The softer material found in boring B-1 appeared to possibly be excavated material from the adjacent detention pond that was placed during construction of the previous improvements. Below this depth, alternating layers of loose to medium dense sand and firm to stiff sandy clay or clay with sand were encountered in both borings to a depth of 32 feet. The sand became cleaner and very dense at a depth of 43 feet in the deep boring and persisted to the termination depth of 100 feet, the maximum depth explored.

In contrast, 12 inches of silty topsoil with organics covered the surface at the River Oaks site and was followed by very stiff silty clay to a depth of approximately 2 feet. The moisture sensitive surface material was underlain by stiff to very stiff lean and fat clay to around 22 feet where a layer of loose clayey sand was found and extended to a depth of 27 feet. The sand became clean and very dense between 27 and 37 feet before transitioning back to alternating layers of firm to sandy and fat clay to around 57 feet. Another layer of very dense silty and poorly graded sand was noted between 57 and 77 feet, at which depth stiff to very stiff fat clay was encountered to 87 feet. The deep boring was terminated in medium to very dense sand at a depth of 100 feet.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics encountered at each site. The boring logs included in the Appendix should be reviewed for specific information at the boring locations. The records include soil descriptions, stratification, penetration resistances, and locations of the samples and laboratory test data. The stratification shown on the boring logs represents the conditions only at the actual boring locations. Variations may occur, and should be expected between locations. The stratification represents the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on the boring logs. The samples, which were not altered by laboratory testing, will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Conditions

Groundwater was initially encountered around 6 feet at the Meadow Lake site and at about 14 feet at the River Oaks site. Delayed measurements taken at the completion of drilling were around 4 feet and 12 feet for the Meadow Lake and River Oaks sites, respectively. However, it should be noted that groundwater levels will fluctuate with seasonal variations in rainfall, extended periods of drought and surface runoff. Therefore, it is recommended that the actual groundwater level at the site be determined by the contractor at the time of the construction activities.

IBC Site Classification

The International Building Code (IBC), 2021 Edition, was reviewed to determine the site classification for seismic design. Based on the soils encountered in the borings and our experience in the general vicinity, the site can be classified as Site Class “D”, as outlined in Section 1613.2.2 of the Building Code.

EVALUATION AND RECOMMENDATIONS

General

The type and depth of foundation suitable for a given structure primarily depends on several factors including the subsurface conditions, the function of the structure, the loads it may carry, the cost of the foundation and the criteria set by the Design Engineer with respect to vertical and differential movement which the structure can withstand without damage.

Due to the high magnitude of the structural loads associated with the elevated water tanks, we understand that consideration is being given to various deep foundation systems for support of the structures. As requested, SE has evaluated treated timber and pre-cast concrete piles as well as open end steel pipe piles and steel H-piles installed to various depths.

In addition, we understand that consideration will be given to grade supporting a smaller diameter ground storage tank at the Meadow Lake site. While the near surface material is adequate for supporting a lightly loaded structure on a shallow foundation system, the soft clays encountered in the upper 12 feet could experience some settlement with the placement of a moderate uniform load over a large area. Consequently, some mitigation will be necessary to minimize the potential for differential settlement within the tank footprint. Otherwise, consideration should be given to utilizing a deep foundation system to support the smaller tank. Details related to foundation design, as well as site preparation and development, are presented in subsequent sections of this report.

Site Preparation

Site preparation is expected to include, but not be limited to, removal of any existing structures as well as stripping any topsoil with organics or other deleterious materials from the development areas. Utility lines at both sites should be located and re-routed as necessary. The actual stripping or undercutting depth should be determined by a representative of the Geotechnical Engineer at the time of construction.

The subgrade in the non-pile supported areas should be proofrolled with a tandem axle or similar heavily loaded vehicle weighing about 20 tons. Soils, which are observed to rut or deflect excessively under the moving load, should be undercut and replaced with properly compacted structural fill. The proofrolling and undercutting activities should be witnessed by a representative of the Geotechnical Engineer and should be performed during a period of dry weather.

After subgrade preparation and observation have been completed, the initial layer of fill should be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped and scarified subgrade soils. The structural fill should consist of sandy clays or clayey sands having a maximum liquid limit of 40 percent and a maximum plasticity index of 20.

The fill should be placed in maximum lifts of eight (8) inches of loose materials and should be compacted within one (1) percentage point below and three (3) percentage points above the optimum moisture content. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. The fill should be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D698. Adequate drainage should be provided during site work to promote rapid runoff.

Foundation Recommendations

Deep Foundations

Driven Piles

Based on the field data and laboratory test results, deep foundation systems were evaluated for support of the proposed elevated water tanks at both sites. Due to the magnitude of the structural loads anticipated for the tanks, we understand that consideration may be given to either square pre-cast concrete piles, steel pipe piles or steel H-piles for support of the structures. Therefore, SE has evaluated various sizes of each pile type for consideration. While treated timber piles will likely not provide sufficient capacity for support of the tanks, we have also analyzed small and large treated timber piles for any moderately loaded ancillary structures or equipment.

As previously discussed, alternating layers of loose to very dense sand were encountered throughout the explored depth at both sites, but was consistent below 32 feet at the Meadow Lake site. Some stiff to very stiff clay layers were noted between the sand layers at the River Oaks location between 37 to 57 feet and 77 to 87 feet. Consequently, the piles at both sites will generally derive their support through “skin friction” along their embedded lengths along with some “end bearing” capacity when tipped in the dense sand layer.

The recommended pile lengths are from the existing ground surface at the time of drilling. However, a pile cutoff length of about five (5) feet was considered in the design to accommodate the pile caps. Since the stratigraphy did vary between the sites, site specific pile capacities have been provided based on the soil conditions encountered at each location. The recommended pile lengths and the estimated corresponding allowable capacities are presented in the following tables:

Meadow Lake Site

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*				
F.S. = 2.0 IN COMPRESSION				
F.S. = 3.0 IN TENSION				
Pile Length in Feet**	Small Treated Timber Pile (6" Tip – 8" Butt)		Large Treated Timber Pile (7" Tip – 12" Butt)	
	Compression	Tension	Compression	Tension
35	8+	5	20	6
40	--	--	25+	9

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*						
F.S. = 2.0 IN COMPRESSION						
F.S. = 3.0 IN TENSION						
Pile Depth Feet**	14" Square Pre-Cast Concrete Pile		16" Square Pre-Cast Concrete Pile		18" Square Pre-Cast Concrete Pile	
	Compression	Tension	Compression	Tension	Compression	Tension
45	58	22	65	24	70	26
50	69	29	77	32	85	35
55	80	36	90	41	99	46
60	90	44	100	49	111	54
65	100	50	112	56	124	62

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*				
F.S. = 2.0 IN COMPRESSION				
F.S. = 3.0 IN TENSION				
Pile Length in Feet**	HP14x73 Steel H-Pile		18" Diameter Open-End Steel Pipe Pile	
	Compression	Tension	Compression	Tension
70	70	37	74	38
75	76	41	82	42
80	83	46	89	46
85	90	50	97	51
90	97	54	104	55
95	104	58	111	59

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

River Oaks Site

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*				
F.S. = 2.0 IN COMPRESSION				
F.S. = 3.0 IN TENSION				
Pile Length in Feet**	Small Treated Timber Pile (6" Tip – 8" Butt)		Large Treated Timber Pile (7" Tip – 12" Butt)	
	Compression	Tension	Compression	Tension
35	8+	7	21	14
40	--	--	25+	17

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*						
F.S. = 2.0 IN COMPRESSION						
F.S. = 3.0 IN TENSION						
Pile Depth Feet**	14" Square Pre-Cast Concrete Pile		16" Square Pre-Cast Concrete Pile		18" Square Pre-Cast Concrete Pile	
	Compression	Tension	Compression	Tension	Compression	Tension
45	54	34	61	37	68	41
50	61	37	68	42	76	46
55	66	41	75	46	83	51
60	96	47	105	53	113	59
65	107	54	117	61	127	68

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY, TONS*				
F.S. = 2.0 IN COMPRESSION				
F.S. = 3.0 IN TENSION				
Pile Length in Feet**	HP14x73 Steel H-Pile		18" Diameter Open-End Steel Pipe Pile	
	Compression	Tension	Compression	Tension
55	73	45	75	46
60	88	50	93	50
65	96	54	95	55
70	99	59	102	60
75	107	63	110	64
80	112	68	114	70
85	121	74	124	76
90	134	78	139	80
95	142	82	148	83

* Capacities are soil-pile related capacities and consideration should be given to the structural integrity of the pile member.

** Pile lengths measured from the existing ground surface at the time of drilling.

The allowable capacities presented in the above tables include a factor of safety of 2 in compression and 3 in tension which are typically used when the pile capacities are verified in the field by a static load test.

Pile Settlement

It is estimated that long term settlement of piles, driven to the recommended depth and loaded to their allowable capacities, will be less than one (1) inch. Differential settlement is anticipated to be on the order of 50 percent of the total settlement.

Spacing and Group Effect

A group of piles subjected to vertical loads may not necessarily have the same capacity as the sum of the capacities of the individual piles. For axially loaded piles, published results indicate that the ratio of capacity per pile in a group to that of a single isolated pile typically ranges from 0.5 to 1.0. This efficiency factor depends on the spacing or distance between each pile. In planning groups of driven piles, a minimum center-to-center spacing of 3D (where D is the pile diameter) is recommended to avoid the reduction in capacity and maximize the pile group efficiency.

Group effect should be minimal for piles in clusters of up to 9 piles spaced at a minimum of 3 pile diameters. For larger pile clusters, group effect could become a factor and should be evaluated in accordance with the local building code.

Pile Installation

Pile driving hammers used to drive foundation piles should be selected according to pile type, length, size and weight of pile, as well as potential vibrations resulting from pile driving operations. Care should be taken to assure that the hammer selected is capable of achieving the desired penetration without causing damage to the piles or causing excessive vibrations which could damage existing, nearby structures.

Hammers having a rated energy in the range of 30,000 to 40,000 foot-pounds per blow are recommended for the pre-cast concrete, steel pipe and steel H-piles. For small timber piles hammers having a rated energy in the range of 7,000 to 10,000 foot-pounds per blow should be used while hammers with a rated energy of 15,000 to 20,000 foot-pounds are recommended for the large timber piles. Each pile should be driven to the desired tip elevation and the driving resistance should be monitored without interruption in the driving operations.

Since relatively dense sand was encountered at shallow depths, pre-drilling will be necessary to advance the piles to the required tip elevation without compromising their integrity and causing excessive vibrations. Pre-drilling should be performed with a “fish-tail” bit no larger than 75 percent of the pile diameter and should extend no deeper than about 15 feet from the pile tip elevation.

Driving of the center piles in the cluster first will facilitate the driving operations. Accurate records of the final tip elevation and driving resistances should be obtained during the pile driving operations. Some pile heaving may be experienced during installation of adjacent displacement type piles. It is therefore recommended that the tip elevation of the piles be recorded and if significant heave is noted after driving of subsequent piles, provisions must be made for reseating them.

Pile Driving Monitoring

We recommend that the pile driving be monitored by the Geotechnical Engineer or his representative. Sometimes, premature refusal occurs due to poor performance of the hammer rather than from soil resistance. Any changes in hammer blow counts should be carefully examined before making any decisions about the pile penetration.

Vibration Monitoring

Thresholds of vibration induced cracking are generally site specific and depend on the type and age of the structure, the frequency of ground vibration, and the type of soil supporting the structure. Research by the U.S. Bureau of Mines (USBM) and other investigative groups have established criteria relating the occurrence of structural damage to certain frequencies and level of ground motion. According to the USBM, within the range of four (4) to 12 hertz, the maximum particle velocity recommended to preclude the threshold damage to plaster-on-wood old structures is 0.5 inch per second (ips).

Peak particle velocities of 0.25 ips are perceived to be uncomfortable to humans. Furthermore, peak particle velocities in excess of 0.25 ips could densify near surface cohesionless soils resulting in cosmetic cracks in structures supported on these soils. Therefore, if sustained peak particle velocities exceed 0.25 ips, the construction activities causing these vibration levels should be halted and the construction procedures altered to maintain a safe level of vibration and minimize potential damage to adjacent structures.

Although the threshold of 0.25 ips is adopted by the local engineering community, it is presented as a guide for consideration by the design engineer. The determination of site specific vibration thresholds involves a more detailed study of the structure in question as well as an evaluation of typical pre-construction background vibration levels in the area. As such, a lower threshold may be necessary should construction take place near historic structures. These services are beyond the scope of this study, and if desired, should be completed by others prior to commencement of construction activities.

Furthermore, a pre-construction survey of nearby structures as well as development of base line of vibration induced by normal daily activities in the area is highly recommended prior to construction. This could allow for a fair settlement of third party property damage claims. While Stratum Engineering is providing this general information as a guide, SE does not assume responsibility for the impact of construction vibrations on nearby structures.

Pile Load Test

It is recommended that the pile capacity at each site be verified by a field load test. At least two (2) probe piles should be driven in the pile cap footprint of each water tank to the design tip elevation using the same equipment and technique proposed for the job piles. The pile at each location which exhibits the least resistance to driving should be load tested in compression as outlined by ASTM D1143. The pile load tests should be performed under the guidance of the Geotechnical Engineer so that the data may be interpreted and the recommended pile capacities adjusted, if necessary, according to the load test results.

Dynamic Pile Testing

If a static load test is not implemented to verify the pile capacity in the field, the capacity of the piles for the water towers should be verified by dynamic pile testing using a Pile Driving Analyzer (PDA) in accordance with ASTM D4945. A PDA can monitor the driving stresses during pile installation and monitor the energy transferred to the pile by the hammer to evaluate the pile installation efficiency. Furthermore, it may be used to re-strike the pile to verify the capacity after a setup period of 7 to 14 days. Data from the dynamic pile testing can be further evaluated by CAPWAP analyses and the capacity adjusted according to the test results. A factor of safety of 2.5 should be applied to the ultimate compression capacity obtained with the PDA.

Lateral Load Analysis

For deep foundations, the lateral loads are resisted by the soil as well as the rigidity of the pile. Analyses can be performed by methods ranging from chart solutions to finite difference methods. Lateral load analysis is typically performed to limit the amount of deflection or determine a maximum yield moment resistance of the piles once the loading and configuration have been finalized for the structure.

Since the design for the water tanks is still being finalized, lateral loading was not analyzed by Stratum Engineering at this stage of the project. SE may be retained to perform lateral load analyses on the selected pile configuration, if needed, once the finalized loads and configurations are available for both sites. Should the lateral loads be analyzed by others, the following tables provide soil parameters for both locations which are typically needed to utilize lateral load analysis software, such as LPILE:

Meadow Lake Site

AVERAGE SOIL PARAMETERS							
Depth (ft.)	'p-y' Criteria	Effective Unit Weight, γ' (pcf)	S_u (ksf)	ϕ (deg.)	k (pci)	ϵ_{50} %	Dr %
0 – 4	Firm Clay	123	0.79	--	150	1.15	--
4 – 12	Soft Clay	43	0.25	--	28	2.32	--
12 – 17	Loose Sand	47	--	31	19	--	24
17 – 22	Soft Sandy Clay	43	0.25	--	28	2.32	--
22 – 27	Medium Sand	53	--	33	34	--	36
27 – 32	Soft Clay	46	0.33	--	36	1.98	--
32 – 42	Medium Sand	60	--	38	87	--	63
42 – 100	Very Dense Sand	67	--	40	154	--	85

Note: S_u – Undrained shear strength (psf); ϕ – Angle of internal friction; k – Limiting Modulus of Subgrade Reaction (pci) for static loading condition; ϵ_{50} – Strain corresponding to one-half the principle stress; Dr – Relative density.

River Oaks Site

AVERAGE SOIL PARAMETERS							
Depth (ft.)	'p-y' Criteria	Effective Unit Weight, γ' (pcf)	S_u (ksf)	ϕ (deg.)	k (pci)	ϵ_{50} %	Dr %
0 – 2	Very Stiff Clay	133	2.50	--	814	0.57	--
2 – 4	Firm Clay	119	0.61	--	91	1.35	--
4 – 12	Stiff Clay	132	1.91	--	570	0.67	--
12 – 22	Stiff Clay	69	1.61	--	451	0.75	--
22 – 27	Loose Sand	43	--	29	11	--	17
27 – 37	Very Dense Sand	67	--	40	154	--	85
37 – 57	Firm Clay	63	0.91	--	192	1.06	--
57 – 77	Very Dense Sand	67	--	40	154	--	85
77 – 87	Stiff Clay	70	1.93	--	575	0.67	--
87 – 100	Dense Sand	63	--	39	121	--	75

Note: S_u – Undrained shear strength (psf); ϕ – Angle of internal friction; k – Limiting Modulus of Subgrade Reaction (pci) for static loading condition; ϵ_{50} – Strain corresponding to one-half the principle stress; Dr – Relative density.

Shallow Foundations

Although the results of the exploration indicate the subsurface soils exhibit fair bearing characteristics, due to the soft clays encountered between 4 and 12 feet below the surface at the Meadow Lake site, mat type foundations with moderate uniform bearing pressures will experience some settlement. However, taking into consideration the granular nature of the soils encountered within the explored boring depths, the estimated elastic and consolidation settlements associated with the new ground supported tank will likely dissipate within a short period of time after application of the tank's maximum load as will be discussed in more detail in the subsequent section of the report.

Mat Foundations

Estimates of Modulus of Subgrade Reaction (k) for mat foundations will depend on the type and strength of bearing soils, mat size, shape, bearing depth, and magnitude of sustained loads. For the design of the mat foundation, a Modulus of Subgrade Reaction (k) of 250 pci may be used with the provision of six (6) inches of compacted 610 limestone below the mat. The foundations at the Meadow Lake site may be designed for a maximum allowable bearing pressure of 1,500 psf while an allowable bearing capacity of 2,500 psf may be used for the River Oaks site. The recommended allowable bearing capacities include a factor of safety of 3

Differential settlements of mat foundations depend on the rigidity of the mat. Differential settlements for mats with a rigidity factor greater than 0.5 will be negligible. For mat foundations with rigidity factors less than 0.5, differential settlements will generally be on the order of 50 percent of the total settlement.

Analyses were made to estimate the settlement under a loaded area roughly about 20 feet in diameter at the Meadow Lake site. Based on a loading condition exerted by a uniform load of 1,500 psf, long term settlement at the center of the loaded area was estimated to be about 1 ½ to 2 inches. Settlement at the edge of the circular mat was estimated to be about 1 to 1 ½ inches.

While the estimate of settlement is based on the deep boring drilled at the south end of the site, the shallower boring completed at the north end of the property showed slightly better subsurface conditions which could yield a lower magnitude of settlement depending on the soil conditions at the actual tank footprint.

Regardless of the soil conditions, stage loading of the proposed ground supported tank is highly recommended during hydro-testing to avoid sudden shock loading. This gradual loading will also reduce the possibility of excessive differential settlements. The tank settlement should be monitored after placing each load increment to verify the tank movement is decreasing with each increment and ensure the tank is stable prior to making any rigid connections. Sufficient time should be provided between loading intervals to allow any immediate movement to equalize prior to commencing with the next loading stage. This process should be the responsibility of the tank manufacturer/installer.

Shallow Footings

Lightly loaded ancillary structures may be supported on shallow foundations at both sites, but based on the site specific subsurface conditions, the allowable bearing pressures at the Meadow Lake facility have been reduced to minimize the potential for long term settlement.

Consequently, spread footings and continuous footings at the Meadow Lake site, bearing at least two (2) feet below the finished grade on the firm to stiff clay or on compacted structural fill, could be designed for maximum allowable bearing pressures of 1,500 psf and 1,000 psf, respectively, based on dead loads and design live loads. The allowable bearing pressures at the River Oaks site may be increased to 2,500 psf and 2,000 psf, respectively. The recommended allowable bearing capacities include a factor of safety of 3.

Minimum dimensions of twenty-four (24) inches for column footings and eighteen (18) inches for continuous footings should be used in foundation design to minimize the possibility of a localized bearing failure.

The uplift resistance of shallow spread footings formed in open excavations should be limited to the weight of the foundation concrete and the soil above it. For preliminary design purposes, the uplift resistance can be computed by using a total unit weight of 115 pcf for the structural fill placed and compacted above the footing, and a unit weight of 150 pcf for the concrete. Concrete reinforcing steel should be properly sized to resist uplift forces. We recommend that a factor of safety of at least 1.5 be used when determining the allowable uplift resistance of spread footings.

Soil resistance to horizontal forces is developed by lateral earth pressures acting on the face of the footing and by friction or adhesion on the footing base. We recommend that the allowable passive pressure be computed for spread footings below grade using the following equations:

$$P_p = 1000 + 120H \text{ (Clay) – Meadow Lake Site}$$
$$P_p = 2000 + 120H \text{ (Clay) – River Oaks Site}$$

where P_p is the lateral soil resistance in psf (pounds per square foot) and H is the depth in feet. For exterior footings, H is measured from one (1) foot below adjacent finished grade, provided that the adjacent finished grade extends level and at least beyond a point that makes a 45-degree angle from the bottom of the exterior footing to the finished ground surface.

The top foot of passive resistance at foundations should be neglected unless the ground surface around the footing is covered by concrete or pavement. The resistance to sliding of spread footings bearing in structural fill can be computed by multiplying the footing base contact area by a sliding friction factor of 0.38. Spread footings should also be sized to resist overturning due to moment forces.

The foundation excavations should be observed by a representative of SE prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of firm soils or adequately compacted fill as directed by the Geotechnical Engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with compacted structural fill or graded crushed stone, as determined by the Geotechnical Engineer.

The concrete should be placed in the footing excavations as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond prior to or after concrete placement. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

Shallow Foundation Settlement

Settlement of a spread footing designed for the recommended bearing pressure is estimated to be less than one (1) inch. Differential settlements could be 50 percent of the total settlement.

CONSTRUCTION CONSIDERATIONS

It is recommended that SE be retained to provide observation and testing of construction activities involved in the foundations and related activities of this project. SE cannot accept any responsibility for any conditions which deviate from those described in this report, nor for the performance of the foundations, if not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather Related Concerns

The upper soils encountered at this site are extremely sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, an increase in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Drainage and Groundwater Concerns

Water should not be allowed to collect in the foundation excavations or on the prepared subgrade in the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the foundations.

Groundwater was measured around 4 feet at the Meadow Lake site and 12 feet at the River Oaks site upon completion of the drilling operations. However, it is possible that seasonal variations will cause fluctuations of the water table. Additionally, perched water may be encountered in discontinuous zones within the overburden soils. Any water accumulation should be removed from the excavations by pumping. If excessive and uncontrolled amounts of seepage occur, the Geotechnical Engineer should be consulted to provide additional recommendations, if necessary.

Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its “Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P”. This document was issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavation, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor’s “responsible person”, as defined in 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor’s safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. Stratum Engineering does not assume responsibility for construction site safety or the contractor’s or other parties’ compliance with local, state, and federal safety or other regulations.

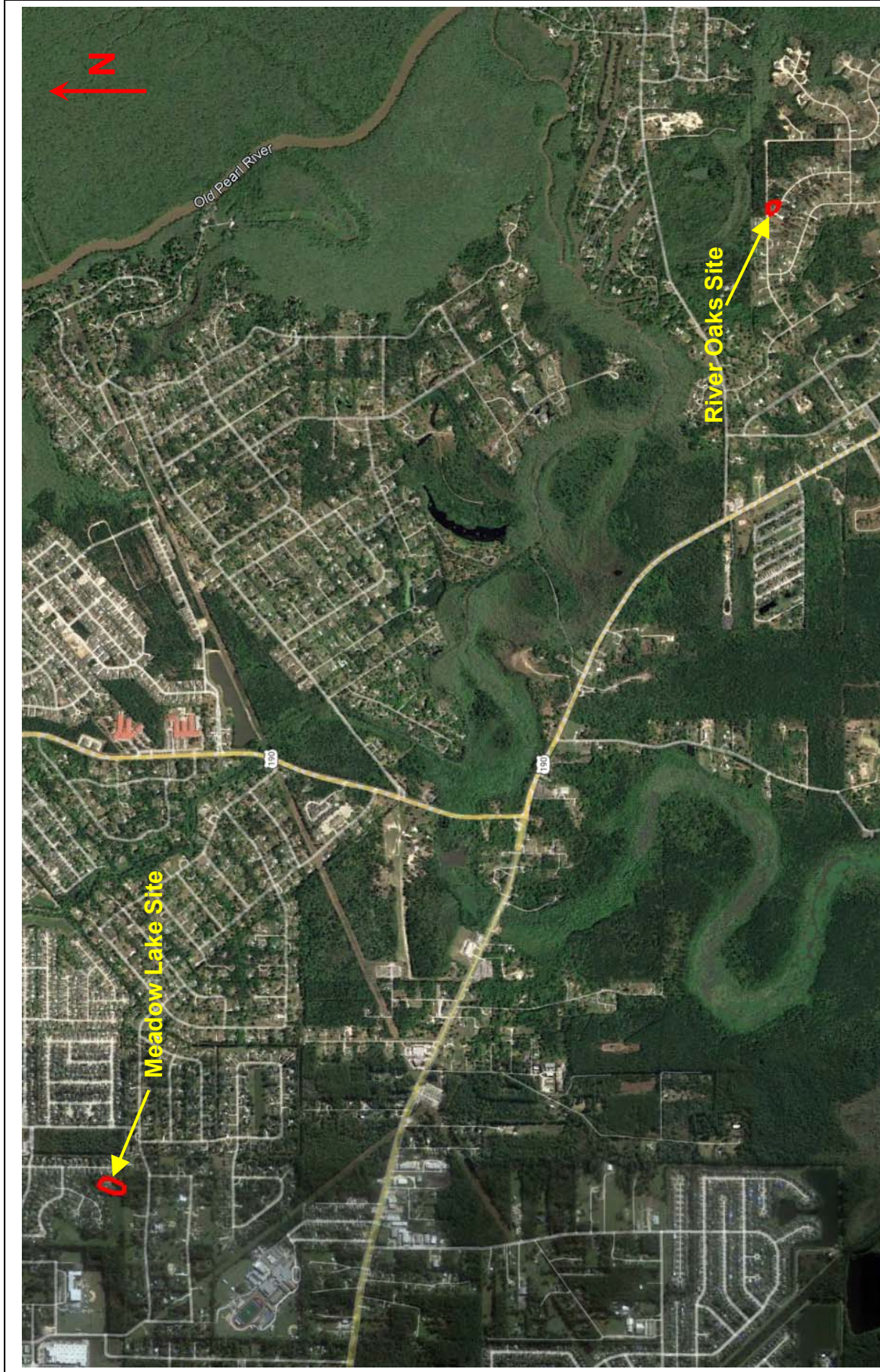
REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by SE and design details furnished by the Principal Engineering, Inc. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, SE should be notified immediately to determine if changes in the foundation recommendations are required. If SE is not notified of such changes, SE will not be responsible for the impact of those changes on the project.

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

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated in to the design documents. At that time, it may be necessary to submit supplementary recommendations. If SE is not retained to perform these functions, SE will not be responsible for the impact of those conditions on the project. This report has been prepared for the exclusive use of the Principal Engineering, Inc. for the specific application to the proposed new Water Tanks to be constructed at the Meadow Lake and River Oaks wastewater treatment plants in Slidell, Louisiana.

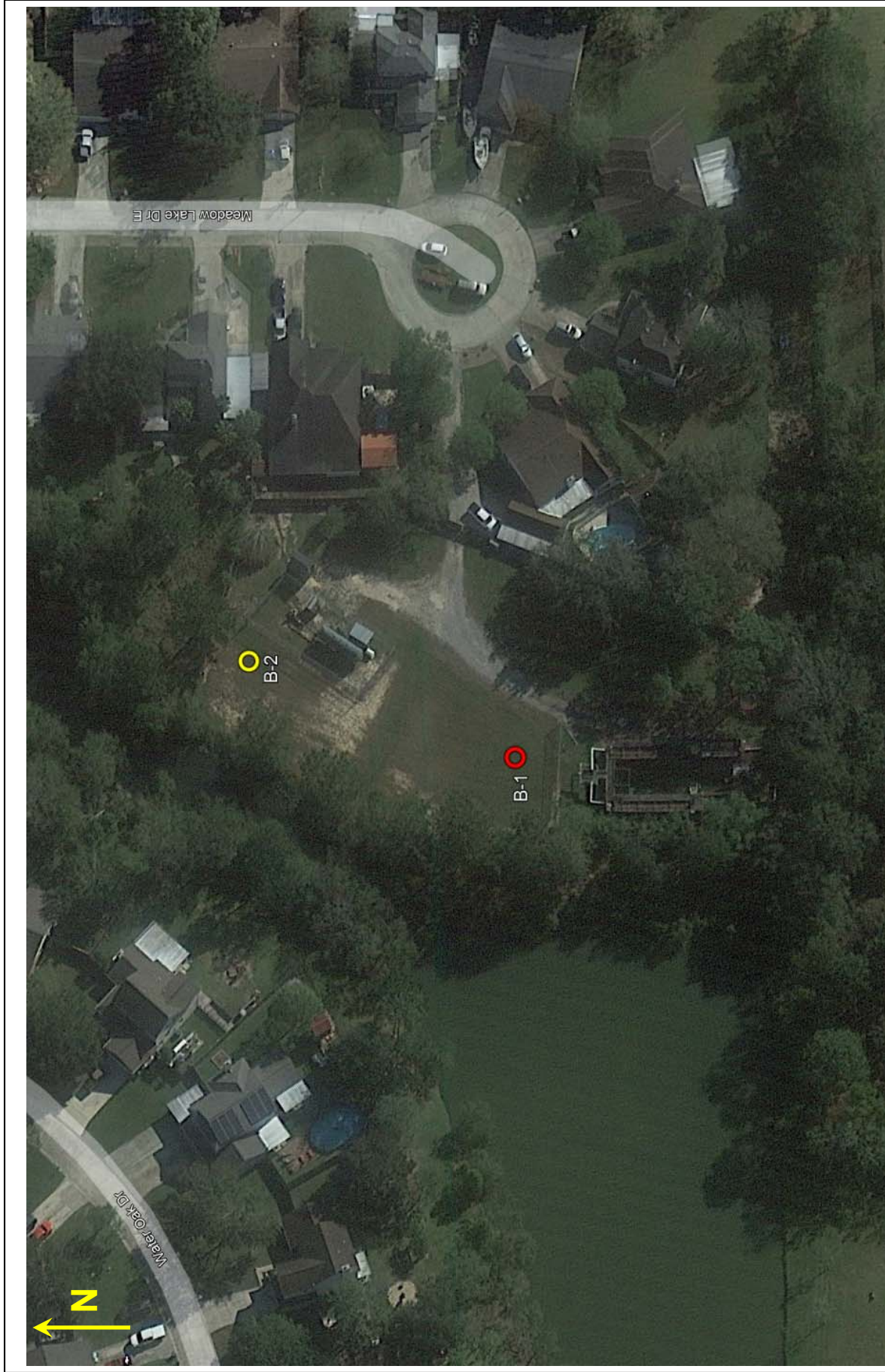
APPENDIX



GEOTECHNICAL ENGINEERING SERVICES
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

SITE VICINITY MAP
SE PROJECT NO. G23-063





GEOTECHNICAL ENGINEERING SERVICES
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

BORING LOCATION PLAN
MEADOW LAKE SITE
SE PROJECT NO. G23-063





BORING LOCATION PLAN
RIVER OAKS SITE
SE PROJECT NO. G23-063

GEOTECHNICAL ENGINEERING SERVICES
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA



LOG OF BORING B-1
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: MEADOW LAKE WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENETROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
0			12" Silty Topsoil with organics						18			
0			Firm to stiff tannish gray Lean Clay with sand		0.79	1.50		106	19			
5			- becomes very soft to firm at 4'			0.25			23			
5					0.25	0.50		105	23			
10						0.50			21			
15			Loose tannish gray Clayey Sand		0.48	0.75		111	21			
20			Firm tannish gray Sandy Lean Clay	4					31			
25			Medium dense tannish gray Silty Clayey Sand	11					29	23	6	41
30			Firm gray Lean Clay with sand		0.53	0.75		90	37	43	27	83
35			Medium dense to dense tannish gray Silty Sand	23					30			39
40				31					24			
45			- becomes very dense at 43'	50+					22			29
50				50+					21			

DEPTH OF BORING: 100 Feet

GROUNDWATER: Measured at 4 Feet Upon Completion of Drilling

DATE: 7/13/2023



LOG OF BORING B-1 (continued)
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: MEADOW LAKE WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENTROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
55	Very dense tannish gray Silty Sand	X		50+					22			21
60				50+					18			
65				34					31			13
70				50+					19			
75				50+					18			15
80	Very dense tannish gray Poorly Graded Sand	X		50+					17			
85				50+					18			8
90				50+					15			
95				50+					20			7
100				50+					18			

- dense at 63'

DEPTH OF BORING: 100 Feet
 DATE: 7/13/2023



LOG OF BORING B-2
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: MEADOW LAKE WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENETROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
			12" Silty Topsoil with organics			2.25			18			
			Very stiff reddish tan Sandy Lean Clay		0.96	1.50		107	18	31	17	65
			- firm to stiff tannish gray at 2'									
5			Firm to stiff tannish gray Fat Clay with sand			1.00			30			
			Very stiff tannish gray Sandy Lean Clay		2.97	3.50		108	20			
10			Medium dense tannish gray Clayey Sand			1.50			18			48
				18					20			41
15												
			Firm to stiff tannish gray Sandy Lean Clay	8					27			
20			Boring Terminated at 20 Feet									
25												
30												
35												
40												
45												
50												

DEPTH OF BORING: 20 Feet
 DATE: 7/14/2023

GROUNDWATER: Measured at 4 Feet Upon Completion of Drilling



LOG OF BORING B-3
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: RIVER OAKS WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENETROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
			12" Silty Topsoil with organics			2.50			19			
			Very stiff gray Silty Clay									
			Firm to stiff tannish gray Lean Clay		0.62	1.00		103	24			
5			Stiff to very stiff tannish gray Fat Clay			1.75			23			
			- with sand lenses, 6' to 10'		1.91	2.25		104	22			
10						2.00			26			
15			- becomes olive gray at 13'		1.62	2.50		86	35			
20						2.75			46			
25			Loose tannish gray Clayey Sand		0.32	0.50		83	36	44	28	39
30			Very dense tannish gray Poorly Graded Sand	50+					23			5
35				50+					24			6
40			Stiff gray Sandy Fat Clay	9					28	57	39	58
45			Firm to stiff gray Sandy Lean Clay		0.91	1.00		110	20			
50			Stiff olive gray Fat Clay			1.50			26			

DEPTH OF BORING: 100 Feet
 DATE: 7/18/2023

GROUNDWATER: Measured at 12 Feet Upon Completion of Drilling



LOG OF BORING B-3 (continued)
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: RIVER OAKS WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENETROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
55	Fat Clay	-	Stiff olive gray Fat Clay		1.27	1.50		89	31			
			- with trace of organics at 53'									
60	Silty Sand	X	Very dense light gray Silty Sand	50+					21			20
65			50+						21			
70	Poorly Graded Sand	X	Very dense tannish gray Poorly Graded Sand	50+					21			7
75			50+						19			12
80	Fat Clay	-	Stiff to very stiff gray Fat Clay	10					40			
85			- light gray at 83'		1.93	2.00		102	25			
90	Clayey Sand	-	Medium dense light gray Clayey Sand			2.50			19			
95	Poorly Graded Sand	X	Very dense light gray Poorly Graded Sand	50+					19			8
100			50+						25			

DEPTH OF BORING: 100 Feet
 DATE: 7/18/2023



LOG OF BORING B-4
PROPOSED NEW ELEVATED WATER TANKS
MEADOW LAKE & RIVER OAKS
SLIDELL, LOUISIANA

TYPE OF BORING: WET ROTARY

LOCATION: RIVER OAKS WWTP

PROJECT NO.: G23-063

DEPTH, FT.	SOIL TYPE	SAMPLES	DESCRIPTION	N-BLOWS/FT.	UNCONFINED COMPRESSIVE STRENGTH tsf	HAND PENETROMETER tsf	TORVANE tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
			12" Silty Topsoil with organics			3.25			12			
			Very stiff tannish gray Silty Clay									
			Stiff to very stiff tannish gray Lean Clay		1.21	1.50		102	23	47	29	
5						3.50			20			
			Stiff to very stiff tannish gray Fat Clay		2.59	3.50		110	20	50	35	92
10			- light gray at 8'			2.50			29			
15			- becomes olive gray at 13'		1.83	3.00		88	35			
20						2.50			44			
			Boring Terminated at 20 Feet									
25												
30												
35												
40												
45												
50												

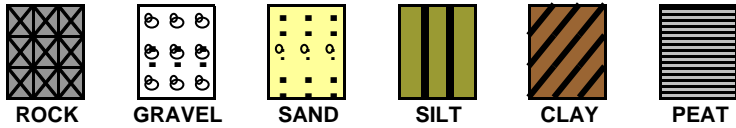
DEPTH OF BORING: 20 Feet
 DATE: 7/19/2023

GROUNDWATER: Measured at 12 Feet Upon Completion of Drilling

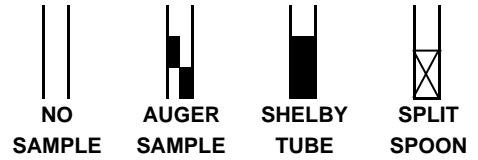


KEY TO TERMS AND SYMBOLS USED ON LOGS

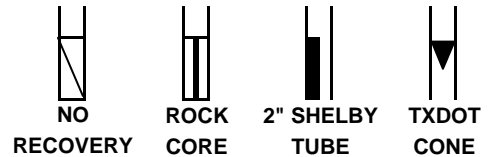
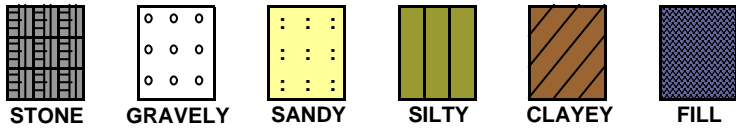
SOIL TYPE



SAMPLER TYPE



MODIFIERS



UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D 2487 (1980)

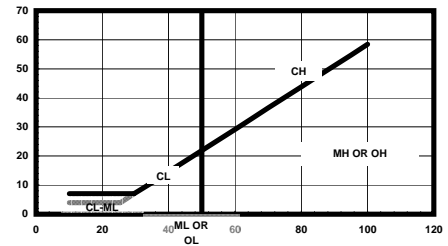
MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS	GRAVEL & GRAVELLY SOILS	CLEAN GRAVEL (LITTLE OR NO FINES)	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		LESS THAN 50% PASSING NO. 4 SIEVE	GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
	SANDS	CLEAN SANDS (LITTLE FINES)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES	
		MORE THAN 50% PASSING NO. 4 SIEVE	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	SANDS WITH APPRECIABLE FINES	CLEAN SANDS (LITTLE FINES)	SW	WELL GRADED SAND, GRAVELY SAND (LITTLE FINES)	
		MORE THAN 50% PASSING NO. 4 SIEVE	SP	POORLY GRADED SANDS, GRAVELY SAND (L.FINES)	
	SANDS WITH APPRECIABLE FINES	CLEAN SANDS (LITTLE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	
		MORE THAN 50% PASSING NO. 4 SIEVE	SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
	FINE GRAINED SOILS	SILTS AND CLAYS	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR	ML	SILTY OR CLAYEY FINE SANDS OR CLAYEY SILT W/ LOW PI
			LIQUID LIMIT LESS THAN 50	CL	INORGANIC CLAY OF LOW TO MEDIUM PI LEAN CLAY GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS
ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PI			OL		
SILTS AND CLAYS		FINE SANDY OR SILTY SOILS, ELASTIC SILTS	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS	
	LIQUID LIMIT GREATER THAN 50	CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS		
	ORGANIC CLAYS OF MED TO HIGH PI, ORGANIC SILT	OH			
HIGHLY ORGANIC SOIL			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	
UNCLASSIFIED FILL MATERIALS			ARTIFICIALLY DEPOSITED AND OTHER UNCLASSIFIED SOILS AND MAN-MADE SOIL MIXTURES		

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	SHEAR STRENGTH IN TONS/FT ²
VERY SOFT	0. TO 0.125
SOFT	0.125 TO 0.25
FIRM	0.25 TO 0.5
STIFF	0.5 TO 1.0
VERY STIFF	1.0 TO 2.0
HARD	> 2.0 OR 2.0+

RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (BLOWS/FOOT)
VERY LOOSE	0-4
LOOSE	4-9
MEDIUM DENSE	10-29
DENSE	30-49
VERY DENSE	> 50 OR 50+



ABBREVIATIONS

- | | |
|------------------------|--|
| HP - HAND PENETROMETER | UC - UNCONFINED COMPRESSION TEST |
| TV - TORVANE | UU - UNCONSOLIDATED UNDRAINED TRIAXIAL |
| MV - MINIATURE VANE | CU - CONSOLIDATED UNDRAINED |

NOTE: PLOT INDICATES SHEAR STRENGTH AS OBTAINED BY ABOVE TESTS



CLASSIFICATION OF GRANULAR SOILS

U.S. STANDARD SIEVE SIZE(S)

	6"	3"	3/4"	4	10	40	200		
BOUL- -DERS	COBBLES	GRAVEL		SAND			SILT	CLAY	
		COARSE	FINE	COARSE	MEDIUM	FINE			
	152	76.2	19.1	4.76	2.0	0.42	0.075		0.002
GRAIN SIZE IN MM									