



CITY OF NEWARK
DELAWARE

Bid Security

Vendor

CITY OF NEWARK

Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

NOTICE

Do not disassemble. Return intact with
properly completed forms or bid may be rejected.

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

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CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

NOTICE OF LETTING

Sealed bids for Contract No. 23-08 SOUTH WELLFIELD RESIN-GAC SYSTEM will be received by the City of Newark Purchasing Division (220 South Main Street; Newark, Delaware 19711) until 2:00 p.m., prevailing time, on Tuesday, June 20, 2023, and will be publicly opened and recorded in the Council Chamber shortly thereafter.

Alternatively, bids may also be emailed in PDF form to the City Purchasing Division at contracts@newark.de.us by the deadline noted above and will be opened immediately after the closing date and time and will be publicly recorded in the Council Chamber shortly thereafter.

A mandatory pre-bid meeting will be held on Tuesday, May 30, 2023, at 10:00 a.m. at the South Wellfield Water Treatment Plant, located at 912 South Chapel Street, Newark, DE 19713. Funding for this project is through the State of Delaware Clean Water State Revolving Fund and attention of the bidder is particularly called to the requirements of this program. The work will be subject to the Equal Opportunity requirements of the program. All contractors and subcontractors performing work covered by this contract must pay their workers the higher of the State of Delaware and Davis-Bacon prevailing wages and fringe benefits determinations for the classifications. A bid bond equal to not less than 10% of the bid price must accompany the bid.

All questions/requests for information regarding this contract (bid process, drawings, and technical specifications, etc.) must be submitted via email to contracts@newark.de.us by 5:00 p.m. on Tuesday, June 13, 2023, to allow staff sufficient time to develop answers to questions deemed appropriate. Please submit all questions/requests for information in bulk (e.g., in a Word document attachment to an email) to limit the total number of emails received.

The contract documents for Contract No. 23-08 may be obtained from the City's web page at www.newarkde.gov/bids.

DELAWARE DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

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Delaware Health and Social Services



Office of Engineering

Drinking Water State Revolving Fund (DWSRF)

Program Requirements

**DRINKING WATER STATE REVOLVING FUND
PROGRAM REQUIREMENTS
PART A:
Prevailing Wage Regulations**

The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the following provisions are included in this Contract pursuant to the provisions applicable to such SRF Program. Loan Recipients or engineering representatives are to notify the State of Delaware Department of Labor to verify the appropriate wage determination before they go out for competitive bidding. A copy of the Delaware Prevailing Wage Regulations may be obtained from the State of Delaware Department of Labor by calling **(302) 761-8200** or by writing to this address:

**State of Delaware
Department of Labor
225 Corporate Blvd. Suite 104
Newark, DE 19702**

As of 2010 all DWSRF projects will also be required to pay wage rates according to Davis-Bacon wage rates and/or Delaware State wage rates. When considering which rate to use for a classification the higher of the two rates shall be used. If only one of the wage rates has the classification for the job task that is the rate to be used.

The Davis Bacon wage rate determination can be obtained at: <http://www.gpo.gov/davisbacon/>

SEE ATTACHED WAGE RATE REFERENCES OBTAINED FOR THE PROJECT.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

PART B:

Equal Employment Opportunity

I. Executive Order 11246 (Contracts/subcontracts above \$10,000)

(A). During the performance of this contract, the contractor and all subcontractors agree as follows:

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

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

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

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

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

(6). In the event of the contractors' noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract

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

(7). The contractor will include the portion of the sentence immediately preceding Paragraph (1) and the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase orders as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided; however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

PART C:

Notice to Prime Contractor of Requirement for Certification of Nonsegregated Facilities

Bidders and offerers are cautioned as follows: By signing this bid or offer, the bidder or offerers will be deemed to have signed and agreed to the provisions of the “Certification of Nonsegregated Facilities” in this solicitation. The certification provides that the bidder or offerer does not maintain or provide for his employees’ facilities which are segregated on a basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that he will not maintain such segregated facilities.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

PART D: Construction Contractors Requirements

(1). Whenever the contractor or any subcontractor at any tier subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract, the provisions of these specifications and the Notice to which contains the affirmative action goals for minority and female participation, as is set forth in the solicitations from which this contract resulted.

(2). The fair share objective for the Delaware State Revolving Fund Program is as follows:

Statewide – 16% MBE / 8% WBE

(3). The MBE/WBE goals set forth in the contract are shown in #2 above. The contractor shall make every reasonable attempt to achieve the goals as stated. When so notified by the owner, the apparent low bidder shall provide a listing of MBE's and WBE's he proposes to use on this project. Should the bidder fail to meet the aforementioned objectives, he shall provide complete documentation which demonstrates the positive efforts taken. Failure to satisfy this requirement to the satisfaction of the owner shall constitute a non-responsible bid and shall be cause for the owner to reject the bid.

(4). The contractor shall implement the specific six affirmative steps as provided in the Special Notice under the Instructions to Bidders section of these specifications.

(5). The contractor and all subcontractors must maintain documentation and records of all solicitations of offerers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations. Within 21 days of the determination of the apparent low bidder, the contractor must furnish to the Loan Recipient all pertinent documentation, which evidences or documents a good faith effort in MBE/WBE solicitation and projected utilization. Failure to comply with the submission of appropriate MBE/WBE documentation may result in the determination of a bidder as non-responsible and shall cause for the bid to be rejected.

(6). Immediately following the award of contracts and continuing through the constructions state, all records of MBE/WBE utilization shall be maintained and reported in accordance with the Department of Commerce Form SF-334. A MBE/WBE Utilization Report Form SF-334 shall be completed and submitted to the Loan Recipient on a calendar year quarterly basis during the construction period. Please see the attached Instruction to Bidders/Offerers for MBE/WBE Requirements.

**Instruction to Bidders/Offerers:
Minority Business and Women's Business Enterprise (MBE/WBE)
Requirements of 40 CFR 33.240**

Bidder/Offerer Responsibilities:

A. Affirmative Steps: Activities during preparation of bids and offers. Bidders/Offerers shall take affirmative steps in compliance with the regulations, prior to submission of bids or closing data for receipt of initial offers, to encourage participation in projects by MBEs and WBEs. Such efforts include:

(1). Establish and maintain a current solicitation list of minority and female recruitment sources, and assure MBEs and WBEs are solicited once they are identified.

(2). When feasible, segmenting total work requirements to permit maximum MBE/WBE participation and establish delivery schedules to encourage MBE/WBE participation.

(3). Assuring that MBEs and WBEs are solicited whenever they are potential sources of goods or services. This step may include:

a. Sending letters or making other personal contact with MBEs, WBEs, private agencies and state associations (e.g., those whose name appears on lists prepared by the recipient and other MBE/WBE known to the bidder/offerer). MBEs and WBEs should be contacted when other potential subcontractors are contacted, within reasonable time prior to bid submission or closing date for receipt of initial offers. Those letters or other contacts should communicate the following:

(i) Specific description of the work to be contracted;

(ii) How and where to obtain a copy of plans and specifications or other detailed information needed to prepare a detailed price quotation.

(iii) Date the quotation is due to the bidder/offerer

(iv) Name, address, and phone number of the person in the bidder/offerer's firm whom the prospective MBE/WBE subcontractor should contact for additional information.

- b. Using the services and assistance of the Small Business Administration, the Office of Minority Business Enterprises of the U.S. Department of Commerce, or the list by DELDOT in Dover, DE.
- B. Bidders/Offerers must demonstrate compliance with MBE/WBE requirements to be deemed responsible. Demonstration of compliance may include the following information; however, the recipient may specify other methods of demonstrating compliance:
 - (1). Names, addresses, and phone numbers of MBE/WBEs expected to perform work;
 - (2). Work to be performed by the MBEs and WBEs;
 - (3). Show dollar amount of work to be performed by MBEs and show dollar amount to WBEs separately.
 - (4). Description of contacts to MBE and WBE organizations, agencies, and associations which service MBEs/WBEs, including names of organizations, agencies, and associations and dates of contacts.
 - (5). Descriptions of contacts to MBEs and WBEs, including number of contacts, fields, (i.e., equipment or material supplier, excavators, transport services, electrical subcontractors, plumbers, etc.), and dates of contact.
- C. Successful bidders/offerers should take responsible affirmative steps to subcontract with MBEs and WBEs whenever additional subcontracting opportunities arise during the performance of the contract.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

SPECIAL INSERT

For insertion into the Instructions for Bidders

This is to advise bidders of the requirements of this program regarding the “affirmative steps” necessary to be deemed a responsive and responsible bidder.

The Federal Register Part 40 CFR 33.240 requires these “affirmative steps” in procurement actions to assure that MBE and WBE firms are awarded a fair share of subagreements:

- (1). Including qualified small, minority, and women’s business solicitation lists.
- (2). Assuring that small, minority, and women’s businesses are solicited whenever they are potential sources.
- (3). Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women’s businesses.
- (4). Establishing delivery schedules, where the requirements of the work permit which will encourage participation by small minority and women’s businesses.
- (5). Using the services and assistance of the Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce.
- (6). Requiring each party to a subagreement to take the affirmative steps in 1 through 5 above.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

PART E:

Civil Rights Act of 1964

The contractor and any subcontractors shall not, on the grounds of race, color, or national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination, any person under any program or activity receiving Federal financial assistance.

PART F:

Section 13 of PL 92-500; Under the Federal Water Pollution Control Act; Rehabilitation Act of 1973; PL 93-112; And Age Discrimination Act of 1975

The contractor and any subcontractors shall not on the ground of race, color, national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person or activity funded in whole or in part with Federal funds. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975, or with respect to any otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 shall also apply to any such program of activity.

DRINKING WATER STATE REVOLVING FUND PROGRAM REQUIREMENTS

PART G: Compliance with Section 306 of the Clean Air Act and Section 508 of the Clean Water Act

(Contracts and Subcontracts in Excess of \$10,000)

The contractor agrees that:

- 1.) Any facility to be utilized in the performance of this contract or any subcontract shall not be a facility listed on the EPA List of Violating Facilities pursuant to 40 CFR 15.20.
- 2.) The contractor and subcontractors will comply with all requirements of Section 306 of the Clean Air Act, as amended, and Section 508 of the Clean Water Act, as amended, and all regulations and guidelines issued thereunder.

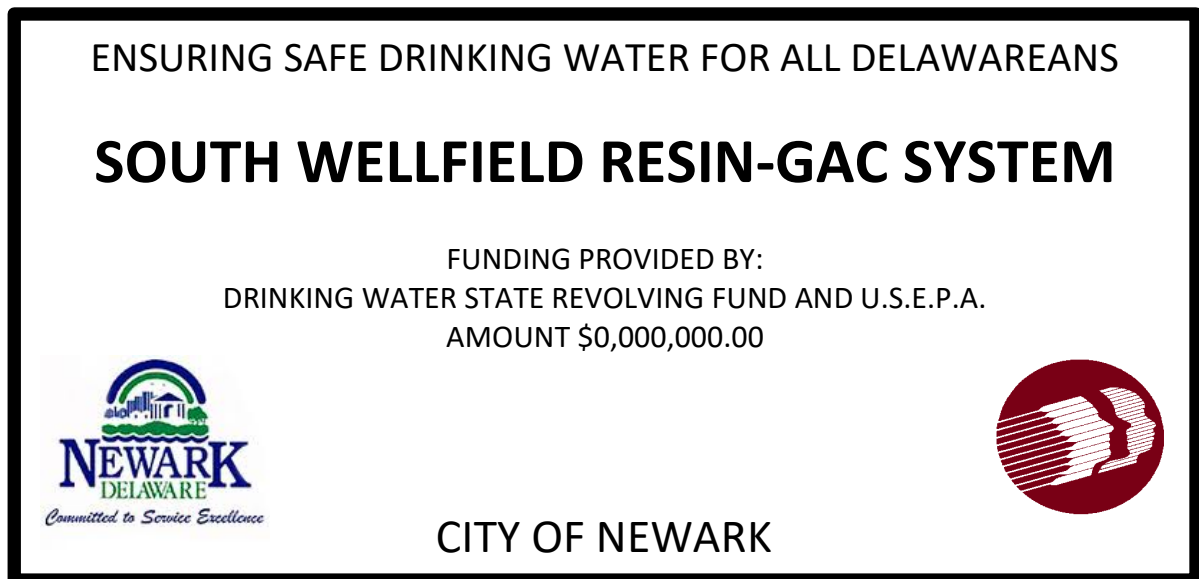
PART H: Suspension and Debarment and Other Responsibility Matters

The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the following provision is included in this Contract pursuant to the provisions applicable to such SRF Program. Loan Recipients or engineering representatives are to refer to the “List of parties exclude from Federal Procurement and Nonprocurement Programs” to insure that the contractor or subcontracts are not on this list. A copy of the list may be obtained from the world wide web at www.sam.gov/portal/SAM/#1#1 or by calling (202) 512-1800 or by writing to this address:

Superintendent of Documents
U.S. Government Printing Office
Washington, DC
20402

PART I: PROJECT SIGN

- 1.) The contractor shall provide and erect a sign at a prominent location at each construction site. The sign and location shall be approved by the Engineer. It shall be the responsibility of the Contractor to maintain the sign in good condition throughout the life of the project.
- 2.) The sign shall be prepared as noted.
 - Sign Dimensions (4'x 8'x 3/4") Exterior Plywood (A-B Grade)
 - Ensuring Safe Drinking Water letters are 2.75 inches tall
 - Project Title letters are 3.5 inches tall
 - Remaining lines are 2 inches tall
 - Black letters on white background with three-inch border around the perimeter in black
 - Keep sign a proper distance above grade to permit public viewing and provide adequate support for sign
 - DHSS logo stickers will be provided by the Office of Engineering
- 3.) The sign wording shown below is for example only and must be adapted to suit each project. The Contractor shall be responsible for obtaining the appropriate wording from the Engineer.



PART J: ACCESS TO PROJECT SITE

- 1.) The Contractor shall allow representatives of U.S. EPA, and State of Delaware DHSS-ODW access to the project site.

AMERICAN IRON AND STEEL (AIS) REQUIREMENT

Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement.

Implementation:

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that—

- (1) applying subsection (a) would be inconsistent with the public interest;
- (2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
- (3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the

engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

Iron / Steel Products:

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- Lined or unlined pipes or fittings;
- Manhole Covers;
- Municipal Castings (defined in more detail below);
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;
- Structural steel (defined in more detail below);
- Reinforced precast concrete; and
- Construction materials (defined in more detail below).

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required.

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Often, other metals are added to give steel a particular property, such as chromium and nickel to make it stainless.

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material.

However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

Municipal Castings:

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

- Access Hatches;

Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;
Meter Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section 3 inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners, welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, gates, and screens.

The following examples are NOT considered construction materials: gear reducers, drives, mixers, heat exchangers, pumps, motors, blowers/aeration equipment, meters, variable frequency drives (VFDs), valve actuators, controls, supervisory control and data acquisition

(SCADA), membrane bioreactor systems, membrane filtration systems, filters, disinfection systems, belt presses, HVAC (excluding ductwork), water heaters, generators, cabinetry and housings, lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, and analytical instrumentation.

For purposes of construction of the project, yes, welding rods are a construction material and must be produced in the US. Additionally, if welding rods are used in the production of a listed product, that welding rod used by a manufacturer, fabricator, etc., must also be produced in the US.

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing rebar must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. If the reinforced concrete is cast at the construction site, the reinforcing rebar is considered to be a construction material and must be produced in the US.

Compliance Documentation:

In order to ensure compliance with the AIS requirement, the step certification process shall be used. The step certification process is a method used to ensure adherence to AIS requirements and establish accountability.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc.) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. It should include the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party.

Alternatively, the final manufacturer that delivers the iron or steel product to either the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it does not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information.

Sample Certification for Step Certification Process

The following information is provided as a sample letter of step certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address
City, State Zip

Subject: Buy America Step Certification for Project (XXXXX-XXXXXXA)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

BUILD AMERICA, BUY AMERICA (BABA) ACT COMPLIANCE

The Contractor acknowledges to and for the benefit of the City of Newark ("Owner") and Delaware Health and Social Services (the "Funding Authority") that it understands the goods and services under this Agreement are being funded with federal monies and have statutory requirements commonly known as "Build America. Buy America;" that requires all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States ("Build America, Buy America Requirements") including iron and steel, manufactured products, and construction materials provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and Funding Authority (a) the Contractor has reviewed and understands the Build America, Buy America Requirements, (b) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior, written consent of the Funding Authority.

See Building A Better America Signage Attachment.

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

GENERAL PROVISIONS

1. BIDS

Each bid shall be submitted on the proposal form included herein. The proposal and all other required documents must be submitted in a sealed envelope clearly identified with the bidder's name and marked "City of Newark - Contract No. 23-08, SOUTH WELLFIELD RESIN-GAC SYSTEM". **Bid Documents must be received by the Purchasing Division prior to 2:00 p.m. prevailing time, Tuesday, June 20, 2023.** Each bid so submitted shall constitute an irrevocable offer for a period of thirty (30) calendar days following the bid opening date. A bid bond equal to not less than 10% of the bid price must accompany the bid.

Alternatively, bids may also be emailed in PDF form to the City Purchasing Division at contracts@newark.de.us by the deadline noted above and will be opened immediately after the closing date and time and will be publicly recorded in the Council Chamber shortly thereafter.

The project includes, but is not limited to, installation of two Calgon Model 12-40 resin-GAC units, a concrete slab foundation, a concrete valve vault, two manifold enclosures, a new sodium hypochlorite feed system, piping, electric, controls, and SCADA monitoring. The Contractor shall include subconsultant services of Allied Control Systems for the furnish and installation of the controls and SCADA equipment.

A **mandatory** pre-bid meeting will be held on **May 30, 2023, at 10 a.m.** at the South Wellfield Water Treatment Plant, located at 912 South Chapel Street, Newark, DE 19713.

2. DEFINITIONS

- A. *Agreement*: The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
- B. *Contract Documents*: Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
- C. *Contractor*: The individual or entity with whom the Owner has entered into the Agreement.
- D. *Engineer*: The Owner's consultant engineer. The Engineer for this project is Pennoni.

- E. *Owner*: The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed. The Owner for this project is the City of Newark.
- F. *Shop Drawings*: All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
- G. *Site*: Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
- H. *Subcontractor*: An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
- I. *Work*: The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, as required by the Contract Documents.

3. BID SECURITY

Each bid must be accompanied by a certified check, or cashier's check, or bid bond in the amount of ten percent (10%) of the proposed bid price, payable to the City of Newark. Failure to provide the required bid security may be grounds for rejection of the bid.

If the successful bidder fails or refuses to execute and deliver the contract within twenty (20) calendar days after receiving notice of the award of the contract, the successful bidder shall forfeit to the City for such failure or refusal the security deposited with the bid. Any certified check or cashier's check submitted as security shall be returned to all unsuccessful bidders thirty (30) calendar days after the bid opening date.

4. CONTRACT SURETY BOND

The successful bidder shall provide the City with a Performance Bond and Payment Bond in the full amount of the contract guaranteeing faithful performance of the contract. Such bonds shall be provided to the City with the executed contract within twenty (20) calendar days after receiving notice of award of the contract. Upon receipt of the contract surety bond, the City will return any certified check or cashier's check submitted as bid security by the successful bidder.

If a warranty is included as part of this contract's scope of work, once the project is substantially complete the surety bond shall be converted into a warranty bond for the term of the warranty. Once substantial completion of the project is reached and approved, City staff shall release any remaining retainage and issue a close out letter to the vendor stating the start date of the warranty period. A copy of the above noted warranty bond shall be provided to the City Purchasing Division no later than thirty (30) days from the receipt of the City's close out letter.

5. TAXES

The price(s) quoted shall not include federal or state taxes. If applicable, the successful bidder shall provide the City with three (3) copies of the required tax exemption forms to accompany the bidder's invoice.

6. AWARDS

The City Manager or designee shall review each of the bids submitted and make a recommendation to the City Council on the disposition of the bids. The City Council reserves the right to accept or reject any or all bids or parts of bids as they may determine and to waive any irregularities or defects where the best interest of the City would be served.

7. BID PRICE

The bid price shall include all transportation, delivery, installation, and all charges for the goods and services specified for this contract. All goods specified in this contract shall be F.O.B. Newark Warehouse (406 Phillips Avenue; Newark, DE 19711). The work done under this contract will be funded by the State Revolving Loan Fund Program, therefore, prevailing wage rates and Davis Bacon wage rates apply to this contract; the Contractor is required to pay the higher of the wage rates listed for each labor category. The Contractor will be held to have examined and be familiar with the entire Bid Specification prior to submitting their Bid Proposal. No allowance for additional compensation will be considered for failure to comply with this requirement.

Any prices quoted are those for which the material will be furnished F.O.B. Destination and include all charges that may be imposed during the period of the contract. Unless otherwise specified and agreed upon by both parties in writing, all material shall be designated F.O.B. Destination and have freight included in quotations.

8. TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Contractor is to complete the work within ninety (90) calendar days from the date specified by the City in a written "Notice to Proceed". Liquidated damages of five hundred dollars (\$500.00) per day may be assessed to the Contractor by the City for each day the contract is extended beyond the completion date to provide recovery of costs. Liquidated damages are not to be construed as a penalty in any sense, but rather a reasonable estimate of the damages that would be suffered by the City in the event of a breach. The City and the contractor shall acknowledge that the actual damages resulting from a breach may be difficult to ascertain and that this provision represents a reasonable estimation of such damages. This provision shall not limit the City's right to pursue any other remedies available under law or equity.

9. INTENT OF SPECIFICATIONS

It shall be the Contractor's responsibility to furnish the goods and services specifically indicated in the scope of work and specifications and such other as may be required to meet the intent of the specifications, drawings, or as may be necessary to provide the operation intended by the City.

10. EXCEPTIONS & OMISSIONS

Any and all exceptions which are taken to the drawings and specifications must be noted in the space provided on the proposal. The listing of any exception to the specifications may be grounds for rejection of the bid.

Further, the bidder recognizes that the City of Newark is not in the business of preparing specifications, and any omissions in this contract/RFP must be strictly addressed by the firm with the submittal of its proposal.

11. EQUALS

Where a specific product is specified by catalog or model number, the acceptability of any other "or equal" product shall be subject to the sole judgment of the City of Newark.

12. WARRANTIES AND STANDARDS

All goods are to be new and unused in all component parts, including all accessories. The specifications will be construed as the minimum required. When the manufacturer's standard exceeds the specifications, the standard units shall be furnished. All materials shall be free of defects. All standard manufacturer's warranties and guarantees shall apply to equipment and goods supplied under this contract.

The Contractor guarantees all of the work and materials for a period of one year, unless specifically stated as longer in the technical specifications or project plans after the date of completion and final acceptance by the City.

13. WORKMANSHIP

Workmanship will conform to the best current manufacturing practice followed for goods of this type. Component parts and units will be manufactured to definite standard dimensions with proper fit and clearances.

14. FINAL INSPECTION

All delivered goods and services will be subject to inspection by the City of Newark, Delaware. If in any way an item fails to meet the terms of the contract, it may be rejected or liquidated

damage charges made. The decision of the City will be final, and any rejected items or materials will have to be replaced at the expense of the vendor.

15. ADVERTISEMENTS

Any bidder submitting a bid will not use the name of the City in any advertisement without first obtaining the written consent of the City Manager or their designee. All such requests should be submitted in writing to contracts@newark.de.us.

16. EEO AND BUSINESS LICENSES

The contractor shall be licensed to do business in the State of Delaware and shall be registered as a contractor in the City of Newark and possess all other required licenses. The contractor shall also be a fair and equal opportunity employer.

17. NONCOLLUSION

The bidder shall not, either directly or indirectly, enter into any agreement, participate in any collusion, or otherwise take any action in restraint of free competitive bidding in connection with the contract. Signed non-collusion statement shall be submitted with bid.

18. ADDENDA AND QUESTIONS

Any changes to the contract documents shall be made by written addenda, no later than four (4) calendar days prior to the bid opening date which may be issued with extensions to the bid submittal date if necessary to allow adequate time for response. Bidders shall bear the entire responsibility for being sure they have received all such addenda. **Bidder is responsible for submitting a signed letter listing the addendums received for this contract.** All addenda will be posted on the City website at www.newarkde.gov/bids. After the bids have been received, no claim that the bidder did not have complete information will be considered. No verbal agreement or conversation with any officer, agent or employee of the City, either before or after the execution of this contract, shall affect or modify any of the terms or conditions outlined herein.

All questions/requests for information regarding this contract (bid process, drawings and technical specifications, etc.) must be submitted via email to contracts@newark.de.us by 5:00 p.m. on Tuesday, June 20, 2023 to allow staff sufficient time to develop answers to questions deemed appropriate. Please submit all questions/requests for information in bulk (e.g., in a Word document attachment to an email) to limit the total number of emails received. Any answers deemed necessary will be provided via addendum prior to the bid opening date.

19. PAYMENT

No invoice will be processed for payment until the goods and/or services have been delivered and verification is made that the specifications under this contract have been met. Progress payments, when requested, will be evaluated and approved for payment based on work completed to date according to the approved schedule of values. Upon written request from the Contractor, payment for material stored on site may be made at 50% of the material's invoice price. Full payment will be made after the material is installed. Payment will be made within thirty (30) days of final acceptance by the City.

20. BIDDERS QUALIFICATIONS

No contract will be awarded to any bidder who in the judgment of the City is not a responsible bidder, or is not prepared with all the necessary experience, capital, organization, and equipment to conduct and complete the work for which the bidder proposes to contract.

21. LIABILITY INSURANCE

- A. The Contractor shall at all times maintain and keep in force such insurance as will protect him from claims under Worker's Compensation Acts, and also such insurance as will protect him and the owner from any such claims for damages for personal injuries, including death, which may arise from operations under this contract, whether such operations be by the Contractor or by any Subcontractor or anyone directly or indirectly employed by any of them.
- B. The Contractor shall be required to provide Workers' Compensation (WC)/Employer's Liability (EL) coverage with limits of insurance not less than:

\$1,000,000 Per Accident
\$1,000,000 Per Illness, Employee
\$1,000,000 Per Illness, Aggregate

The Contractor shall be required to provide Contractors Professional Liability coverage with limits of insurance not less than:

\$2,000,000 Per Claim
\$2,000,000 Per Aggregate

The Contractor shall be required to provide Umbrella/Excess Liability coverage with limits of insurance not less than:

\$5,000,000 Each Occurrence
\$5,000,000 Aggregate

The Contractor shall be required to provide Commercial General Liability (CGL) coverage with limits of insurance not less than:

\$2,000,000 Each Occurrence Limit
\$2,000,000 Personal & Advertising Injury Limit
\$3,000,000 Annual Aggregate Limit
\$3,000,000 Products-Completed Operations Limit
\$1,000,000 Business Auto Liability Limit (Owned, Hired, & Non-Owned Autos)

The Contractor, The City of Newark (Owner), Pennoni (Engineer), and all other parties required of the Contractor shall be included as insured on the CGL, using additional insured endorsements providing coverage as broad as the coverage provided for the named insured Subcontractor.

Subcontractors approved in association with the hiring of a Contractor shall be required to provide Commercial General Liability (CGL) coverage with limits of insurance in equal amount to those required of the Contractor.

All Contractors shall provide Contractors Pollution Liability with limits not less than:

Each Claim or Occurrence	\$3,000,000
Annual Aggregate	\$3,000,000

The Contractors Pollution Liability policy shall include coverage for Emergency Response Costs, Contingent Transportation, Non-Owned Disposal Sites, and Natural Resource Damage. If coverage is written on a claims-made basis, an Extended Reporting Period, or tail coverage, shall be provided for two (2) years following completion of the insured's services. In the alternative, the Contractors Pollution Liability policy shall be renewed for not less than two years following completion. The policy retroactive date shall be no later than the effective date of the Agreement.

- C. A copy of the Certificate of Insurance must accompany each bid. The Contractor shall ensure that all insurances required remain valid for the entire term of the contract, inclusive of any term extension(s) and retroactive if claim is made afterward. The Prime Contractor's attention should be directed to other sections of the contract documents in the event additional insurance is required based on the scope of work.

22. ITEMS TO BE EXECUTED AND SUBMITTED WITH BID

Bidders are notified that the proposal, insurance documentation, and bid security must be executed and completed in full and submitted with the bid at the time of bidding, or bid may be subject to rejection.

The Contractor shall also submit the following with the bid:

- A. List of Subcontractors and Qualifications
- B. Exceptions or qualifications to the Contract Documents
- C. Executed Bid Bond
- D. Acknowledgment of Addenda
- E. Proposal

23. ITEMS TO BE SUBMITTED WITH SIGNED CONTRACT

- A. Construction Schedule
- B. Performance Bond
- C. Insurance Documentation
- D. Payment Bond

24. RETAINAGE

The City will retain 5% of the progress payments until such time as the project is complete and accepted by the City.

25. INDEMNIFICATION

The Contractor shall solely be responsible and liable for the accuracy and completeness of all work performed and shall agree to indemnify, defend and hold harmless the City of Newark, its officers, agents and employees, from and against any and all claims, actions, suits and proceedings arising out of, based upon or caused by negligent acts, omissions or errors of or the infringement of any copyright of patent, by the contractor, its officers, agents, employees or subcontractors, in the performance of the contracted agreement.

26. TERMINATION OF AGREEMENT

This agreement may be terminated by the City upon thirty (30) days written notice if the contractor fails to perform satisfactorily in accordance with the terms and conditions of the contract. In the event this agreement is terminated, the contractor shall be paid for services satisfactorily rendered up to the termination date.

27. FAMILIARITY WITH PROPOSED WORK

A complete understanding of the conditions as they exist is required by careful personal examination of the work at the site. Each contractor bidding must completely satisfy himself as to the exact nature and existing conditions of the work area. The contractor also shall carefully examine the plans, specifications, and the contract forms for the work contemplated. Failure to do so will not relieve the successful contractor of his obligation to carry out the provisions of the contract.

The contractor shall not, at any time after the execution of the contract, set up any claims whatsoever based upon insufficient data or incorrectly assumed conditions, nor shall claim any misunderstanding in regard to the nature, conditions or character of the work to be done under this contract, and shall assume all risks resulting from any change in the conditions which may occur during the progress of the work.

The Contractor is solely responsible to identify, obtain, and pay for all required permits, licenses, and approvals required by any and all State, local, or Federal authorities or governmental agencies to complete the Work.

28. CONTRACTOR'S UNDERSTANDING

It is understood and agreed that the contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground; the character, quality and quantity of the material which will be required; the character of equipment needed preliminary to and during the prosecution of the work; the general and local conditions; all permit restrictions and conditions; and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent, or employee of the City of Newark, either before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.

29. SAFETY REQUIREMENTS

The Contractor shall comply with the requirements and standards of the Occupational Safety and Health Act and all other state and local laws, ordinances and codes governing all work to be provided under the contract documents.

The Contractor shall maintain on-site and in all vehicles at all times spill response equipment appropriate for the types and quantities of fluids and/or materials that may be subject to spillage during the project. All discharges to the storm drainage system or surface waters are strictly prohibited. In the event that a spill reaches the storm drainage system and/or surface waters, the contractor shall notify the Public Works and Water Resources Department immediately at 302-366-7000. The Contractor will also be responsible for spill response and clean-up at no cost to the owner. If the Contractor fails to respond to and clean up a spill to the satisfaction of the owner, the owner will perform clean up and bill the Contractor for 150% of the personnel time and material expenses incurred by the City as necessary for the response.

30. RESTORATION OF DISTURBED AREAS AND CLEAN UP

Upon completion of the work, all related work, such as lawns, curbs, sidewalks, fences, shrubbery, and driveways that have been disturbed shall be restored to their original condition and in accordance with City of Newark Standards and Specifications. The area shall

be cleared of all tools, equipment and refuse resulting from the project. The contractor shall, at the end of each day, leave the areas in which he has worked, free of debris and safely secure his material and equipment.

31. INSPECTION OF MATERIAL AND WORK

- A. Workmanship shall be of good quality and all work and material shall be at all times subject to the inspection of the City of Newark or their duly authorized representatives. The Contractor shall provide reasonable and necessary facilities for such inspection. If required by the City of Newark, the contractor shall take down or uncover portions of the finished work.
- B. The Contractor agrees that in case any of the material or work, or both, shall be rejected as defective or unsuitable by the city, material and the work shall be done again immediately to the satisfaction and approval of the city at the cost and expense of the Contractor.
- C. Any omission or failure on the part of the City of Newark or inspectors to disapprove or reject any defective work or materials shall not be construed to be an acceptance of any defective work or material.
- D. In case the City should not consider the defect of sufficient importance to require the contractor to replace any imperfect work or materials, the City shall have the power to make an equitable deduction from the stipulated price.
- E. Neither the inspection nor supervision of the work, nor the presence or absence of an inspector shall relieve the contractor of any of his obligations under the contract or of making his work conform to the specifications.

32. DEBRIS COLLECTION AND DISPOSAL

The Contractor is responsible for collection, removal, transport, and lawful disposal of construction debris and or materials.

33. OWNERSHIP OF MATERIAL

All documents prepared and submitted pursuant to this RFP or contract shall be property of the City upon submittal and will be subject to staff and public review and discussion in association with our public bidding and formal proposal process. Any information or documents deemed proprietary shall be so marked at time of submittal and limited to detail where the disclosure of contents could be prejudicial to competing offerors during the process of negotiation, and any commercial or financial information of a privileged or confidential nature.

34. REGULATIONS AND EXCEPTIONS

The application of lead paint as defined in Title 16, Chapter 30M of State Code and Chapter 7 of City Code as part of this contract is prohibited. The Contractor will be subject to fines as outlined in State and City Code if it is determined that lead paint was applied in violation of State and City Code.

Safety Data Sheet information for all paints applied to internal or external structures shall be provided to the City for review and approval prior to application. The Contractor will be required to remove and remediate any lead paint to the satisfaction of the City, at no cost to the City. Prior to commencing removal and remediation efforts, the Contractor shall provide a written remedial action plan which includes health safety protection requirements for both employees and the public for review and approval by the City and/or DNREC/DHSS. Any and all sample results that are generated as a result of improper application of lead paint shall be provided to the City within five (5) working days of being received by the Contractor. The Contractor will also be required to replace all paint removed with non-lead paint to the satisfaction of the City, and at no cost to the City.

Failure to adequately remove, remediate, and replace lead paint applied in violation of State and City Code as outlined herein will be considered a breach of contract.

35. FORCE MAJEURE OCCURANCE

Upon the occurrence of a force majeure event, the City of Newark shall immediately notify the awarded vendor. In this instance, the City shall be excused from any further financial or contractual obligations for as long as such circumstances prevail. As used in this document, a “force majeure occurrence” means acts of God; acts of the public enemy; acts of the State and any other governmental entity in its sovereign or contractual capacity; fires; floods; epidemics or pandemics; quarantine restrictions; strikes or other labor disputes; freight embargoes; unusually severe weather; or other unusual event outside of the reasonable control of a party hereto that prevents a party to this Agreement from performing its contractual obligations.

36. RELEASE OF LIENS

The Contractor is required to provide documentation stating that all liens filed against the Contractor have been paid before the final 5% retainage is released to the Contractor.

37. VENDOR REQUIREMENTS FOR FEDERALLY FUNDED PROJECTS

If this contract or RFP is funded through the State Revolving Loan Fund, a federal grant, or any other federal funding, the awarded vendor and all subcontractors must be registered at www.sam.gov before contract agreements are signed. The awarded vendor and all subcontractors must also show proof of SAM registration and good standing through the SAM portal before contract agreements are signed. SAM (System for Award Management) is the primary supplier database for the U.S. Federal Government.

The City of Newark shall not conduct business with vendors that are debarred or otherwise flagged/blacklisted if the project is funded using federal money. If a vendor or subcontractors are determined to be debarred at any point during the term of a contract, this will be seen as

grounds for termination of the contract, and potentially grounds for termination from other contracts held with the City, if any.

The Federal Register Part 40 CFR 33.240 requires these “affirmative steps” in procurement actions to assure that MBE and WBE firms are awarded a fair share of subagreements:

- (1) Including qualified small, minority, and women’s business solicitation lists.
- (2) Assuring that small, minority, and women’s businesses are solicited whenever they are potential sources.
- (3) Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women’s businesses.
- (4) Establishing delivery schedules, where the requirements of the work permit which will encourage participation by small minority and women’s businesses.
- (5) Using the services and assistance of the Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce.
- (6) Requiring each party to a subagreement to take the affirmative steps in 1 through 5 above.

38. SEVERABILITY

If any provision of this contract (general, special, technical, or other) shall be held to be invalid or unenforceable for any reason, the remaining provisions shall continue to be valid and enforceable. If a court finds that any provision of this contract is invalid or unenforceable, but that by limiting such provision it would become valid and enforceable, then such provision shall be deemed to be written, construed, and enforced as so limited.

39. PREFERENCE FOR DELAWARE LABOR

According to State law, any person, company, or corporation who violates the requirements of Title 29, Section 6962, of the Delaware Code regarding preference for Delaware Labor shall pay a penalty to the State Secretary of Finance equal to the amount of compensation paid to any person in violation of this Section. This regulation is waived if it is in conflict with Federal requirements.

40. LIST OF SUBCONTRACTORS’ CERTIFICATIONS

- A. Each bidder shall execute and submit with his bid, on the form provided herein, a list of subcontractors, including complete names and addresses, whose services the bidder intends to use in performing all work under the contract. Bids submitted without such a list, or with a list not completely or properly executed, are subject to rejection.
- B. Each bidder is required to notify all subcontractors that they are obligated to comply with the provisions of Federal and State law as they pertain to this project, and that they must submit evidence of such compliance upon notice or request. The bidder shall certify his compliance with this requirement on the list of subcontractors.

- C. After the contract has been awarded, the successful bidder shall not substitute another subcontractor for any subcontractor whose name was set forth on the list of subcontractors which accompanied his bid, without the written consent of the City.

41. GUARANTEE

The contractor hereby guarantees all work for a period of one year after the date of completion and final acceptance thereof by the City as follows:

- A. Against all faulty or imperfect materials and against all imperfect, careless, and/or unskilled workmanship.
- B. The Contractor agrees to replace with proper workmanship and materials, and to re-execute, correct or repair without cost to the City, any work which may be found to be improper or imperfect and/or which fails to perform as specified.
- C. The guarantee obligations assumed by the contractor under these contract documents shall not be held or taken to be in any way impaired because of the specifications, indication or approval by or on behalf of the City of any articles, materials, means, combination of things used or to be used in the construction, performance and completion of the work or any part thereof.
- D. No use or acceptance by the City of the work or any part thereof, nor any failure to use the same nor any repairs, adjustments, replacements, or corrections made by the City due to the contractor's failure to comply with any of his obligations under the contract documents, shall impair in any way the guarantee obligations assumed by the Contractor under these contract documents.

42. APPROVAL

The contractor shall receive approval in writing from the engineer before ordering any material for work to be done under this contract.

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

SCOPE OF WORK

1. SCOPE OF WORK

The project includes the construction and installation of two Calgon Model 12-40 resin-GAC units, a concrete slab foundation, sidewalks, concrete valve vault, wooden manifold enclosures, and new ductile iron water main piping. The project also includes the installation of a new sodium hypochlorite feed line and pump, electrical equipment, including lighting and unit heaters, wiring, controls, and SCADA monitoring for the manifold enclosures and resin/GAC systems. The Contractor shall include subconsultant services of Allied Control Systems for the integration of new controls equipment with SCADA.

The drawings and specifications further define the scope of work. The Contractor shall furnish all required equipment, materials, and labor necessary for completion of the work described herein.

2. LOCATION

The project is located at the South Wellfield Water Treatment Plant at 912 South Chapel Street.

3. PERMITS, CERTIFICATIONS, LAWS, AND ORDINANCES

The Contractor shall perform the work in accordance with all local, state, and federal laws and ordinances.

The Contractor is required to have or obtain a City contractor's license and State of Delaware business license prior to starting the work. The Contractor is required to obtain any permits required for completion of the work. The fees for City of Newark permits, if applicable, will be waived.

4. COORDINATION

- A. Contractor shall coordinate construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Contractor shall coordinate its operations with operations that depend on each other for proper installation, connection, and operation.
- B. Schedule construction operations in sequence required to obtain the best results where

installation of one part of the Work depends on installation of other components, before or after its own installation.

- C. Coordinate removal of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

5. SUBMITTALS

The Contractor shall submit an **electronic copy** of each submittal for review and approval by the Owner. Provide submittals in accordance with specifications. For scheduling purposes, the Contractor shall allow for a ten (10) business day review time by the Owner. Comments and Approvals will be returned in a digital format. The Contractor shall provide, at minimum, all submittals identified in the specifications. Each shop drawing shall contain only one work item and shall be consecutively numbered before submission. Additional submittals may be requested at the discretion of the Owner.

6. RESTORATION

The Contractor is responsible to restore all disturbed areas to original or better condition and remove all debris, residuals, trash, and excess materials from the sites.

7. SECURITY AND SITE ACCESS

The work area is on the City's private property. The Contractor is responsible to establish a laydown area and for the security of the equipment and materials related to the work. The laydown area must be approved by the City before construction activities can begin. The Contractor must provide sanitary facilities on site for the duration of the project. The Contractor is responsible for security of his equipment and materials related to the work. The Contractor is responsible for maintaining the work site in a safe and orderly manner.

Prior to mobilization, the Contractor shall take a pre-construction video or photographs of any such areas to be used for access, staging, or work during the project and submit to the Owner. Video or photographs shall be used to document any existing damage or deteriorated conditions.

It shall be the responsibility of the Contractor to obtain permission from any neighboring property owner if said Contractor finds it necessary to enter upon or use in any manner the property of any neighbor for the expedition of the Contractor's work.

8. WORK RESTRICTIONS

- Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- On-Site Work Hours: Limit work at the site to normal business working hours of 7:00 a.m.

to 5:00 p.m., Monday through Friday, unless otherwise indicated or approved by City of Newark.

- Any and all work within a DelDOT right-of-way shall be in accordance with DelDOT work restrictions and traffic control requirements which may require nighttime work activity inside the right-of-way when impacting the travel lanes.
- Weekend Hours: Weekend hours must be approved by the City. Contractor must submit request to work on weekends at least five (5) business days in advance of the projected work date.
- Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - Notify Owner not less than five (5) days in advance of proposed utility interruptions.
 - Obtain Owner's written permission before proceeding with utility interruptions.
- Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption with Owner.
 - A. Notify Owner not less than two (2) days in advance of proposed disruptive operations.
 - B. Obtain Owner's written permission before proceeding with disruptive operations.
- Controlled Substances: Use of tobacco products and other controlled substances on Project sites is not permitted. See Office of Management and Budget – Drug Testing Requirements for further information regarding controlled substances.
- Contractor shall have contaminant spill response equipment readily available on-site during construction activity.

9. SITE CONSTRUCTION AND EXISTING UTILITIES

- A. The Contractor is responsible to account for and consider existing site conditions and existing utilities. Prior to starting any work, the Contractor shall contact Miss Utility of Delmarva at 1-800-282-8555 or 811 for a utility mark out. The Contractor is responsible for locating and protecting existing utilities for the duration of the work.
- B. The failure to show on the contract drawings any existing utilities shall not relieve the contractor of his responsibility in determining the locations of utilities.
- C. Any damage done to existing utility lines, services, poles, and structures shall be repaired or replaced by the Contractor at his own expense. The Contractor shall notify all possible owners of utilities in the areas where work is to be done and the schedule and extent of such

work.

10. EXAMINATION OF SITE, DRAWINGS, ETC.

Before submitting proposals, bidders shall inform themselves fully of the nature of the work by a personal examination of the site and the drawings and by such other means as they may prefer or consider necessary, as to matters, conditions and considerations bearing on or in any way affecting the preparation of their proposals and the contract. They shall not, at any time after submission of the proposal, dispute the accuracy of such drawings or the specifications and the general conditions nor assert that there is any misunderstanding in regard to the location, extent or nature of the work to be performed.

11. STARTING DATE, SEQUENCE OF CONSTRUCTION & COMPLETION DEADLINE

The starting date of this contract will be as specified by the City in a written "Notice to Proceed." A preconstruction meeting shall be scheduled to finalize the sequence of construction. The final decision as to sequence of construction shall be that of the Owner.

12. SUPERVISION OF WORK AND COORDINATION

The Contractor shall supervise the work and shall secure full cooperation of all subcontractors, if any, to complete the work with a minimum interference from the operating personnel of the Owner.

13. COORDINATION WITH THE OWNER

The Contractor shall coordinate all activities with the City including, but not limited to, traffic control, requests for system shutdowns, and inspections. The Contractor shall provide the City with reasonable time to respond to requests for information and for coordination.

14. INSPECTION OF MATERIAL AND WORK

- A. Workmanship shall be of good quality and all work and material shall be at all times subject to the inspection of the City of Newark or their duly authorized representatives. The Contractor shall provide reasonable and necessary facilities for such inspection. If required by the City, the Contractor shall take down or uncover portions of the finished work.
- B. The Contractor agrees that in the event that any of the material or work, or both, shall be rejected as defective or unsuitable by the City, the material shall be replaced, and the work shall be done again immediately to the satisfaction and approval of the City at the cost and expense of the Contractor.
- C. Any omission or failure on the part of the City of Newark or its inspectors to disapprove or reject any defective work or materials shall not be construed to be acceptance of any defective work or material.
- D. Contractor and City Inspector must agree on additional work required outside of the

contract documents. A daily time and material log for all additional work shall be supplied by the Contractor and signed by the City Inspector.

15. PROTECTION TO PUBLIC AND PROPERTY

- A. The Contractor shall insure protective measures to the general public and to occupants of property along and adjacent to the work area.
- B. The Contractor is responsible for any and all damage or injury of any kind which directly or indirectly may be done to any property or sustained by any persons during the execution of the work.
- C. If any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the work, the contractor shall restore at his own expense such property to a condition similar or equal to that existing before such damage or injury was done by repairing, rebuilding or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

16. SAFETY PRECAUTIONS

- A. The Contractor shall execute work under this contract with the utmost concern for the safety of the general public. All areas worked upon and subject to travel by the public shall be identified with the proper warning indicators and signs during the working period. Upon completion of the contract or when such areas are reopened to public travel, they shall be rendered in a safe condition using either temporary or permanent repair material as the case may be. No private driveway shall be blocked or closed without the property owner being notified and obtaining their agreement.
- B. Streets, roads, and driveways used by the Contractor for access to and from the work site shall be protected from damage in excess of that caused by the normal traffic of vehicles used for or in connection with construction work. Any such damage done shall be repaired immediately and left in good condition at the end of the construction period and shall be repaired at the Contractor's expense.

17. RIGHT-OF-WAY

All operations shall be confined to the assigned work area. The City will provide no right-of-way over other properties. The Contractor shall take every precaution to minimize the inconvenience to the owners or tenants of adjacent property. Public roads shall not be obstructed in such a way as to cut off traffic. The Contractor shall, at his own expense, repair any damage or injury to either public or private property during the progress of the work.

18. TRAFFIC CONTROL AND ROAD SIGNS

- A. The Contractor shall be responsible for traffic control for the duration of the project, as needed, and shall coordinate traffic control plans and obtain necessary permits from the

Owner for work on city-owned roads. The Contractor shall be responsible for removal and re-installation of all signs in the work area. Signs necessary for the safe movement of traffic shall be maintained in operation during construction. Any other signs shall be properly stored by the Contractor, who shall be responsible for them. All signage shall comply with the current Manual on Uniform Traffic Control Devices (MUTCD).

- B. The Contractor shall provide notice to the City seven (7) calendar days in advance of any planned road or entrance closure. All closures shall be at the discretion of the City.

19. EXCAVATED MATERIAL

It shall be the responsibility of the Contractor to dispose of all excavated material which, in the opinion of the City, is unsatisfactory for backfill or fill. The cost of this disposal shall be borne by the Contractor.

20. DUST CONTROL/EROSION AND SEDIMENT CONTROL

It shall be the responsibility of the Contractor to handle dust control on this project and necessary erosion and sediment controls required by the City and State, including, but not limited to, compost filter socks. The City Inspector shall make the final determination on necessary measures.

21. WATER SUPPLY

The Contractor shall not use City fire hydrants without permission and advance notice. The Contractor shall schedule and perform work in a manner that minimizes disruption of water service to City of Newark customers. The Contractor shall not operate any water valves unless permission in writing is granted by the City.

22. JOB SITE MAINTENANCE, RESTORATION AND CLEANUP

The Contractor is responsible to restore all disturbed areas to original or better condition and remove all debris, residuals, trash, and excess materials from the site. The Contractor is required to keep the work area clean during construction and remove trash as it accumulates. Roads shall be kept clean and free of mud, debris, and dirt. At the direction of the City Inspector, the Contractor is responsible for the cost of street sweeping and maintenance required for upkeep of clean road surfaces.

23. PROJECT MEETINGS

Progress meetings shall be scheduled and held monthly during construction and shall be facilitated by the City or the City's representative.

24. DRAWINGS

Project Drawings are included as an attachment.

25. BID ITEMS

Bidders must provide prices on the Proposal form including all adjustment bid items. The Owner reserves the right to delete from the Contract one or more items listed and the right to add or subtract from the quantity of each item. The total price to be paid will be adjusted in accordance with the Contractor's unit prices as required below. There will be no extra compensation or increase in unit prices in the Proposal if such additions and/or deletions are made to quantities.

26. AS-BUILT DRAWINGS

The Contractor shall submit field sketch as-built plans of all installed items.

27. BASIS OF PAYMENT

Payment for these items shall be included in the unit prices for each item as described in the Proposal. All other items, methods, and materials necessary to complete the work as described below shall be incidental to the bid item the work is being completed under.

Application and Certification for Payment shall be made on proper AIA Documents.

28. METHOD OF MEASUREMENT AND INCIDENTALS DETERMINATION

Payment for the material furnished and work done under this contract will be made as stipulated herein for the amount of materials supplied and work done under authorization of the City and in accordance with actual measurements; and the Contractor shall not be entitled to receive additional compensation for anything else furnished or done, except for such extra work as shall be required by a written change order issued and approved by the City.

It is intended that all work shown on the contract drawings and included in the specifications is to be paid for under the items listed in the proposal form. The absence from the proposal form of bid items specifically described in the Standard Specifications or shown on the drawings shall be interpreted as meaning that the cost of such work contemplated by the contract documents shall be included in the prices bid for related items for which quantities have been established.

All work shall be paid based on the methods of Measurement and Payment Provisions in the Standard Specifications except as otherwise noted herein.

The item numbers referenced in this contract relate to the Construction Details outlined in

the Standard Specifications.

The Contractor shall prepare a monthly Application and Certification for Payment of the total amount of work completed on the contract. For the purpose of arriving at a basis for monthly payment, the Contractor shall submit an invoice for work performed during the preceding month, with a breakdown of the work performed and the unit prices for the various items included in the proposal.

In accordance with Title 29, Section 6962 of the Delaware Code, the City shall retain five percent (5%) of the funds to be paid to the Contractor during the contract until completion and final acceptance of all work by the City.

Unless otherwise specifically specified herein, the measurement of payment shall be for the installation of the materials listed in the proposal in accordance with the unit described as Each (EA), Linear Foot (LF), Square Yard (SY), Ton (TN), etc. All incidental work and costs associated with the Bid Item shall be included in the Contractor's unit price for each bid item.

Bid Item Descriptions:

1. Mobilization/Demobilization: This lump sum bid item includes, but is not limited to, bonding, insurance, shop drawings, meetings, construction stakeout, pre-construction video, utility locating, staging, movement of equipment, site maintenance, erosion and sedimentation pollution controls including but not limited to compost filter sock, site clean-up, replacement of any damaged property, and as-built plans. The Contractor shall provide redline plan markups, including as-built rim and invert elevations. Payment will be scheduled as follows: fifty (50) percent upon issuance of Notice to Proceed and the balance upon completion of the project.
2. Remove Existing Tree: Price and payment shall be full compensation for furnish, setup, and removal of trees for preparation of the site, including disposal, excavation, and shoring. This item is measured and paid per each tree removed.
3. Modify Existing Monitoring Well: Price and payment shall be full compensation to modify the existing monitoring well as per the contract drawings, including furnishing and installing a protective casing, well monitoring manhole, penetration reinforcement, and all other appurtenant labor, work, supervision, tools, equipment, materials, and all other items incidental thereto. This item is measured as a lump sum.
4. Miscellaneous Excavation and Backfill: Price and payment shall be full compensation for furnishing all labor, equipment, unclassified excavation, protection of existing utilities, provision of GABC or AASHTO #57 stone, backfill, compaction, sheeting and shoring, dewatering, disposal of all excess excavated materials, and all other appurtenant labor, work, supervision, tools, equipment, materials, and all other items incidental thereto beyond the contract depths and limits as directed by the Engineer and not paid under

other bid items. This item is measured per cubic yard.

5. Concrete Slab Foundation for Resin-GAC Tanks: The lump sum cost for this bid item includes, but is not limited to, unclassified excavation and backfill, stone base, cast-in-place concrete slab, reinforcing, pipe and conduit penetrations, forming, finishing, and protection of the concrete, compaction, installing control, expansion, and contraction joints, testing, disposal of all excess excavated materials, and any other measures required to complete all of the work identified on the project plans and specifications.
6. Install Calgon Resin-GAC Tanks: The lump sum cost for this bid item includes, but is not limited to, off-loading, placement, and anchoring of the tanks on the concrete slab as per the contract drawings and Calgon requirements along with any other measures required to complete all of the work identified on the project plans and specifications for complete installation for active operation.
7. Concrete Valve Vault: The lump sum cost for this bid item includes, but is not limited to, unclassified excavation and backfill, sheeting and shoring, dewatering, stone base, cast-in-place concrete, reinforcing, pipe and conduit penetrations, wall sleeves and Link-Seals, forming, finishing, and protection of the concrete, compaction, testing, interior epoxy coating, aluminum access hatch, safety ladder and ladder safety post, pipe support, sump pump and sump pump piping, disposal of all excess excavated materials, and any other measures required to complete all of the work identified on the project plans and specifications.
8. Construct Manifold Enclosure: Price and payment shall be full compensation for furnishing and installation of manifold enclosures, including structure, heating, lighting, and other electrical components. This item is measured and paid per each manifold enclosure installed.
9. Concrete Sidewalk: Price and payment shall be full compensation for furnishing and installing new concrete sidewalk and replacement sidewalk, including unclassified excavation and backfill, sawcutting and removal of existing concrete for replacement location, furnishing and installing all materials in sidewalk section (6" concrete, 4" AASHTO #57 stone), forming, finishing, and protection of the concrete, compaction, installing control, expansion, and contraction joints, disposal of all excess excavated materials, and all other appurtenant labor, work, supervision, tools, equipment, materials, and all other items incidental thereto. This item is measured and paid per square yard of sidewalk installed.
10. 8" DI Water Main Pipe: Price and payment shall be full compensation for furnishing and installing water main pipe, including fittings, reducers, elbows, blind flanges, and tees, existing pipe demolition and disposal, unclassified excavation, sheeting and shoring, dewatering, provision of aggregate pipe bedding and backfill, compaction, testing, disinfection, disposal of excavated and excess materials, and other appurtenances. This

item is measured and paid per linear foot of pipe installed.

11. 4" DI Water Main Pipe: Price and payment shall be full compensation for furnishing and installing water main pipe, including fittings, reducers, elbows, blind flanges, and tees, existing pipe demolition and disposal, unclassified excavation, sheeting and shoring, dewatering, provision of aggregate pipe bedding and backfill, compaction, testing, disinfection, disposal of excavated and excess materials, and other appurtenances. This item is measured and paid per linear foot of pipe installed.
12. 8" DI Class 150 Check Valve: Price and payment shall be full compensation for furnishing and installing water main check valve complete in place including testing, disinfection, disposal of excavated and excess materials, connection to piping, and other appurtenances. This item is measured and paid per each valve assembly installed.
13. 8" DI Class 150 Gate Valve: Price and payment shall be full compensation for furnishing and installing water main gate valve complete in place including testing, disinfection, disposal of excavated and excess materials, connection to piping, and other appurtenances. This item is measured and paid per each valve assembly installed.
14. 4" DI Class 150 Gate Valve & Valve Box: Price and payment shall be full compensation for furnishing and installing water main check valve and valve box complete in place including unclassified excavation, sheeting and shoring, dewatering, provision of aggregate pipe bedding and backfill, compaction, testing, disinfection, disposal of excavated and excess materials, connection to piping, and other appurtenances. This item is measured and paid per each gate valve and valve box assembly installed.
15. 8" Butterfly Valve w/ Valve Stem Extension & Beck Actuator: Price and payment shall be full compensation for furnishing and installing water main butterfly valve with valve stem extension and beck actuator complete in place including testing, disinfection, disposal of excavated and excess materials, connection to piping, controls, and other appurtenances. This item is measured and paid per each valve assembly installed.
16. Connect to Existing 16" Water Main: Price and payment shall be full compensation for furnishing and installation of all fittings, reducers, labor, and materials required for connection to the existing water main as required to construct a watertight connection between the existing pipe and proposed pipe, including existing pipe demolition and disposal, unclassified excavation, sheeting and shoring, dewatering, two 16" x 8" DI reducers, provision of aggregate pipe bedding and backfill, compaction, testing, disinfection, disposal of excavated and excess materials, dewatering of the existing water main, and other appurtenances. This item is measured as a lump sum.
17. 4" Cam-Lock Connection Fitting: Price and payment shall be full compensation for furnishing and installing cam lock complete in place including connection to piping and other appurtenances. This item is measured and paid per each cam-lock connection fitting

installed.

18. 3/4" Sample Tap: Price and payment shall be full compensation for furnishing and installing stainless steel sample tap complete in place including connection to piping and other appurtenances. This item is measured and paid per each sample tap installed.
19. Shallow Backwash Manhole: Price and payment shall be full compensation for furnishing and installing backwash connection precast concrete shallow manhole complete in place including unclassified excavation, sheeting and shoring, dewatering, provision of aggregate base and backfill, compaction, manhole, frame, cover, vacuum testing, disposal of excavated and excess materials, connection of piping, and other appurtenances. This item is measured and paid per each shallow manhole assembly installed.
20. Plant Thuja Plicata "Green Giant" Tree: Price and payment shall be full compensation for furnishing and installing new trees as per the contract drawings. This item is measured and paid per each tree installed.
21. Install New NaOCl Feed Piping & Blue-White Pro-Series M3 NaOCl Pump w/ Tuffskid Frame: The lump sum cost for this bid item includes, but is not limited to, furnishing and installation of feed piping, pump and pump skid, connections and modifications to existing feed piping, electrical connection, controls, and any other measures required to complete all of the work identified on the project plans and specifications.
22. Electrical Installation: The lump sum cost for this bid item includes all electrical materials, installation, equipment, and services as detailed in the contract specifications and project plans, including power and controls wiring and conduit to the GAC system, actuators, chemical feed pumps, existing panels, etc.
23. Controls Installation: The lump sum cost for all system integrator materials, SCADA, equipment, and services, as detailed in the contract specifications and project plans shall be furnished by the Contractor through the City's approved vendor Allied Control Services, Inc. The price for this item is as provided based on the attached proposal from ACS received by the City.
24. 2" Mill and Overlay Existing Asphalt Driveway: This bid item includes milling and overlaying the existing asphalt driveway if directed and approved in advance by the Engineer or Owner for restoration at the completion of construction, including milling and disposal of existing asphalt for 2" depth, paving with 2" Type C hot mix in accordance with DelDOT Construction Specifications, tack coat, sealing, compaction, and all appurtenant labor, work, supervision, tools, equipment, materials, and all other items incidental thereto. This item is measured and paid per square yard of asphalt driveway that is milled and overlaid. Any pavement damage beyond the limits for this bid item that are specified on the contract drawings shall be the responsibility of the Contractor to repair at their own risk.

25. Site Restoration: This bid item includes, but is not limited to, re-grading and restoration of grade, lawn, other site features, and any other measures required to complete all of the work identified on the project plans and specifications. This item is measured and paid as a lump sum for completed restoration.

29. AVAILABLE BACKGROUND INFORMATION

Maps, photographs, and other documents provided herein form a part of this Bid Specification to the extent referenced and provide detailed information about the Project Location, and existing conditions of the site(s). The documentation is provided for informational purposes only and for the sole use of the Contractor. The City makes no claims as to the correctness or accuracy of the data provided therein. The Contractor shall review and determine for themselves the correctness and accuracy of the information before incorporating and relying on the prior work as part of their work product to the City.

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

PROPOSAL

To: The Mayor and City Council
Newark, Delaware

From: _____

The undersigned as a lawfully authorized agent for the below named bidder has carefully examined the Bid Documents to be known as Contract No. 23-08 and binds himself on award to him by the Mayor and City Council of Newark, Delaware to execute in accordance with such award, a contract of which this Proposal and said General Provisions and Specifications and any Addenda shall be a part, and to furnish the goods as specified F.O.B. Newark, Delaware in a manner that is in complete accordance with said General Provisions and Specifications at the following named unit price on or before the delivery period stated below:

BID ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL
1	Mobilization/Demobilization	LS	1		
2	Remove Existing Tree	EA	3		
3	Modify Existing Monitoring Well	LS	1		
4	Miscellaneous Excavation and Backfill	CY	50		
5	Concrete Slab Foundation for Resin-GAC Tanks	LS	1		
6	Install Calgon Resin-GAC Tanks	LS	1		
7	Concrete Valve Vault	LS	1		
8	Construct Manifold Enclosure	EA	2		
9	Concrete Sidewalk	SY	69		
10	8" DI Water Main Pipe	LF	270		
11	4" DI Water Main Pipe	LF	20		
12	8" DI Class 150 Check Valve	EA	2		
13	8" DI Class 150 Gate Valve	EA	2		
14	4" DI Class 150 Gate Valve & Valve Box	EA	1		
15	8" Butterfly Valve w/ Valve Stem Extension & Beck Actuator	EA	3		
16	Connect to Existing 16" Water Main	LS	1		
17	4" Cam-Lock Connection Fitting	EA	2		
18	3/4" Sample Tap	EA	4		

19	Shallow Backwash Manhole	EA	1		
20	Plant Thuja Plicata "Green Giant" Tree	EA	16		
21	Install New NaOCl Feed Piping & Blue-White Pro-Series M3 NaOCl Pump w/ Tuffskid Skid Frame	LS	1		
22	Electrical Installation	LS	1		
23	Controls Installation	LS	1		\$85,750.00
24	2" Mill and Overlay Existing Asphalt Driveway	SY	295		
25	Site Restoration	LS	1		
<u>TOTAL BID</u>					\$

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

PROPOSAL (CONT.)

We acknowledge that we **are/are not (circle one)** registered on www.sam.gov. We also acknowledge that there are no exceptions noted against us as outlined on www.sam.gov.

Our unique entity identifier (UEI), as outlined on www.sam.gov is (write N/A if none): _____

We acknowledge receipt of addendum(a) numbers: _____

Exceptions: _____

Contact Information for Notice of Award/Rejection (If different from below): _____

Project to be Completed by _____

BIDDER: _____

DATE: _____

SUBMITTED BY:

Legally Authorized Representative Signature

Print Name

Title

Address Line 1

Email Address

Address Line 2

Telephone Number

City, State, ZIP Code

CITY OF NEWARK
Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

BOND TO ACCOMPANY PROPOSAL

(Not Necessary if Certified or Cashier's Check is Used)

KNOW ALL MEN BY THESE PRESENTS THAT _____ of _____
_____ in the County of _____ and State of _____
_____ Principal, and _____ of _____
_____ as surety, legally authorized to do business in the
State of Delaware, are held and firmly bound unto the City of Newark in the sum of _____
_____ Dollars, to be paid to said City of Newark for use and benefit
of the Mayor and Council of Newark, for which payment well and truly to be made, we do bind
ourselves, our and each of our heirs, executors, administrators and successors, jointly and severally,
for and in the whole, firmly by these presents. Sealed with our seals, dated the _____ day of _____
_____ in the year of our Lord, two thousand and twenty-three (2023).

NOW THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that if the above bound principal _____
_____ who has submitted to said City of Newark, a certain proposal to
enter into a certain Contract No. 23-08, SOUTH WELLFIELD RESIN-GAC SYSTEM, shall be awarded
said Contract, and if said _____ shall well
and truly enter into and execute said contract and furnish therewith such surety bond or bonds
as may be required by the terms of said contract and approved by said City of Newark, said

contract, and said bond to be entered into within twenty (20) days after the date of official notice of award thereof in accordance with the terms of said proposal, then this obligation to be void, otherwise shall remain in full force and virtue.

SIGNED AND SEALED IN
THE PRESENCE OF
WITNESS:

SIGNED: _____(SEAL)

BY: _____(SEAL)

SIGNED: _____(SEAL)

BY: _____(SEAL)

CITY OF NEWARK

Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

NON-COLLUSION STATEMENT

Date: _____

City of Newark
Newark, Delaware

This is to certify that the undersigned bidder _____
has not, either directly or indirectly entered into any agreement, participated in any collusion, or
otherwise taken any action in restraint of free competitive bidding in connection with this proposal
submitted to the City of Newark on the _____ day of _____, 20__.

Signature of Bidder: _____

By: _____
Its legally authorized representative

Sworn to and subscribed before me on this _____ day of _____ 20__.

My Commission expires _____

Notary Public

CITY OF NEWARK

Delaware

CONTRACT NO. 23-08

SOUTH WELLFIELD RESIN-GAC SYSTEM

EQUAL OPPORTUNITY AFFIDAVIT

CERTIFICATION REGARDING COMPLIANCE WITH EQUAL OPPORTUNITY REQUIREMENTS

The undersigned Bidder _____ (has, has not) previously performed work subject to the Presidents Executive Order Nos. 10925, 11114 or 11246.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS

FOR CERTIFICATION OF NON-SEGREGATED FACILITIES

A certification of Non-Segregated Facilities, as required by the May 9, 1967 order (32 F.R. 7439, May 19, 1967), on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$10,000, which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semi-annually, or annually).

NOTE: The penalty for making false statements in orders is prescribed in 18 U.S.C. 10001.

Date: _____

Signature of Bidder or Prospective Contractor

Address (Including Zip Code)

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END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 2. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 3. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Owner's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

corrections or revisions to submittals noted by Owner and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Owner's final release or approval.
 - g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Owner's Digital Data Files: Electronic digital data files of the Contract Drawings will **not** be provided by Owner for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 7 days for review of each resubmittal.
- D. Paper submittals will not be accepted.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-06 10 00.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Name and address of Owner.
 - f. Name of Contractor.
 - g. Name of firm or entity that prepared submittal.
 - h. Names of subcontractor, manufacturer, and supplier.
 - i. Category and type of submittal.
 - j. Submittal purpose and description.
 - k. Specification Section number and title.
 - l. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - m. Drawing number and detail references, as appropriate.
 - n. Indication of full or partial submittal.
 - o. Transmittal number; numbered consecutively.

- p. Submittal and transmittal distribution record.
 - q. Remarks.
 - r. Signature of transmitter.
 - s. Other necessary identification.
 - t. Remarks.
- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Owner.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Owner's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files.

- a. Owner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Action Submittals: Submit copy of each submittal unless otherwise indicated. Owner will return annotated file.
 3. Informational Submittals: Submit copy of each submittal unless otherwise indicated. Owner will not return the copy.
 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on electronic sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
 3. Submit Shop Drawings as PDF electronic file only.
- C. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.
- E. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- F. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- G. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- H. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- I. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- J. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- K. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S ACTION

- A. Action Submittals: Owner will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:
 - 1. If a submittal is acceptable, it will be marked "No Exceptions." Two copies of the submittal will be returned to Contractor. Upon return of a submittal marked "No Exceptions Taken," Contractor may order, ship, or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.

2. If a shop drawing is marked "Exceptions as Noted," corrections to drawings are required. The Contractor is required to make the corrections indicated. The Contractor may order, ship, or fabricate the materials included on the submittal.
3. If a submittal is unacceptable, a copy will be returned to Contractor noted "Revise and Resubmit".
 - a. The "Revise and Resubmit" notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, Contractor shall repeat the initial approval procedure utilizing acceptable material or equipment.
- B. Informational Submittals: Owner will review each submittal and will not return it or will return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Owner without action.

END OF SECTION

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and control services required by Owner or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Owner for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- E. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- F. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Owner.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 78 23 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Owner will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 14 days before commencing demonstration and training. Owner will return copy with comments.
1. Correct or revise each manual to comply with Owner's comments. Submit copies of each corrected manual within 7 days of receipt of Owner's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Names and contact information for major consultants that designed the systems contained in the manuals.
 7. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

- b. If drawings are too large to be used as foldouts, fold, and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

END OF SECTION

SECTION 01 78 39 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit 2 set(s) of marked-up record prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of structures.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Change Directive.
 - k. Changes made following Owner's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Owner.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as annotated PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Owner's reference during normal working hours.

END OF SECTION

SECTION 01 79 00 – DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

- B. Scheduling: Provide instruction at mutually agreed on times.
 - 1. Schedule training with Owner/Calgon with at least 7 days' advance notice.
- C. Conduct training on-site Conduct training using final operation and maintenance data submittals.

END OF SECTION

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings, vault walls and top slab, and sidewalks.
 - 2. Slabs-on-grade.
 - 3. Equipment foundations.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Engineer.
- D. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.

4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Curing compounds.
 7. Waterstops.
 8. Floor and slab treatments.
 9. Bonding agents.
 10. Adhesives.
 11. Semirigid joint filler.
 12. Joint-filler strips.
 13. Repair materials.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 318, "Building Code Requirements for Structural Concrete and Commentary."
 2. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete:
1. Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish panel sizes that create the least number of joints.

2. Plywood, metal, or other approved panel materials.
3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form-Release Agent
 1. Commercially formulated form-release agent that will not bond with, stain, and adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 2. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties
 1. Factory-fabricated, removable, or snap-off metal or glass-fiber-reinforced plastic form ties that resist lateral pressure of fresh concrete on forms and prevent spalling of concrete on removal.
 2. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 3. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from deformed bars, assembled with clips.
- D. Plain-Steel Wire: ASTM A82/A82M, as drawn.
- E. Deformed-Steel Wire: ASTM A496/A496M.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I
- B. Normal-Weight Aggregates
 - 1. ASTM C33, Class 3S coarse aggregate or better, graded.
 - 2. Provide aggregates from a single source with documented service record data of no less than 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 3. Coarse-Aggregate Size: No greater than 1-1/2 inches nominal, comply with recommendations in ACI 350 for Environmental Structures.
 - 4. Fine Aggregate: free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Westec.
 - b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - d. Vinylex Corp.
 - e. BoMetals, Inc.
- 2. Profile: flat, ribbed with center bulb, dumbbell with center bulb.
 - 3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, humid curing, and that bonds to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.8 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C109/C109M

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Combined Fly Ash and Pozzolan: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, Slabs-on Grade, Vault, and Sidewalks: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4,500 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus and minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 - 5. Air Content: 6 percent, plus and minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116 and furnish batch ticket information.
 - 1. When air temperature is between 85°F and 90°F (30°C and 32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 350 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, and recesses for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50°F for 24 hours after placing concrete. Ensure concrete is hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, and otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened and partially hardened concrete surfaces.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened and partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at no less than 1/4 of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at each slab junction with vertical surfaces. For example, at column pedestals, foundation walls, and grade beams.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch and not more than 1 inch below finished concrete surface where joint sealants are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Lace or clip sections together when more than one length is required.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat 1/2 of dowel length to prevent concrete bonding to one side of joint.

3.6 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage and reduced strength caused by frost, freezing actions, and low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 degrees Fahrenheit for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials and materials containing ice and snow. Do not place concrete on frozen subgrade and on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, and other materials containing antifreeze agents and chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90°F (32°C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

3.9 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in honeycombs, holes, and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling and required to complete the Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
 - 1. Install new tanks on concrete slab on grade 7 days after concrete has been placed and obtained a concrete minimum compressive strength of 3,000 psi.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

- B. Formed Surfaces: Cure formed concrete surfaces, underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

3.11 CUTTING, PATCHING, AND REPAIR OF CONCRETE SURFACES

- A. Concrete repairs shall be provided where shown on the drawings in addition to areas referred to in this section and shall be in accordance with the drawings and these specifications.
- B. Defective area in concrete surfaces shall be repaired immediately after removal of forms as specified herein or directed by the Resident Engineer.
- C. Cut out honeycomb, rock pockets, voids of 1/4" in any dimension, and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with approved bonding agent. Place patching mortar after bonding compound has dried.
- D. Surfaces exposed to view shall be repaired with a blend of white Portland cement and standard Portland cement so that, when dry, patching mortar will match the color surrounding. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- E. Formed surfaces not exposed to view shall be repaired by removing and replacing concrete having defective surfaces if defects cannot be repaired to the satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surfaces; and stains and other discolorations that cannot be removed by cleaning.
- F. Unformed surfaces that contain defects which affect the durability of concrete shall be repaired. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions shall be repaired.

- G. High areas in unformed surfaces shall be corrected by grinding, after concrete has cured at least 14 days.
- H. Low areas in unformed surfaces shall be corrected during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds shall be approved by the Resident Engineer prior to application.
- I. Other defective areas, except random cracks and single holes not exceeding 1-inch diameter shall be repaired, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all round. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- J. Use epoxy-based mortar or epoxy modified concrete for structural repairs, where directed by Resident Engineer. Epoxy modifier for mortar and concrete must be approved by the Resident Engineer prior to use.
- K. Repair methods not specified above may be used, subject to acceptance by Resident Engineer.

3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. The Owner's qualified testing and inspection firm shall make test cylinders in accordance with the requirements of the "Methods of Making and Curing Concrete Compression and Flexure Test Specimens in the Field" ASTM Designation C31, latest edition. The tests shall be performed by the qualified testing and inspection firm in accordance with the requirements of the Standard Method of Test for Compressive Strength of Molded Concrete Cylinders, ASTM Designation C39. Test cylinders shall be made at intervals spaced to provide a representative sampling of the entire pour. Two specimens shall be tested at seven days, two specimens tested at 28 days, and one specimen shall be retained in reserve for later testing, if required.
- C. Contractor shall provide proper storage area for initial curing of test cylinders.
- D. Every delivery of concrete to the job site must be accompanied by a certificate showing weights of materials, type and quantity of admixtures and date and time of loading.
- E. The qualified testing and inspection firm will perform the following sampling and testing of fresh concrete in accordance with ASTM C172/C172M at the Contractor's expense:
 - 1. Slump: ASTM C143/C143M; one test at point of placement for each set of concrete cylinders, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. Slump measurement shall be recorded for each set of concrete cylinders as indicated in Section 3.7.1.5.

2. Air Content: ASTM C231/C231 M; pressure method for normal weight concrete; one test shall be made for each set of concrete cylinders, but not less than one test for each day's pour of each concrete mixture.
 3. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40°F and below and 80°F and above; one test for each set of concrete cylinders.
Admixtures: Note all admixtures used in test samples in submitted reports.
- F. Reinforcing material shall be properly identified and supplied with two copies of mill certification. If mill certifications are not provided the Contractor shall pay for the testing of the reinforcement.
- G. Reinforcing steel failing to meet the requirements of the following specifications shall be rejected and removed from the site. No steel shall be used for reinforcing until satisfactory test reports on such steel are received by the Engineer.
- H. The Contractor shall allow the Owner's testing and inspection firm free access to material stockpiles and work areas. Tests not specifically indicated, including retesting of rejected materials and installed work shall be done in accordance with the Resident Engineer's instructions at the Contractor's expense.

END OF SECTION

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
 - 3. Plywood backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Expansion anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- B. Application: Treat items indicated on Drawings, and the following:
 1. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with concrete.
 2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. All Framing: No. 2 grade.
 1. Application: Framing other than interior partitions not indicated as load-bearing.
 2. Species:
 - a. Spruce-pine-fir; NLGA.
 - b. Douglas fir-larch; WCLIB or WWPA.
 - c. Southern pine; SPIB.
 - d. Douglas fir-south; WWPA.
 - e. Hem-fir; WCLIB or WWPA.
 - f. Douglas fir-larch (north); NLGA.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Furring.
 4. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

END OF SECTION

SECTION 07 21 00 – BUILDING INSULATION

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 this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Extruded polystyrene foam-plastic board
 - 2. Concealed building insulation.

1.3 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per “Erosion Test” and “Mold Growth and Humidity Test” described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
 - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
 - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 - 1. Manufacturers:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.

- c. Owens Corning.
 - d. Pactiv Building Products Division.
- 2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

2.3 AUXILIARY INSULATING MATERIALS

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive or mastic to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
- D. Install foam-plastic board insulation sheathing substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 2. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
 3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- E. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 31 13 – ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphalt shingles.
 - 2. Underlayment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and blend specified.
- C. Product test reports.
- D. Research/evaluation reports.
- E. Maintenance data.
- F. Warranties: Sample of special warranties.

1.3 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
 - 1. Material Warranty Period: 15 years from date of Substantial Completion, prorated, with first three years non-prorated.
 - 2. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LAMINATED FIBERGLASS ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide TAMKO Roofing Products, Inc.; Heritage Weathered Wood, or comparable product by one of the following:
 - a. Atlas Roofing Corporation.
 - b. CertainTeed Corporation.
 - c. GAF Materials Corporation.
 - d. IKO.
 2. Algae Resistance: Granules treated to resist algae discoloration.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 4869, Type I, asphalt-saturated organic felts, nonperforated.

2.3 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Vent, Inc.; a Gibraltar Industries company.
 - b. Cor-A-Vent, Inc.
 - c. GAF Materials Corporation.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.5 METAL FLASHING AND TRIM

- A. General:
 - 1. Sheet Metal: Aluminum, mill finished.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
- C. Double-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Install a 19-inch-wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
 - 1. Install fasteners at no more than 36-inch o.c.

3.2 METAL FLASHING INSTALLATION

- A. General: Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

3.3 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.

- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
 - 1. When ambient temperature during installation is below 50°F, seal asphalt shingles with asphalt roofing cement spots.

END OF SECTION

SECTION 07 46 46 – FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiber-cement siding.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.

1.2 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Fiber-cement siding.
- B. Product Data Submittals: For each type of fiber-cement siding, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Samples for Initial Selection: For fiber-cement siding, including related accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fiber-cement siding.
- B. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of fiber-cement siding, including related accessories, to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

- A. Fiber-Cement Siding: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Building Products, Inc.; HardiePlank® Lap Siding or comparable product.
- B. Labeling: Provide fiber-cement siding that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Vertical Pattern: 48-inch- wide sheets with wood-grain texture and grooves **8 inches** o.c.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps,

and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
1. Corner posts.
 2. Door and window casings.
 3. Fasciae.
 4. Moldings and trim.
- C. Flashing: Provide aluminum flashing at wall openings and door heads and where indicated.
1. Finish for Aluminum Flashing: Same as siding.
- D. Fasteners:
1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
 3. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 1. Do not install damaged components.
 2. Install fasteners no more than 16 inches o.c.

- B. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 92 00 – JOINT SEALANTS

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 this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the applications indicated in the Joint-Sealant Schedule at the end of Part 3, and the following applications:
 - 1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between different materials listed above.
 - c. Perimeter joints between materials listed above and frames of doors.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- G. Field Test Report Log: For each elastomeric sealant application.
- H. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
 2. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Engineer seven days in advance of dates and times when test joints will be erected.

- E. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet or dirty.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

PART 2 - PRODUCTS

2.1 SEALANTS

- A. Type A Sealant:
 - 1. Manufacturers:
 - a. Euclid Chemical Company "Eucolastic II – Pourable".
 - b. Mameco International "Vulkem 245".
 - c. Sika Corp. "Sikaflex 2C-SL".
 - d. Sonneborn Building Products "Sonolastic Paving Joint Sealant".
 - e. Substitution under provisions of Division 1.

B. Type B Sealant:

1. Manufacturers:
 - a. Euclid Chemical Company "Eucolastic I or II – Gun Grade".
 - b. Mameco International "Vulkem 921 or 922".
 - c. Pecora Corp. "Dynaflex".
 - d. Sika Corp. "Sikaflex 1A or 2C-NS".
 - e. Sonneborn Building Products "Sonolastic NP I or NP II".
 - f. Tremco "Dymonic or Dymeric".
 - g. Substitution under provisions of Division 1.
2. Single or multiple component, non-sag, polyurethane-based sealant conforming to ASTM C 920, Type S or M, Grade NS, Class 25.

C. Type C Sealant:

1. Manufacturers:
 - a. Adco Seal "No. B-100".
 - b. Pecora Corp. "BC-158".
 - c. PTI Sealants "No. 707".
 - d. Tremco "Butyl Sealant".
 - e. Substitution under provisions of Division 1.
2. Butyl rubber-based sealant conforming to ASTM C920, Type S, Grade NS, Class 7.5.

D. Type D Sealant:

1. Manufacturers:
 - a. Pecora Corp. "AC-20".
 - b. Sonneborn Building Products "Sonolac".
 - c. Tremco "Acrylic Latex Caulk".
 - d. Substitution under provisions of Division 1.
2. Latex acrylic-based sealant conforming to ASTM C834.
3. Low-modulus silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 50.

E. Type F Sealant:

1. Manufacturers:
 - a. Sika Chemical Corp. "51NS".
 - b. Substitution under provisions of Division 1.
2. Flexiblized Epoxy Sealant: ASTM D 2240 Shore A hardness, 75 minimum; ASTM D732 shear strength, minimum 800 psi at 14 days; ASTM C82 bond strength, 800 psi minimum.

G. Type G (Acoustical) Sealant:

1. Tape:

a. Manufacturers:

- 1) Norton Co. "Norseal V30 Series".
- 2) Arlon "Series 6A".
- 3) Substitution under provisions of Division 1.

- b. Polyvinyl chloride foam tape with pressure-sensitive adhesive on one side, 3/4-inch wide by the thickness required to accommodate unevenness of substrate and completely fill openings between partition framing and building floors and concrete or masonry walls.

2. Compound:

a. Manufacturers:

- 1) Ohio Sealants "Sound Caulk (solvent type)".
- 2) Pecora Corp. "BA-98".
- 3) Tremco "Acoustical Sealant".
- 4) Substitution under provisions of Division 1.

- b. Permanently resilient type manufactured specifically for acoustical applications.

2.2 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean, porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

- a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Tapes: Install according to manufacturer's written instructions.
- H. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform two (2) tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
 2. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type

of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

- b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
- 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 - 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 SCHEDULE

- A. Type A
 - 1. Joint in concrete floors, and paved surfaces subject to foot traffic.
- B. Type B
 - 1. Exterior and interior vertical joints in concrete, except as otherwise specified.
 - 2. Around metal door, window and louver vents frames penetrating exterior concrete.

3. Do not use single-component sealants when excessive movement is expected within the curing time of the sealant.

C. Type C

1. Interior wall penetrations for pipe and conduit that will be concealed by escutcheons and other trim and plate, and for lap joints in sheet metal.

D. Type D

1. Joints, voids and penetrations not otherwise specified for interior surfaces exposed to view and requiring painting.
2. Bedding of fixtures, partitions, equipment and accessories fastened to walls and floors, flanges and escutcheons of items penetrating surfaces in areas requiring sanitary conditions to eliminate any open joints between contact surface.

E. Type F

1. Construction joints, window and hollow metal frame perimeters, furnishings and equipment at wall, ceiling, and floor surfaces adjacent to concrete.

F. Type G

1. Perimeter joints around sound-retardant partitions and electrical boxes and other penetrations in such partitions.

END OF SECTION

SECTION 08 22 00 – FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. General Conditions, Supplementary Conditions and Division 1 Sections apply to this work.
2. Section 08 71 00 – Door Hardware.

1.2 SUMMARY

- A. Section Includes:
 1. Fiberglass reinforced plastic doors and frames.
- B. Related Requirements:
 1. Attached drawings.

1.3 SUBMITTALS

1. Submit shop drawings and product data under provisions of Section 01 33 00.
2. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, and finish.
3. Indicate door elevations and internal reinforcement.
4. Submit manufacturer's product literature, fabrication descriptions and installation instructions under provisions of Section 01 33 00.

1.4 DELIVERY, STORAGE AND PROTECTION

1. Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage. Doors shall not be received before the building is enclosed. Only remove cartons upon arrival of doors at job site if cartons are wet or damaged. Doors shall be stored out of weather and/or extreme temperatures. The doors shall be stored in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors. All damaged or otherwise unsuitable doors and frames, when so ascertained, shall be immediately removed from the job site.

1.5 REGULATORY REQUIREMENTS

1. Fire-rated door and panel construction conforms to products tested under ASTM E152, UL10B & NFPA 252.
2. Install door and panel assembly conforming to NFPA 80 for fire-rated class, ANSI A117.1 specifications for handicap accessibility, ADA requirements, ANSI A151.1 Mod. swing cycle test in excess of 1,000,000 cycles.
3. Flame Spread: All FRP component parts, including the gelcoat finish, shall have a flame spread classification of 25 or less per ASTM E84 and shall be self-extinguishing per ASTM D635 unless operating conditions dictate otherwise.
4. Resins: Resins to meet with USDA and FDA standards for incidental food contact, if applicable to this project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Products manufactured by the following companies complying with these specifications will be acceptable: CORRIM Company, Oshkosh, Wisconsin 54901. Telephone (920) 231-2000. Fax (920) 231-2238.
- B. Products manufactured that have successfully completed ANSI A151.1 Mod. Swing Cycle test in excess of 1,000,000 cycles, with no failure of any design features of the door.

2.2 DOORS

- A. Door Fabrication FRP (Fiberglass Reinforced Plastic) Face Sheets
 1. Face Sheets: Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 40% by weight.
 2. Face sheets shall be 0.070" to 0.125" in thickness. Standard being 0.120". Total door thickness to be a nominal 1-3/4".
 3. Finish:
 - a. Standard gelcoat color to be gray or white.
 - b. Special gelcoat color to be selected by the architect.
 - c. 15 mils thick coverage, ± 3 mils.
 - d. Smooth, seamless finish.
- B. Internal Construction
 1. Core:
Option A: Balsa Core
Core: Balsa core, of end grain construction, shall be laminated to the interior of the

panels. The balsa shall have a density of 8.5 - 9.0 lbs./cu. ft. and shall be 1-1/2" thick. Compressive strength, perpendicular to the door panel surface shall be 1,400 psi.

2. Stiles and Rails: Stiles and rails shall be 1-1/2" square pultruded fiberglass tubes. A polyester-based resin filled with 1/4" chopped glass strands and aerosil shall be used for reinforcements and corner blocks, etc. The bottom rail shall allow 1-1/4" inches of height alterability without loss of the panel's integrity. No metal or wood lumber reinforcements will be allowed.

C. Hardware Preparations

1. Reinforcement Blocking:
 - a. Lockset – non-swelling polymer blocking.
 - b. Surface mounted hardware – non-swelling polymer blocking.
 - c. Thru-bolted hardware – non-swelling polymer blocking.
2. Mortise Hardware:
 - a. Full mortise hinges – non-swelling polymer blocking.
 - b. Mortise locksets – to suit template provided.
 - c. Exit devices – to suit template provided.
3. All doors shall be mortised and reinforced to allow application of hinges and locks, in accordance with hardware schedule and manufacturer's templates. The hinges shall be attached by using stainless steel wood screws. Pilot holes shall be in strict accordance with manufacturer's recommendations.

D. Door Accessories:

1. Glazing: Glass support structures shall ensure that the glass area is weather sealed as not to permit moisture to enter the core of the door. This is to be accomplished by utilizing pultruded FRP tubes to fabricate the window opening. Glazing must allow for ready access for repair, in the event of damage or replacement, without affecting the sealed integrity of the cutout in the door panel itself. Openings cut directly into the core material will not be allowed.
2. Louver: Louvers shall be fabricated of FRP material of an inverted "V" design and shall be subject to the same performance guarantee as the door panel. The louver opening will be fabricated in the same method as for glazing above.
3. Fasteners: Provide stainless steel fasteners as required for glazing openings and louvers.
4. Transoms: All transom panels will be identical to the doors in construction, materials, thickness, color, and reinforcement.
5. Astragals: Astragals for pairs of doors to be fabricated of FRP material of manufacturer's standard flat design.

2.3 FRAMES

A. Frame Fabrication FRP (Fiberglass Reinforced Plastic)

1. Jamb Depth: as shown on drawings.
2. Face Dimension: 2" standard. Headers available in 2" or 4", as shown on elevations.
3. Return: 7/16"
4. Stop: 5/8" Rabbet: 1-15/16"
5. Corner Miter: Head and Jamb members shall be standard 45-degree miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly.
6. Pultrusion: In compliance with pultrusion industry standards.

B. Reinforcements and Braces/Supports

1. Corner Reinforcement: 4" x 4" x 5-3/8" x 1/4" thick pultruded fiberglass angle. Attached to head bar at factory using stainless steel screws or suitable polymer rivets.
2. Mortise Hinge Reinforcement: 1-1/2" x 7" x 1/4" thick polymer. Attached to frame by means of bonding and stainless-steel countersunk screws.
3. Closer Reinforcement: Same as mortise hinge reinforcement, less screws.
4. Strike Reinforcement: 1-1/2" x 9" x 3/4" thick polymer material. Attached to frame by means of bonding and stainless-steel countersunk screws or suitable polymer rivets.

C. Anchoring Systems

1. "T"-Strap or Wire Anchor for masonry construction.
2. Concealed existing wall anchor if necessary.

D. Finish

1. Gelcoat: 15 mils thick, ± 3 mils on all exposed surfaces. Color to match door unless otherwise indicated.

2.4 FABRICATION

1. Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Frames shall be rigid, neat in appearance and free from defects. Field measurements shall be taken as required for coordination with adjoining work.
2. Form exposed surfaces free from warp, wave, and buckle, with all corners square, unless otherwise shown. Set each member in proper alignment and relationship to other members with all surfaces straight and in a true plane.
3. Reinforce members and joints with plates, tubes or angles for rigidity and strength.
4. Doors and frames shall be mortised and reinforced for hardware in accordance with the hardware manufacturer's instructions and templates. The reinforcing shall be designed to receive hinges, locks, strikes, closures, etc.
5. Mortar guard boxes shall be provided for hardware cutouts in frames.
6. Furnish at least three (3) metal anchors or polymer spacers in each jamb of frames up to 84" high and one (1) additional anchor for each 24" in height above 84", in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction. Fabricate joint anchor of stainless steel.
7. Terminate bottom of frames at the indicated finished floor level.

8. Provide clearance for doors of 1/8" at jambs and heads; 1/4" clearance above threshold.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer shall examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

1. General: Install FRP doors, frames, and accessories in accordance with final shop drawings, NFPA 80 standards at fire-rated openings, and as herein specified. Installation to be similar to that of hollow metal doors and frames, and in accordance with FRP manufacturer's written instructions.
2. Frame Installation
 - a. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Frame must not be drilled for brace supports as finish may be damaged.
 - b. In masonry construction, locate three (3) wall anchors per jamb at hinge and strike levels. Frames may be grouted full of mortar at jambs and anchors shall be built into the joints as walls are laid up. A continuous bead of silicone sealant is to be applied between the head and jamb at the miter joint.
3. Door Installation
 - a. Fit FRP doors accurately in frames, within clearances specified in Paragraph 2.4 of this section.

3.3 TOLERANCES

1. Maximum Diagonal Distortion: 1/8" measured with a straight edge, corner to corner. Maximum measurable plane is 4'-0" x 7'-0".

3.4 ADJUSTING

1. At substantial completion, adjust all operable components to ensure proper installation and that they function smooth and freely.

3.5 CLEANING

1. Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer's recommended cleaning techniques and procedures for cleaning all surfaces. Use only cleaning products that will not scratch or damage the surfaces and are recommended by the manufacturer.
2. Remove debris from project site.

3.6 WARRANTY

1. To include one (1) year free from defects in materials and workmanship from date of shipment, and ten (10) years from degradation or failure due to corrosion from date of shipment, provided that the structural integrity of the doors and frames have not been violated or compromised. (No unauthorized cuts, bores, or other structural alterations affecting the core of the door, or the structure of the frame.)
2. Normal wear and tear, or physical abuse of a specific installation is not part of this warranty.

END OF SECTION

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if included) and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 08 22 00 – Fiberglass Reinforced Plastic Doors and Frames

1.2 SUMMARY

- A. Section Includes:
 - 1. Hardware for swinging FRP Door Openings.
- B. References:
- C. Use the following references to properly detail, schedule, furnish and install finish hardware items.
 - 1. NFPA 80 – Standard for Fire Doors and Other Opening Protectives (2007).
 - 2. DHI Installation Guide for Doors and Hardware (1984).
 - 3. DHI Sequence and Format for the Hardware Schedule (1996).
 - 4. ANSI/BHMA A156.4 – Door Controls – Closers (2008).
 - 5. ANSI/BHMA A156.2 – Bored and Preassembled Locks and Latches (2011).
 - 6. ANSI/BHMA A156.18 – Materials and Finishes (2012).
 - 7. Attached drawings.

1.3 SUBMITTALS

- A. Schedule:
 - 1. Provide submittals in accordance with 01 33 00 – Submittal Procedures.
 - 2. Provide hardware schedule in vertical format on 8-1/2-inch by 11-inch paper. Conform to DHI publication Sequence and Format for Hardware Schedule using Architect's door numbers and hardware set numbers.
 - 3. Provide elevation drawings for openings with electrical hardware and access control devices with each hardware schedule. Include illustration of opening, operational description, electrified hardware components, legend, approximate mounting location and size of enclosures, size and quantity of conductors, facility name and date.

- B. Product Data: Provide one set of manufacturer's catalog and technical data for each hardware item used, highlighting design, function, fasteners, accessories, and options to facilitate review with each hardware schedule submitted.
- C. Templates: Provide two sets of manufacturer's templating information for mortised and template hardware upon receipt of approved hardware schedule to the door and frame supplier(s). Include requirements for internal reinforcements required for surface mounted hardware.
- D. Keying Schedule: Arrange meeting with Owner, Architect, and finish hardware supplier to determine keying requirements immediately upon receipt of finish hardware schedule.

1.4 CLOSEOUT SUBMITTALS

- A. Furnish operations and maintenance manual in accordance with Section 01 78 28 – Operations and Maintenance Data and as follows:
 - 1. Furnish one copy of manual at date of Substantial Completion in a 2-1/2-inch-thick binder labeled with project information, date and name and contact information for the hardware supplier.
 - 2. Include in manual:
 - a. Copy of approved hardware schedule, including door numbers and locations. Highlight fire rated door to aid in annual fire door inspection.
 - b. Copy of approved keying schedule.
 - c. Catalog data for each product.
 - d. Parts list for locksets, exit devices, door closers, and auto door operators.
 - e. Installation templates and instructions.
 - f. Warranty information.
 - g. Name, address, and phone number of local representatives for each manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Jointly check in hardware, upon delivery to jobsite, against approved hardware schedule with hardware supplier. Record shortage or damage and replace or repair as necessary.
 - 2. Deliver hardware to be installed during fabrication of doors and frames, to manufacturer.
- B. Storage:
 - 1. Store hardware in a secure, dry, temperature-controlled room on shelving to protect against loss, theft, and damage.
 - 2. Store items too long for shelving on pallet, off the floor.
- C. Marking and Packaging:

1. Deliver hardware to jobsite in manufacturer's original packaging marked to correspond with approved hardware schedule with Architect's door numbers and hardware sets.
2. Mark all locksets, exit devices, cylinders, auxiliary hardware, and key switches with keyset symbol.
3. Replace any wet or damaged packaging with new.

D. Extra Materials:

1. Screws and Fasteners: Fifty of each screw and fastener required for general maintenance of hinges, locks, closers, exit devices, and sealing systems.
2. Deliver to Owner remaining finish hardware fasteners and special installation tools upon completion of Project.

1.6 QUALITY ASSURANCE

A. Supplier:

1. Furnish hardware from recognized supplier who has warehousing facility within 100 miles of project location, and who has actively supplied hardware for similar projects in the vicinity for a minimum of five years.
2. Supplier shall employ an Architectural Hardware Consultant (AHC), as certified by Door and Hardware Institute, on staff full time to administer and supervise project.

B. Installer: Install hardware using installers who have actively installed commercial door hardware for a minimum of five years and are familiar with hardware installation of type required on this Project.

C. Fire Rated Door Openings:

1. Comply with NFPA 80.
2. Furnish nationally recognized testing agency label or stamp on hardware for labeled openings.
3. Only labeled locks or latches or fire exit hardware can be used on fire rated openings.
4. Where UL requirements conflict with Drawings or Specifications, furnish hardware conforming to the UL requirements.

1.7 WARRANTY

A. Extended or limited warranties shall be as follows:

1. Furnish minimum ten-year factory warranty on door closers, against defects in material and workmanship, from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers used in preparation of the hardware schedule.

- | | |
|-------------------------|----------------|
| 1. Hinges | Stanley |
| 2. Locks and Latchsets | Best |
| 3. Surface Door Closers | Stanley |
| 4. Protection Plates | Trimco |
| 5. Wall Stops | Trimco |
| 6. Gasketing | National Guard |
| 7. Silencers | Trimco |

2.2 MATERIALS

A. Screws and Fasteners:

1. Provide manufacturer's recommended fasteners of proper type, material, and finish.
2. Provide self-tapping screws for sweeps and stop applied weather-stripping.
3. Utilize through-bolts for the attachment of door closers and exit devices on non-reinforced doors only. Finish: match door face.
4. Protection plates at lead lined door shall be adhesive applied.
5. Exposed screw heads: Phillips type.

B. Hinges:

1. Type:
 - a. Five-knuckle, full mortise, ball bearing.
 - b. Furnish heavy weight hinges on heavy doors and doors expected to have high frequency use.

C. Quantity:

- a. One pair of hinges for all doors up to 5 feet high. Furnish one additional hinge for every 2'-6" in height or fraction thereof.
- b. Four hinges at dutch doors up to 7'-6" in height.

D. Size:

- a. For 1-3/4-inch-thick doors up to 3 feet wide: 4 1/2-inches high
- b. For 1-3/4-inch-thick doors over 3 feet wide: 5-inches high
- c. For all doors over 1-3/4-inches thick: 5-inches high
- d. Size in width shall minimally clear door trim.

E. Application:

- a. NRP (non-removable pin) at exterior doors and reverse bevel doors with locking hardware.

F. Acceptable manufacturers and types:

Stanley	McKinney	Hager
FBB199	TA2714	BB1191

1. Flushbolts:

- a. Manual Flushbolts: Two for inactive leaf of locked pairs of doors.
- b. Acceptable manufacturers and types:

Bolt/Door Type	DCI	Trimco	Rockwood
Manual Metal	1008F	3921	580

2. Locksets:

- a. Mortise Type Locks and Latches:
- b. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
- c. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
- d. Provide 9001-Quality Management and 14001-Environmental Management.
- e. Fit ANSI A115.1 door preparation.
- f. Functions and design as indicated in the hardware groups.
- g. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel.
- h. Auxiliary deadlatch to be made of one-piece stainless steel, permanently lubricated.
- i. Provide sufficient curved strike lip to protect door trim.
- j. Lever handles must be of forged or cast brass, bronze or stainless-steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable.
- k. Spindle to be designed to prevent forced entry from attacking of lever.
- l. Provide locksets with 7-pin removable and interchangeable core cylinders.
- m. Each lever to have independent spring mechanism controlling it.
- n. Core face must be the same finish as the lockset.

Best (No Substitute)

45H 14D Series

o. Cylinders:

- 1) Mortise and rim cylinders and cores from same manufacturer as locksets.
- 2) Appropriate cam and blocking rings for proper installation.

G. Keys & Keying

1. Cylinders: 7-pin, interchangeable core keyed into an Owner's existing BEST factory registered Masterkey System.
2. Provide construction cores and keys during construction period. Construction control and operating keys and cores are not part of permanent keying system or furnished on same keyway (or key section) as permanent keying system.
3. Permanent Keys and Cores: Prepare permanent cores and keys in accordance with keying schedule. Provide Grand Masterkeys, Masterkeys and other Security Keys as required by key system configuration.
4. Furnish keys in the following quantities:
 - a. 4 each Grand Masterkeys (as req'd).
 - b. 4 each Masterkeys per set.
 - c. 2 each Change keys each keyed core.
 - d. 6 each Construction masterkeys.
 - e. 2 each Control keys.
5. Install permanent cores in locksets.
6. Return construction cores to Hardware manufacturer's representative.

H. Surface Door Closers:

1. Conform to ANSI/BHMA A156.4 Grade 1.
2. Furnish manufacturers recommended size, arms and configuration for door and frame application required.
3. Furnish brackets, spacers, support shoes, and plates for complete and proper installation.
4. DA (delayed-action) at toilet room doors and as scheduled.
5. Acceptable manufacturers and types:

Stanley	LCN	Sargent
CLD-4550 Series	4040 Series	351 Series

I. Overhead Door Stop:

1. Provide overhead stop or overhead stop/holder for interior doors as specified. Provide overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.
2. Where overhead holders are specified provide friction type at doors without a closer and positive type at doors with a closer.
3. Acceptable manufacturers:

ABH 9000 series	Rixson 9 series	Glynn Johnson 900 series
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J. Protection Plates:

1. Where bottom rail allows, furnish 10-inch-high kick plates.
2. Material: 0.050-inch-thick stainless-steel plates with four beveled edges.

3. Countersink screw heads.
4. Width: 2-inch less door width on stop (push) side and 1-inch less door width on face (pull) side.
5. Acceptable manufacturer and types:

Trimco	Rockwood	Burns
KO050	K1050	KP 050

K. Door Stops:

1. Convex, cast, wall stops. Provide concave stop where push button or turn piece in lock lever makes contact with stop.
2. Furnish fastener suitable for wall condition.
3. Acceptable manufacturers and types:

Trimco	Rockwood	Hager
1270CX	409	230W

L. Gasketing:

1. Flexible adhesive fire/smoke gasketing at where scheduled.
2. Acceptable manufacturers and types:

Pemko	National Guard	Reese
Equal	5050C	Equal

M. Silencers:

1. Grey rubber silencers with injector tool.
2. Three silencers at single doors and two silencers at pairs.
3. Acceptable manufacturers and types:

Trimco	Rockwood	Hager
1229A	608	307D

N. Electric Strikes:

1. Provide electric strikes complying with BHMA 156.5, Grade 1, UL Listed as burglary-resistant. Where required, provide electric strikes UL Listed for fire doors and frames. Provide fail-secure type electric strikes, unless specified otherwise. Provide each strike with extended lips as required to suit jamb conditions. Provide electric strikes designed for use with type of locks shown in hardware sets, coordinate voltage, provide transformers and rectifiers as required for
2. Manufacturers:

BEST Locking	HES	Von Duprin
ES5B series	1006 series	6000 series

2.3 FINISHES

- A. Conform to ANSI/BHMA A156.18.

1.	Interior Hinges	US32D	Satin Stainless steel
2.	Locks and Latches	630	Satin Stainless Steel
3.	Door Closers	689	Spray Painted Aluminum
4.	Protection Plates	630	Satin Stainless Steel
5.	Stops and Holders	630	Satin Stainless Steel

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify doors and frames are plumb, square, level, and true and free from defects that would prevent proper installation of finish hardware.
- B. Wash down masonry walls and complete painting and staining of doors and frames prior to installation of hardware.
- C. Complete finish flooring at doorways.
- D. Correct conditions that inhibit a proper installation before continuing with work.

3.2 INSTALLATION

- A. Install hardware in compliance with the DHI publication, Installation Guide for Doors and Hardware.
- B. Drill and countersink items not factory prepared for fasteners.
- C. Mount closers on room-side of corridor doors, inside of exterior doors, and stair-side of stairway doors. Mount closers at clean rooms and operating rooms opposite room side to eliminate shelf to collect dust and debris. Use necessary arms, brackets, spacers, and plates to accommodate auxiliary hardware and special applications.
- D. Install fire door assemblies to maintain clearances at door edge to frame and meeting edge of pairs of doors in compliance with NFPA 80, providing 1/8-inch clearance at the hinge edge, lock edge, head and between pairs. Provide maximum 3/4-inch undercut at door bottom. Where panic thresholds are used, undercut door to allow 1/8-inch clearance between door and threshold.
- E. Trim, cut, and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Set thresholds in bed of mastic sealant, forming tight seal between threshold and surface to which set.
- F. Use only fasteners furnished by manufacturer for installation as recommended by manufacturer.
- G. Install blocking material for all wall mounted door stops at height appropriate to contact door trim.

- H. Install weather-strip prior to installation of door closers and exit devices. Do not cut or notch weather-strip.

3.3 FIELD QUALITY CONTROL

- A. Verify doors open and close smoothly without rubbing or catching and have positive latching where scheduled. Verify fire rated doors are installed with clearances in compliance with NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Upon substantial completion, make final adjustments to door closers and other items of hardware after balance of heating and ventilating equipment to ensure doors close and latch properly.
- B. Clean and polish all exposed hardware surfaces in accordance with manufacturer's recommended procedures.
- C. Clean or repair pencil or tool marks from adjacent surfaces damaged or soiled by work of this Section.
- D. Recycle cardboard boxes and paper products used in packaging and transport of finish hardware.

3.5 PROTECTION

- A. Remove hardware prior to painting or finishing door and frame. Wrap or mask exposed hardware that cannot be removed until date of substantial completion to avoid exposure to paint, solvents, and abuse.
- B. Repair or replace hardware damaged during construction at least two weeks prior to date of substantial completion.

3.6 SCHEDULES

- A. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
- B. Where items of hardware aren't definitely or correctly specified, are required for Completion of the Work, a written statement of such omission, error, or other discrepancy to Architect, prior to date specified for receipt of bids for clarification by addendum; or furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- C. **HARDWARE SETS**

Hardware Set #1 (8'-0" x 10'-0")

Doors: 100

2 EA	Continuous Hinges	652HD	32DSTN
1 EA	Extended Surface Bolt	cd1055-6"	628STN
1 EA	Deadlock	48H7M S1	626BE
1 EA	Surface Bolt	3921	626TRM
4 EA	Flush Door Pulls	1111L	630TRM
2 EA	OH Stop/Holder	9000 series	630ABH
1 EA	Threshold	426 ssms/ea	628NGP
1 SET	Mtg Stile Seal	156V x 156V	628NGP
1 SET	I-Beam Seal	I-615A	628NGP
1 SET	Perimeter Seal	165SA	628NGP
2 EA	Sweeps	101VA	628NGP

Hardware Set #2

Doors: 101, 104, 200

1 EA	Continuous Hinges	652HD	32DSTN
1 EA	Storage Lockset	45H7D14D	630BE
1 EA	Electric Strike	ES5B	630BE
1 EA	Power Supply	AL300 ULX BB	PTDALX
1 EA	Door Closer Stop/HO	CLD4550 CSH AVB	689STN
1 EA	Kickplate	10" X 2" LDW X .050 X B4E X CSK	32DTRM
1 EA	Threshold	426 ssms/ms	628NGP
1 EA	Sweep	101VA	628NGP
1 EA	Weather Seals	165SA	628NGP
1 EA	Rain Drip	16A	628NGP
1 EA	Card Reader	by Security Contractor	

Note: Access via Card Reader which will release electric strike or mechanical key. Electric strike should be fail-secure. Egress at all times via inside lever.

Hardware Set #3

Doors: 203

3 EA	Hinges	FBB199 4-1/2" X 4-1/2"	32DSTN
1 EA	Privacy Set	45H0L14D	630BE
1 EA	Wall Stop	1270 series	32DTRM
3 EA	Silencers	1229A	Grey TR

Hardware Set #4

Doors: 201, 202

3 EA Hinges	FBB199 4-1/2" X 4-1/2" NRP	32DSTN
1 EA Classroom Lockset	45H7R14D	630BE
1 EA Door Closer	CLD 4550 REG	689STN
1 EA Kickplate	10" X 2" LDW X .050 X B4E X CSK	32DTR
1 EA Wall Stop	1270 series	26DTR
1 EA OH Stop/holder	1000 series	630ABH
3 EA Gasketing	5020C	Grey NGP

Hardware Set #5

Doors: 102, 103

3 EA Hinges	FBB199 4-1/2" X 4-1/2" NRP	32DSTN
1 EA Storeroom Lockset	45H7D14D	630BE
1 EA Door Closer	CLD 4550 REG	689STN
1 EA Kickplate	KO050 10" x LDW .050 x B4E x CSK	630TRM
1 EA Wall Stop	1270 series	26DTR
1 SET Gasketing	5020C	GRY NGP

END OF SECTION

SECTION 09 96 00 – PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SCOPE

- A. This Section includes shop and field surface preparation and shop and field painting related to water and wastewater treatment facilities.
 - 1. Surface preparation, including in the shop and applications of metal primer, and field applications of primers and finishes are specified in this Section.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. Related Sections:
 - 1. Section 03 30 00 – Cast-In-Place Concrete

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. SSPC: The Society for Protective Coatings
 - a. SSPC SP10/NACE No. 2 Near White Metal Blast Cleaning joint standard.
 - b. SSPC SP6/NACE No. 3 Commercial Blast Cleaning joint standard.
 - c. SSPC SP1 Solvent Cleaning.
 - d. SSPC SP2 Hand Tool Cleaning.
 - e. SSPC SP3 Power Tool Cleaning.
 - f. SSPC Paint 20 Zinc-Rich Coating.
 - g. SSPC Paint 22 Epoxy Polyamide Paints.
 - h. SSPC Paint 36 Two Component Weatherable Aliphatic Polyurethane Topcoat.
 - i. SSPC PA 2 Measurement of Dry Coating Thickness with Magnetic Gauges.
 - 2. NACE International
 - a. NACE SP0274 – Standard Practice for High-Voltage Electrical Inspection of Pipeline Coatings.
 - b. NACE SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
 - c. NACE No. 2 Near White Metal Blast Cleaning joint standard.

- d. NACE No. 3 Commercial Blast Cleaning joint standard.
- 3. American Concrete Institute (ACI)
 - a. ACI 224.1R – Causes, Evaluation and Repair of Cracks in Concrete Structures.
 - b. ACI 301 – Specifications for Structural Concrete.
 - c. ACI 308R – Guide to Curing Concrete.
 - d. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - e. ACI 515 – A Guide to the use of Waterproofing, Dampproofing, Protective, and Decorative Barrier Systems for Concrete.
 - f. ACI 546.R – Concrete Repair Guide.
 - g. ACI 546.3R – Guide for the Selection of Materials for the Repair of Concrete.
- 4. ASTM International (ASTM)
 - a. ASTM C 413-01(2006) – Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - b. ASTM C 868-02(2008) – Standard Test Method for Chemical Resistance of Protective Linings.
 - c. ASTM D 870-09 – Standard Practice for Testing Water Resistance of Coatings Using Water Immersion.
 - d. ASTM D 1653-03(2008) – Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
 - e. ASTM D 2240-05 – Standard Test Method for Rubber Property—Durometer Hardness.
 - f. ASTM D 4060-07 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - g. ASTM D 4541-09 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- 5. 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.

1.3 SUMMARY

- A. This Section includes surface preparation, priming, painting, and finishing of exposed interior and exterior items and surfaces.
 - 1. Steel Surfaces (Ferrous, Carbon, Ductile Iron, Galvanized, Miscellaneous Metals).
 - 2. Concrete and CMU.
 - 3. Gypsum Wallboard Interior Exposure.
 - 4. Insulated Pipe.

5. PVC Pipe.

- B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Engineer will select from standard colors or finishes available.
- C. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

1.4 SUBMITTALS

A. Product Data:

- 1. Submit manufacturer's product literature describing products to be provided, giving manufacturer's name, product name, and product line number for each material.
- 2. Submit technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.
 - a. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin, and pigment.
- 3. Submit manufacturer's Material Safety Data Sheets (MSDS) and other safety requirements.

B. Shop Drawings:

- 1. Submit a complete list of products proposed for use, including identifying product names and catalog numbers.
 - a. Arrange in same format as Schedule of Paint Finishes below.
 - b. Include applicable manufacturer's data and recommendations.

C. Samples:

- 1. Selection Samples:
 - a. Submit color charts displaying manufacturer's full range of standard colors for initial selection by Architect.

1.5 QUALITY ASSURANCE

A. Manufacturers Quality Assurance

- B. Provide products from a company specializing in manufacture of high-performance coatings with a minimum of 10 years experience.
- C. Applicator Quality Assurance
 - 1. Applicator shall be trained in application techniques and procedures of coating materials and shall demonstrate a minimum of 5 years successful experience in such application.
 - 2. Submit list of a minimum 5 completed projects of similar size and complexity to this work. Include for each project:
 - a. Project name and location.
 - b. Name of owner.
 - c. Name of contractor.
 - d. Name of engineer.
 - e. Name of coating manufacturer.
 - f. Approximate area of coatings applied.
 - g. Date of completion.
- D. Maintain, throughout duration of application, a crew of painters who are fully qualified to satisfy specified qualifications.
- E. Single Source Responsibility:
 - 1. Materials shall be products of a single manufacturer or items standard with manufacturer of specified coating materials.
 - 2. Provide secondary materials which are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.
- F. Regulatory Requirements:
 - 1. Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements for finishes at time of application.
- G. Pre-Installation Meetings:
 - 1. Schedule a conference and inspection to be held on-site before field application of coating systems begins.
 - 2. Conference shall be attended by Contractor, Owner's representative, Architect, coating applicators, and a representative of coating material manufacturer.
 - 3. Topics to be discussed at meeting shall include:
 - a. A review of Contract Documents and accepted shop drawings shall be made and deviations or differences shall be resolved.
 - b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
 - c. Establish which areas on-site will be available for use as storage areas and working area.

4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work should be completed before coating application can begin.
5. Prepare and submit to parties in attendance a written report of pre-installation conference. Report shall be submitted with 3 days following conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver products in manufacturer's original unopened containers. Each container shall have manufacturer's label, intact, and legible. Containers shall fully identify brand, type, grade, class, and other qualifying information used to describe contents.
2. Include on label for each container:
 - a. Manufacturer's name.
 - b. Type of paint.
 - c. Manufacturer's stock number.
 - d. Color name and number.
 - e. Instructions for thinning, where applicable.
3. Storage and Protection:
 - a. Store materials in a protected area, away from construction activities. Restrict storage area to paint materials and related equipment.
 - b. Maintain temperature in area of storage between 40°F and 110°F.
 - c. Comply with health and fire safety regulations.
 - d. Remove damaged materials from Site.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:

1. Apply coating materials under conditions as follows:
 - a. Air temperature shall not be below 35°F or above 110°F.
 - b. Refer to specific product information sheets for minimum surface temperature requirements. Surface temperatures shall be at least 5°F above dew point and in a rising mode.
 - c. Relative humidity shall be no higher than 85%.
 - d. For exterior spray application, wind velocity shall be less than 15 mph.
 - e. Atmosphere shall be relatively free of airborne dust.

1.8 SEQUENCING

A. Coordination:

1. Perform work in proper sequence with work of other trades to avoid damage to finished work.
2. Where coatings are scheduled to be applied over shop applied coatings, coordinate work of such shop applied products to ensure compatibility with field applied coating systems.

PART 2 - PRODUCTS

2.1 PREAPPROVED MANUFACTURERS

- A. Products specified are manufactured by Tnemec Company, Inc., 123 W. 23rd Avenue, North Kansas City, MO 64116, (816) 483-3400, www.tnemec.com, and are specified as a standard of quality/performance and basis of design. The specified basis of design is intended to provide the longest service life, lowest life cycle cost, and most sustainable solution.
- B. Contact: Atlantic Coating Consultants | Wally Bates | wally@acconsultants.com | 855.855.0100
- C. Materials specified herein shall not preclude consideration of equivalent or superior materials. Submitted equivalent materials or other substitutions shall be submitted to specifier for consideration in compliance with substitution procedures in Division 1 of the Project Manual and include the following:
 1. Requests for substitution shall be provided no later than (14) days prior to the published bid opening date and must include all required data as listed in these specifications. Substitution requests with incomplete data shall not be reviewed.
 2. Requests for substitution shall be made by a plan holding, licensed, prospective bidder on the project.
 3. Requests for substitution shall include actual case histories as evidence of satisfactory past performance in similar environment with similar estimated service life of system specified.
 4. Substitutions will not be considered that change the number of coats or do not meet specified dry film thicknesses.
 5. Requests for substitution shall include manufacturer's certified test reports showing the substitute product(s) full list of performance data for comparison.
 6. After second submittal, Engineer/Owner or Owner's Agent hourly rates will be charged to review further submittals.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.

2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the Engineer about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted or provide surface applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
1. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 2. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
- B. Ferrous Metal Surfaces:
1. Surfaces shall be free of residual deposits of grease, rust, scale, dirt, dust, and oil.
 2. Immersion Service (Non-Chemical):
 - a. For shop primed surfaces in spot clean, removing loose primer and all rust per SSPC-SP10 Near White Blast Cleaning.
 - b. Provide a minimum surface profile of 2.0 mil minimum anchor profile.
 3. Immersion Service (Chemical Exposure)
 - a. For shop primed surfaces in spot clean, removing loose primer and all rust per SSPC-SP10/NACE No. 2 Near White Blast Cleaning.
 - b. Provide a minimum surface profile of 2.0 mil minimum anchor profile. (Certain high film thickness coating systems (20 mils DFT and higher) will require a minimum profile greater than 1.5 mils. Check with the coating manufacture's technical service department for advice for high film coating systems)
 4. Non-Immersion, Interior & Exterior Exposed:
 - a. SSPC-SP6/NACE No. 3 Commercial Blast Cleaning. If Sandblasting is deemed impractical clean surfaces per SSPC-SP11 Power Tool Cleaning to Bare Metal.

Feather edges to make touch-up patches inconspicuous. Field welds and touch-ups shall be prepared to conform to original surface preparation standards as indicated in Schedule of Coating Systems below.

- b. Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in field. Use repair procedures which insure complete protection of adjacent primer. Repair methods 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 necessitate use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive to touch-up, item shall be re-cleaned and coated or painted.
- c. For surfaces non-shop primed, surfaces shall be cleaned in compliance with specifications of Steel Structures Painting Council as indicated in Schedule of Coating Systems below.

C. Cast & Ductile Iron & Mill Coated Ductile Iron (Immersion Service)

1. Solvent Cleaning:

- a. All surfaces shall be first be inspected and precleaned with the appropriate solvents to remove grease, oil, and other soluble contaminants. The preferred method of precleaning is through scrubbing of the surface with a stiff bristle brush soaked in solvent. Prior to evaporation remove solvent by wiping with clean, lint-free cloths rags. Remove rag residue (if any) with dry, oil free compressed air.

2. Reference NAF 500-03 Surface preparation standard for ductile iron pipe and fittings in exposed locations receiving special external coatings and/or special internal linings.

3. Surface Profile: Measure surface profile (anchor pattern) in accordance with ASTM D 4417, Method C.

- a. If surface profile is less than 1.5 mils then proceed with brush-off blast cleaning in accordance with No. 3 below.
- b. If surface profile is greater than 1.5 mils proceed with hand or power tool cleaning in accordance No. 4 below. (Certain high film thickness coating systems (20.0 mils DFT and higher) will require a minimum profile greater than 1.5 mils. Check with our technical service department for advice for high film coating systems).

4. Brush-Off Blast Cleaning:

- a. Remove all loose annealing oxides, loose rust, dirt, and other foreign matter by compressed air nozzle abrasive blast cleaning using a fine grade abrasive. Any dust or other contaminants remaining after blasting shall be removed with dry, oil free compressed air or by vacuum cleaning. Recheck surface profile prior to painting. A profile depth at least 1.5 mils is required.

5. Hand or Power Tool Cleaning:

- a. Remove all loose annealing oxides, loose rust, dirt, and other foreign matter with the use of hand or power tools. Do not use cleaning tools that burnish or smooth the natural roughness (profile) of the cast surface. Any dust or other contaminants remaining after hand or power tool cleaning shall be removed with dry, oil free compressed air or by vacuum cleaning.
- 6. Protection from Moisture:
 - a. The cleaned cast iron surfaces shall be protected from condition of high humidity, rainfall, and surface moisture. All surfaces shall be clean, dry, and at least (5) degrees above the dew point during application of protective coatings.
- D. Galvanized Steel & Aluminum Surfaces:
 - 1. Immersion/Non-Immersion
 - a. SSPC SP16 (in accordance with ASTM D 6386-99) – Abrasive brush blast cleaning. Uniformly abrade the galvanized or aluminum surface without damaging the surface.
 - b. Remove any rust and uniformly scarify the surface with a power grinder in accordance with SSPC-SP3 Power Tool Cleaning.
- E. Lightweight Metals:
 - 1. Prepare surfaces in compliance with SSPC SP2 Hand or SP3 Power Tool Cleaning.
- F. Cast-In-Place and/or Precast Concrete Surfaces: Non-Immersion
 - 1. All specified surface preparation shall be performed in accordance with the latest version of the SSPC-SP13/NACE 6, or ICRI 03732 and other standards referenced in this section.
 - 2. Allow concrete to cure 28 days. Verify dryness by testing for moisture with a “plastic film tape-down test.” (Reference ASTM D 4263)
 - 3. Abrasive Blast Clean or mechanically grind concrete per SSPCSP13/NACE6 or ICRI 03732.
 - 4. Clean entire surface to remove laitance, form coatings, and provide a uniform surface texture per or ICRI 03732 CSP 2-3.
 - 5. Perform blast cleaning so as to open up voids and bugholes so that holes are concave. Care should be taken to keep aggregate exposures to a minimum.
 - 6. Fill all hole flush with the surface of the concrete using Tnemec Series 218 Mortar Clad. Fill larger voids, bugholes and other cavities (1/2" (13 mm) in depth and/or 2" (50 mm) in diameter) flush with the surface using Tnemec Series 217.
 - 7. This preparation will be followed by vacuum cleaning to remove all dust, dirt or friable substances leaving clean, dust free surfaces for resurfacing.
- G. Concrete – Immersion & Chemical Exposure/H2S
 - 1. All specified surface preparation shall be performed in accordance with the latest version of the SSPC, NACE, ICRI and other standards referenced in this section.

2. Allow concrete to cure 28 days. Verify dryness by testing for moisture with a “plastic film tape-down test.” (Reference ASTM D 4263)
3. If necessary, for testing horizontal surfaces, perform “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.” (Reference ASTM F 1869)
4. Moisture content not to exceed three pounds per 1,000 sq. ft. in a 24-hour period.
5. Oil and grease shall be removed before mechanical cleaning is started via an alkaline-based emulsifying detergent, such as Extra Muscle by Great Lakes Laboratories or as recommended by the resurfacing material manufacturer.
6. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants that might interfere with the adhesion of the resurfacing materials.
7. Reference SSPC SP13/NACE 6, ICRI 03732,
 - a. Specific concrete surface profile (CSP) to be determined by the condition of the concrete and specified coating materials.
 - b. Clean entire surface to remove laitance, form coatings, and provide a uniform surface texture.
 - c. Perform blast cleaning so as to open up voids and bug holes so that holes are concave. Care should be taken to keep aggregate exposures to a minimum. Large voids, bug holes and other cavities (1/2" (13 mm) in depth and/or 2" (50 mm) in diameter) shall be filled and patched flush with the surface using Tnemec Series 217 Mortar Cast.
 - d. Parge Coat: Apply a parge coat of Series 218 Mortar Clad over brush-off blast cleaned concrete surface 1/16-inch up to ¼ inch thickness. Purpose of the parge coat is to minimize out gassing of the concrete that results in pinhole and holidays in the chemical resistant coatings.
 - e. This preparation will be followed by vacuum cleaning to remove all dust, dirt or friable substances leaving clean, dust free surfaces for resurfacing.

H. Concrete Floors: Thin Mil Systems

1. All specified surface preparation shall be performed in accordance with the latest version of the SSPC, NACE, ICRI and other standards referenced in this section.
2. Allow concrete to cure 28-days. Verify dryness by testing for moisture with a “plastic film tape-down test.” (Reference ASTM D 4263)
3. If necessary, for testing horizontal surfaces, perform “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.” (Reference ASTM F 1869).
4. Moisture content not to exceed three pounds per 1,000 sq. ft. in a 24-hour period. Oil and grease shall be removed before mechanical cleaning is started via an alkaline-based emulsifying detergent, such as Extra Muscle by Great Lakes Laboratories or as recommended by the resurfacing material manufacturer.
5. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants that might interfere with the adhesion of the resurfacing materials.

6. Shot blast or mechanically abrade to remove laitance, curing compounds, hardeners, sealers, and other contaminants and to provide surface profile per SSPC SP13 ICRI CSP 2-3.
 7. Large voids and other cavities should be filled with recommended filler or surfacer.
- I. Masonry Surfaces: (facing brick or concrete masonry units)
1. Allow surfaces to cure for not less than 30-days prior to painting.
 2. Remove dirt, loose mortar, scale, efflorescence, or powder.
- J. Cement Plaster: (stucco)
1. Allow surfaces to cure for 30 to 60-days prior to painting.
 2. Fill minor isolated hairline cracks with patching plaster and smooth off to match texture of adjacent surfaces.
 3. Remove dirt, loose material, scale, efflorescence, powder, and other foreign matter. Remove oil and grease by washing with a tri-sodium phosphate solution, rinse with clean, clear water and let thoroughly dry.
 4. For solvent based paints, wash surfaces with a 4% zinc sulphate solution, rinse with clean, clear water and let thoroughly dry before painting.
- K. Gypsum Wallboard Surfaces:
1. Fill narrow, shallow cracks and small holes with spackling compound.
 2. Rake deep, wide cracks and deep holes; dampen with clean, clear water and fill with thin layers of joint cement.
- L. Copper Surfaces:
1. SSPC SP1 Solvent Cleaning, followed by uniform scarification with 80-grit aluminum oxide sandpaper.
- M. Stainless Steel Surfaces:
1. Immersion & Non-Immersion:
 - a. Provide uniform scarification per SSPC SP16 Abrasive Brush-Off Blast Cleaning or power grinding.
- N. Wood Surfaces:
1. Sand wood surfaces and edges smooth and even before finishing or painting and between coats. Remove dust after each sanding.
 2. Remove residue from knots, pitch streaks, cracks, open joints, and sappy spots. Knots shall be coated with a pigmented stain sealer prior to painting. Avoid use of shellac as an undercoat.
 3. Countersink nails and fill nail holes, cracks, open joints and other defects with tinted putty or wood filler after priming is dry and before second coat.

O. Brick or Concrete Surfaces:

1. Surfaces shall be sound, dry, and free of cracks, dirt, oils, paint, or other contaminants which may affect the penetration of the clear penetrating water repellent.
2. Fill all cracks, voids, and tuck point mortar joints if necessary.
3. New mortar must be allowed to cure a minimum of twenty-one (21) days before treatment.
4. Surface and air temperature must be above 40°F (50°C).

P. Insulated Coverings, Canvas or Cotton:

1. Clean using high-pressure air and solvent of type recommended by coating manufacturer.

Q. Polyvinyl Chloride (PVC) Pipe:

1. Remove ink markings by wiping down with clean-lint-free cloths saturated denatured alcohol. Uniformly sand surface with 36 grit sandpaper and wipe out off dust residue.

R. Moisture Emission Test for Concrete and Masonry:

1. Test substrates for moisture prior to application of coating systems. Test shall be plastic sheet method in compliance with ASTM D4263.

S. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer and only within recommended limits.

T. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Provide finish coats that are compatible with primers used.

3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment with prime coat only.
 7. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
 8. Sand lightly between each succeeding enamel or varnish coat.
 9. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform, or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
 2. Insulation.
 3. Supports.
 4. Motors and mechanical equipment.
 5. Accessory items.

- G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Conduit and fittings.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative materials analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
 - 3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously

painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing, or replacing, and repainting, as acceptable to Engineer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 PAINT SYSTEM SCHEDULES

- A. Steel Surfaces [Ferrous, Carbon, Ductile Iron, Galvanized, Etc.]
 - 1. New Structural Steel, Tanks, Pipes and Equipment (Exterior Non-Immersion)
 - a. Surface Prep: SSPC-SP6 Commercial Blast Cleaning
 - b. Shop Primer: Series 90-97 Tneme-Zinc, DFT 2.5 – 3.5 mils
 - c. Field T/U Primer: Series 90G-1K97, DFT 2.5 – 3.5 mils
 - d. Intermediate Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - e. Finish Coat: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils
 - 2. Existing Structural Steel, Tanks, Pipes and Equipment (Exterior Non-Immersion)
 - a. Surface Prep: SSPC-SP2/3 Hand/Power Tool Cleaning
 - b. Spot Prime: Series 138 ProTuff, DFT 4.0 – 6.0 mils
 - c. Full Prime Coat: Series 138 ProTuff, DFT 4.0 – 6.0 mils
 - d. Finish Coat: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils
 - 3. New Structural Steel, Tanks, Pipes and Equipment (Interior Non-Immersion)
 - a. Surface Prep: SSPC-SP6 Commercial Blast Cleaning
 - b. Shop Primer: Series 90-97 Tneme-Zinc, DFT 2.5 – 3.5 mils

- c. Field T/U Primer: Series 90G-1K97, DFT 2.5 – 3.5 mils
 - d. Intermediate Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - e. Finish Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
4. Existing Structural Steel, Tanks, Pipes and Equipment (Interior Non-Immersion)
- a. Surface Prep: SSPC-SP2/3 Hand/Power Tool Cleaning
 - b. Spot Prime: Series 138 ProTuff, DFT 4.0 – 6.0 mils
 - c. Full Prime Coat: Series 138 ProTuff, DFT 4.0 – 6.0 mils
 - d. Finish Coat: Series 138 ProTuff, DFT 4.0 – 6.0 mils
5. New Structural Steel, Tanks, Pipes and Equipment, Pre-engineered Metal Buildings (Generic Factory Primed Surfaces) (Non-Immersion)
- a. Primer: Series 27 Typoxy, DFT 3.0 – 4.0 mils
 - b. Finish: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils
6. Structural Steel, Tanks, Pipes and Equipment (Wastewater Immersion, Splash, Spill)
- a. Surface Prep: SSPC-SP10 Near-White Metal Blast Cleaning
 - b. Primer: Series 394 Perimeprime, DFT 2.5 – 3.5 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish: Series 141 Epoxoline, DFT 12.0 – 14.0 mils
7. Structural Steel, Tanks, Pipes and Equipment (Immersion NSF 61/600)
- a. Surface Prep: SSPC-SP10 Near-White Metal Blast Cleaning
 - b. Primer: Series 91/94 H2O Hydro-Zinc, DFT 2.5 – 3.5 mils
 - c. Intermediate: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - d. Finish: Series 21 Epoxoline, DFT 12.0 – 14.0 mils
8. Shop Primed Steel Pipe Exterior Exposure (Non-immersion)
- a. Surface Prep: SSPC SP6 Commercial-Blast Cleaning
 - b. Shop Primer: Series 394 Perime-Prime, DFT 2.5 – 3.5 mils or Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 3.0 – 4.0 mils
 - d. Finish Coat: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils
9. Shop Primed Steel Pipe Exterior/Interior Exposure (Immersion Non-NSF)
- a. Surface Prep: SSPC-SP10 Near-White Metal Blast Cleaning
 - b. Shop Primer: Series 394 Perime-Prime, DFT 2.5 – 3.5 mils or Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
10. Shop Primed Steel Pipe Exterior/Interior Exposure (Immersion NSF 61/600)

- a. Surface Prep: SSPC-SP10 Near-White Metal Blast Cleaning
 - b. Shop Primer: Series V140 Pota-Pox Plus, DFT 3.0 – 4.0 mils
 - c. Intermediate: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - d. Finish: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
11. Shop Primed Ductile Iron Pipes, Valves, Fittings Etc. (Non-Immersion)
- a. Surface Prep: Reference NAPF 500-03
 - b. Primer: Series 394 Perime-Prime, DFT 2.5 – 3.5 mils or Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils
12. Shop Primed Ductile Iron Pipes, Valves, Fittings Etc. (Immersion Non-NSF)
- a. Surface Prep: Reference NAPF 500-03
 - b. Primer: Series 394 Perime-Prime, DFT 2.5 – 3.5 mils or Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
13. Shop Primed Ductile Iron Pipes, Valves, Fittings Etc. (Immersion NSF 61/600)
- a. Surface Prep: Reference NAPF 500-03
 - b. Shop Primer: Series V140 Pota-Pox Plus, DFT 3.0 – 4.0 mils
 - c. Intermediate: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - d. Finish: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
14. Uncoated Ductile Iron Pipes, Valves, Fittings Etc. (Immersion Non-NSF)
- a. Surface Prep: Reference NAPF 500-03
 - b. Primer: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
15. Uncoated Ductile Iron Pipes, Valves, Fittings Etc. (Immersion NSF 61/600)
- a. Surface Prep: Reference NAPF 500-03
 - b. Primer: Series Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - c. Intermediate: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - d. Finish: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
16. Galvanized Pipe and Miscellaneous-Fabrications (Exterior Non-Immersion)
- a. Surface Prep: SSPC-SP 16
 - b. Primer: Series V69 Hi-Build Epoxoline II, DFT 3.0 – 4.0 mils
 - c. Finish: Series 1095 Endura-Shield, DFT 2.0 – 3.0 mils

17. Galvanized Pipe and Miscellaneous-Fabrications (Interior Non-Immersion)

- a. Surface Prep: SSPC-SP 16
- b. Primer: Series V69 Hi-Build Epoxoline II, DFT 3.0 – 4.0 mils
- c. Finish: Series V69 Hi-Build Epoxoline II, DFT 3.0 – 4.0 mils

18. Condensation Mitigation Coatings

- a. Surface Prep: Minimum SSPC-SP 3
- b. Primer: Series 394 Perime-Prime, DFT 2.5 – 3.5 mils
- c. First Coat: Series 971 Aerolon, DFT 40.0 – 50.0 mils
- d. Finish Coat: Series 971 Aerolon, DFT 40.0 – 50.0 mils
- e. Finish Coat: Series 1028 Enduratone, DFT 2.0 – 3.0 mils

B. Concrete and CMU (Non-Immersion)

1. Interior Exposure New or Previously Unpainted (moderate/light service)

- a. Surface Prep: SSPC SP13
- b. Filler: Series 130 Envirofill applied at 60-80 sq. ft. / gal
- c. Intermediate: Series 113 H.B. Tneme-Tufcoat, DFT 4.0 – 6.0 mils
- d. Finish: Series 113 H.B. Tneme-Tufcoat, DFT 4.0 – 6.0 mils

2. Interior Exposure (Previously Painted, moderate/light service)

- a. Surface Prep: Remove all loose paint. Clean and dry.
- b. Primer: Series 151-1051 Elasto-Grip FC, DFT 0.7 – 1.5 mils
- c. Intermediate: Series 113 H.B. Tneme-Tufcoat, DFT 4.0 – 6.0 mils
- d. Finish: Series 113 H.B. Tneme-Tufcoat, DFT 4.0 – 6.0 mils

3. Interior Exposure (heavy abuse)

- a. Surface Prep: SSPC-SP13/ Clean and Dry
- b. Base Coat (CMU): Series 215 Surfacing Epoxy
- c. Primer (Concrete): Series 201 Epoxoprime, DFT 4.0 – 6.0 mils DFT
- d. Base Coat (Concrete): Series 273 ML Stranlok, DFT 8.0 – 12.0 mils
- e. Embedded Fiberglass Mat: Series 273-0273C
- f. Saturant Coat: Series 280 Tneme-Glaze, DFT 6.0 – 8.0 mils DFT
- g. Finish Coat: Series 280 Tneme-Glaze, DFT 6.0 – 8.0 mils DFT
- h. Topcoat (optional): Series 297 Enviroglaze, DFT 2.0 – 3.0 mils

4. Exterior Exposed Masonry/CMU (Previously unpainted)

- a. Surface Prep: SSPC-SP13/ Clean and Dry
- b. Block Filler (when necessary): Series 130 Envirofill, 60-80 Sq. Ft. / gal
- c. Primer: Series 151-1051 Elasto-Grip, DFT 0.7 – 1.5 mils
- d. First Coat: Series 156 Enviro-Crete, DFT 4.0 – 6.0 mils

- e. Finish Coat: Series 156 Enviro-Crete, DFT 4.0 – 6.0 mils
- 5. Exterior Exposed Masonry/CMU (Previously painted)
 - a. Surface Prep: SSPC-SP13/ Clean and Dry
 - b. First Coat: Series 156 Enviro-Crete, DFT 4.0 – 6.0 mils
 - c. Finish Coat: Series 156 Enviro-Crete, DFT 4.0 – 6.0 mils
- 6. Resinous Coated Floors [Light/Moderate Service]
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 3 or greater
 - b. Prime Coat: Series 237/238 Power Tread, DFT 6.0 – 8.0 mils
 - c. Intermediate: Series 237/238 Power Tread, DFT 8.0 – 10.0 mils
 - d. Finish Coat: Series 248 Everthane, DFT 2.0 – 3.0 mils
- 7. Resinous Coated Floors [Impact and MVT Resistant]
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Base Coat: Series 245 Ultra-Tread applied at 3/16"
 - 1) Broadcast to refusal with 30-50 mesh aggregate
 - c. Grout: Series 222 (clear)/237 (pigmented), DFT, 14.0 – 16.0 mils
 - d. Topcoat: Series 222 (clear)/237 (pigmented) DFT, 8.0 – 10.0 mils
 - e. Finish Coat: Series 248 Everthane, DFT 2.0 – 3.0 mils
- C. Concrete Immersion and Headspace Environments
 - 1. High Build Epoxy MIC Coating (Elevated Hydrogen Sulfide Environments)
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Surfacer/Filler [$\frac{1}{4}$ " and greater]: Series 217 MortarCrete
 - c. Surfacer/Filler [$\frac{1}{4}$ " and less]: Series 218 MortarClad
 - d. Base Coat: Series 434 Perma-Shield H2S, DFT 125 mils
 - e. Glaze Coat: Series 435 Perma-Glaze, DFT 15.0 – 20.0 mils
 - 2. Light to Moderate Wastewater Environments
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Surfacer/Filler [$\frac{1}{4}$ " and greater]: Series 217 MortarCrete
 - c. Surfacer/Filler [$\frac{1}{4}$ " and less]: Series 218 MortarClad
 - d. Prime Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - e. Finish Coat: Series 141 Epoxoline, DFT 12.0 – 14.0 mils
 - 3. Immersion NSF 61/600
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Surfacer/Filler [$\frac{1}{4}$ " and greater]: Series 217 MortarCrete

- c. Surfer/Filler [$\frac{1}{4}$ " and less]: Series 218 MortarClad
 - d. Prime Coat: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - e. Finish Coat: Series 21 Epoxoline, DFT 12.0 – 14.0 mils
 - 4. Immersion NSF 61/600 (100% solids Epoxy)
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Surfer/Filler [$\frac{1}{4}$ " and greater]: Series 217 MortarCrete
 - c. Surfer/Filler [$\frac{1}{4}$ " and less]: Series 218 MortarClad
 - d. Prime Coat: Series 22 Epoxoline, DFT 10.0 – 15.0 mils
 - e. Finish Coat: Series 22 Epoxoline, DFT 10.0 – 15.0 mils
 - 5. Micro/Ultra Filtration Tanks (NSF and Wastewater Immersion)
 - a. Surface Prep: SSPC-SP13 ICRI-CSP 5 or greater
 - b. Prime Coat: Series 21 Epoxoline, DFT 4.0 – 6.0 mils
 - c. Base Coat: Series 215 Surfacing Epoxy, DFT 60-80 mils
 - d. Fiberglass Mat: Embed Series 211-215 $\frac{3}{4}$ ounce fiberglass mat into basecoat while still wet, overlap smooth with ribbed roller to remove any voids or wrinkles.
 - e. Saturant Coat: Series 22 Epoxoline at 40-50 square foot per gallon, thinned up to 5% with Tnemec No. 2 solvent, until glass attains a uniform, wet-out appearance. Do not over-saturate.
 - f. Finish Coat: Series 22 Epoxoline, DFT 20.0–30.0 mils.
- D. Gypsum Wallboard Interior Exposure
- 1. Architectural/Light Exposure
 - a. Surface Prep: Clean and dry.
 - b. Primer: Series 151-1051 Elasto-Grip FC, DFT 0.7 – 1.5 mils
 - c. First Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils
 - d. Finish Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils
 - 2. Chemical Exposure
 - a. Surface Prep: Clean and dry
 - b. Primer: Series 151-1051 Elasto-Grip FC, DFT 0.7 – 1.5 mils
 - c. First Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - d. Finish Coat: Series V69 Hi-Build Epoxoline II, DFT 4.0 – 6.0 mils
 - 3. Heavy Abuse
 - a. Surface Prep: Clean and dry
 - b. Primer: Series 201 Epoxoprime, DFT 4.0 – 6.0 mils DFT
 - c. Base Coat: Series 273 ML Stranlok, DFT 8.0 – 12.0 mils
 - d. Embedded Fiberglass Mat: Series 273-0273C
 - e. Saturant Coat: Series 280 Tneme-Glaze, DFT 6.0 – 8.0 mils DFT
 - f. Finish Coat: Series 280 Tneme-Glaze, DFT 6.0 – 8.0 mils DFT

- g. Topcoat (optional): Series 297 Enviroglaze, DFT 2.0 – 3.0 mils
- E. Insulated Pipe (Interior Exposure)
- 1. Surface Prep: Clean and dry.
 - a. First Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils
 - b. Finish Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils
- F. PVC Pipe
- 1. New or Previously Unpainted PVC Pipe
 - a. Solvent clean and dry. Lightly sand with #150-200 sandpaper
 - b. First Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils
 - c. Finish Coat: Series 1026 Enduratone, DFT 2.0 – 3.0 mils

3.8 COLOR SYSTEM MATERIAL IDENTIFICATION

Water	Generic Color	Tnemec Color
Raw Water	olive green	110GN Clover
Settled or Clarified	aqua	10GN Aqua Sky
Finished or Potable	dark blue	11SF Safety Blue
Wastewater	Generic Color	Tnemec Color
Sewage Plant Effluent	clay	07RD Terra Cotta
Backwash Waste	light brown	68BR Twine
	Reclaimed Water	
Sludge	dark brown	84BR Weathered Bark
Sewer (sanitary or other)	dark gray	GR28 Fossil
Chemical	Generic Color	Tnemec Color
Alum. Or Primary	orange	04SF Safety Orange
Ammonia	white	11WH White
Carbon Slurry	black	35GR Black
Caustic	yellow with green band	02SF /02SF
Chlorine (Gas and	yellow	02SF
Fluoride	light blue with red band	25BL Fountainbleu/06SF
Lime Slurry	light green	PA30 Daiquiri Ice
Ozone	yellow with orange band	02SF/ 04SF
Phosphate Compounds	light green with red band	PA30 Daiquiri Ice/06SF
Polymers or Congulant	orange with green band	04SF /14SF
Potassium Permanganate	violet	14SF Safety Purple
Soda Ash	light green with orange band	
Sulfuric Acid	yellow with red band	02SF /06SF
Sulfur Dioxide	light green with yellow band	

Other	Generic Color	Tnemec Color
Compressed Air	dark green	91GN Balsam
Gas	red	28RD Monterrey Tile
Other Lines	light gray	32GR Light Gray
Hoists/Trolleys	yellow	02SF Safety Yellow
Fire Protection	red	06SF Safety Red

END OF SECTION

SECTION 22 07 11 – THERMAL PIPE INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section includes the requirements for the thermal insulation of outdoor and indoor piping, valves, and equipment as defined below. The work includes the procurement and installation of thermal insulation on the exterior process above ground piping as indicated on the drawings and interior cold-water piping.

1.2 STANDARDS

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
 - 1. ASTM B209 – Standard Specification for Aluminum Alloy Sheet
 - 2. ASTM C450 – Standard Practice for Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments
 - 3. ASTM C 585 – Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
 - 4. ASTM C534 – Standard Specification for Preformed Elastomeric Cellular Thermal Insulation in Sheet or Tubular Form
 - 5. ASTM C552 – Specification for Cellular Glass Thermal Insulation
 - 6. ASTM C585 – Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
 - 7. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - 8. ASTM C1094-01 – Standard Guide for Flexible Removable Insulation Covers
 - 9. MIL-C-20079 – Specification for Covers, Glass Textiles, Cloths, Tapes and Threads
 - 10. ASTM C547 – Standard Specification for Mineral Fiber Pipe Insulation
 - 11. ASTM C552 – Specification for Cellular Glass Thermal Insulation
 - 12. ASTM C585 – Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)

1.3 DESIGN CRITERIA

- A. Minimum Ambient Temperature: -10°F
- B. Average Wind Speed: 20 mph

1.4 SUBMITTALS

- A. Insulating contractor shall submit product data sheets in accordance with Section 01 33 00 for all materials including but not limited to: insulation, covers, fitting covers, vapor barriers, jacketing, finishings, caulks, sealants, adhesives, cements, and tapes to the Owner for approval prior to the delivery of material on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing: Ship insulation materials in containers marked by manufacture with appropriate ASTM specification designation, type, and maximum use temperature.
- B. Insulation materials shall be kept dry and protected from the weather at all times until installation is complete. Insulation material found to be wet or damaged shall be replaced by the contractor at no cost to the owner.

1.6 OWNER AUTHORIZATION TO PROCEED

- A. Insulation of any piping or equipment may not begin until the Owner provides the Contractor authorization to proceed with the work for any particular piping or equipment. Authorization to proceed shall not be provided until the pipe or equipment and any heat tracing is completed, inspected, and tested.

1.7 WARRANTY

- A. The Contractor shall warrant that materials furnished and installed be free of defects for a period of one (1) year from the time the system is completed.
- B. If a defect occurs in materials, workmanship or application within the stated time, the Contractor shall promptly repair or replace the defective material.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials furnished under this specification shall be standard, catalogued products, new and commercially available, suitable for service requiring high performance and reliability with low maintenance, and free of all defects.
- B. Insulation Services and thicknesses are provided in Appendix A of this specification.

2.2 PIPE INSULATION AND ACCESSORIES

- A. Fiberglass: Meeting ASTM C547; rigid, molded, noncombustible, Knauf 1000°, Owens Corning Fiberglass, Johns Mannville Micro-Lok.

1. 'K' ('ksi') Value: ASTM C335, 0.23 at 75°F (0.033 at 24°C).
 2. Maximum Service Temperature: 1,000°F (538°C).
 3. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C1136, Type 1, secured with self-sealing longitudinal laps and butt strips.
- B. Closed Cell Meeting: ASTM C534, Elastomeric Cellular Thermal Insulation, Armaflex.
1. 'K' ('ksi') Value: ASTM C177, 0.27 at 75°F (0.33 at 24°C).
 2. Maximum water vapor transmission rating of 0.8 perms.
 3. Seam and butt joint adhesives, manufacturer's recommended adhesive.

2.3 POLYISOCYANURATE PIPE INSULATION

- A. Insulation meeting ASTM C591: Rigid closed-cell polyisocyanurate thermal insulation bunstock, fabricated into shapes required to insulate pipe, valves, fittings, vessels, and/or special shapes. Density and physical properties are as specified in the Equipment Sections below. Polyiso material shall not be produced with, or contain, any of the United States EPA regulated CFC compounds listed in the Montreal Protocol of the United Nations Environmental Program.
- B. Vapor Retarder: Even though polyisocyanurate has excellent water vapor permeance, an additional vapor retarder is recommended and can improve thermal efficiency, water penetration characteristics, and fire spread and smoke development attributes. Vapor retarders may consist of sheet-type film, such as cross-laminated high density polyethylene sheeting, polyvinylidene chloride polymer film, or similar materials. (Vapor retarder sheets may require matching tape if not self-adhering.)
- C. Tape: Polyiso insulation is secured to the pipe with filament-reinforced tape, such as the synthetic filament-reinforced polyester film backing tape with non-thermosetting rubber adhesive, wrapped on a 3-inch paper core manufactured by 3M.
- D. 2.5 lb/ft³ Density Polyiso Physical properties:
1. Compressive Strength: Minimum 37 psi (255 kPa) Parallel to Rise (thickness).
 2. Dimensional Stability: <0.1 percent linear change (7 days) at -30°F and +158°F (-34°C and +70°C, respectively).
 3. Water Vapor Permeance: Less than or equal to 2.23 perm-inch (3.25 ng/(Pa*s*m)).
 4. Water Absorption: Not to exceed 0.1 percent by volume; C272.
 5. Flame Spread: Not to exceed 25 for thicknesses up to 4 inches.
 6. Smoke Development: Not to exceed 160 for thicknesses up to 4 inches (100 mm).
 7. Service Temperature: -297°F to 375°F (-183°C to +190°C).
 8. K-value: Maximum 0.18 BTU*in/hr*ft²*F after 6 months aging at 75°F.

2.4 PIPE INSULATION ACCESSORIES

- A. Aluminum Field Applied Covers

1. Metal: Aluminum, 0.024 inch (0.45 mm) thick in embossed finish with factory-applied moisture barrier. Overlap shall be 2 inches (50 MM) minimum. Fittings shall be die-shaped with factory-applied moisture barrier. Fastening Devices: Strapping: Type 18-8 stainless steel, 0.020 inch thick, 3/4 inch wide. Wing Seals: Type 18-8 stainless steel, 0.032 inch thick.
- B. PVC Field Applied Jackets or Fitting Covers
1. PVC: UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC, materials with fiberglass inserts. Thickness shall be equal to adjacent pipe insulation. Fiberglass insert has a thermal conductivity ('K') of 0.26 at 75°F (ksi – 0.037 at 24°C).
- C. Attachment Accessories
1. Tape: Tape for sealing joints in the insulation shall be a minimum of 3 inches wide, pressure sensitive and of the same type of material as the insulation jacket it is used on in accordance with MIL-C-20079.
 2. Strapping Type 18-8 stainless steel, 0.020 inch thick, 3/4 inch wide.
 3. Wire: 0.062-inch, soft-annealed, stainless steel.
 4. Screws: Stainless steel sheet metal screws.

2.5 UNDERGROUND JACKETING

- A. 125 mil (3.2 mm) thick heat-sealable, multiply laminate for protecting underground closed cell and glass cell pipe insulation with outer surface temperatures below 190°F (87.7°C). Underground jacketing consists of three layers of a polymer-modified, bituminous compound separated by glass reinforcement and aluminum foil. An outer layer of polyester film is laminated to the bituminous paper.

2.6 PREFORMED THERMAL JACKETS

- A. Insulation
1. Flexible Type Jackets:
 - a. Glass mat, type E needled fiber. ¼", ½" @ 9 LB/CF & 1" @ 11.3 LB/CF.
 - b. Estimation of Maximum Use Temperature 1200°F (650°C).
 2. All insulation materials shall be Non-Asbestos.
- B. Jacket:
1. Jacketing, liner, gussets, straps, and flaps will be constructed of a 13.5 oz. PTFE coated fiberglass cloth, LFP-2109, as manufactured by TCI, or equal, flexible, tear resistant PTFE jacketing is proven to be unaffected by complete immersion in wet

environments, Temperature Limit: 600°F (316°C), Weight: 13.5 oz/yd², Thickness: 0.009".

C. Thread:

1. Braided pure Teflon or Kevlar thread.

D. Construction:

1. Double sewn lock stitch with a minimum 4 to 6 stitches per inch. Jackets shall be sewn with two (2) parallel rows of stitching using thread in section 1.3D. The thread must be able to withstand the skin temperatures without degradation.
2. Hog rings, staples and wire are not acceptable methods of closure.
3. No raw cut jacket edges shall be exposed.
4. Jackets shall be fastened using hook and loop (Velcro) straps and 1" Slide Buckles.
5. Provide a permanently attached Aluminum or stainless-steel nameplate on each jacket to identify its location, size, and tag number.
6. Provide a stainless steel or brass grommet at the low point of each jacket, in wet areas or exterior locations for moisture drain (on horizontal jackets as required).
7. The insulation shall be designed to minimize the convection current in the space between the hot metal surface and the inner layer of insulation. To this end, during jacket fabrication, the layers of insulating mat shall be placed in an overlapping pattern.
8. All jacket pieces which match mating seams must include an extended 2" flap constructed from the exterior fabric and shall be secured using hook & loop closure (i.e. VelcroTM) parallel to the seam.
9. Insulation must be sewn as integral part of the jacket to prevent shifting of the insulation. Insulation pins are not an allowable method of preventing the insulation from shifting and will not be used.
10. Steam Trap and Steam Trap Station Jackets must be constructed in a box shape for removal and replacement inspection ease.

PART 3 - EXECUTION

3.1 GENERAL

- A. All insulation work shall be performed by skilled mechanics regularly engaged in the insulation trade and installed in strict accordance with the manufacturer's instructions. The final appearance of the insulation work shall be a neat, workmanlike and attractive insulation system.
- B. Progressive testing of systems to be insulated shall have been completed, inspected, and approved by the Owner before insulation is applied. Insulation shall not be applied until all surfaces are clean, dry, free of dirt, grease, frost, moisture, and other imperfections. Heat tracing systems shall be installed prior to insulation installation. Work performed prior to receipt of approved documents or submittals, which later proves to be incorrect or inappropriate, shall be promptly replaced by the Contractor without cost to the Owner.

- C. Insulation shall be protected from moisture and weather during storage and installation. Applied insulation, which becomes wet shall be thoroughly dried before it is sealed or jacketed. Insulation pins and studs shall be as specified and installed in accordance with acceptable standards.
- D. Insulation, fabric, and jacketing shall be protected from mechanical damage during construction. Damage by the insulator shall be repaired without cost to the Owner. Damage by others shall be reported in writing to the Owner.
- E. All insulation adjacent to tank walls, flanges and valves shall be neatly finished where exposed to view.
- F. Vapor retarders shall be continuous through sleeves, hangers, etc. If pierced, vapor retarders shall be covered and suitably sealed.
- G. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
- H. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.

3.2 PIPING INSULATION

- A. Insulation shall be fabricated in required shapes from bun stock in accordance with ASTM C-450 Standard Practice for Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments and C-585 Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System). Insulation shall be factory fabricated from bun stock.
- B. Fittings, such as valves, valve stations, flanges, 90° and 45° elbows, and tees shall be two-piece flycut or routed as the preferred fabrication method. For diameters too large for flycutting or routing, the pieces shall be fabricated in two halves with each half made up of mitered sections. Both methods shall be in accordance with ASTM C-450 and C-585. Larger outer diameter valves and flanges may be slightly oversized.
- C. Insulation for electrical tracing systems shall be oversized by 1/2" inside insulation radius on bottom half shells only. Outside insulation diameters shall remain the same on bottom and top sections. The 1/2" annular space on the bottom half section will allow spacing for the electrical tracing system. Do not oversize the bottom half shell of insulation at pipe hangers and supports. When oversizing the bottom half shell, the insulation thickness of the bottom half shell shall be that specified as the design thickness. The insulation thickness of the upper half shell shall be ½ match the bottom half shell.
- D. Orient longitudinal joints between half sections of the outer insulation layer in the 3 and 9 o'clock position on the pipe. All insulation shall be tightly butted and free of voids and gaps.

- E. Install prefabricated insulation fittings on elbows, tees, and valves. Insulation at fittings shall be the same thickness as on pipe sections.
- F. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- G. Insulation shall be secured to the pipe with 3/4" wide fiber reinforced tape. Tape to be applied 3 inches from a joint and at 6-inch intervals. Weather seal shall be continuous. Straight sections of jacketing shall be neatly secured with bands and seals with a maximum spacing of 9" on center. End joints shall be secured with bands and seals centered directly over joint. All fasteners and bands shall be neatly aligned, and overall work must be of high-quality appearance and workmanship.
- H. Oversize and overlap insulation at expansion joints to allow for expansion and contraction all expansion joints.
- I. For closed cell elastomeric insulation, seal seams and butt joints with manufacturer's recommended adhesive

3.3 BELOW GRADE INSULATION

- A. Insulation for buried or below grade piping shall be insulated to a depth of 36 inches below final grade with closed cell with Pittsburgh-Corning. Closed cell insulation shall extend to a height of 18 inches above the finish grade. Below grade insulation shall be finished with pittwrap jacketing to a height of 6 inches above the final grade. Aluminum jacketing shall be used above that elevation.

3.4 INSTALLATION OF PROTECTIVE COVERINGS

- A. Protective coverings shall be installed, if not an integral part of the insulation material, in strict accordance with the manufacturer's instructions.
- B. Installation shall be finished in accordance with the applicable detail illustrations in the MICA National Insulation Standards.

3.5 THE OWNER'S ACCEPTANCE

- A. All materials, accessories and methods of installation and fabrication are subject to the Owner's inspection and approval during any phase of the work.

3.6 HOUSEKEEPING

- A. The Contractor shall prevent the accumulation by removing all insulation debris at the end of each workday or as an area is completed.

PART 4 - TABLES

Table 1 - INSULATION SERVICES

Pipe Service	Insulation	Service
Process Flow Above grade	ASTM C547 Fiberglass: Embossed Aluminum Jacket	Freeze Protection
Process Flow Below grade	ASTM C552 – Cellular Glass	Freeze Protection
Drain Valves	1" thick removable blanket	Freeze Protection

Table 2 - PIPE INSULATION THICKNESS

Pipe Size	Conserve Heat	Freeze Protection	Anti-Sweat	Personnel Protection
1" and below		1"	1/2"	1/2"
1-1/4" to 4"		1-1/2"	1/2"	1/2"
6" to 8"	1-1/2"	2"	1/2"	1/2"
8" and above	2"	2-1/2"	1/2"	1/2"

SECTION 22 14 29 – SUMP PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The Contractor shall furnish all materials, equipment, labor, supervision, and accessories required for a complete and operational installation in accordance with the drawings and specifications.
- B. Furnish and install one submersible sump pump.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 26 – Electrical

1.3 SUBMITTALS

- A. Submit shop drawings and product data on all materials, equipment, and appurtenances in accordance with Section 01 33 00.
- B. The following items shall be submitted by the supplier:
 - 1. Pump catalog data.
 - 2. Pump performance curve.
 - 3. Break Away Fitting (BAF) data.
 - 4. Access frame data.
 - 5. Typical installation drawing.
 - 6. Pump electrical data.
 - 7. Pump wiring schematic.
 - 8. Accessory data.
 - 9. Installation & Operation Manuals with Parts List.

1.4 PUMPS

- A. The pump shall be capable of delivering the following performance points, 5 U.S. GPM at 28' TDH; 20 U.S. GPM at 24' TDH; 35 U.S. GPM at 18.5' TDH and 55 GPM at 11' TDH with a shut off head of 30' TDH (minimum). The pump motor speed shall be 3450 RPM, 1/2 HP (maximum), 1 Phase, 60 Hertz, 120 Volts.
- B. Pumps shall be capable of handling sump water, and two (1/2) inch diameter spherical solids. The pump shall be built with an integral thermoplastic strainer around the bottom. The pump shall be capable of handling liquids with temperatures to 104°F continuous.

- C. The pump shall be manufactured in North America by a company regularly engaged in the manufacture and assembly of similar units for a minimum of ten (10) years. The pump shall be Barnes® Pumps model SP50VFX or approved equal.

PART 2 - PRODUCTS

2.1 PUMP CONSTRUCTION:

- A. The volute, seal plates, impeller and motor housing shall be constructed of high-quality ASTM A-48 class 30 cast iron. The pump shall be painted with a water-based air-dry enamel of 2.0 mil minimum thickness. All exposed hardware shall be 300 series stainless steel. The pump construction shall contain no points of critical clearance nor require periodic adjustment or replacement to maintain operating efficiency. Discharge connection shall be a standard 1.5-inch NPT in the vertical position. All gaskets shall be of the compression square ring type eliminating critical slip fits and the possibility of damage during service associated with sliding O-ring sealing arrangements.
- B. The impeller shall be of the non-clog vortex design with pump out vanes on the back side. The impeller shall be dynamically balanced to ISO G6.3 specifications. Pumps using thermoplastic impellers will not be allowed. The bottom of the pump shall be protected by a thermoplastic pump strainer.
- C. The unit shall utilize a single mechanical shaft seal which will operate in an oil atmosphere. The materials of construction shall be carbon for the rotating face and ceramic for the stationary face, lapped and polished to a tolerance of one light band, 300 series stainless steel hardware, and all elastomer parts to be of Buna-N. The seal shall be commercially available and not a proprietary design of the manufacturer.
- D. The pump shall be designed to be non-overloading throughout the entire pump curve. The motor shall be constructed with the windings operating in a sealed environment containing clean dielectric oil, making it capable of operating in a totally, partially, or non-submerged condition for extended periods of time without damage due to the heat being generated. Air-filled motors shall not be acceptable. The motor windings shall be of Class B insulation. The lower bearing shall be of the single ball type to accept radial and thrust loads, and the upper bearing of the single ball design, for radial loads. Bearings shall operate in an oil bath atmosphere for superior life. Permanently lubricated bearings are not acceptable.
- E. Single phase shall have an overload switch on the motor windings and do not require any external protection. The pump shall be equipped with 20 ft. of type SJTOW/SJTW power cable and connected to the motor.

2.2 VERTICAL FLOAT CONSTRUCTION:

- A. A vertical float switch with piggyback plug shall be supplied with the pump and installed on the pump. Vertical floats not affixed to the pump that would need to be attached to the discharge piping are not acceptable. The float switch shall be manufactured of an

impact resistant PVC switch and housing, neoprene float stop, and 20' SJOW cord with piggy-back plug. The switch rating should be 13 amps maximum running current @ 120v. The float should have an adjustable pumping range from .75" to 6.5". The standard setup with the float mounted to the pump should have an off level 2.95" off the floor and an on level 7.31" off the floor providing an operating range of 4.36". Swing type float setups are not acceptable because of the larger footprint needed for a swing type float.

PART 3 - EXECUTION

3.1 HANDLING, SHIPPING AND DELIVERY

- A. Handle equipment in a manner to ensure installation in a sound and undamaged condition.
- B. Contractor shall receive and store equipment in accordance with the manufacturer's recommendations. Contractor shall report any damaged equipment or missing parts immediately upon delivery of equipment to the job site.

3.2 START-UP AND TESTING

- A. The Chemical Feed System Supplier shall provide the services of a factory authorized field engineer for the purposes of installation inspection, equipment start-up, performance testing and training of plant personnel regarding proper operation and maintenance of the equipment. Services shall be provided for a minimum of four (4) hours of training in addition to any startup and testing otherwise required.
- B. Field testing shall be under normal operating conditions in the presence of the Professional, or his authorized representative, and the Manufacturer's service representative.

3.3 EQUIPMENT WARRANTY

- A. The manufacturer shall warrant that the equipment and accessories will be free from defects in workmanship or material for a period of one (1) year from the date of completion and acceptance of the chemical feed system. Acceptance of the chemical feed system will be obtained after the equipment has been started-up and proven to function correctly.

END OF SECTION

SECTION 26 00 01 – GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General Electrical Requirements applicable to all electrical work involved with the project.
- B. General description of electrical work.

1.2 DESCRIPTION OF WORK

- A. The work covered by the Contract Documents is at existing and new facilities. The work required for electrical systems shall consist of furnishing all labor, materials, tools, equipment, services, and related items necessary to accomplish the installation and proper operation of the work as indicated and described in the Contract Documents. The complete installation as a whole, and in every part, shall be left ready for satisfactory operation.
- B. Equipment or materials and labor, obviously a part of the work and necessary for installation and proper operation of same, although not specifically shown on the drawings or specified, shall be provided as if called for in detail, at no additional cost to the Owner.
- C. Without intending to limit or restrict the amount of work involved, and solely for the convenience of the Contractor, the work in general shall comprise the following:
 - 1. Temporary electric distribution and lighting systems for Contractor's use during construction, including all work and costs for same.
 - 2. All coordination activities with the Owner involving temporary electric distribution and lighting, including all work and costs for same.
 - 3. All coordination activities with other contractors involved with the project and the Owner.
 - 4. Maintenance of existing electrical equipment, devices, items, wiring, etc., at the project location not specifically involved in the project but which are impacted by the work during the course of the project.
 - 5. Relocation of existing equipment, wiring, and appurtenances as required to meet actual field construction conditions.
 - 6. Installation of complete power distribution, lighting, and control systems including all equipment, devices, items, conduit, fittings, wiring, and all associated appurtenances as indicated and/or specified and/or required.
 - 7. All wiring and connections for equipment/items furnished by the Owner for use in the work.
 - 8. All wiring and connections for equipment/items furnished under other divisions/sections of the Contract Documents.
 - 9. All wiring and connections for existing equipment/items which remain or are reused in

the work.

10. All equipment foundations, dowels, supports, anchors, bolts, etc. required for the complete installation of all equipment furnished under this division and for all equipment/devices required to be installed by the electrical Contractor under other divisions/sections of the Contract Documents.
11. All cutting, coring, and patching required for the complete installation of all equipment furnished under this division and for all equipment/devices required to be installed by the electrical Contractor under other divisions/sections of the Contract Documents.
12. All trenching, excavation, backfilling, shoring, and care for all groundwater required for the complete installation of all equipment furnished under this division and for all equipment/devices required to be installed by the electrical Contractor under other divisions/sections of the Contract Documents.
13. Repair or replacement of damage caused by construction.
14. Cleaning, painting, legends, and labeling.
15. Testing, adjusting, and instructions.
16. Shop drawing and product data submittals.
17. Operation and maintenance documents submittals.
18. Operation and maintenance manuals.
19. Record drawings and documents.

1.3 REFERENCES

- A. ANSI/NFPA 70: National Electrical Code.
- B. NECA: Standard of Installation.
- C. UL: Electrical Construction Materials Directory.

1.4 SUBMITTALS

- A. Submit under provisions of 01 33 00 and as specified herein.
- B. Proposed Products List: Include products specified in the individual sections.
 1. Within 15 days after date of Notice to Proceed, submit a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 2. The Proposed Products List and individual items therein will be used for reference during submittal reviews and will not be reviewed for acceptance.
- C. Equipment/Product Submittals: Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.
 1. A minimum of two (2) hard (paper) copies or one (1) electronic copy (PDF) of each shop drawing/product data submittal shall be submitted and acceptance obtained before shipment and/or installation of material. Acceptance is given only to indicate general

compliance with contract requirements and does not relieve the Contractor from any obligation undertaken under the contract. All acceptances are subject to reversal if field inspection reveals unfavorable conditions not previously disclosed.

2. Submittals shall be checked and corrected before submission. All deviations from Contract requirements shall be noted. If more than one item appears on a submission and the proposed item is not marked, acceptance will be based upon the item that meets specifications.
 3. Mark shop drawings and product data with the appropriate specifications section(s), drawing and/or detail reference number(s).
 4. Mark dimensions, ratings, and values in units to match those specified.
 5. Without intending to limit or restrict the types or quantity of shop drawing/product data submittals, and solely for the convenience of the Contractor, these submittals shall include, but not be limited to, the following:
 - a. Hand holes.
 - b. Conduit, conductors, cable, grounding, and accessories.
 - c. Wiring devices.
 - d. All identification markings.
 - e. Enclosed switches.
 - f. Panelboard modifications.
 - g. Lighting equipment.
 - h. Heating equipment.
 6. All equipment/product submittals shall be transmitted for review simultaneously (as a group).
 7. In general, where a manufacturer's name and/or style number is mentioned in the description of material and equipment in the specifications or on the drawings, it is to be understood that it is for the purpose of setting a standard.
 - a. Where three manufacturers are named, the material or equipment shall be from one of those named.
 - b. When a proprietary product is specified, the material or equipment shall be that specified.
 8. If any substitute items are to be submitted and there are any questions of quality of such items, the Contractor may be required, at his own expense, to submit samples of both the item specified and that to be substituted or furnish further proof of equivalence to the entire satisfaction of the Owner. In no case shall he be allowed additional remuneration if he must supply any items as specified because of the rejection of a substitute.
- D. Submit installation instructions and operation and maintenance (O&M) information grouped into a complete/combined and bound manual formatted by specification section with index, for the entire project.
1. Installation instruction and O&M information shall consist of, but shall not be limited to, the following:

- a. Description of equipment/system.
 - b. Installation instructions.
 - c. Start-up instructions.
 - d. Operating instructions.
 - e. Maintenance instructions.
 - f. Recommended maintenance schedule.
 - g. Troubleshooting information techniques.
 - h. Spare parts list.
 - i. Schematic diagrams.
 - j. Wiring diagrams.
 - k. Safety/precautionary instructions.
 - l. Factory warranties/guarantees.
 - m. List of manufacturers' local representatives or service agents.
- 2. One (1) copy of the manual shall be submitted for review and comments. Comments shall be included/addressed/incorporated in the final O&M Manuals for the project.
- 3. Operation and maintenance information shall be submitted not more than 45 days after submission of equipment/product submittals.
- 4. Without intending to limit or restrict the types or quantity of installation instructions and operation and maintenance information, and solely for the convenience of the Contractor, this information shall be provided for, but not limited to, the following:
 - a. Lighting equipment.
 - b. Heating equipment.
- E. Specific submittals and other submittals (not listed in this section) are required by the Contract Documents and/or are listed in the specifications. The Contractor shall be responsible for all submittals.
- F. Prior to submission, the Contractor shall mark all submittals with an appropriate submittal number and with the Contractor's review stamp indicating that the Contractor has reviewed the submittal for compliance with the Contract Documents and found it acceptable.
- G. Review of submissions, in whole or in part, shall not constitute acceptance of any errors, omissions, changes, or other deviations from the Contract Documents. Checking is only for conformance with the design concept of the project and compliance the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication, shipping, handling, storage, assembly, installation or to techniques of construction; for coordination of the work of all trades, and for all safety aspects of the work.

1.5 DEFINITIONS

- A. Wherever the word "Provide" appears in the Contract Documents it shall mean furnish and install with all required associated work, wiring, raceways, and appurtenances, make all final connections, and leave in a satisfactory operating condition.

- B. Wherever the word "Equipment" appears in the Contract Documents, it shall mean all wiring, apparatus, raceways, fixtures, panels, boxes, switches, appurtenances, devices, and similar items as required.
- C. Wherever the word "Work" appears in the Contract Documents, it shall mean all required equipment and all materials, supervisions, transportation, adjustments, labor, rigging, scaffolding, and tools of an auxiliary nature required to install the equipment for a complete approved installation.
- D. Wherever the word "Wiring" appears in the Contract Documents, it shall mean all cables and conductors, insulated and uninsulated, grounded, and ungrounded, and their enclosed raceways, including all associated fastenings, supports, boxes, bushings, devices, appurtenances, fixtures, and equipment as required.
- E. Wherever the word "Conduit" appears in the Contract Documents, it shall refer to rigid metal conduit, PVC externally coated rigid metal conduit, rigid non-metallic conduit (Schedule 40 PVC), or liquid-tight flexible metal conduit.
- F. Where work or equipment is referred to in singular terms, such reference shall be deemed to apply to as many items of work or equipment as required to complete the entire installation.

1.6 REGULATORY REQUIREMENTS

- A. Rules and Regulations: All work shall be done in strict compliance with the requirements of the National Electrical Code; all local, state, and federal safety requirements; all local, state, and federal environmental requirements; and all other public authorities having jurisdiction. These rules and regulations shall be considered as forming a part of the Contract Documents.
- B. Fees and Certificates: Obtain and pay for all permits and certificates required in conjunction with the work. Furnish a copy of all permits and certificates to the Owner.
- C. Contractor's License: All electrical work shall be done by a fully qualified and duly licensed electrical Contractor. The Contractor shall maintain his license in effect throughout the course of the work.
- D. Underwriter's Label: All material for which label service is available shall bear the label of the Underwriters Laboratories, Inc.
- E. Underwriter's Inspection: During the course of the work at periodic intervals, the Contractor shall, at his expense, have an inspection of the work made by a representative of an independent inspection agency. Corrections to the work required by said inspections shall be accomplished immediately at no additional cost to the Owner.
 - 1. Prior to commencing work, submit to the Owner evidence that inspection services of an independent inspection agency have been obtained.
 - 2. Prior to the installation of finish materials, and while all concealed work is accessible, obtain a certificate/letter from the independent inspection agency indicating approval

- of the rough wiring. This certificate/letter shall be forwarded to the Owner.
3. Upon completion of the work, an approved Certificate of Electrical Inspection for the entire project shall be delivered to the Owner.

1.7 PROJECT/SITE CONDITIONS

- A. Install work as indicated in the Contract Documents, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of Owner before proceeding.
- C. Commencement of construction shall mean that the Contractor accepts project/site conditions.

1.8 COORDINATION

- A. Electrical work shall be coordinated with other trades/utilities involved in the project. All work shall be carefully laid out in advance coordinating electrical features with architectural, structural, and mechanical features of construction before the work is installed. Prior to roughing-in, the Contractor shall review approved shop drawings of the other trades involved in the project.

1.9 COOPERATION

- A. Cooperate fully with other trades/utilities involved in the project and the Owner as is necessary to accomplish intelligent and proper execution of work.

1.10 SUPERINTENDENCE

- A. The Contractor shall give his personal superintendence to the work or have a competent superintendent, satisfactory to the Owner, present at all times during construction with full authority to act for him in matters relating to the work. The Contractor shall provide an adequate organization for the proper coordinating and expediting of the work. The Contractor shall lay out his own work and shall be held fully responsible for all measurements executed by him under the contract. He shall verify all information shown in the Contract Documents and shall be held fully responsible for all errors resulting from failure to exercise these precautions.

1.11 DRAWINGS

- A. The Contract Drawings have been made to scale with the best knowledge of conditions, dimensions, and space requirements available at the time of drafting. Report errors or discrepancies to the Owner immediately upon discovery for instructions as to further procedure. The wiring/raceway layout shown on the drawings shall not be considered as absolute but shall

be subject to such revisions as may be necessary to overcome field obstructions. No changes shall be made in the location or placement of apparatus without approval of the Owner. The drawings may not indicate all the existing equipment, devices, wiring, structures, piping, etc., either exposed or concealed. Prior to commencing construction, the Contractor shall obtain or verify the exact location of all the existing items that affect the work.

1.12 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Owner. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

1.13 PROTECTION

- A. Effectively protect all parts of the installation, materials stored on site, and materials installed against theft and vandalism. All materials and equipment removed or damaged through theft or vandalism shall be replaced by the Contractor at no additional cost to the Owner. The Contractor shall also effectively protect all portions of the work, materials, and equipment that are liable to injury during the period of construction. Conduit and openings into same, wiring, and all materials and equipment under the contract before and after being set in place, shall be adequately covered and protected to prevent damage or entrance of foreign matter detrimental to the operation of the equipment. The Contractor shall be held responsible for all damage done to his work until such is finally and fully accepted by the Owner.

1.14 EXAMINATION OF THE WORK

- A. Furnish all labor, material, equipment, and instruments as may be required by the Owner in making examination of the work.

1.15 RECORD DRAWINGS AND DOCUMENTS

- A. It shall be the Contractor's responsibility to annotate the record drawings and documents to show "As-Built" conditions as the construction proceeds.
- B. Upon completion of the work, the Contractor shall furnish two (2) sets of record drawings and documents to the Owner (one hard/paper copy and one electronic/PDF copy).
- C. Record drawings and documents shall consist of annotated contract drawings, specifications, addenda, change orders, shop drawings, and field directives.
- D. These drawings and documents shall indicate as a minimum, equipment locations, conduit layout, wiring diagrams, and related details. They shall show wire and conduit sizes and equipment capacities, all important dimensions, and necessary information for operation and maintenance of equipment.

1.16 INSTRUCTIONS

- A. Upon completion of the work and prior to acceptance, the Contractor shall instruct designated employees of the Owner in the operation of the various items of equipment and in the operation of each of the systems.

1.17 SPECIAL REQUIREMENTS

- A. The Contractor shall be responsible to insure "on the job" safety for his employees. In addition, he shall be responsible to ensure that his work shall be performed in a manner that will provide safe conditions for other persons employed on the project, employees of the Owner, all other persons having authorized or unauthorized access to the work, and the public.
- B. It shall be the responsibility of the Contractor to conduct his work in such a manner as to minimize the interference and/or interruption of the normal activities at the project site.
- C. The Contractor shall notify the Owner not less than five (5) working days prior to commencing any electrical work that may interfere and/or interrupt the normal activities at the project site.
- D. The Contractor shall assure, and take all necessary actions to assure, that the existing facilities are kept operational at all times for the duration of this contract. Interruption of existing facilities' operation will not be permitted. If it becomes necessary to interrupt electric service to any part of the facilities, schedule activities to be performed at times agreeable to the Owner. The work shall be conducted in such a manner that electric service will never be completely interrupted. Contractor shall include, in his bid, all premium pay that may be required in connection with these requirements.
- E. It shall be the responsibility of the Contractor to obtain accurate dimensional data of the equipment and to determine that such equipment will fit space allocated with adequate clearance for operation and maintenance.
- F. It shall be the responsibility of the Contractor to verify the actual electrical requirements of all equipment involved in the work and to size all wire, all conduit, all circuit protection, etc. in accordance with the National Electrical Code, and the published requirements/recommendations of the equipment manufacturer. However, size and ratings shall not be less than those indicated on the drawings or specified, unless approved by the Owner.
- G. The Contractor shall be responsible for the replacement and/or repair of all damage caused by his work. Replacement and/or repair work shall conform to the existing conditions.
- H. The bidders are hereby instructed that prior to submitting a proposal, each bidder shall visit the site and carefully examine the existing conditions affecting the Work and verify those items that impact the project. Additional labor/materials and equipment required through failure to follow these instructions shall be provided by the Contractor at no additional cost to the Owner.

1.18 GUARANTEE

- A. All new materials or equipment and all workmanship shall be fully guaranteed in writing for a period of one (1) year from the date of acceptance by the Owner. This guarantee shall include an agreement to repair or replace all material or work which is discovered to be defective during said period.

1.19 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 78 23 "Operation and Maintenance Data".

1.20 OWNER FURNISHED AND EXISTING EQUIPMENT

- A. The project includes Owner furnished and existing equipment which shall be used in the work. The Contractor shall be responsible to coordinate/verify the specific equipment with the Owner, prior to use.
- B. The Contractor shall be responsible to thoroughly familiarize himself with all aspects of the Owner furnished and existing equipment in order to properly use same.
- C. The bidders shall be responsible to contact the Owner prior to submitting a proposal and verify all equipment and/or requirements regarding the use of Owner furnished and existing items. Additional equipment, materials, and labor required through failure to follow these instructions shall be provided by the Contractor at no additional cost to the Owner.

1.21 SEQUENCE AND SCHEDULING

- A. The sequence and scheduling of the work shall be coordinated by the Contractor with the Owner and the other trades/utilities involved in the project.
- B. Existing electrical equipment shall be maintained in operation until the new facilities are complete and ready for start-up.
- C. All changeovers from existing facilities to new facilities shall be coordinated by the Contractor with the Owner and the other trades/utilities involved in this project and shall be accepted by the Owner prior to commencement of the change-over.
- D. All changeovers shall be conducted in a continuous and expedient manner (i.e. from commencement to completion without a stoppage in the change-over work).

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and free of defects. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements. When two or more units of the same type, class, and sizes of equipment are required, these units shall be products of a single manufacturer; however, the component parts of this system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name, address, the model and serial number on a nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- B. Items not specified but necessary for the proper installation of the electrical work and operation of the system shall be furnished in a grade and quality, meeting normal trade standards. Materials shall be compatible with the materials of the system in which they are to be installed.
- C. All material and equipment shall be acceptable to the authority having jurisdiction or shall be replaced with acceptable items at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install all work using the procedures as defined in the NECA Standard of Installation.
- B. All equipment shall be installed and wired in strict compliance with the requirements and recommendations of the equipment manufacturer.
- C. All work shall be installed in a first-class manner by mechanics skilled in the trade involved. All details of the installation shall be mechanically and electrically correct and all work shall comply with the requirements of the National Electrical Code and all local codes having jurisdiction.
- D. Installation, wiring, and connections of equipment furnished under other divisions/sections of the Contract Documents or existing equipment shall be accomplished using the requirements and recommendations of the equipment manufacturer.

3.2 CLEANING

- A. During construction, the Contractor shall maintain all areas in which he is working or using for storage and access free from rubbish and debris at all times.
- B. Upon completion of the work, the Contractor shall thoroughly clean all parts of the installation to the satisfaction of the Owner. The switches, receptacles, cabinets, and enclosures, disconnects, circuit breakers, and similar items of the equipment shall be thoroughly cleaned

prior to final acceptance.

3.3 PAINTING

- A. Paint all damaged factory finished surfaces. Use paint and method of application as recommended by the equipment manufacturer.

3.4 LEGENDS

- A. Provide for each cabinet and enclosure, disconnect, circuit breaker, and similar items of equipment a laminated plastic nameplate of molded phenolic compound to indicate the device and equipment served. Characters shall be white, not less than one-eighth inch (1/8") high.
- B. Provide tags for all feeders, at both ends and at intermediate junction and pull boxes, indicating feeder designation or equipment served.

3.5 TESTING

- A. Upon completion of the work and prior to acceptance, the Contractor shall test all conductors to insure freedom from unwanted grounds, continuity, proper splicing, and insulation values in accordance with National Electrical Code requirements. In addition, the Contractor shall check all conduits for continuity. Preliminary testing with a megneto or ohmmeter shall be permitted, but final measurements shall be obtained with a "Megger" or suitable voltage output. The Contractor shall furnish all required instruments, labor, material, and other equipment necessary for testing.

3.6 ADJUSTMENTS

- A. Upon completion of the work, all component parts, individually and as a whole, shall be adjusted and left in a satisfactory operational condition.
- B. All overload devices shall be set and adjusted to load conditions.

3.7 REPAIRS OR REPLACEMENT

- A. The Contractor shall be responsible to repair and/or replace all damage caused by his work.
- B. All repair and/or replacement work shall be performed in a neat and workmanlike manner by craftsmen skilled in the trades involved and shall be accomplished in accordance with the best practice of the trade.
- C. All damaged equipment shall be replaced before acceptance of the work, regardless of who caused the damage. In areas where electrical construction has been performed over finished

surfaces, all marred surfaces shall be touched-up as directed by the Owner. All burned-out lamps shall be replaced at Substantial Completion.

3.8 EARTH WORK

- A. All earth work shall be done in accordance with Federal, State, and Local requirements and as per the Contract Drawings and Documents.

3.9 CONCRETE WORK

- A. All concrete work shall be done in accordance with the requirements of Division 3 – Concrete of the Contract Documents.

3.10 CUTTING, CORING, AND PATCHING

- A. All cutting shall be done by this Contractor as required for the installation of his work. All holes through existing concrete or masonry construction shall be core drilled. Prior to any core drilling, verify that same will not damage or interfere with existing piping, equipment, etc.

END OF SECTION

SECTION 26 05 18 – CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.

1.3 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.4 PROJECT CONDITIONS

- A. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
- B. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.5 COORDINATION

- A. Determine required separation between wiring and other work.
- B. Determine wire and cable routing to avoid interference with other work.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Generally, cable, wire and connectors shall be of manufacturer's standard materials, as indicated by published product information.
- B. Provide factory-fabricated wire of the size, rating, material, and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards.
- C. If more than three phase conductors are installed in a single raceway, the conductors shall be derated in accordance with the National Electrical Code. Increase wire size so that resulting ampacity, after derating factor is applied, is equal to or greater than ampacity of conductor required.
- D. The conductors of wires and cables shall be of copper (tinned where specified) and have conductivity in accordance with the standardization rules of the IEEE. The conductor and each strand shall be round and free of kinks and defects.
- E. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the NEC. Conductors intended as a neutral shall be colored solid white or identified as required by the NEC.
- F. Use compression lugs for all wiring terminations, except on breakers or terminal strips in panelboards.

2.2 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THHN/THWN-2.

2.3 INSTRUMENTATION CABLE

- A. 300 Volt Instrumentation Cable, Multiple Pairs, Overall Shield, Type PLTC

1. Individual Conductors: #18 AWG, stranded, tinned copper, flame retardant polyethylene or PVC insulated, rated 105°C.
2. Assembly: Individual twisted pairs having a 100 percent coverage aluminum-polyester shield and 20 AWG stranded tinned copper drain wire. Conductor bundle shall be shielded with 100 percent coverage overall aluminum-polyester shield complete with #18 AWG copper drain wire. All group shields completely isolated from each other. Bundle wrapped with cable tape and covered with an overall flame-retardant PVC jacket. The cable shall be UL listed and labelled. The cable shall have a nominal capacitance of no more than 24 pf/ft.

2.4 ETHERNET CABLE

- A. Multiconductor, 4-bonded pairs, #22 AWG solid copper conductors; ANSI/TIA 568.2-D, Category 5e or better; plenum rated, NEC/UL CMR compliant. Belden Cable #7922A or an acceptable equivalent.

2.5 FIBER OPTIC CABLE

- A. Single, tight-buffered, 6-fiber, riser (OFNR); 50-micrometer, multimode (OM2); OSP construction, flame retardant, UV-resistant outer jacket; ICEA S-104-696 and UL 1666 listings; TIA-598 color-coded. Corning Cable #006T8F-31131-29 or an acceptable equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that mechanical work likely to damage wire has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire or cable.

3.3 INSTALLATION

- A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and as required to ensure that products serve the intended functions.
- B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- C. Use stranded conductors for control circuits.
- D. No conductor smaller than #12 AWG shall be used for lighting and power purposes.

1. Conductor sizes shown on drawings are minimum and shall be increased as necessary to comply with voltage drop restrictions specified herein. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions.
 - a. 480 Volt Branch Circuits: The voltage drop in the case of 277/480 volt circuits shall not exceed 1.0% at maximum load and 70.0% power factor.
 - b. 120/240 Volt Branch Circuits: The voltage drop in the case of 120/208 volt circuits shall not exceed 2.0% at maximum load and 70.0% power factor.
 2. To accommodate circuits increased in size to offset voltage drop, provide pigtails as required to make terminations at source and load. Pigtail splices at source shall be in separate j-box (not inside panelboard). Increase size of load side termination box as required.
- E. Use conductor not smaller than 14 AWG for control circuits.
- F. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 ft.
- G. Pull all conductors into raceway at same time.
- H. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- I. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- J. Protect exposed cable from damage.
- K. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- L. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- M. Feeder or Branch Circuit Size Omission: In the event that an electrical feeder or branch circuit size is omitted, the Contractor shall report the same to the Engineers in time to issue an Addendum prior to bid date. If the omission is not discovered in time to issue an Addendum, the Contractor shall base his bid on installation of Conductors sized in accordance with the National Electrical Code and protected by an overcurrent device sized per the N.E.C. (maximum of 3% voltage drop). Conduit for these conductors shall be sized in accordance with the National Electrical Code. Contractor shall confirm the conduit and conductor sizes with the Engineer before purchasing or installing same.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
- D. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- E. Keep conductor splices and taps accessible and to a minimum, and in junction boxes only. Control circuit conductors shall terminate at terminal blocks only. Do not splice below grade or in outdoor pull boxes.
- F. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- G. Clean conductor surfaces before installing lugs and connectors.
- H. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable.
- B. Identify each conductor with its circuit number or other designation indicated on the drawings.

3.6 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values to ensure compliance.
- C. Verify continuity on all power and equipment branch circuit conductors.
- D. Verify proper phasing connections.
- E. Before final acceptance, the Contractor shall make voltage, insulation, and load tests, necessary to demonstrate to the Owner's representative the satisfactory installation and proper performance of all circuits.
- F. Test conductors clear of faults. Insulation-resistance test shall be conducted per NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. Test

results below 50 megohms shall be cause for rejection of the wiring installation. Replace and retest all such rejected conductor.

- G. Perform tests and inspections and prepare test reports to be submitted to Engineer.
- H. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance, feeder, and branch circuit conductors for compliance with requirements.
 - 2. Perform visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- I. Remove and replace failed conductors and/or cabling, and retest as specified above.

END OF SECTION

SECTION 26 05 26 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power system grounding.
- B. Electrical equipment and raceway grounding and bonding.

1.2 SYSTEM DESCRIPTION

- A. Ground the electrical service system neutral at service entrance equipment to metallic water piping and to supplementary grounding electrodes.
- B. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and metallic piping systems.
- C. Install grounding as indicated on the drawings and as required by the National Electrical Code.
- D. Ground each separately derived system neutral to nearest effectively grounded electrode.

1.3 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features:

1. Test wells.
 2. Ground rods.
 3. Grounding arrangements and connections for separately derived systems.
- C. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ground Rods: Copper-encased steel, $\frac{3}{4}$ inch diameter, minimum length ten (10) feet.
- B. Wire: Standard copper, size to meet ANSI/NFPA 70.
- C. Exothermic Welds: Cadweld type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Provide a separate insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.
- B. Connect grounding conductors to ground ring using a suitable ground clamp. Provide bonding per NEC requirements.
- C. Supplementary Grounding Electrode: Use driven ground rod.
- D. All grounding and bonding connections below grade shall be of the exothermic welded type.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Enclosure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

- 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Install products in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 5 ohms.
- C. Excessive Ground Resistance: If resistance to ground exceeds ten (10) ohms (or other indicated values), install additional grounding system components as necessary to reduce ground resistance.
- D. Provide ground resistance test results to the Owner.

END OF SECTION

SECTION 26 05 29 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Fastening hardware.

1.2 GENERAL

- A. The Contractor shall provide all necessary hangers and supports for equipment and materials. Equipment and materials shall be adequately supported to provide a structurally sound installation.
- B. Wiring/raceways and/or equipment fastened to concrete and/or masonry construction shall be secured thereto using approved clamps and/or fittings with expansion anchors and machine screws or concrete inserts with approved fasteners. Wood plugs and plastic anchors shall not be permitted.
- C. Where applicable, all raceway, devices, equipment, etc. may be supported and hung by the use of one and five-eighths inch (1-5/8") size channel strut system. The channels shall be constructed of mild strip steel, which has been hot dipped galvanized conforming to ASTM Specifications A-123 or A-153. The support and hanger system shall be installed following the manufacturer's installation instructions.
- D. All screws and nuts used to fasten device covers, enclosure covers, and similar applications where screws must be used for servicing or replacement of equipment shall be stainless steel. All other screws and bolts shall be zinc or cadmium plated or hot-dipped galvanized.
- E. Conduit straps shall be of malleable iron construction, hot-dipped galvanized, size and finish to match raceway.

1.3 SUBMITTAL REQUIREMENTS

- A. Product Data: For equipment and conduit/raceway supports and assemblies.
- B. Shop Drawings: For freestanding support structures.

1.4 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Support Channel: Galvanized steel.
- B. Hardware: Corrosion resistant.
- C. Supporting devices used within 3'-0" of treatment, process, or chemical tanks and/or used in conjunction with runs of PVC externally coated conduit shall be of the PVC-coated type, to match conduit coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors. Do not use spring steel clips and clamps.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- E. Install surface-mounted cabinets with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

END OF SECTION

SECTION 26 05 33 – CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Rigid metal conduit and fittings.
- B. Liquidtight flexible metal conduit and fittings.
- C. Rigid PVC conduit and fittings.

1.2 REFERENCES

- A. ANSI C80.1 – Rigid Steel Conduit, Zinc-Coated.
- B. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies.
- C. ANSI/NFPA 70 – National Electrical Code.
- D. NEMA RN 1 – PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.
- E. NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- F. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Submit shop drawings and product data for conduit, conduit fittings, and associated materials. Clearly identify the specific product and material intended to be used.

1.5 PROJECT CONDITIONS

- A. Conduit routing shown on drawings is approximate unless dimensioned. Route conduit as required to meet project conditions.
- B. Where conduit routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.6 COORDINATION

- A. Determine required separation between conduit and other work.
- B. Determine conduit routing to avoid interference with other work.

1.7 PROJECT RECORD DOCUMENTS

- A. Accurately record actual routing of all conduits.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. PVC Externally-Coated Conduit: NEMA RN 1; rigid steel conduit with external 40 mil PVC coating and internal galvanized surface.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB1; materials to match conduit, all connections shall be threaded.

2.2 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.3 PLASTIC CONDUIT AND FITTINGS

- A. Conduit: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.4 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron, finish to match conduit.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type installed or for Type THWN conductors, whichever is larger; 3/4-inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6-inch clearance between conduit (including any encasement, when required) and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized spacers and straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction before conductors are pulled.
- H. Support conduit at a maximum of 7 feet on center.
- I. Liquid tight flexible metal conduit shall not exceed 24 inches in length and all runs shall be provided with an appropriate length of ground conductor.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; ream and de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to cabinets/enclosures in damp or wet locations.
- D. Install no more than the equivalent of three 90-degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction, as around beams.

- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Use PVC externally-coated rigid steel factory elbows for bends in plastic conduit runs longer than 100 feet, or in plastic conduit runs which have more than two bends regardless of length.
- L. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
- M. All underground conduits shall be direct buried, unless otherwise noted.
- N. For concrete encased conduit, the thickness of concrete covering the conduit on all sides and between conduits shall not be less than three (3) inches.
 - 1. Install top of underground conduit a minimum of 30 inches below finished grade.
 - 2. Stagger conduit joints in concrete encasement 6 inches minimum, horizontally.
 - 3. Use suitable separators and chairs installed not greater than 4 feet on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement.
 - 4. Provide minimum 3-inch concrete cover at bottom, top, and sides of conduit.
 - 5. Provide two No. 6 steel reinforcing bars in top of concrete encasement.
- O. All rigid steel conduit which is underground or encased in concrete shall be coated with two (2) coats of bituminous mastic paint or shall be PVC externally-coated conduit. The bituminous or PVC coating shall be carried no less than six (6) inches above grade.
- P. A plastic warning tape shall be installed over all buried conduits. The tape shall have the warning "Caution--Buried Electric Line" continuously imprinted on a red background. The tape shall be positioned above the conduit at a point twelve (12") below finished grade.

3.3 CONDUIT INSTALLATION SCHEDULE

- A. Inside Locations: Rigid steel conduit.
- B. Underground installation more than three feet (3'-0") from slab/structure (Not Exposed): Schedule 40 plastic conduit.

- C. Installations in or under concrete slab, or underground within three feet (<3'-0") of slab/structure, and where exposed when conduit transition to above grade: Rigid steel conduit with bituminous or PVC coating.
- D. Outdoor Locations (Exposed): PVC-externally-coated rigid steel conduit.
- E. Flexible Connections: Liquid tight flexible metal conduit.

END OF SECTION

SECTION 26 05 34 – BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Outlet boxes.
- B. Pull and junction boxes.

1.2 REFERENCES

- A. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NFPA 70 – National Electrical Code.
- C. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Submit shop drawings and product data for outlet boxes, pull and junction boxes, and associated materials. Clearly identify the specific product and material intended to be used.

1.5 PROJECT CONDITIONS

- A. Verify locations of outlets in work areas prior to rough-in.
- B. Electrical boxes are shown on drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 PULL AND JUNCTION BOXES

- A. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

2.3 PVC-COATED TYPE BOXES

- A. All outside boxes shall be of the PVC-coated type, to match conduit coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- B. Install electrical boxes to maintain accessibility and to present neat mechanical appearance.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate mounting heights and locations of outlets mounted for dedicated uses.
- B. Position outlet boxes to locate devices as shown on drawings.

END OF SECTION

SECTION 26 05 43 – HAND HOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prefabricated polymer concrete hand holes.
- B. Hand hole covers and accessories.

1.2 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. ANSI/SCTE 77 – Specification for Underground Enclosure Integrity.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 33 00.
- B. Indicate material specifications, dimensions, capacities, size, and location of openings, reinforcing details, and accessory locations.
- C. Include product data for hand hole accessories.
- D. Submit manufacturer's installation instructions.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in precast polymer concrete structures with ten years' experience.

PART 2 - PRODUCTS

2.1 PRECAST POLYMER CONCRETE HAND HOLES

- A. Precast Polymer Concrete: Aggregate material consisting of sand and gravel bound together with a polymer and reinforced with continuous woven glass strands.
- B. Strength: Compressive 11,000 psi; tensile 1,700 psi; flexural 7,500 psi, minimum.
- C. Construction: Stackable service box assembly and cover with stainless steel penta-head bolts.
- D. Hand Hole Shape: Rectangular.
- E. Inside Dimensions:
 - 1. Electric Hand Holes: 2.5 ft. length; 1.5 ft. width; 1.5 ft. deep; nominal.
 - 2. Instrumentation Hand Holes: 1.5 ft. length; 1 ft. width; 1.5 ft. deep; nominal.
- F. Design Load: ANSI/SCTE Tier 15 rated, minimum.

2.2 HAND HOLE ACCESSORIES

- A. Hand Hole Covers: Cast the word "ELECTRIC" or "COMMUNICATIONS" in the top face of the cover, as appropriate.

2.3 ACCEPTABLE MANUFACTURERS - HAND HOLES

- A. Quazite/Composolite "PG" Style or an acceptable equivalent.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate, install base material, and compact base material in accordance with manufacturer's instructions.

3.2 INSTALLATION - PRECAST POLYMER CONCRETE HAND HOLES

- A. Install and seal precast hand holes in accordance with manufacturer's instructions.
- B. Install hand holes plumb.
- C. Set the top of each hand hole to 1.5 inches above finished grade elevation in grass/earth areas.
- D. Set the top of each hand hole flush with finished grade elevation in paved or areas with

vehicular traffic (e.g. driveway or parking areas).

- E. Install hand holes on 1/3 cu yd crushed gravel bed.
- F. Install ground rod with top protruding four inches (4") above floor/bottom of hand hole.

END OF SECTION

SECTION 26 18 01 – EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to and/or installation of equipment specified under other divisions/sections of the Contract Documents, equipment furnished by the Owner, and/or existing equipment.
- B. All electrical installation work involved with the new Calgon Resin-GAC System equipment and associated devices. The Resin-GAC System has been pre-purchased by the Owner and includes a proprietary engineered and packaged assembly of equipment, devices, and apparatus. As such, each and every detail of the system may not be delineated by the Contract Documents. The specifications and drawings outline the general arrangement of the equipment along with minimum installation requirements and equipment/device interconnections. The Contractor shall be responsible for installation of a complete and comprehensive system, including all necessary equipment, devices, items, piping, conduit, and wiring as specifically required to accomplish the installation, start-up, and operation of this system. The Contractor's bid shall include all costs involved with this installation work.
 - 1. The system equipment/devices include, but may not be limited to, the following items:
 - a. Three (3) motor operated butterfly valves and ancillary devices and appurtenances, as outlined in the specifications.
 - b. Miscellaneous instrumentation and control devices as outlined in the specifications.
 - c. SCADA System interconnections as outlined on the drawings along with all coordination with the Owner and the System Integrator – Allied Control Services (ACS) as needed for proper integration into the existing PLC control panels.
 - 2. The Contractor shall be responsible for coordination of system startups and field testing with the various equipment suppliers, the other contractors involved with the work, and the Owner.

1.2 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. NEMA WD 1 – General Purpose Wiring Devices.
- C. NEMA WD 6 – Wiring Device Configurations.

1.3 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.4 ELECTRICALLY OPERATED APPARATUS

- A. Unless otherwise noted, the Contractor shall provide all power and control wiring for all electrically operated apparatus involved in the project, make all final connections, and leave apparatus in approved operating condition. It shall be his responsibility to examine detailed drawings, wiring diagrams, roughing-in drawings, and other information pertaining to the apparatus in question to determine the extent of work to be provided and exact locations of service.
- B. The horsepower of motors or wattage of equipment indicated in the Contract Documents is the estimated horsepower or wattage requirement of equipment to be furnished. All feeders, conduit, wiring, motor starters, fuses, circuit breakers and similar items shall be of the sizes and capacities to suit horsepower of the motors or wattage of equipment actually furnished. However, all ratings as shown on the drawings or indicated in the specifications shall not be reduced without specific written approval from the Owner.

1.5 COORDINATION

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other divisions/sections or by the Owner.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- D. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND PLUGS

- A. Attachment Plug: NEMA WD 1.
- B. Attachment Plug Configuration: NEMA WD 6; Match receptacle configuration at outlet provided for equipment.

- C. Cord Construction: Oil resistant thermostat insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.
- D. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to adjustable or vibrating equipment using liquid-tight flexible metal conduit.
- C. Install pre-finished cord set where connection with attachment plug is indicated, specified, or required. Use attachment plug with suitable strain-relief clamps.
- D. Provide suitable strain-relief clamps with kellems for cord connections to outlet boxes and equipment connection boxes.
- E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated and/or required.
- F. Install disconnect switches, controllers, control stations, and control devices such as limit switches as indicated and/or required. Connect with conduit and wiring as indicated and/or required.
- G. Provide interconnecting conduit and wiring between devices and equipment as indicated and/or as required by the manufacturer of the equipment.

PART 4 - EQUIPMENT CONNECTION SCHEDULE

4.1 GENERAL CONTRACTOR FURNISHED EQUIPMENT

- A. Without intending to limit or restrict the types or quantity of equipment furnished, and solely for the convenience of the electrical Contractor, the equipment shall include, but shall not be limited to, the following:
 - 1. Equipment furnished and installed by the General Contractor and wired complete by the electrical Contractor.
 - a. Filter Building Chemical Metering Pump SHMP-122.
 - b. Valve Vault Motor Operated Butterfly Valves BFV-1, BFV-2, BFV-3.
 - c. Heat Tracing at the Resin-GAC Tanks.
 - d. Sump Pump in the Valve Vault.
- B. The electrical Contractor shall provide all connections, wiring, and electric power for all of the equipment furnished by the General Contractor in accordance with the provisions of this division/section, as recommended by the manufacturer, as shown on the drawings, and as specified.

4.2 SYSTEM INTEGRATOR (ACS) FURNISHED EQUIPMENT UNDER THE GENERAL CONTRACT

- A. Without intending to limit or restrict the types or quantity of equipment furnished, and solely for the convenience of the electrical Contractor, the equipment shall include, but shall not be limited to, the following:
 - 1. Equipment furnished by the General Contractor and/or System Integrator (ACS), installed by the General Contractor, and wired complete by the electrical Contractor.
 - a. Manifold Pressure Transmitters PIT-1.1, PIT-2.1, PIT-1.2, PIT-2.2, PI-3.1, PI-3.2.
 - b. Valve Vault Flowmeter FE-1040 and FIT-1040.
 - c. Valve Vault Level Switch LSH-1042.
 - d. Manifold Differential Pressure Transmitters DPT-294-1.1, DPT-294-2.1, DPT-294-1.2, DPT-294-2.2.
 - e. Manifold Enclosure Temperature Transmitters TT-1 and TT-2.
 - f. Manifold Enclosure Door Switches ZSO-1, ZSO-2.
 - g. Valve Vault Hatch Switch ZSO-3.
 - 2. Equipment furnished by the General Contractor and/or System Integrator (ACS) and installed and wired by the electrical Contractor.
 - a. SCADA Panel – PLC-2.
 - b. Upon its delivery to the site, this equipment shall be turned over to the electrical Contractor for installation. The electrical Contractor shall install this equipment in accordance with the provisions of this division/section and as recommended by the

manufacturer.

- B. The electrical Contractor shall provide all connections, wiring, and electric power for all of the equipment furnished by the General Contractor in accordance with the provisions of this division/section, as recommended by the manufacturer, as shown on the drawings, and as specified.

END OF SECTION

SECTION 26 19 50 – ELECTRICAL IDENTIFICATION AND LABELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.

1.2 SUBMITTALS

- A. Submit product data sheets.
- B. Include schedule for nameplates and labels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplates and Labels: Engraved two-layer laminated plastic, white letters on a black background.
- B. Nameplates and labels shall be affixed to items using brass or stainless-steel screws. No adhesive types will be allowed.
- C. Wire and Cable Markers: Cloth markers, split sleeve, or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates and labels.
- B. Install nameplates and labels parallel to equipment lines.
- C. Secure nameplates and labels to equipment fronts using screws.
- D. Embossed tape will not be permitted for any application.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, equipment cabinets and enclosures, pull boxes, outlet, and junction boxes, and at load connection. Identify with branch circuit or feeder number for control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical distribution and control equipment and loads served. Letter Height: 1/8 inch for individual switches and loads served, 1/4 inch for distribution and control equipment identification.
- B. Nameplates and labels shall be provided for (both new and existing equipment) but may not be limited to the following items:
 - 1. Panelboard Modifications.
 - 2. Disconnect Switches.
 - 3. SCADA Panel.
 - 4. Motor Operated Butterfly Valves.
- C. Nameplates and labels for other similar items shall be provided by the Contractor as deemed necessary by the Owner.

END OF SECTION

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Light switches.
- B. Receptacles.
- C. Device plates and covers.

1.2 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. NEMA WD 1 – General Purpose Wiring Devices.
- C. NEMA WD 6 – Wiring Device Configurations.

1.3 SUBMITTALS

- A. Submit product data sheets and installation instructions.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, operation, and installation of product.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum of ten (10) years' experience.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LIGHT SWITCHES

- A. Description: NEMA WD 1; heavy-duty, AC only, general-use snap switch.
- B. Device Body: Brown plastic with toggle handle.
- C. Voltage Rating: 120-277 volts, AC.
- D. Current Rating: 20 amperes.

2.2 RECEPTACLES

- A. Description: NEMA WD 1; heavy-duty general-use receptacle.
- B. Device Body: Brown plastic.
- C. Configuration: NEMA WD 6; type as specified and indicated.
- D. Convenience Receptacle: Type 5-20.
- E. GFCI Receptacle: Convenience receptacle with integral Class A ground fault circuit interrupter.
- F. Special Receptacle: As indicated on drawings.

2.3 DEVICE PLATES AND COVERS

- A. Interior Cover Plate: Smooth steel.
- B. Weatherproof Cover Plate: Gasketed, corrosion resistant, non-metallic with hinged gasketed device cover and suitable for use in "wet locations" with cover closed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify outlet boxes are installed at proper height.
- B. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install receptacles with grounding pole on top.
- D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- E. Connect wiring devices by wrapping conductor around screw terminal.
- F. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
- G. Use side wiring with binding-head screw terminals.
- H. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
- I. When conductors larger than No. 12 AWG are installed on 20-A circuits, splice #12 AWG pigtails for device connections.
- J. Tighten unused terminal screws on the device.
- K. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- L. Conductors terminating at devices shall be screwed to the devices. Wire nuts and push-in connections are not permitted.
- M. Device Plates: Do not use oversized plates.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. In general, install convenience receptacles 18 inches above finished floor as measured from the center of the faceplate.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.

- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust devices and cover plates to be plumb and square.

END OF SECTION

SECTION 26 28 16 – ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Disconnect switches.

1.2 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. NEMA KS 1 – Enclosed Switches.

1.3 SUBMITTALS

- A. Submit product data and installation instructions.
- B. Include outline drawings with dimensions and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 COORDINATION

- A. Coordinate layout and installation of switches, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.6 EXTRA MATERIALS

- A. Furnish extra materials (spare parts) that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 20 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Non-fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- B. Fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in "ON" position. Handle lockable in "OFF" position.
 - 1. Fuse Clips: Class R fuse type.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Locations: Type 12, unless indicated otherwise.
 - 2. Exterior (Weatherproof) Locations: Type 4X, stainless steel, unless indicated otherwise.

2.2 MOTOR OPERATOR DISCONNECT SWITCHES FOR BUTTERFLY VALVES

- A. Non-metallic, Non-fusible Switch Assemblies: NEMA Type 4X enclosure; 30A rated load interrupter rotary switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Basis of Design Manufacturer: Square-D Class 3110, Catalog No. MD3304X, or an acceptable equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated or required.
- B. In general, mount disconnect switches 4' - 6" above finish floor or grade.

3.2 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Enclosed switches will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.3 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 51 10 – LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Luminaires and accessories.
- B. Ballasts.
- C. Lamps.

1.2 REFERENCES

- A. ANSI C78.377 – Electric Lamps – Specifications for the Chromaticity of Solid State Lighting (SSL) Products.
- B. ANSI C82.1 – Ballasts for Fluorescent Lamps – Specifications.
- C. ANSI C82.4 – Ballasts for High Intensity Discharge and Low-Pressure Sodium Lamps (Multiple supply type).
- D. ANSI/IES RP-16-10 – Nomenclature and Definitions for Illuminating Engineering.
- E. IES LM-79 – Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
- F. IES LM-80 – Approved Method: Measuring Lumen Maintenance of LED Light Sources.
- G. NEMA SSL-3 – High-Power White LED Binning for General Illumination.
- H. ANSI/NFPA 70 – National Electrical Code.
- I. UL Standard: UL8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.3 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Shop Drawings: Indicate dimensions and components for each luminaire.
- C. Product Data: Provide dimensions, ratings, and performance data.
 - 1. LED lamp Power Supply Unit (PSU) including drivers.

2. Life, output lumens, Correlated Color Temperature (CCT), Color Rendering Index (CRI), and Luminaire Efficacy Rating (LER), and energy-efficiency data for lamps.
 3. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of each luminaire.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Maintenance Data: Include instructions for maintaining luminaries and replacement parts list.

1.7 SPARE PARTS

- A. Lamps: Furnish spare lamps to the Owner.
1. 2 of each size and type installed.
- B. LED Arrays/Light Bars and Drivers: Furnish to the Owner.
1. Light Emitting Diode (LED) Arrays/Light Bars – 2 of each size and type installed.
 2. Light Emitting Diode (LED) Drivers – 2 of each size and type installed.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as specified in schedule on drawings.

- B. Install ballasts and/or drivers and specified accessories at factory.

2.2 BALLAST

- A. High Intensity Discharge (HID) Ballast:
 - 1. Description: ANSI C82.4, high power factor type lamp ballast.
 - 2. Provide ballast suitable for lamp specified.
 - 3. Voltage: Match luminaire voltage.

2.3 LAMPS

- A. Acceptable Lamp Manufacturers:
 - 1. General Electric.
 - 2. Philips.
 - 3. Sylvania.
- B. Provide lamp type specified for luminaire.

2.4 REQUIREMENTS FOR LIGHT EMITTING DIODE (LED) LUMINAIRES

- A. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following:
 - a. LED Array Type, Wattage, Part Number, Manufacturer and CCT.
 - b. LED Driver, Type, Wattage, Input Voltage, Part Number and Manufacturer.
- B. LED Array.
 - 1. Structured for optimized [roadway] photometric distribution.
 - 2. LED printed circuit board assembly.
 - 3. Nominal CCT of 4000K.
 - 4. CRI $\geq$ 65.
 - 5. Initial luminaire efficacy $\geq$ 55 lm/W.
 - 6. Minimum Rated Life 50,000 hours, 70% of initial lumens in accordance with IES LM-80.
- C. LED Driver.
 - 1. Minimum Efficiency: 85%.
 - 2. Operating Temperature Range: -40°C to 50°C.
 - 3. Minimum Rated Life: 50,000 hours.
 - 4. UL Class I or II output.
 - 5. Input Voltage: 120V, 240V or 277V.

6. Operating Frequency: 60Hz.
7. Power Factor: $\geq 90\%$.
8. Total Harmonic Distortion: $\leq 20\%$.
9. Comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

D. Heat Sink.

1. Aluminum fins designed to efficiently transfer heat away from LED array and driver.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate and support points for luminaries.
- B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- C. Install wall mounted luminaires at height as indicated on drawings.
- D. Install accessories furnished with each luminaire.
- E. Make wiring connection to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- F. Bond products and metal accessories to branch circuit equipment grounding conductor.
- G. Install specified lamps in each luminaire.

3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Aim and adjust luminaires as directed.
- B. Relamp luminaires that have failed lamps at Substantial Completion.

3.5 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosure.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

3.6 DEMONSTRATION

- A. Provide minimum of two (2) hours demonstration of luminaire operation.

END OF SECTION

SECTION 26 60 01 – TESTING AND COMMISSIONING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing and Commissioning.

1.2 TESTS

- A. All work shall be tested regularly during its progress. The Owner shall have the authority to require testing of any portion of the work at any time. The Contractor shall provide all labor and material as necessary in making such tests. The foreman in charge of work shall give his personal attention, together with any other assistance required, in order to investigate any portion of the work. As a minimum, the following tests shall be performed: insulation resistance, load balancing in switchboards and panelboards, correct rotation of motors.
- B. Perform all tests in the presence of the Owner. Furnish labor, materials, and instruments necessary to conduct the tests.
- C. On completion, the work is to be inspected and must satisfactorily pass tests against short circuits and grounds.
- D. Motor rotation shall be checked and corrected if necessary.
- E. The electrical Contractor shall be present during the test operation of all process and mechanical equipment to which electrical connections have been made.
- F. After all the work is completely installed, the Contractor shall operate the systems and equipment in the presence of the Owner's personnel and shall demonstrate the proper operation of all controls.
- G. The Contractor shall demonstrate the proper operation of all alarm devices.

1.3 RESPONSIBILITY DURING TESTS

- A. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

1.4 FAILURE OF TESTS

- A. Any defects in the equipment, or deviations from the requirements of the Contract Documents shall be promptly corrected by the Contractor by replacements or otherwise. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when re-tested shall fail again to meet the contract requirements, the Owner (notwithstanding having made partial payment for work and materials) may reject the equipment and order the Contractor to remove it from the project at the Contractor's expense.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. References
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM D1557; Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lbs (2.49-kg) Rammer, and 12-in. (304.8 mm) Drop.
 - b. ASTM D1556; Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - c. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - d. ASTM D2922; Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 2. Delaware Department of Transportation (DelDOT) Standard Specifications, latest edition.
 - 3. Occupational Safety and Health Administration (OSHA)
 - a. Code of Federal Regulations, Title 29, Part 1926 (29 CFR Part 1926), Subpart M and Subpart P--Excavations, plus Appendices A, B, C, D, E, and F.

1.2 SUMMARY

- A. Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete all the work of trench excavation and backfill within the designated areas and as required for the construction of other work as shown, specified, or required by the Contract Documents.
- B. Contractor shall locate or verify location of all existing active and abandoned utilities and structures in designated work areas prior to start of excavation activities. Contractor shall also protect from damage those utilities and structures which are to remain in place.
- C. Contractor shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction. Contractor shall provide a Competent Person to implement, supervise, and inspect all work.

1.3 INFORMATIONAL SUBMITTALS

- A. Certificates. Submit certificates from soil and aggregate supplier(s) that imported backfill materials shall comply with the material specifications of this section.
- B. Test Reports
 - 1. Submit reports of the results of testing based on requirements stated in Quality Control Testing requirements, the last article under Part 3 of this Section.

1.4 QUALITY CONTROL

- A. Laboratory Tests. The specified aggregate materials shall require advance examination or testing according to methods referenced, or as required by the Engineer.
 - 1. Testing laboratory shall furnish both Engineer and Contractor, three certified copies of recent, representative test result reports. Same reports will be considered as sufficient evidence of acceptance or rejection of materials represented.
 - 2. Conduct aggregate quality tests in accordance with requirements of appropriate Referenced Standard for such materials.
 - 3. The Engineer reserves the right to accept aggregate materials based on certification from supplier that the aggregate originates from a source approved by DelDOT and that the aggregate complies with specified DelDOT requirements.

1.5 DEFINITIONS

- A. As specified in all related sections and such added definitions included herein.
- B. Unclassified Excavation Below Subgrade: Same as unclassified excavation except such excavation is performed below elevations given as subgrade.
- C. Miscellaneous Unclassified Excavation: Unclassified excavation required by the Engineer and not included in other items for payment.
- D. Subgrade: Trench bottom prepared as specified to receive coarse-aggregate pipe bedding, concrete cradle or concrete encasement, or the bottom of excavations prepared to receive pipeline structures.
- E. Satisfactory Soil Material/Structural Fill: Granular fill should consist of well-graded material with a maximum particle size less than 3 inches, not more than 20 percent passing the No. 200 sieve and have a plasticity index (PI) not greater than 8 percent.
- F. Unclassified Excavation: Excavation of all materials regardless of character.

1.6 SITE CONDITIONS

- A. Classification of Excavated Materials. No consideration will be given to the nature of materials encountered in trenching operations. Therefore, as unclassified trenching, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. Removal of Obstructions
 - 1. DO NOT OBSTRUCT FIRE HYDRANTS.
 - 2. Except for known utility relocations remove obstructions as described in the following paragraphs.
 - 3. Remove, realign, or change the direction of above- or below-ground utilities and their appurtenant supports, if such is required in the opinion of the Engineer. Perform such work as extra work unless such work is done by the Owner of the obstruction without cost to the Contractor. However, uncover and sustain the obstruction at own expense prior to the final disposition of obstruction. The Contractor is not entitled to claims for damage or extra compensation due to the presence of such obstruction or delay in the removal or rearrangement of same. Additional precautions concerning obstructions as follows:
 - a. Do not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing or replacing their property or structures, but allow said persons, firms, corporations or utilities to take such measures as they may consider necessary or advisable under the circumstances; which shall not relieve the responsibilities of the Contract.
 - b. Without extra compensation, break through and reconstruct if necessary, the invert or arch of a sewer, culvert or conduit that may be encountered if the said structure is in such a position, in the judgment of the Engineer, as not to require its removal, realignment or complete reconstruction.
- C. Environmental Requirements
 - 1. Do not perform trenching, backfilling, or compacting when weather conditions or the condition of materials are such, in the opinion of the Engineer, that work cannot be performed satisfactorily.
 - 2. Do not use frozen materials as backfill nor wet materials containing moisture in excess of the amount necessary for satisfactory compaction.
 - 3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
 - 4. Plan work to provide adequate protection during storms with provisions available for preventing flood damage. Protect installed piping and other work against damage from uplift due to high ground water levels.
 - 5. Accommodation of Drainage. Keep gutters, sewers, drains, and ditches open for surface drainage. No damming or ponding of water in gutters or other waterways will be permitted, except where stream crossings are necessary and then only to an extent which the Engineer shall consider necessary. Do not direct water flows across or over pavements except through approved pipes or properly constructed troughs of proper sizes and lengths. When so required, provide pipes or troughs of such sizes and lengths as required,

and place the same as required at no expense to the Owner. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.

6. Pumping. Keep excavations free from water during the performance of the work under this Contract at no expense to the Owner. Provide and operate pumps of sufficient capacity for dewatering the excavations.

- a. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to the portion of the work completed or in progress, nor to cause an impediment to the use of streets, roads, and highways.

- 1) All discharges to surface waters or stormwater pipelines shall be free of sediment. If discharges are sediment laden, the Contractor shall employ techniques to remove sediment prior to discharge. These techniques shall be presented at the Preconstruction Meeting for approval by Owner and Engineer.

7. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling.
8. Provide effective dust control by sprinkling water.
9. Do not dispose of water in trenches by draining through completed portions of sewer piping.

- D. Protection. Assume the risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits, and support work for same existing structures, and property of whatever nature. Damages and expenses arising out of the Work, for direct or indirect injury to such structures or to any person or property by reason of them or by reason of injury to them, whether such structures are or are not shown on the Drawings, rests solely with the Contractor.

1. Take necessary precautions to protect trees, shrubs, lawns, and such other landscaping from damage. Restitution work for damages rests solely with the Contractor.
2. Pipe Supports. Adequately support underground pipes or conduits exposed as a result of excavations. Provide adequate support along their entire exposed length by timber or planking. Install these supports in such manner that backfilling may be performed without dislodging such pipes or conduits. Place and carefully compact select backfill or aggregate backfill around the supports and leave such supports in place as a guard against breakage due to backfill settlement. No additional payment will be due the Contractor for support material left in place nor for the labor of installing and maintaining supports.

3. Temporary Protective Construction

- a. Temporary Fence Barricade. Erect and maintain substantial temporary fences or barricades surrounding excavation to warn and prevent unauthorized persons entering or unwanted intrusion in such areas.

- b. Excavation Covers. Cover open excavation when work therein is suspended or left unattended, such as at the end of a workday. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
 - c. Remove temporary protective construction at the completion of work on the Project.
- E. Accommodation of Traffic. Do not obstruct streets, roads, and highways. Unless the Municipality or Governing Agency authorizes in writing the complete closing of the street, road, or highway, employ such measures as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from construction operations and materials.
- F. Explosives and Blasting. Not permitted on site.
- G. Removal of Rock by Means Other Than Blasting. Where removal of rock by means other than blasting is required, in accordance with the requirements of State and local laws, rules and regulations, and utility owner requirements, remove by the use of mechanical surface impact equipment, or by drilling and hydraulic rock splitting equipment, or by other methods.
- H. Excavation Condition. The Contractor is solely responsible for the conditions and results of his excavation work. Remove slides and cave-ins at whatever time and under whatever circumstance they occur.
- I. Excess Materials. All excess materials shall be removed from the site and legally disposed of by the contractor, unless otherwise indicated.
- J. Borrow Material. When the required quantity of backfill material exceeds the quantity of suitable on site material, provide borrow material at no increase in Contract Price. If borrow material is needed, notify the Engineer sufficiently in advance to permit the Engineer to verify such need and to view the proposed borrow pit to determine the material suitability. Borrow excavation will be subject to the Engineer's approval whose written consent shall be obtained prior to its use.
- K. Change of Excavation Location
 - 1. Should the Engineer require a change in location of an excavation from that indicated on the Drawings due to the presence of an obstruction or from other cause, and if such changed location increases or decreases the quantity of excavation, then payment will be made under the unit price bid for Miscellaneous Excavation and Backfill.
 - 2. If a change of excavation location is authorized by the Engineer upon the Contractor's request, the Contractor shall not be entitled to extra compensation, and if such change of excavation location involves the abandonment of excavation already made, the abandoned excavation and backfill shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General Backfill. On-site excavated soil or free of topsoil, vegetation, lumber, metal and refuse, organic materials and other deleterious materials which may be compressible or which cannot be properly compacted, and free of rock or similar hard objects larger than 1.5 inches in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.
- B. Aggregate Backfill: AASHTO #57 stone.
- C. Pipe Bedding and Initial Backfill: AASHTO #57 stone.
- D. Concrete Cradle or Encasement: 3000 psi concrete.
- E. Underground Warning Tape
 - 1. Printed polyethylene tape, six inches minimum width, color coded, printed with name of utility buried below, and suitable for installation in all soil types.
 - a. Text Example: "Caution: Buried Sewer Line Below"
 - 2. Magnetic.
 - 3. Use the following color scheme:
 - a. Sanitary sewers, green.
 - b. Storm sewers, green.
 - c. Electrical conduit, red.
 - d. Telephone and other communications, orange.
 - e. Water piping, blue.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Lines and Grades of Pipe. Maintain lines and grades as follows:
 - 1. Contractor is responsible for all construction layout work. Contractor shall retain the services of a surveyor licensed in the State of Delaware to perform the layout work. Use Engineer's cut sheets as guides for rough excavation, allowing for excavating to accommodate the pipe bedding, and concrete cradles or concrete encasements where indicated on the Drawings or required by the Engineer.
 - 2. Methods used to maintain lines and grades of pipelines will be subject to the approval of the Engineer. If use of laser beam is approved by Engineer, check beam positions every fifty feet of line by survey or other approved method.
- B. Perform shoring in accordance with requirements of Authorities having jurisdiction.
- C. Material Storage

1. Stockpile satisfactory excavated materials where directed by Engineer until required for backfill placement. Stockpile different soil materials without intermixing. Place, grade, and shape stockpiles to provide proper drainage. Cover stockpiles to prevent wind-blown dust when requested by Engineer.
2. Stockpile soil materials away from edge of excavations. Do not stockpile soil materials within the drip line of existing trees.

3.2 EXCAVATING

- A. General Requirement. Perform excavation and backfilling using machinery, except that hand excavation and backfilling may be required where necessary to protect existing structures, utilities or private or public properties, and except that backfilling by hand shall be done to the extent specified herein. No additional compensation will be paid for hand excavation and backfilling instead of machine excavation and backfilling, as may be necessary from whatever cause.
 1. Begin excavation in trenches at the control point having the lower invert and proceed upgrade.
 2. Remove surface materials of whatever nature over the line of trenches and other excavations, and properly separate and store removed materials.
 3. Remove subsurface materials of whatever nature down to subgrade elevation. Properly separate and store removed subsurface materials.
 4. Surplus excavated materials suitable, but not required, for backfill shall be stockpiled in the area designed by the Owner.
- B. Excavated Material Storage. Perform excavated material storage, as specified herein, at no increase in Contract Price.
 1. Where more material is excavated from trenches than can be backfilled or stored on the roadway or within rights-of-way limits, leaving space for traffic and drainage, remove and store such excess material. Return this material for backfilling when required.
- C. Trench Width and Depth
 1. Trench side-slopes, means of trench egress, and requirements for protective systems such as shoring, bracing, shields, etc. shall comply with OSHA requirements.
- D. Trench Width and Depth for Electrical Work
 1. Excavate trenches for both single and banded conduit runs to vertical lines and to not less than a minimum nor more than a maximum width required to accommodate the conduit's or conduits' width plus twelve inches.
 2. Excavate trenches for both single and banded conduit runs to elevations indicated, and where not indicated, to the depth required to provide a minimum of 42 inches of cover unless indicated otherwise on the Drawings.
- E. Excavation Width and Depth for Manholes and In-Line Structures

1. Make excavations for manholes to a nearly vertical plane beginning at bottom of excavation one-foot beyond manhole base outside diameter (six inches each side) to two-feet beyond manhole base outside diameter for top of excavation limit (one-foot each side). If personnel are to work within excavation, make excavation in compliance with OSHA trenching rules referenced in Paragraph 1.06C.
 2. When surface pavement of any type is encountered (vehicle or pedestrian ways), cut such pavement to a rectangular shape as opposed to circular shape of manhole. Make limits of cut not to exceed one-foot beyond top of excavation limit as specified.
 3. No additional compensation will be allowed should excavation limits or surface pavement cut limit be exceeded.
- F. Additional Excavation. The Engineer's written requirement for excavation beyond the maximum allowable trench width shall entitle the Contractor to reimbursement for the quantities of additional excavation at the unit price bid for Miscellaneous Excavation and Backfill.
1. Do not excavate below depths indicated or specified except where unstable or unsuitable material is encountered at subgrade. Excavate such material to the increased depth as may be required by the Engineer and refill to the proposed subgrade with thoroughly compacted aggregate backfill material as required by the Engineer.
 2. When excavations are carried below indicated or specified subgrades without written permission, refill excavations to proper subgrade with thoroughly compacted aggregate backfill material with no additional compensation paid.
 3. The Engineer's written requirement for Excavation Below Subgrade shall entitle the Contractor to reimbursement for the quantities of additional excavation at the unit price bid for Miscellaneous Excavation and Backfill.
- G. Length of Open Trench. The Engineer shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling, but in no case shall these amounts exceed 300 feet and 100 feet, respectively. Complete trench excavation at least twenty-five feet in advance of pipe laying and keep trenches free from obstructions, except that at the end of a workday or at the discontinuance of work, the pipe laying may be completed to within five feet of the end of the open trench. Additional open trench limitations are as follows:
1. The Engineer is empowered to require trench refilling over completed pipe lines when in his judgment such action is necessary. No additional compensation will be paid for such trench refilling even though work must be stopped elsewhere as a result.
 2. When Work is stopped on a trench, except as required by the Engineer, and the excavation is left open for an unreasonable period in advance of construction in the opinion of the Engineer, the Engineer may order trench refilling at the Contractor's expense and not allow trench reopening until ready for actual use.
- H. The subgrade at the bottom of the excavation shall be tested for soil quality and compaction capabilities before pipe installation. Poor pipe bedding may result in the need for additional ballast stone shall and protection of the backfill material as required by the Engineer.

3.3 BACKFILLING

- A. General Requirements. Perform trench backfilling and backfilling excavations for other in- line structures by methods which will result in thorough compaction of backfill material without displacement of the grade and alignment of the pipeline and its appurtenances, will result in minimum settlement of backfilled material, and will prevent damage to pipe. Displacement of the pipeline and settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require re-grading and realigning the pipeline and removing and re-compacting settled material with no additional compensation paid to Contractor.
- B. Backfill Restrictions
 - 1. Use earthen materials acceptable to Engineer and free of all undesirable materials as specified in Part 2 of this Section.
 - 2. Do not use in backfilling work materials such as house ashes, putrescible refuse, organic materials, and such other materials considered unsatisfactory by the Engineer. Do not permit excavations to be used as dumping areas for refuse.
 - 3. Do not use frozen backfill materials or place backfill materials on frozen subgrade or trench surfaces.
 - 4. Should there be a deficiency of proper backfill material, provide acceptable borrow material with no additional compensation paid to Contractor.
 - 5. Except for temporary use in backfilling, no permanent bulkheads or retaining walls will be allowed in the trenches over piping.
 - 6. Backfill shall not be placed until pipes, pipeline, connections, or other pipeline appurtenances have been inspected in-place and approved by Engineer.
- C. Subgrade Inspection. Notify Engineer when excavations have reached subgrade elevations. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities at the Contractor's expense, as directed by the Engineer. When Engineer determines that unforeseen unsatisfactory subgrade soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- D. Pipe Bedding (Subgrade Preparation). Provide coarse-aggregate pipe bedding as pipe foundations in trenches made in both earth and rock. Instead of coarse-aggregate pipe bedding, provide Concrete Encasement or Concrete Cradle, or other type of bedding, where and as shown on the Drawings or required by the Engineer. If maximum trench widths specified above are exceeded, provide concrete cradle or concrete encasement in such locations. Construct coarse-aggregate bedding, concrete encasement and concrete cradle as specified and in accordance with detail(s) shown on the Drawings, at no increase in Contract Price.
- E. Initial Backfill. Following coarse-aggregate pipe bedding, piping and in-line structure installation, backfill trenches to a height at least 6-inches above the top of the outside barrel of the pipe with AASHTO #57 aggregate placed. This initial backfill shall be carefully placed in trenches in such manner as not to damage or disturb the pipe.
 - 1. Refill remainder of the trench using backfill placed in layers not exceeding six inches in thickness after compaction. Exercise care to carry backfill up evenly on opposite sides of

the piping. Replace topsoil to approximate depth of existing as final refill operation and crown to such height as required by the Engineer. Maintain crowned surface to the satisfaction of the Engineer during the Maintenance Period.

- F. Backfilling in Roadways. Refill remainder of the trench using backfill materials specified below. Exercise care to carry backfill up evenly on opposite sides of the piping.
1. Paved Roadways: Aggregate Backfill compacted in six-inch-thick layers to the bottom of temporary or permanent pavement section.
 2. Unpaved Shoulders: General Backfill compacted in six-inch-thick layers to a point six inches below the adjacent existing surface. Refill the remaining six inches with compacted aggregate backfill.
 3. Sidewalks: General Backfill compacted in six-inch-thick layers to a point eight inches below the adjacent existing surface. Refill the remaining eight inches with compacted aggregate backfill and specified replacement pavement section.
 4. Unpaved Areas: General Backfill compacted in six-inch-thick layers to bottom of topsoil. Replace topsoil to approximate depth of existing topsoil as the final refill operation, and crown to such height as required by the Engineer. Maintain crowned surface to the satisfaction of the Engineer, during the Maintenance Period.
- G. Underground Warning Tape. For the purposes of early warning and identification of buried pipes during future trenching or other excavation, provide continuous identification tapes in trenches. Install in accordance with printed recommendations of the tape manufacturer, and as specified herein. Bury tape at a depth of 12 inches below grade; in pavements measure 12 inches from subgrade of pavement.
1. Provide warning tape in trenches for utilities as specified in Part 2 of this Section.
- H. Compacting. During the course of backfilling and compacting work, the Engineer reserves the right to make tests at various locations or depths of trenches, to determine whether the Contractor's compaction operations are meeting specified requirements. Compact trench backfill as follows:
1. Solidly tamp each layer of general backfill around the pipeline with proper tamping tools made especially for this purpose.
 2. Thoroughly compact aggregate backfill with a vibratory compactor of a type and size satisfactory to the Engineer. Compacting of aggregate backfill by puddling or jetting will not be permitted.
 3. Use mechanical tampers to compact backfill materials in trench backfilling operations to produce a density of backfill at the bottom of each layer of not less than:
 - a. 90 percent of maximum density obtained at plus or minus two percentage points of the optimum moisture content as determined by the ASTM D1557 method for pipeline in open land or unpaved roadways, or
 - b. 95 percent of maximum density obtained at plus or minus two percentage points of the optimum moisture content as determined by the ASTM D1557 method for pipeline beneath structures or in paved roadways.

I. Cleanup

1. Remove surplus excavated material, rubbish and other construction debris and keep such removed to a point not more than two hundred feet from the head of the open trench, unless otherwise authorized by the Engineer.
2. After trenches and other excavations are backfilled and the work completed, remove surplus excavated materials, rubbish or such other materials from the work and stockpile or dispose as designated by the Owner.
3. Stockpile and leave in neat condition the surplus excavated material with proper erosion and sediment control measures as directed.
4. Furnish and place topsoil, fertilize and seed grassed areas, both within and outside rights-of-way as affected by construction. Reseed and re-fertilize areas that fail to show an acceptable uniform stand of grass. Water, mow, rake, weed and otherwise maintain grass until final acceptance of Contract.
5. Restore the area covered by both temporary and permanent rights-of-way over private property to as near the original conditions as is practical. Bring area up to original grade, place topsoil, seed; replant, or replace damaged or removed shrubbery; repair or replace walks, driveways, fences, and other improvements.
6. Execute provision of topsoil, lime, fertilizer, and seed in a manner consistent with practices acceptable to Delaware Department of Natural Resources and Environmental Control (DNREC).
7. In case the Contractor shall fail or neglect to do so, or to make satisfactory progress in doing so, within twenty-four hours after the receipt of a written notice from the Engineer, the Owner may remove such surplus material and clear the roadways, sidewalks and other places, and the expense for such work charged to the Contractor or deducted from any moneys due or to become due him under the Contract.

- J. Maintenance. The Contractor is solely responsible for injury or damage resulting from lack of trench protection and maintenance during the Maintenance Guarantee period. If trench surfaces are not satisfactorily maintained, or repairs are not begun within three days after written notice from the Engineer, such repairs may be made by the Owner and the expense for such work charged to the Contractor or deducted from any moneys due to become due under the Contract.

3.4 QUALITY CONTROL AND ASSURANCE TESTING

- A. Allow Engineer to inspect subgrade and each lift of backfill material before further backfill work is performed.
- B. Any areas that do not meet the requirements of this Section shall be reworked by providing additional compaction effort until acceptable test results are obtained. Contractor shall not proceed with a new lift of backfill until Engineer has approved that the previous lift has attained required density.

END OF SECTION

SECTION 40 05 13 – PIPING, FITTINGS, AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pressure Filter and Finished Water Piping, Valves, Fittings, and Accessories

1.2 QUALITY ASSURANCE

- A. All pipe, appurtenances and installation shall conform to the applicable AWWA Standard.
- B. Ductile Iron Pipe: AWWA C151; Ductile Iron Pipe, Centrifugally Cast or Sand Lined Molds, for water or other liquids.
- C. Cement Lining: AWWA C104; Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for water.
- D. Rubber Gasket Joints: AWWA C111; Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- E. Fittings: AWWA C110; Gray Iron and Ductile Iron Fittings, 3 inch through 48 inch, for water and other liquids.
- F. Flanged Pipe: AWWA C115; Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges.
- G. Installation: AWWA C600; Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances.
- H. Manufacturer's name and applicable manufacturing specifications data shall be on all pipe and appurtenances.
- I. ASTM A-436: Austenitic Gray Iron Castings.
- J. Ductile Iron Pipe: AWWA C150; Thickness Design of Ductile-Iron Pipe.

1.3 SUBMITTALS

- A. Submit manufacturer's certification that the pipe and appurtenances have been manufactured in accordance with the applicable AWWA standard and these specifications.
- B. Submit product data on all valves, fittings, and service fittings.

PART 2 - MATERIALS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. All non-buried pipe shall be Class 52 Ductile Iron Flanged Joint (AWWA C115) unless otherwise indicated. Pipe shall be as manufactured by the American Cast Iron Pipe Co., U.S. Pipe Co. or approved alternate.
- B. Fittings shall be Ductile Iron mechanical joint (AWWA C153), Class 250 as manufactured by American Cast Iron Pipe Co., U.S. Pipe Co., or approved equal. Fittings shall be furnished suitable for use with the type of pipe specified herein.
- C. Flanged fittings shall be Ductile Iron rated for 250 psi working pressure and shall conform to the applicable provisions of AWWA C110 and C115. The flange shall be drilled according to ANSI B16.1, Class 125.
- D. Cement mortar lining and seal coating for all pipe and fittings shall be in accordance with ANSI A 21.4-AWWA C104.
- E. Non-buried, flanged pipes and fittings shall have arc-applied or paint-applied, 99.99% pure zinc coating, having a mass of 200g/m² with a finished layer of standard shop-applied primer paint in accordance with AWWA C151. Pipe markings shall include the word "ZINC" in the pipe markings or label required by AWWA C151 and/or other markings as deemed appropriate by the manufacturer.
 - 1. Zinc coating shall comply with all applicable parts of ISO 8179 for zinc coatings.
 - 2. Shop applied primer coat shall be provided for pipe installed interior to vault or building areas.
 - 3. Field applied performance coating shall be provided upon completion in piping installation.

2.2 RESTRAINED JOINT COUPLING

- A. CASTINGS: All cast components (end rings, center ring and bolt guides) are ductile iron, meeting or exceeding the requirements of ASTM A536, grade 65-45-12.
- B. FLANGE: Compatible with flat face flanges with ANSI Class 125 and 150 bolt circles. See page 10-6 for filler flange.
- C. GRIPPERS: Ductile (nodular) iron, meeting, or exceeding ASTM A536, grade 65-45-12.
 - 1. Machine sharpened and heat treated.
 - 2. PPG Xylan 1424 coated for corrosion protection.
- D. GASKET: SBR compounded for water and sewer service in accordance with ASTM D2000. NBR available upon request.

1. NSF/ ANSI 61 & 372 Certified.
- E. DRAW-HOOK FASTENERS: 304L stainless steel.
- F. RAMP RUNNERS: Reinforced nylon.
- G. BOLT & NUT: 304 stainless steel, 5/8-11 bolts with heavy hex e-coated nuts. Fasteners provided with anti-galling protection.
- H. WASHER: 304 Stainless steel.
- I. COATINGS: Flanged coupling Romacoat fusion bonded epoxy, NSF 61 certified. End rings are Romabond polyester.
- J. WORKING PRESSURE: Up to 350 PSI.
- K. Coupling shall be ROMAC ALPHA FC flanged coupling or approved equal.

2.3 GASKETS AND BOLTING MATERIALS

- A. Provide all gaskets, bolts, lubricant, and other accessories required to install pipe, fittings, and specials complete and ready for service.
- B. Gaskets shall be 1/8 inch thick, cloth inserted synthetic rubber full face gaskets with holes punched for flanges conforming to AWWA C-111. Gaskets for ductile iron flanged pipe and fittings 12 inches and smaller shall have "nominal" inside diameters, not the larger inside diameters, per ANSI B16.21.
- C. Gaskets and bolts for other than flanged joints shall be as otherwise specified for pipe and pipe joints.
- D. Flanged Dismantling Joints
 1. Flanged Dismantling Joints (non-restraint) shall be ROMAC, Smith-Blair Type 971, or approved equal.
 2. Flanged Dismantling Joints (restraint) shall be ROMAC, Smith-Blair Type 975 or approved equal.

2.4 VALVES

- A. Butterfly Valve (Actuator Controlled)
 1. Mueller Henry Pratt 2FI
 2. Flomatic SYLAX 3 butterfly valve, lug connection, NSF/ANSI 61 certified with ductile iron body, EPDM vulcanized seat, stainless-steel stem and disc, 250 PSI bi-directional pressure rating, for use with ANSI 125/150 flanges, actuator shaft connection.

2.5 VALVE ACTUATOR

A. Acceptable Manufacturer

1. Harold Beck & Sons, Inc. Model 11-163

B. Features

1. Electric actuators shall conform to the requirements of AWWA Standard C540-93. The gearbox case shall be epoxy coated ductile iron. Motor case and cover shall be aluminum. All external fasteners on the electric actuator will be stainless steel.
2. The actuation time shall be a minimum of 60 seconds.
3. Actuators shall contain electric motor, gearing, manual over-ride, limit switches, torque switches, reversing contactor, drive coupling, hand wheel, integral motor controls, and In-Automatic feedback contact.
4. Motor speed reduction shall be by means of a gear train consisting of hardened steel spur gears and self-locking worm and worm gear set. The worm shall be heat-treated alloy steel and have worm thread surface rolled or ground. The worm gear shall be bronze. Non-metallic gears in the power train are not acceptable.
5. The motor shall be designed for actuator service, totally enclosed, non-ventilated, 120 volt, 1-phase 60 Hz, NEMA 4, Class F insulation and protected by means of thermal switches.
6. The actuator shall be equipped with a manual hand wheel for manual mode operation.
7. Limit switches shall be geared to the drive mechanism. Cams attached to the valve shaft or travel type limit switches are unacceptable. Limit switches shall be capable of indicating valve travel during manual operation. Limit switches shall be rated 2A at 120-volt AC, minimum. Two (2) sets of NO and NC contacts shall be provided for each direction of travel.
8. The actuator shall include an adjustable torque switch to interrupt the motor power when an obstruction is encounter in either opening or closing direction.
9. The actuator shall include mechanical limit stops to restrict valve travel.

C. Controls

1. Actuators shall be furnished with NEMA 4 enclosure. The control voltage shall be 120 volts. Actuators will be capable of operating in an ambient temperature range of -20°F to +160°F.
2. The actuator shall be furnished with a terminal chamber. The terminals shall allow installation of bare wire(s) or with crimped terminations. All wire termination screws shall be factory installed. Terminal identification shall be clearly marked as an integral part of the terminal strip.
3. Local Operation shall be by an Open and Close control knob and a Local, Stop, and Remote selector knob.

2.6 STAINLESS STEEL PIPE AND FITTINGS

A. Pipe

1. Forged stainless steel material conforms to ASME SA182 Grades F304/304L & F316/316L.
2. Forged stainless steel flange dimensions conform to ASME B16.5.
3. NPT threads conform to ASME B1.20.1.
4. Manufacturing facility is ISO 9001:2008.
5. Stainless steel plate flange dimensions conform to ASME B16.5 Class 150.
6. Stainless steel plate flange made from ASTM A240 plate or cast in conformance with ASTM A351

B. Camlock Connection

1. 316 Stainless Steel.
2. Seal: Buna.
3. Includes Safety Pins.
4. Type: "B" Quick Disconnect.
5. Type "B" female camlock (Cam & Groove) coupler to male NPT threads.
6. NSF/ANSI/CAN 61 Section 8, Annex G (1/4" to 2").

2.7 STAINLESS STEEL VALVES

A. Stainless Steel Full-Port Ball Valve

1. Female NPT Thread, 1/4"-3" 1000 CWP (psig), Cold Non-Shock.
2. 150 psig Saturated Steam.
3. Vacuum Service to 29 inches Hg. MSS SP-110 Compliant.
4. Designed, cast, machined, assembled, and 100% factory tested in USA.
5. NSF/ANSI/CAN 61 Section 8, Annex G (1/4" to 2").
6. NSF/ANSI 372 - Drinking Water System Components – Lead Content.
7. Apollo Valve 76F Series CF8M or approved equal.

2.8 PIPE SUPPORTS

- A. Support horizontal piping so that no strain is exerted on any equipment, machinery or piping due to weight of piping.
- B. Where practical, support riser piping independently of connected horizontal piping.

PART 3 - EXECUTION

3.1 VALVE ACTUATOR

A. Field Installation

1. Install valves, actuators, extensions, valve boxes, and accessories according to manufacturer instructions.

2. Firmly support valves to avoid undue stresses on piping.
3. Coat studs, bolts, and nuts with anti-seizing lubricant.
4. Verify valve torque requirements.
5. Verify valve travel so that limits can be factory set.
6. Provide required valve extension and mounting hardware.
7. Coordinate control and power connections.

B. Start-Up

1. The Contractor shall coordinate with the manufacturer's authorized service representative to inspect the finished wiring and installation and then place the actuator in service, and then exercise each the valve over its full range in operating local and remote.

C. Training

1. Manufacturer's authorized service representative shall provide operational and maintenance training in a 4-hour training session.

3.2 HYDROSTATIC TESTING

A. Pressure Testing

1. Before being tested, buried piping shall be backfilled to a safe level and thrust restraint suitable to withstand the hydrostatic test pressure shall be in place. Pipelines shall be thoroughly flushed to remove all foreign materials which may have entered the pipe during construction.
2. The Contractor shall hydrostatically test all water mains at a pressure of 150 psi, maintained for a period of not less than 4 hours. Allowable leakage is AWWA standards and CIPRA recommendations.

- B. Should any of these tests on a section of pipeline disclose an inability to hold the stipulated test pressure or leakage in an amount greater than that permitted, the Contractor shall, at his own expense, locate and correct any defects and retest same to the satisfaction of the Engineer.

3.3 DISINFECTING WATER MAINS

- A. All newly installed water mains shall be disinfected in accordance with the applicable section of AWWA Standard C601-81.

END OF SECTION

SECTION 40 41 13 – PROCESS PIPING HEAT TRACING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: Provide all labor, material, tools, equipment, and incidentals required to furnish, install, and place into satisfactory operation heat tracing systems, complete with appurtenances as shown, specified, and as required.
- B. Related Sections:
 - 1. Section 22 07 11 – Thermal Pipe Insulation.
 - 2. Section 26 18 01 – Equipment Wiring Systems.
 - 3. Section 40 05 13 – Piping, Fittings, and Accessories.

1.2 QUALITY ASSURANCE

- A. All equipment specified in this Section shall be furnished by a single supplier.
- B. Reference Standards:
 - 1. American National Standards Institute, Inc. (ANSI).
 - 2. Institute of Electrical and Electronic Engineers (IEEE).
 - 3. National Electrical Supplier's Association (NEMA).
 - 4. National Electrical Code (NEC).
 - 5. Underwriters Laboratories, Inc. (UL).
 - 6. Factor Mutual Research Corporation (FM).

1.3 SUBMITTALS

- A. Shop Drawings and Product Data: Comply with the requirements of Section 01 33 00 – Submittal Procedures and provide the following:
 - 1. Supplier's literature, illustrations, specifications, and engineering data including dimensions, materials, size, weight, performance data including efficiencies.
 - 2. Electric and control wiring diagrams.
 - 3. Layout drawings showing locations of power taps and thermostats.
 - 4. Sizing calculations for each run of heat trace. Calculations shall show:
 - a. Ambient temperature and wind loss used.
 - b. Temperature maintained in material.
 - c. Running and startup current values.

B. Reports:

1. Submit all test reports to Engineer within 10 days of testing completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Suppliers:

1. 10BTV1-CT Type Auto-Trace, Self-Regulating by Raychem Corporation.
2. Approved equivalent.

B. Service Conditions

1. Process Water Piping
 - a. Pipe heat tracing system shall be provided for the piping as specified or shown on the Drawings and shall be capable of preventing freezing of the pipes or objects protected throughout the ambient temperature range of minus 6°F to plus 45°F.
2. Design the heat tracing system with the assumption that the carried water in the piping is not moving.
3. Power supply shall be 120 volts.

C. Pipe Heat Tracing Materials

1. Type: Self-regulating, designed so that it can be cut to any length without significantly changing the heater output per unit length.
2. The heater output shall vary in response to temperature changes along the pipe.
3. Constant wattage heaters shall not be used.
4. Heater cable shall be rated for 225F, 240-volt AC (for use on 120VAC system). Cable make-up shall include a five-component system consisting of stranded copper bus wire, self-regulating semi-conductive core, fluoropolymer jacket, tinned copper shield and fluoropolymer outer jacket.
5. The outer jacket of fluoropolymer shall be provided of suitable thickness and corrosion resistant properties to prevent corrosion from the surrounding environment.
6. The heating system shall also include all necessary components for proper installation of each circuit as required. Components shall include the following:
 - a. Power connection kit with junction box for connecting each heater to the power circuit.
 - b. Fibrous glass tape to fix heater to pipe every 2 feet.
 - c. Cable end seal kit for termination of cable.
 - d. Peel-off self-sticking black on yellow labels "Electric Traced". Labels shall be provided for each ten feet of pipe.

7. Provide a heat-tracking control panel at each location shown on the Drawings. The control panel shall be a compact, full-featured, microprocessor-based, single-point heat-tracing control system. It shall provide control and monitoring of electrical heat-tracing circuits for both freeze protection and temperature maintenance, and with alarms, ground-fault, and voltage protection.
 - a. The panel shall be a NEMA 4X with 120 VAC power feed.
 - b. Temperature measurement shall be via a 3-wire 100-ohm platinum RTD(s) connected directly to the unit.
 - c. Basis of design shall be Raychem 910 series; C910-485 Controller.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Inspect all items immediately upon delivery to site for damage.
- B. Each reel of heater shall be tested prior to installation to determine that the heater has not been damaged in shipment. Provide test results to Engineer.
- C. Heat tracing shall be tested after installation but before insulation is applied. Provide test results to Engineer.
- D. Heat tracing shall be tested after insulation is applied. Provide test results to Engineer.
- E. Install items in complete conformance with the shop drawings and supplier's installation instructions and leave in proper working condition.
- F. Provide all required mounting and control accessories, including all bolts, nuts, ties, junction boxes and adhesives.
- G. Install heating elements directly against metal pipe before insulation is installed. Install in accordance with supplier's instructions.

END OF SECTION

SECTION 40 91 23 – FLOW METERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the requirements for an electromagnetic flowmeter and associated appurtenances.
- B. Contractor is responsible to ensure that new flow meters are properly calibrated, installed and wired and mounted in strict compliance with the requirements and recommendations of the flow meter manufacturer.

1.2 SUBMITTALS

- A. Submit for approval Shop Drawings and product data for all equipment in accordance with Section 01 33 00 "Submittal Procedures".
- B. Submit operations and maintenance manuals as specified in Section 01 78 23 "Operation and Maintenance Data". Final O&M manuals shall be submitted as part of the Complete Pump Station System O&M Manual document.
- C. In addition to the normal Installation, Operation, and Maintenance manuals required by the contract, a spare manual will be shipped with the unit in order to allow for proper operation of the equipment prior to the release of all final Installation, Operation, and Maintenance manuals.
- D. Submit a certificate of factory calibration, field verification results, and manufacturer's certification.

1.3 QUALITY ASSURANCE

- A. All flow meters and associated appurtenances furnished under this Section shall be of a design and manufacture that has been used in similar applications and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to the equipment made by that manufacturer specifically named herein.
- B. Manufacturer of flow meter equipment shall have a minimum of five (5) years installation experience and a minimum of seventy-five (75) units in operation.
- C. Qualifications of Manufacturer: Products used in the work specified shall be produced by manufacturers regularly engaged in the Manufacture of similar items and with a history of successful production.

- D. Basis of Acceptance: The Manufacturer's recommended installation procedures, when approved by the Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.
- E. Flow sensor shall be calibrated and all of the calibration information and factory settings matching the sensor shall be stored in a memory unit. The memory unit shall store sensor calibration data and signal converter settings for the lifetime of the product.
- F. The Manufacturer shall provide an appropriately trained field representative to certify the installation of all equipment. Equipment manufacturer shall warrant all equipment shall be free from defects in material and workmanship; and that it will replace or repair, FOB Factory, any part or parts returned to it, which examination shows to have failed under normal use and service by the user within twelve (12) months from the date of Substantial Completion Acceptance.

1.4 ACCEPTABLE MANUFACTURERS

- A. Manufacturer of flow meters shall be:
 - 1. Siemens, Sitrans F M MAG 5100W.
 - 2. Or approved equal.

PART 2 - PRODUCTS

2.1 ELECTROMAGNETIC FLOW METER

- A. The electromagnetic flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction as manufactured by Siemens or approved equal.
 - 1. EPDM liner for NFS/ANSI Standard 61 approval.
 - 2. Connection flanges EN 1092-1 (DIN 2501), ANSI, AWWA, AS and JIS.
 - 3. Hastelloy integrated grounding and measuring electrodes.
 - 4. Built-in length according to ISO 20456; the standard includes sizes up to DN 400.
 - 5. Meets EEC directives: PED 2014/68/EU pressure directive for EN 1092-1 flanges.
 - 6. Full bore size.
- B. Sensor
 - 1. Operating principle: Utilizing Faraday's Law of Electromagnetic Induction, the flow of liquid through the sensor induces an electrical voltage that is proportional to the velocity of the flow.
 - 2. Operating Temp: -20°F to +158°F.
 - 3. Submergence: The sensor shall be pedestal sealed against accidental submersion to 3 feet for 30 minutes standard, or permanently submerged to 30 feet when the terminal box is backfilled with a non-setting, transparent potting material.

C. Design Data:

1. Meter Type: Electromagnetic Flow Meter – Inline
2. Location: Valve Vault
3. Pipe Size: 8-inch
4. Flow Range: 0 – 1,500 GPM

2.2 RECORDER

A. Digital recorder compatible with the supplied flow meter.

1. 200 msec sampling rate for all channels.
2. Minimum 70 MB internal data buffer.
3. Ethernet TCP/IP Interface.
4. Data logging via USB interface.
5. Touch screen navigation.

B. Acceptable Manufacturer:

1. Siemens, SIREC D200.

PART 3 - EXECUTION

3.1 INSTALLATION AND FIELD QUALITY CONTROL

- A. The Contractor shall install all equipment in strict accordance with the Manufacturer's recommendations and the requirements of this section. The Equipment Supplier shall make all necessary adjustment to equipment in order to provide complete and satisfactory operation upon completion of the Contract.
- B. Upon completion of the installation, the Contractor and the Equipment Supplier shall carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation. Equipment Supplier shall submit written certification of the proper installation of the equipment. Each piece of equipment shall be checked for proper operation.
- C. Equipment manufacturer shall warrant all equipment shall be free from defects in material and workmanship; and that it will replace or repair, FOB Factory, any part or parts returned to it which examination shows to have failed under normal use and service by the user within twelve (12) months from the date of **Substantial Completion Acceptance**.

3.2 FIELD VERIFICATION

- A. Field verification shall use a stand-alone unit to measure a number of selected parameters in the flow sensor, which affects the integrity of the flow measurement, shall be available through a factory verification service.
- B. The meter manufacturer shall provide a Field Service Representative to perform Field Verification of the Flow meter which shall consist of the following test routines:
 - 1. Insulation test of the entire flow meter system and cables.
 - 2. Test of sensor magnetic properties for magnetic meters.
- C. A certificate of verification shall be issued if the flow meter passes all of the tests with-in 1% of the original factory test parameters.

3.3 INSTALLATION

- A. The equipment manufacturer shall provide a service representative properly trained in inspection and operation of the mechanism to approve the installation, certify that the meter is performing properly. If additional service is required due to the mechanisms not being fully operational at the time of service requested by the Contractor, the additional service days will be at the Contractor's expense.
- B. Ensuring that all necessary components, including electrical and controls, required for testing shall be the responsibility of the Contractor. No additional compensation shall be made by the Owner for additional trips required due to the lack of coordination or completion of support items by the Contractor.

END OF SECTION

SECTION 46 33 10 – CHEMICAL FEED SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Chemical feed pump system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Include materials of construction for the tank and accessories.

1.4 QUALITY ASSURANCE

- A. Thermoplastics welding shall be performed by a DVS CERTIFIED welder. Welder certificates shall be provided.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer:
 - 1. General: Provide the chemical feed equipment as manufactured by the following:
 - a. Chemical Feed Skid.
 - 1) TuffSkid
 - 2) Or approved equal.

B. Construction

1. The single pump chemical metering skid shall be completely self-contained and designed to safely feed metered amounts of Sodium Hypochlorite.
2. The chemical metering skid shall include one (1) chemical metering pump (Section 46 33 40 "Chemical Feed Pumps") and accessories.
3. The chemical metering skid shall be completely assembled and tested prior to delivery to the jobsite.
4. Chemical Metering Pump Skid Construction
 - a. The chemical metering skid shall be constructed from solid black UV protected HDPE having a minimum thickness of ½ inch. The skid shall be assembled using thermal plastic welding technology. Bolted or screwed construction is not acceptable. The design of the skid shall include a solid base, back panel, and side panels with an open front and top to ensure ease of access to all components. A minimum two-inch lip shall be provided on the base of the skid to offer a spill containment basin, which will contain a ½ inch FNPT drain plug to be provided for wash down purposes.
 - b. Pedestals shall be provided to elevate metering pumps and all piping above spill containment basin. The metering pumps shall use unions at the suction and discharge of the pump in order to allow for removal of the pump without disturbing the suction and discharge piping.
 - c. All wetted components shall be constructed of materials suitable for use with the chemical being pumped. All piping shall be schedule 80 PVC, or suitable with the chemical being pumped.
 - d. The skid manufacturer shall perform all assembly in a controlled shop environment using precision tools and equipment. All socket-welded connections shall follow the guidelines set by the pipe and fitting manufacturer for proper cleaning, priming, and gluing procedures. A medium bodied solvent cement suitable for use with the applicable chemical shall be used on all applicable joints.
 - e. Threaded connections are only permitted for pulsating damper connections and shall utilize PTFE tape, or suitable threaded sealant or both.
 - f. The piping shall be attached to the chemical feed skid with a non-metallic corrosion resistant support system. All supports shall be welded to the chemical feed skid. Bolted, screwed, or strapped construction is not acceptable.
 - g. All piping and accessory support shall be from the skid base of rear panel. Piping support from above is not acceptable.
 - h. All inlet / outlet connections shall be clearly marked for installation. The skid system shall be tested at the metering pump manufacturer's facility on a computerized calibrated test stand to ensure rated flow, pressure, and hydrostatic conditions are met. Certification of factory testing shall be included in the installation, operation, and maintenance manuals. The chemical metering pump manufacturer shall be responsible for all equipment, valves, piping, and accessories within the skid boundary.
5. All plastic welding must be performed by a DVS CERTIFIED welder for the welding of thermoplastics.

2.2 EQUIPMENT

- A. General: The chemical metering pump on the skid shall include at minimum: (2) backpressure valves, (2) pressure relief valves, (2) pulsation dampeners, (2) diaphragm protected pressure gauges, (1) calibration column, and all required piping, ball valves, and supports.
- B. Accessories: The following accessories are to be included on the chemical feed skid system:
 - 1. (1) Calibration Column shall be provided and installed in the chemical supply piping as close to the metering pump as possible. The top of the calibration column shall be vented back to the supply container for overflow protection.
 - 2. (2) 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.
 - 3. (2) Pressure Relief Valves shall be provided to provide protection against excess line pressure. The pressure relief valves shall be constructed of PVC/Polypropylene with a Teflon diaphragm.
 - 4. (2) Pulsation Dampeners shall be provided and sized for a minimum of 90% dampening. Pulsation dampeners must be of the inline design with PVC housings and Hypalon Diaphragms. The dampener must include a 2 ½" pressure gauge and gas charging valve.
 - 5. Piping and Valves shall be solvent welded schedule 80 PVC. Diaphragm valves must be true union style with Viton/EPDM O-rings and diaphragms for Sodium Hypochlorite.
 - 6. (2) 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.
 - 7. Y-strainers are to be installed in the suction line of the metering pump.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the single pump chemical metering skid as indicated on the drawings and specified 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.

END OF SECTION

SECTION 46 33 40 – CHEMICAL FEED PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Chemical feed pumps.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Include materials of construction for the tank and accessories.

1.4 QUALITY ASSURANCE

- A. Pump shall be warranted by the manufacturer for a period of five years.
- B. Warranty for peristaltic pumps shall include chemical damage to the pump head and roller assembly for a period of two years.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer:
 - 1. General: Provide the chemical feed pump as manufactured by the following:
 - a. Peristaltic Chemical Feed Pump.
 - 1) Blue-White Industries; Pro-Series M3 (Basis of Design).
 - 2) Or approved equal.

2.2 PERISTALTIC CHEMICAL FEED PUMP

- A. Metering pump shall be a positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings. Flex-Pro M-3 model shall be capable of output volumes from 0.0002 to 33.3 gallons per hour.
 - 1. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.
 - 2. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure of up to 125 PSI (8.6 bar).
 - 3. Pump shall be capable of running dry without damage.
 - 4. Pump shall be capable of operating in either direction without output variation.
 - 5. Suction lift shall be 30 feet of water.
- B. Pumphead shall be a single, unbroken track with a clear removable cover.
 - 1. Tube failure detection sensors shall be wholly located in the pumphead. Tube failure detection system shall not trigger with water contact. Float switch type switches alone shall not be used. Process fluid waste ports or leak drains alone shall not be provided as the sole means of protection.
 - 2. Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one-piece thermoplastic rotor. Four polymeric rollers shall be provided; two squeeze rollers for tubing compression shall be located 180 degrees apart and two guide rollers that do not compress the tubing shall be located 180 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring loaded or hinged rollers shall not be used.
 - 3. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.
 - 4. For tubing installation and removal, rotor assembly shall be rotated by the motor drive at 6 RPM maximum when the pumphead cover is removed. Hand cranking of the rotor assembly shall not be required.
 - 5. Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.
 - 6. The pump head cover shall be clear, annealed acrylic thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed to 6 RPM when removed.
 - 7. Cover shall be positively secured to the pump head using four thumb screws. Tools shall not be required to remove the pump head cover.
- C. Pump Tube Assembly
 - 1. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.
 - 2. Pump tube shall be assembled to connection fittings of PVDF material.

3. Connection fittings shall be permanently attached to the tubing at the factory. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.
 4. Connection fittings shall be 1/2" M/NPT.
 5. Tube shall be 1/2" OD polyethylene (3/8" ID).
- D. Drive System shall be factory installed and totally enclosed in a NEMA 4X, (IP66) washdown enclosure. Capable of operating on 110/130VAC 50/60 Hz, or 208/250VAC 50/60 Hz, single phase supply, user configurable via a selection switch located in the junction box.
1. Motor
 - a. Reversible, brushless DC gear motor rated for continuous duty.
 - b. Motor shall include overload protection.
 - c. The maximum gear motor RPM shall be 1250 RPM.
 2. Enclosure
 - a. Pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pretreatment and exterior grade corrosion resistant polyester polyurethane powder coat.
 - b. Rated NEMA 4X (IP66).
 - c. Shall be mounted on chemical feed system skid specified in Division 46.
 - d. A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal board shall be positively secured to the rear of the pump housing by two polymeric screws and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.
 3. Control Circuitry
 - a. All control circuitries shall be integral to the pump and capable of adjusting the pump motor speed from 0.001% to 100.0% in 0.001% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed (10,000:1 turndown ratio).
 - b. The pump output shall be capable of being manually controlled via front panel user touchpad controls. The pump motor speed shall be adjustable from 0.001% to 100.0% in 0.001% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed.
 - c. The pump output shall be capable of being remotely control via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low

input value, a high input value, the required pump percentage of motor speed at the high input value.

- d. The pump output shall be capable of being remotely control via 0-10 VDC input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.
- e. The pump output shall be capable of being remotely control via TTL/Cmos digital high speed pulse type input and an AC sine wave type pulse input in the range of 0 to 1000 Hz. The frequency resolution shall be 1 Hz and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.
- f. The pump output shall be capable of being remotely control via pulse triggered batching. The pump shall accept a TTL/Cmos digital pulse type input and a contact closure type pulse input in the range of 1 to 9999 pulses per batch. The batch time shall be adjustable from 1 to 999999.9 seconds. The pump motor speed during the batch shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.
- g. The pump shall include an internal cycle timer capable of automatically cycling the pump on and off. The pumping total cycle time shall be adjustable from 1 to 999999.9 seconds. The pumping on time during the cycle shall be adjustable from 1 to 999999.9 seconds. The pump motor speed during the cycle shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.
- h. The pump shall be capable of dispensing upon demand. The dispensing shall be manually triggered by pressing the front panel start button or by inputting a contact closure. The dispensing volume shall be adjustable from 1 to 999999.9 milliliters. The pump motor speed during the dispensing cycle shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.
- i. The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a fixed system flow rate. The pump shall permit the user to input the dispensing chemical percentage concentration from 0% to 100.0% in 0.1% increments. The pump shall permit the user to input the dispensing chemical specific gravity from 0.1 to 9.9 in 0.1 increments. The pump shall permit the user to input the fixed system flow rate from 1.0 to 9999.9 liters per minute in 0.1 liters per minute increments. The pump shall permit the user to input the required dosing parts per million (PPM) from 0.1 to 100.0 in 0.1 increments.
- j. The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a variable system flow rate. The pump shall permit the user to input the dispensing chemical percentage concentration from 0% to 100.0% in 0.1% increments. The pump shall permit the user to input the dispensing chemical specific gravity from 0.1 to 9.9 in 0.1 increments. The pump shall permit the user to input a K-factor in pulses per liter from a sensor in the water system that outputs a high-speed digital

pulse from 0 to 1000 Hz that is proportional to the system water flow velocity. The pump shall permit the user to input the required dosing parts per million (PPM) from 0.1 to 100.0 in 0.1 increments.

- k. Provide an 11-button front panel user touchpad control for stop/start, configuration menu access and navigation, operating mode selection, auto priming, display options selection, tube life data, and reverse direction.
- l. Provide a multi-color VGA graphic LCD display for menu driven configuration settings, pump output value, service alerts, tube failure detection (TFD) system and flow verification system (FVS) alarms status, remote input signal values, tubing life timer value. Display color shall be green when indicating normal operation, blue when in stand-by, and red to indicate an alarm condition exists.
- m. Provide for remote stop/start pump via 6-30 VDC powered loop or nonpowered contact closure loop.
- n. Provide a user selectable 4-20mA and 0-1000Hz output signal which are scalable and proportional to pump output volume.
- o. Provide four contact closure alarm outputs. Three rated at 1A-115VAC, 0.8A-30VDC and one rated at 6A-250VAC, 5A-30VDC. Each alarm output shall be assignable to monitor any of the following pump functions: TFD system, FVS system, motor run/stop, motor failed to respond to commands, motor is running in reverse, general alarm (TFD, FVS, and/or motor over current), input signal failure, output signal failure, remote/local control status, revolution counter (tube life) set-point, or monitor which of the nine different pump operating modes is currently active.
- p. Provide a four-digit password protected configuration menu.
- q. Provide a flow verification system with programmable alarm delay time from 1-255 seconds. FVS system shall monitor the FVS flow sensor while pump is running only. System shall not monitor pump while not running.
- r. Provide a roller revolution counter display (tube life indicator) with user programmable alarm set-point value from 1 to 999,999,999 revolutions which can be assigned to any one of the 4 contact closure alarm outputs.
- s. Provide a user programmable maximum RPM (revolutions per minute) setpoint value from 0.1 to 100.0 RPM in 0.1 increments.
- t. Provide a user adjustable response delay time from 0 to 999.9 seconds for the remote start/stop input and the four contact closure alarm outputs to facilitate closed-loop applications.
- u. Provide a power interruption pump restart option which is user programmable to either automatically restart or require a user re-start if AC mains power is interrupted.

E. Flow Verification Sensor shall output high speed digital pulse signal, while pump is running only, to verify chemical injection.

- 1. Flow verification sensor shall be a paddlewheel type sensor.
- 2. Sensor body, paddle, lens cap, and axle material shall be PVDF.
- 3. 1/2" M/NPT connections shall be PVC.

4. Sensor operating range shall be as follows: (Engineer to specify)

Code	Operating Range (ounces per minute)
101	1.0 – 10.0
201	3.5 – 35.0
301	7.0 – 70.0
401	10.0 – 100.0
501	17.0 – 170.0
601	24.0 – 240.0

F. Safety

1. The pump shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 motor operated pump and CSA standard C22.2 process control equipment.
2. Tube Failure Detection (TFD) system sensors shall be wholly located in the pumphead. TFD system will stop the pump within three seconds of leak detection. To prevent false alarms due to rain, wash-down, condensation, etc., tube failure detection system shall not trigger with water contact. Process fluid waste ports or leak drains shall not be provided.
3. Pumphead cover shall include an imbedded magnetic safety interlock which will stop the pump when removed. Pump rotor speed shall be limited to 6 RPM when cover is removed.
4. Secondary user confirmation input required for motor reversal, tube life revolution count reset, and factory default configuration reset.

G. Preferred Manufacturer

1. The pump shall be Blue-White ProSeries-M Flex-Pro series peristaltic pumps, manufactured in the U.S.A. by Blue-White Industries.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the pump as indicated on the drawings and specified 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.

END OF SECTION



CITY OF NEWARK
DELAWARE

DELAWARE STATE WAGE RATES

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 761-8327

Mailing Address:
4425 North Market Street
3rd Floor
Wilmington, DE 19802

Located at:
4425 North Market Street
3rd Floor
Wilmington, DE 19802

PREVAILING WAGES FOR **HEAVY CONSTRUCTION** EFFECTIVE MARCH 15, 2023

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	26.95	23.70	51.54
BOILERMAKERS	86.57	39.16	71.83
BRICKLAYERS	84.08	72.20	30.37
CARPENTERS	59.56	59.56	47.80
CEMENT FINISHERS	53.16	29.69	22.12
DIVER	95.30	Contact DDOL	Contact DDOL
DIVER TENDER	108.79		
ELECTRICAL LINE WORKERS	88.36	88.36	88.36
ELECTRICIANS	79.17	79.17	79.17
GLAZIERS	24.89	21.62	14.65
INSULATORS	65.34	65.34	65.34
IRON WORKERS	73.31	74.33	73.31
LABORERS	53.65	53.65	53.65
MILLWRIGHTS	82.08	82.08	65.93
PAINTERS	91.91	91.91	91.91
PILEDRIVERS	85.37	47.99	37.34
PLASTERERS	23.44	20.38	13.76
PLUMBERS/PIPEFITTERS/STEAMFITTERS	96.38	94.91	23.76
POWER EQUIPMENT OPERATORS	79.29	83.90	79.29
SHEET METAL WORKERS	37.47	23.25	21.84
SPRINKLER FITTERS	40.39	15.29	12.67
TRUCK DRIVERS	41.73	25.08	27.15

CERTIFIED: 04/27/2023 BY: [Signature]
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 761-8327.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: 2023-05 South Wellfield Resin-GAC System, New Castle County

PREVAILING WAGE DEBARMENT LIST

The following contractors have been debarred for violations of the prevailing wage law, 29 Del.C. §6960 or other applicable State statutes.

Therefore, no public construction contract in this State shall be bid on, awarded to, or received by contractors and individuals on this list for a period of (3) three years from the date of the judgment or as deemed by a court of competent jurisdiction.

Contractor	Address	Date of Debarment
Mullen Brothers, Inc. and Daniel Mullen, individually	3375 Garnett Road, Boothwyn, PA 19060	Indefinite/ Civil Contempt
State Contractors Corporation, and Jose Oscar Rivera, individually	13004 Hathaway Drive Silver Spring, MD 20906	Indefinite/ 19 Del.C. 2374(f)
Green Granite and Jason Green, individually	604 Heatherbrooke Court Avondale, PA 19311	Indefinite/ Civil Contempt
Pro Image Landscaping, Inc. and Owner(s) individually	23 Commerce Street Wilmington, DE 19801 and/or 2 Cameo Road Claymont, DE 19703	Indefinite/19 Del.C. §108 & 10 Del.C. 542(c)
Liberty Mechanical, LLC and Owner(s), individually	2032 Duncan Road Wilmington, DE 19801	Indefinite/ 19 Del.C. 2374(f)
Integrated Mechanical and Fire Systems Inc. and Allison Sheldon, individually	4601 Governor Printz Boulevard Wilmington, DE 19809	Indefinite/19 Del.C. §108 & 10 Del.C. 542(c)
ACH 1, INC.	873 Salem Church Road Newark, DE 19702	Indefinite/19 Del.C.6960

Updated: July 6, 2022



CITY OF NEWARK
DELAWARE

DAVIS-BACON WAGE RATES

Superseded General Decision Number: DE20220011

State: Delaware

Construction Type: Heavy

County: New Castle County in Delaware.

HEAVY CONSTRUCTION PROJECTS

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

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

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

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number Publication Date
0 01/06/2023

CARP0173-010 05/01/2022

	Rates	Fringes
CARPENTER (Includes Form Work)...	\$ 34.90	24.21

ELEC0126-003 05/30/2022

	Rates	Fringes
LINE CONSTRUCTION (Lineman).....	\$ 59.17	29.75+11.25

ENGI0542-009 05/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Crane, Forklift, and Scraper)...	\$ 42.16	28.80+A

FOOTNOTE: A. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, and Election Day (provided the employee works the scheduled work day following the holiday.)

LAB00199-008 05/01/2022

	Rates	Fringes
LABORER		
Backfiller, Common or General, Pipelayer, and Tammer (Hand Held).....	\$ 27.15	24.00
Trencher Hand Guided.....	\$ 27.40	24.00

SUDE2014-008 01/20/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.78	0.58
ELECTRICIAN.....	\$ 34.42	24.02
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 34.29	16.18
OPERATOR: Bulldozer.....	\$ 27.09	18.20
OPERATOR: Loader.....	\$ 31.88	12.57
TRUCK DRIVER: Dump Truck.....	\$ 22.60	7.56

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their

own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

The request should be accompanied by a full statement of the interested party's position and by any information (wage

payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

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

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

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

=====

END OF GENERAL DECISIO"



CITY OF NEWARK
DELAWARE

DHSS OFFICE OF DRINKING WATER – APPROVAL TO CONSTRUCT



CITY OF NEWARK
DELAWARE

AWAITING APPROVAL



CITY OF NEWARK
DELAWARE

BUILDING A BETTER AMERICA – PROJECT FUNDING SOURCE SIGN ASSEMBLY

===== PRESIDENT JOE BIDEN =====

BUILDING A BETTER AMERICA

===== BUILD.GOV =====

THE BIPARTISAN INFRASTRUCTURE LAW

Project Funding Source Sign Assembly

BUILDING A BETTER AMERICA SIGNAGE GUIDELINES

Guidelines for Logo Applications

The purpose of this document is to provide general guidelines for signs displayed at project sites for projects funded under the Bipartisan Infrastructure Law, also known as the Infrastructure Investment and Jobs Act.

The first part of this document pertains to signs for projects funded under the Bipartisan Infrastructure Law that are not installed in the highway right-of-way. For highway signage guidance that is MUTCD compliant please see pages 10 and 11.

For all other signs please start here.

This document provides information about the Building A Better American logo mark as well as how logos, marks and seals of state, cities and counties can be incorporated into signage. Logos of contractors are not permitted on the signage. When logos are included in signage, the placement should conform to the brand guideline.

Variations and Usage

There is one approved mark associated with the Building A Better America logo. To preserve the integrity of the Building A Better America logo mark, make sure to apply them correctly. Altering, distorting, or recreating the 'marks' in any way weakens the power of the image and what it represents.

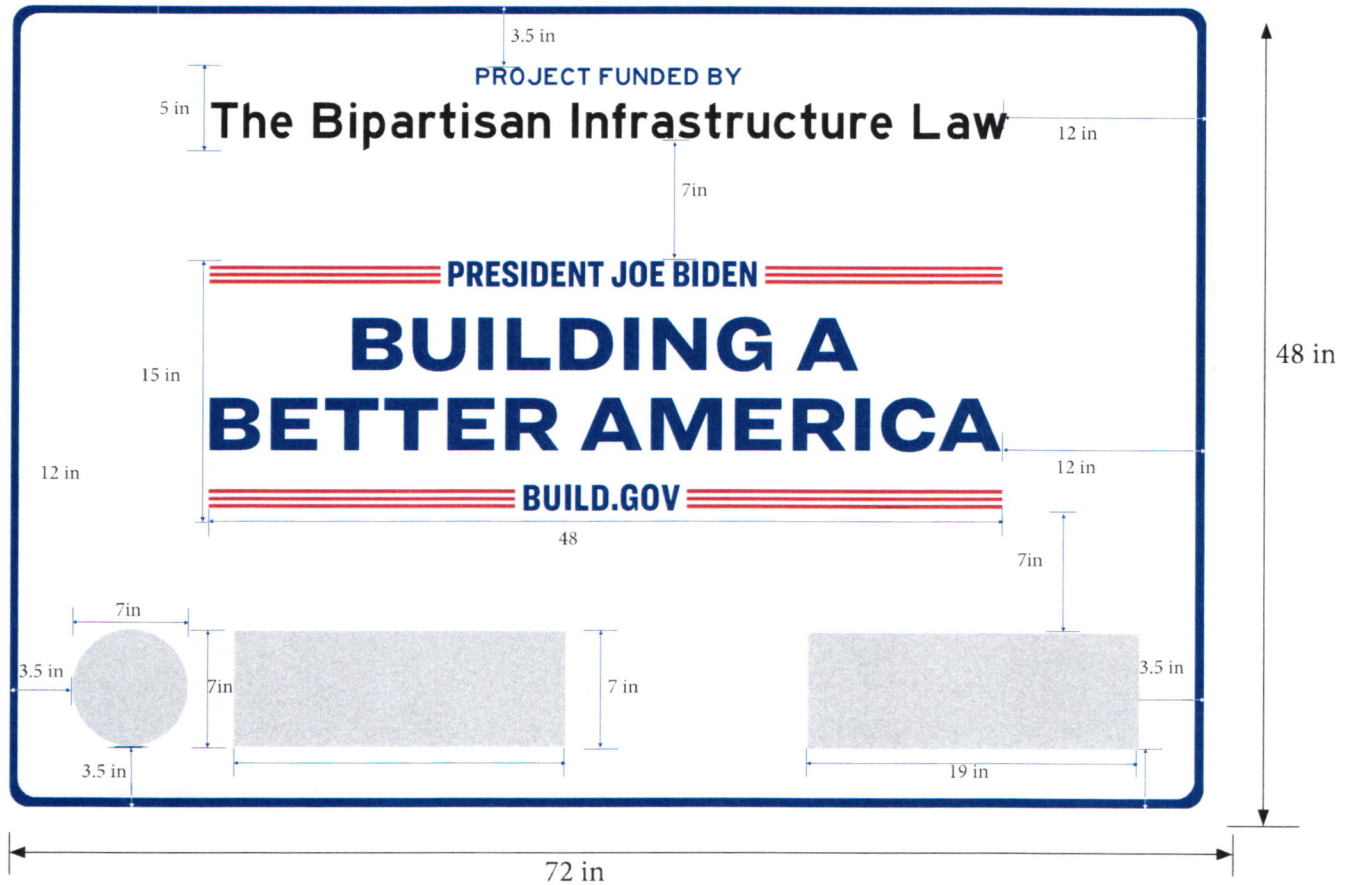
Layout and design of signs and communication materials will vary, so care must be taken when applying the logo mark.



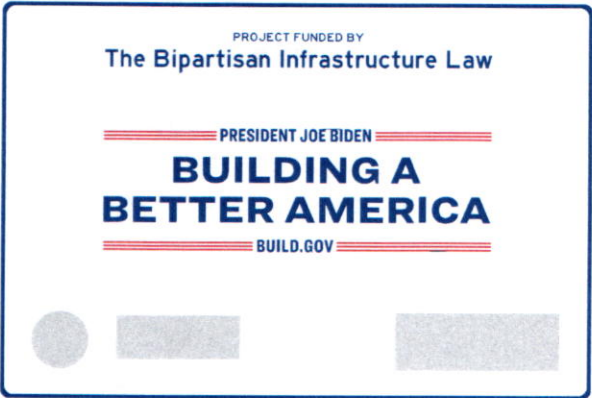
The colors, graphics and fonts used should conform to graphic standards.

COLOR		CMYK	RGB	HEX P	MS
	Blue	83,48,0,48	22 / 68 / 132	#164484	PMS7687C
	Red	0,100,81,0	255/0/49	#FF0031	PMS185C
	White	2,2,0, 3	242 /244/248	#F2F4F8	Bright White

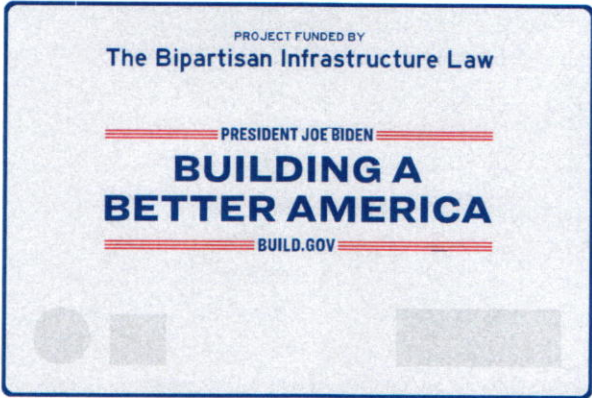
Building A Better America General Guidelines for Logo Applications



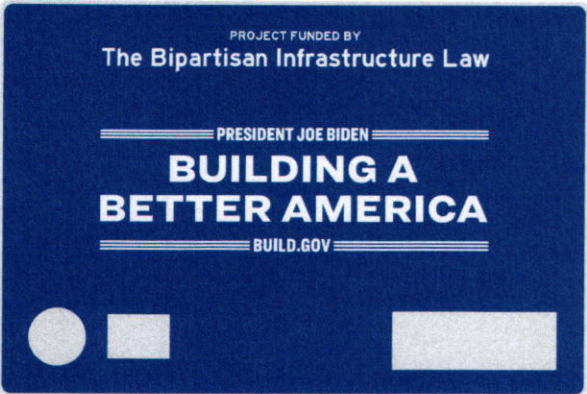
Sign Colors



White



Gray



Blue

EPA LOGO & SEAL SPECIFICATIONS FOR SIGNAGE PRODUCED BY EPA ASSISTANCE AGREEMENT RECIPIENTS

EPA's logo is a two-leaved flower, without stem, accompanied by the Agency's initials to the right. The EPA logo is the primary identifier for use on construction grant signage. Assistance agreement recipients are not required to receive EPA approval to use the EPA logo when used in accordance with the terms and conditions of their assistance agreement award.

The official seal of EPA is circular and is comprised of the two-leaved flower, with stem, encircled by the title UNITED STATES ENVIRONMENTAL PROTECTION AGENCY. The EPA seal may be used only when official comparable seals are used and the recipient has received prior written EPA approval.

It is important that the EPA logo and seal always be reproduced with consistent high quality. The seal and logo must remain intact and unchanged (for example, don't use the flower from the seal by itself). The logo and seal may only be displayed using either the standard color scheme or a single color that complements the background where it appears.

COLOR AND SPACING

- The entire logo and seal must appear in black, gray, or any uniform color or knock out white on a dark background. The flower and text may not be different colors. The flower itself may not contain more than one color. The seal can be monotone or full color, based on the rest of the seals that it's placed with.
- The relationship between the flower portion of the logo and Helvetica type should never be shifted or adjusted.



PMS 362



PMS 660



Process Black at 70%



Process Black 100%



Knock out on a dark color

PREFERRED USE

Use the preferred presentation of the logo on products that do not have enough space for the full logo with text. It may also be used in the presence of other logos.



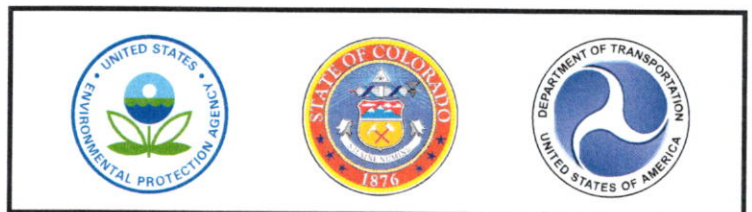
SIZE AND LOGO WITH OTHER LOGOS

It's important that all parts of the EPA logo be readable. The EPA logo should not be reproduced at sizes any smaller than 1.0" height on a sign. There are no maximum size restrictions as long as the clear space requirements are met. The logo should be made the same relative size as the other logos on the signage.



SIZE AND SEAL WITH OTHER SEALS

When there are multiple state or Federal seals/circular logos, the use of the EPA seal is appropriate with prior written EPA approval. The EPA seal should be the same size as the seals that accompany it and should be a minimum of 3 inches in height.



IMPROPER LOGO USAGE





CITY OF NEWARK
DELAWARE

PROJECT DRAWINGS

EXISTING	PROPOSED	DESCRIPTION
		BUILDING
		CURB
		EDGE OF PAVEMENT
		EDGE OF GRAVEL
		EASEMENT
		FENCE
		PROPERTY LINE
		LEGAL RIGHT-OF-WAY
		MINOR CONTOUR
		MAJOR CONTOUR
		WATER MAIN
		FIRE HYDRANT
		WATER MANHOLE
		WATER VALVE
		SANITARY SEWER
		SANITARY SEWER LATERAL
		SANITARY SEWER MANHOLE
		SANITARY SEWER CLEAN-OUT
		SANITARY SEWER FORCE MAIN
		UNDERGROUND ELECTRIC
		ELECTRIC CONDUIT
		OVERHEAD ELECTRIC
		GUY POLE
		ELECTRIC HANDHOLE
		LIGHT
		ELECTRIC MANHOLE
		UTILITY POLE
		UNDERGROUND COMMUNICATION
		COMMUNICATION CONDUIT
		COMMUNICATION HANDHOLE
		GAS LINE
		STORM SEWER INLET
		STORM SEWER
		BOLLARD
		TREELINE
		DECIDUOUS TREE
		CONIFEROUS TREE
		LIMIT OF DISTURBANCE
		COMPOST FILTER SOCK
		GRAVEL
		ASPHALT DRIVEWAY
		CONCRETE SIDEWALK

SHEET INDEX		
SHT.	DWG.	TITLE
1	CS0001	COVER SHEET
2	CS0101	PROCESS FLOW DIAGRAM
3	CS0102	RESIN-GAC PFAS SYSTEM P&ID
4	CS0201	EXISTING CONDITIONS
5	CS1001	SITE & SYSTEM LAYOUT PLAN
6	CS1701	YARD PIPING PLAN
7	CS1702	PIPING SECTIONS
8	CS1703	PIPING SECTIONS
9	CS1704	AIR STRIPPER BUILDING SODIUM HYPOCHLORITE PIPING PLAN
10	CS1705	FILTER BUILDING SODIUM HYPOCHLORITE PIPING PLAN
11	CS2001	LANDSCAPE & EROSION & SEDIMENT CONTROL PLAN
12	CS6001	CONSTRUCTION DETAILS
13	CS6002	RESIN-GAC PFAS SYSTEM DETAILS 1
14	CS6003	RESIN-GAC PFAS SYSTEM DETAILS 2
15	CS6004	EROSION AND SEDIMENT CONTROL DETAILS
16	S0001	DESIGN CRITERIA AND GENERAL NOTES
17	S1000	ADSORBER SLAB PLAN AND DETAIL
18	S2000	ADSORBER SLAB DETAILS
19	E0001	ELECTRICAL NOTES
20	E1001	ELECTRICAL SITE PLAN



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Call Miss Utility of Delmarva
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NEW CASTLE COUNTY, DELAWARE
MAY 2023

PWSID: DE0000630

PREPARED FOR:

220 SOUTH MAIN STREET

NEWARK, DE 19711

(302) 366-7000

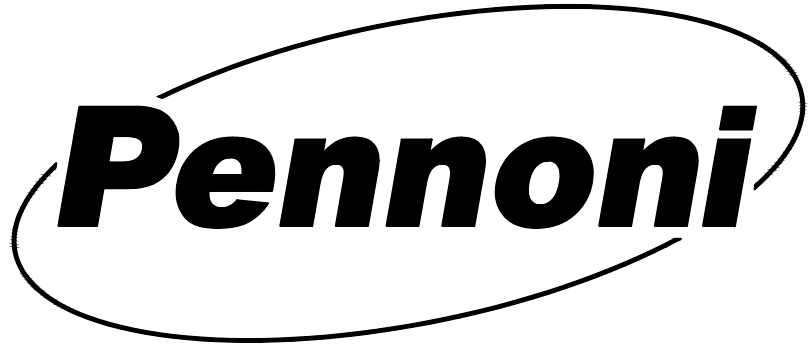


LOCATION MAP

Scale: 1" = 1,000'

PREPARED BY:

PENNONI ASSOCIATES INC.



Christiana Executive Campus
121 Continental Drive, Suite 207
Newark, DE 19713-4310
T 302.655.4451
F 302.654.2895

GENERAL NOTES:

1. EXISTING FEATURES, CONTOURS, SITE PIPING, AND BENCH MARKS AS SHOWN HEREON ARE BASED ON INFORMATION PROVIDED BY THE CITY OF NEWARK. REFERENCE IS MADE TO THE PLANNED TITLE "SOUTH NEWARK FIELDED RECONSTRUCTION PROJECT", SHEET C-03, PREPARED BY AEOM, LAST REVISED 04/16/2021 (PROJECT NUMBER 60598401).
2. A FIELD SURVEY WAS PERFORMED BY PENNOSI ASSOCIATES ON FEBRUARY 21, 2023 FOR THE EXPRESS PURPOSE OF EVALUATING SLOES AND DID NOT INCLUDE SURVEY OF EXISTING FEATURES OR TOPOGRAPHY.
3. HORIZONTAL DATUM: DELAWARE STATE PLANE (NAD 83)
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM (NAVD 88-128)
4. EXISTING UNDERGROUND UTILITIES SHOWN ON THE PLANS, INCLUDING TELEPHONE, ELECTRIC, CABLE TV, GAS, TRAFFIC SIGNAL, WATER, SEWER, FORCE MAINS AND STORM DRAINAGE ARE BASED UPON THE BEST AVAILABLE INFORMATION AND ARE SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. NO GUARANTEE IS MADE OR IMPLIED REGARDING THE ACCURACY OR COMPLETENESS THEREOF. CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF THE LOCATION AND DEPTH SIZE, LOCATION OF ALL UNDERGROUND UTILITIES TO HIS OWN SATISFACTION BEFORE BEGINNING ANY EXCAVATION OR PIPE LAYING. THE OWNER AND ENGINEER DISCLAIM ANY RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF SAID INFORMATION. IF THE CONTRACTOR RELIES ON THE INFORMATION HEREON SO AS TO AVOID THE GIVING OF THE INFORMATION ON THE PLANS WILL NOT RELIEVE THE CONTRACTOR OF HIS OBLIGATIONS TO SUPPORT AND PROTECT ALL SHOWN OR NOT SHOWN EXISTING UTILITIES AND APPURTENANCES. SHOULD ANY EXISTING UTILITIES BE DAMAGED BY THE CONTRACTOR, THEN THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING THE SAME TO THE ORIGINAL CONDITION AT HIS OWN EXPENSE. THE CONTRACTOR SHALL MAKE HIS OWN INVESTIGATION AND TEST PIT EXISTING UTILITIES AS REQUIRED.
5. CONTRACTOR SHALL NOTIFY "MISS UTILITY" (1-800-232-8555) NOT LESS THAN TWO FULL WORKING DAYS, BUT NO MORE THAN 10 WORKING DAYS, PRIOR TO EXCAVATION OR DEMOLITION TO HAVE EXISTING UNDERGROUND UTILITIES LOCATED AND MARKED.
6. ALL NEW DUCTILE IRON PIPE AND MECHANICAL JOINT FITTINGS SHALL BE RESTRAINED. CONCRETE BUTTRESSES ARE REQUIRED BUT NOT SHOWN FOR CLARITY.
7. CONTRACTOR TO COMPLY WITH ALL EROSION AND SEDIMENT CONTROL MEASURES AND SUCH MEASURES ARE TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. CONTRACTOR IS RESPONSIBLE FOR TOPSOIL, SEEDING AND MULCHING DISTURBED AREAS.
8. DRAWINGS DO NOT INCLUDE NECESSARY CONDITIONS FOR CONSTRUCTION SAFETY. ALL CONSTRUCTION MUST BE DONE IN COMPLIANCE WITH THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970, AS AMENDED AND ALL RULES AND REGULATIONS THERE TO APPURTENANCE.
9. CONTRACTOR TO DOCUMENT ANY REVISIONS TO THESE DRAWINGS. CONTRACTOR TO PROVIDE A RECORD SET OF DRAWINGS TO THE CITY OF NEWARK FOR DRINKING WATER FOR APPROVAL OF RECORD DRAWINGS AND TO OBTAIN CERTIFICATE TO OPERATE.

SEQUENCE OF CONSTRUCTION:

1. AT LEAST 7 DAYS BEFORE CONSTRUCTION BEGINS, THE CONTRACTOR SHALL SET UP AN ON-SITE PRE-CONSTRUCTION MEETING WITH ALL CONTRACTORS INVOLVED IN THE PROJECT, THE CITY OF NEWARK, AND PENNONTLI.
2. DELINEATE THE LIMITS OF DISTURBANCE.
3. INSTALL ALL EROSION AND SEDIMENT CONTROLS, INCLUDING COMPOST FILTER SOCK.
4. REMOVE SELECT EXISTING TREES.
5. MODIFY EXISTING MONITORING WELL AS PER CONTRACT DRAWINGS.
6. CONSTRUCT THE ADSORBER FOUNDATION SLAB, INCLUDING ANY CONDUIT OPENINGS REQUIRED FOR ELECTRIC CONTROLS THAT NEED TO BE STUBBED UP THRU THE PAD. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE CITY OF THE ESTIMATED TIME OF COMPLETION OF THE SLAB SO THAT THE CITY CAN NOTIFY CALGON TO SCHEDULE THE DELIVERY OF THE ADSORPTION UNITS. THE CITY WILL THEN NOTIFY CALGON AND PROVIDE THE CONTRACTOR WITH A 7 DAYS NOTICE OF DELIVERY.
7. INSTALL THE CALGON ADSORPTION UNITS AND ASSOCIATED ELECTRIC CONTROLS ON THE SLAB AS PER THE PLAN SHEETS AND CALGON REQUIREMENTS, INCLUDING BUT NOT LIMITED TO, BOLTING THE TANK COLUMNS TO THE SLAB.
8. THE REMAINING ORDER OF THE SEQUENCE OF CONSTRUCTION IS RECOMMENDED, BUT THE CONTRACTOR MAY PROPOSE A DIFFERENT ORDER BASED ON AVAILABLE DELIVERY TIMES.
9. AFTER THE ADSORPTION UNITS HAVE BEEN INSTALLED, THE CITY WILL SHUT DOWN THE WATER SYSTEMPLANT FOR A MAXIMUM OF 3 CALENDAR DAYS (SPECIFIC DAYS TO BE COORDINATED WITH THE CONTRACTOR). DURING THIS TIME, THE CONTRACTOR SHALL INSTALL THE CONCRETE VALVE VAULT WITH ALL ASSOCIATED PIPING, FITTINGS, ACCESSORIES, AND CONTROLS AND CONNECT THE VAULT TO THE INFLUENT LINE TO THE EXISTING 16" EFFLUENT WATER LINE. CONTRACTOR SHALL RESTRAIN THE PIPING TO RESIST THRUST FROM RE-ACTIVATION OF THE WATER SYSTEM.
10. CLOSE THE BUTTERFLY VALVES THE VALVE VAULT TO THE INFLUENT AND EFFLUENT LINES OF THE ADSORPTION UNITS AND LEAVE THE BUTTERFLY VALVE TO BYPASS THE ADSORPTION UNITS OPEN SO THAT THE CITY CAN REACTIVATE THE WATER SYSTEMPLANT.
11. CONSTRUCT ALL OTHER SITE PIPING, FITTINGS, AND ACCESSORIES.
12. PERFORM HYDROSTATIC TESTING OF NEW WATER LINES.
13. DISINFECT NEW WATER LINES.
14. INSTALL MANIFOLD ENCLOSURES WITH ALL ASSOCIATED ELECTRIC AND HEATING.
15. INSTALL THE NaOCl PUMP AND FEED SYSTEM AND CONTROLS IN THE EXISTING FILTER BUILDING AND AIR STRIPPER BUILDING.
16. FILL ADSORPTION UNITS WITH RESIN AND GAC, AND CONDUCT SYSTEM STARTUP. THE CONTRACTOR SHALL NOTIFY CALGON AT LEAST 7 DAYS IN ADVANCE IN ORDER TO SCHEDULE RESIN/GAC DELIVERY AND TO HAVE A CALGON REPRESENTATIVE PRESENT TO ASSIST WITH THE SYSTEM STARTUP.
17. INSTALL CONCRETE SIDEWALKS.
18. PLANT NEW TREES.
19. MILL AND OVERLAY EXISTING ASPHALT DRIVEWAY IF DIRECTED BY OWNER.
20. TOPSOIL, SEED, AND REGRADE LAWN TO RESTORE POSITIVE DRAINAGE CONSISTENT WITH EXISTING DRAINAGE PATTERN.
21. RESTORE ANY OTHER SITE FEATURES THAT WERE DAMAGED DURING THE WORK.
22. REMOVE EROSION AND SEDIMENT CONTROLS.

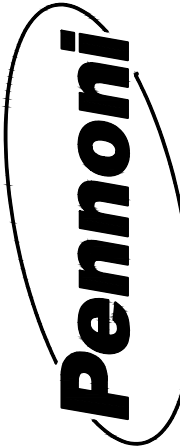
SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL ST
NEWARK, DE 19713

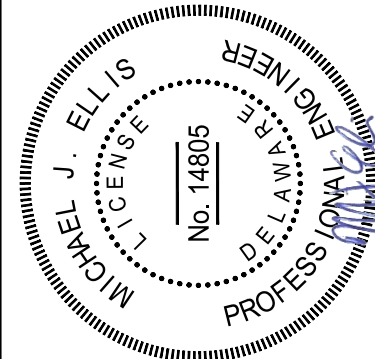
COVER SHEET

CITY OF NEWARK
220 SOUTH MAIN STREET

NEWARK, DE 19711



PENNONI ASSOCIATES INC.
Christiana Executive Campus
121 Continental Drive, Suite 207
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DATE	NO.	REVISIONS	BY
05/19/2023	1	BID PLAN SUBMISSION	ELA

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PROJECT CNEWK22008

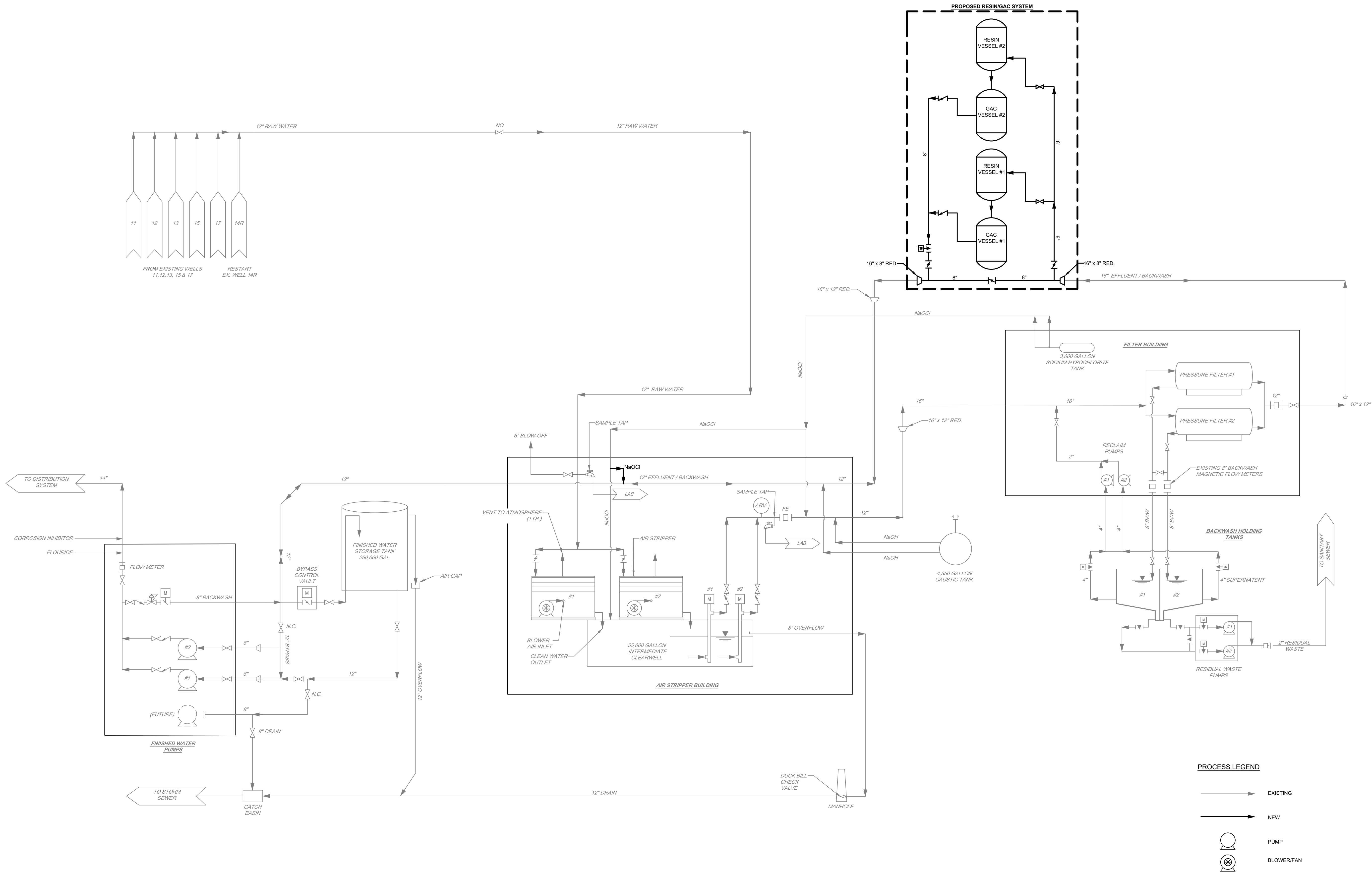
DATE 2023-05-05

DRAWING SCALE AS NOTED

DRAWN BY _____ ELA

CS0001

SHEET 1 OF 20



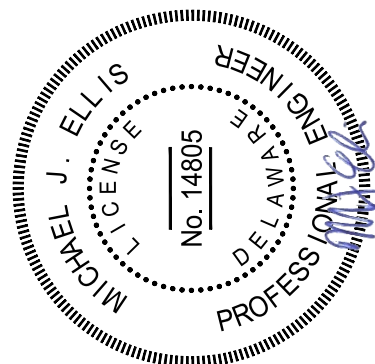
SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

PROCESS FLOW DIAGRAM

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

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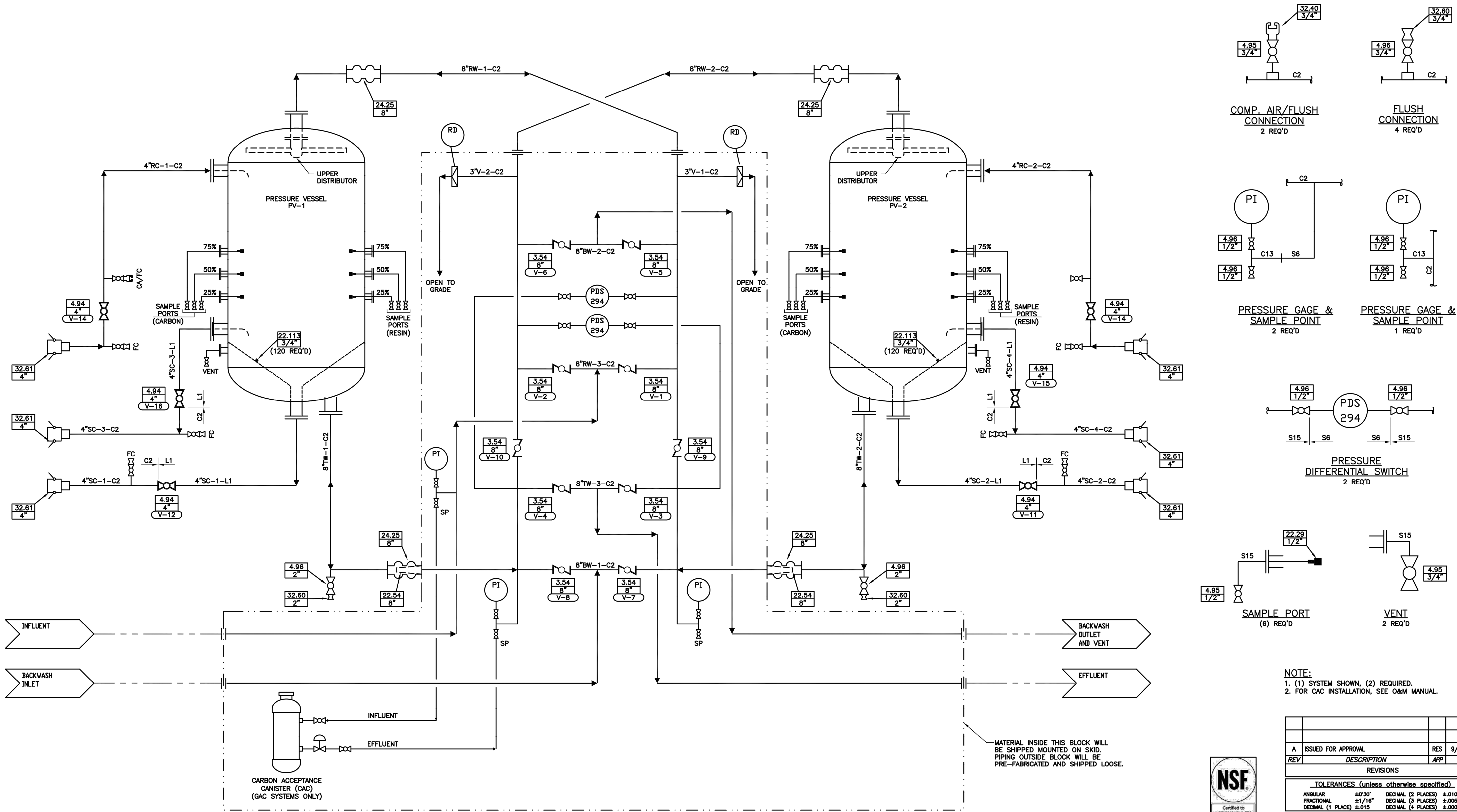


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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	NOT TO SCALE
DRAWN BY	ELA
APPROVED BY	MJE

CS0101
SHEET 2 OF 20

U:\Accounting\NEWARK\CNEWK22002 - South Wellfield PFAS Treatment Study\DESIGN - S&E\TSC\01\02.dwg PLOTTED: 8/17/2023 2:48 PM BY: Elia Addison PLOTTSTYLE: Pennon V02.spl PROJECT STATUS: —



NOTE:
1. (1) SYSTEM SHOWN, (2) REQUIRED.
2. FOR CAC INSTALLATION, SEE O&M MANUAL.

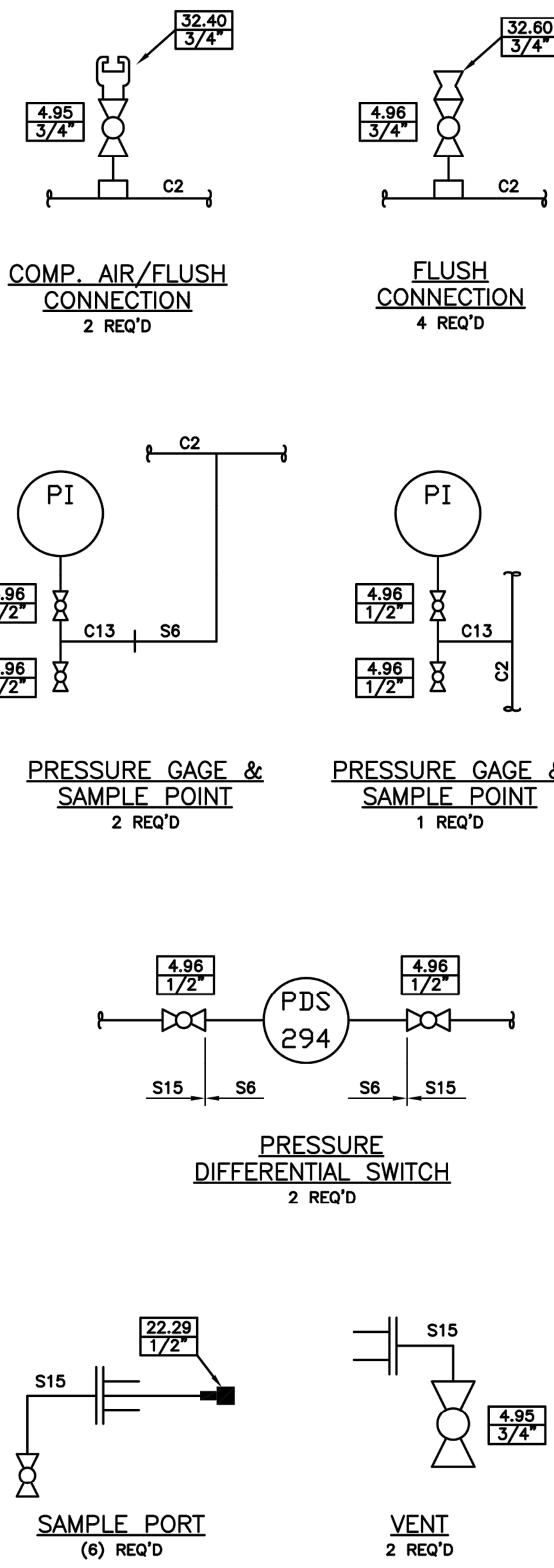
REVISIONS			
REV	DESCRIPTION	APP	DATE
A	ISSUED FOR APPROVAL	RES	9/30/22

TOLERANCES (unless otherwise specified)			
ANGULAR	±0°30'	DECIMAL (2 PLACES)	±0.01
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±0.005
DECIMAL (1 PLACE)	±0.015	DECIMAL (4 PLACES)	±0.0005



CLIENT		CITY OF NEWARK SOUTH WELL FIELD PLANT	
TITLE		DRINKING WATER TREATMENT SYSTEM MODEL 12-40 DW-C, 8" PIPING FLOW DIAGRAM	
DWG. No.	D	SHEET No.	1 OF 1
DWG. No.	91224266	SCALE	NONE
PROJECT No.	IXO.220002.NEWARK	REV.	A

MATERIAL INSIDE THIS BLOCK WILL BE SHIPPED MOUNTED ON SKID. PIPING OUTSIDE BLOCK WILL BE PRE-FABRICATED AND SHIPPED LOOSE.



NOTE:
P&ID FROM CALGON PLAN TITLED DRINKING WATER TREATMENT SYSTEM MODEL 12-40 DW-C, 8" PIPING FLOW DIAGRAM" DATED 9/13/2022.

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR AND OWNER MUST BE NOTIFIED OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK

SOUTH WELLFIELD RESIN-GAC SYSTEM
912 SOUTH CHAPEL STREET
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RESIN-GAC PFAS SYSTEM P&ID

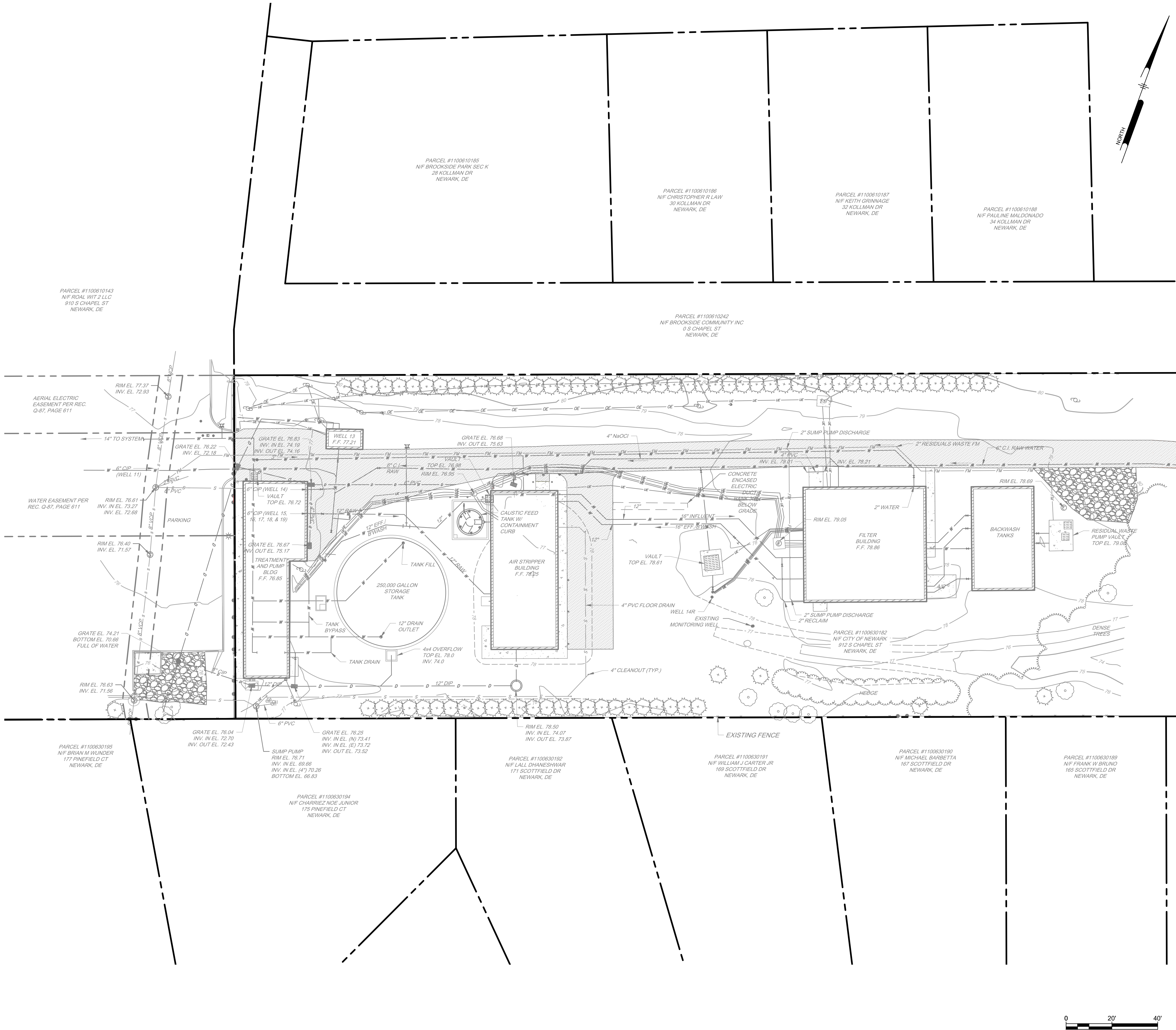
CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY	ELA
1	05/16/2023	BID PLAN SUBMISSION		

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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	NOT TO SCALE
DRAWN BY	ELA
APPROVED BY	MJE

U:\Account\CHEN\K22002 - South Wellfield PWS Treatment Study\DESIGN\SAFETY\CS0201.dwg PLOTTED: 1/17/2023 2:40 PM BY: Elia Addison PLOTTED: Pencon V23.4b PROJECT STATUS: —



NOTES:

1. TAX PARCEL NUMBER 11-006-30-182
2. ZONING: NC 6 (OTHER PERMITTED USES)
3. SOURCE OF TITLE: DEED ON FILE R61-69.
4. A FIELD SURVEY WAS PERFORMED BY PENNONI ASSOCIATES ON FEBRUARY 21, 2023 FOR THE EXPRESS PURPOSE OF EVALUATING SOILS.
5. HORIZONTAL DATUM: DELAWARE STATE PLANE (NAD 83)
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM (NAVD 88-128)
6. WATER SUPPLY - CITY OF NEWARK
WATER SUPPLY IS SUBJECT TO THE APPROVAL OF THE DELAWARE STATE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL AND THE DELAWARE DEPARTMENT OF PUBLIC HEALTH.
7. SANITARY SEWER - NEW CASTLE COUNTY
SEWERAGE IS SUBJECT TO THE APPROVAL OF THE NEW CASTLE COUNTY DEPARTMENT OF SPECIAL SERVICES.
8. DRAINAGE, EROSION & SEDIMENT CONTROL, AND STORMWATER MANAGEMENT SHALL BE PROVIDED IN ACCORDANCE WITH THE NEW CASTLE COUNTY DRAINAGE CODE.
9. THIS PARCEL IS NOT LOCATED WITHIN THE 100-YEAR FLOODPLAIN (REFERENCE: FEMA COMMUNITY PANEL NO. 10003C0140J EFFECTIVE 1/17/2007).
10. THE ENTIRE SITE IS LOCATED WITHIN A "CLASS C" WELLHEAD WATER RESOURCE PROTECTION AREA (WRPA). ADDITIONAL AREAS INDICATED ARE LOCATED WITHIN A "CLASS A" WRPA. ADDITIONAL INDICATED PORTIONS OF THE SITE ARE LOCATED WITHIN A WRPA RECHARGE AREA.
11. A WETLANDS ASSESSMENT WAS PERFORMED BY AECOM ON MARCH 11, 2019. NO WETLANDS WERE IDENTIFIED ON THE SUBJECT SITE..
12. THIS ENTIRE SITE DOES NOT CONTAIN ANY CRITICAL NATURAL AREAS.
13. PARCEL 11-006-30-182 SHALL HAVE ACCESS TO SOUTH CHAPEL STREET EXTENSION/SUNSET LAKE ROAD VIA THE 20 FOOT WIDE RIGHT-OF-WAY.
14. NO NEW PARKING IS PROPOSED WITH THIS PLAN.

SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

EXISTING CONDITIONS

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY
1	05/19/2023	BID PLAN SUBMISSION	ELA

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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	1"=20'
DRAWN BY	ELA
APPROVED BY	MJE

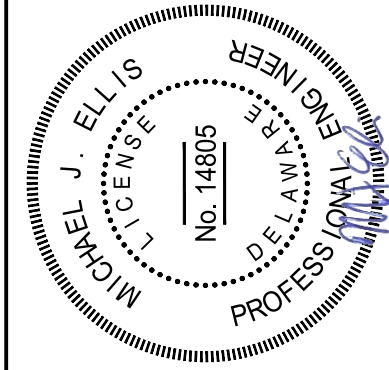
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SHEET 4 OF 20

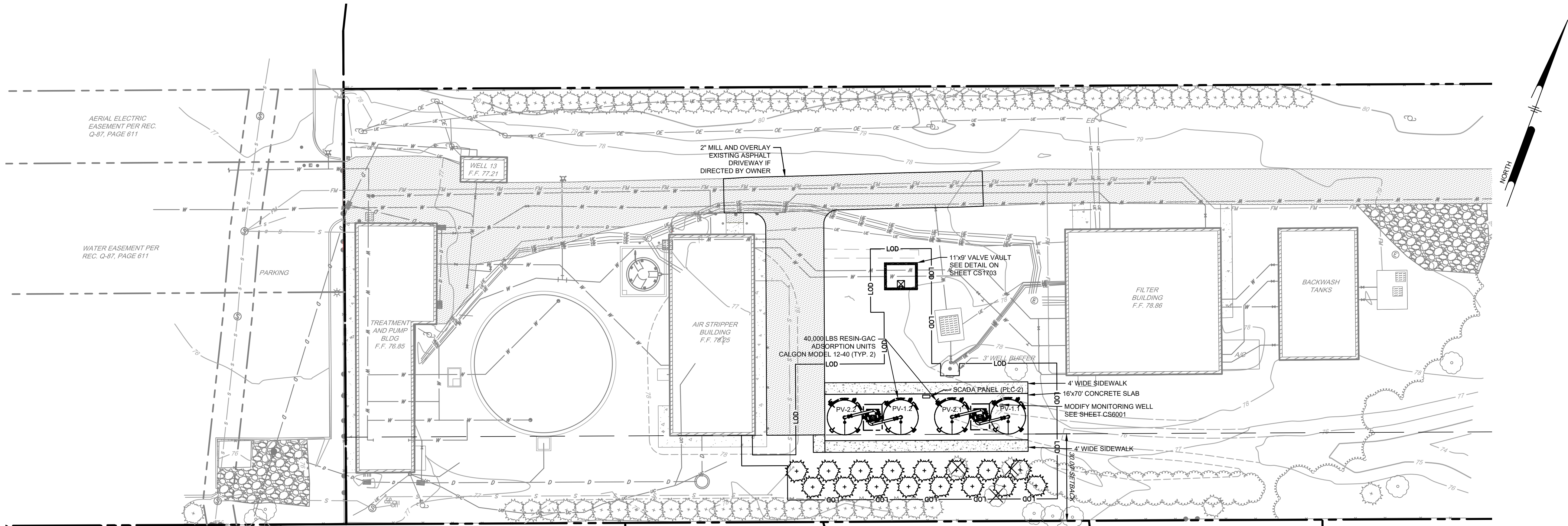
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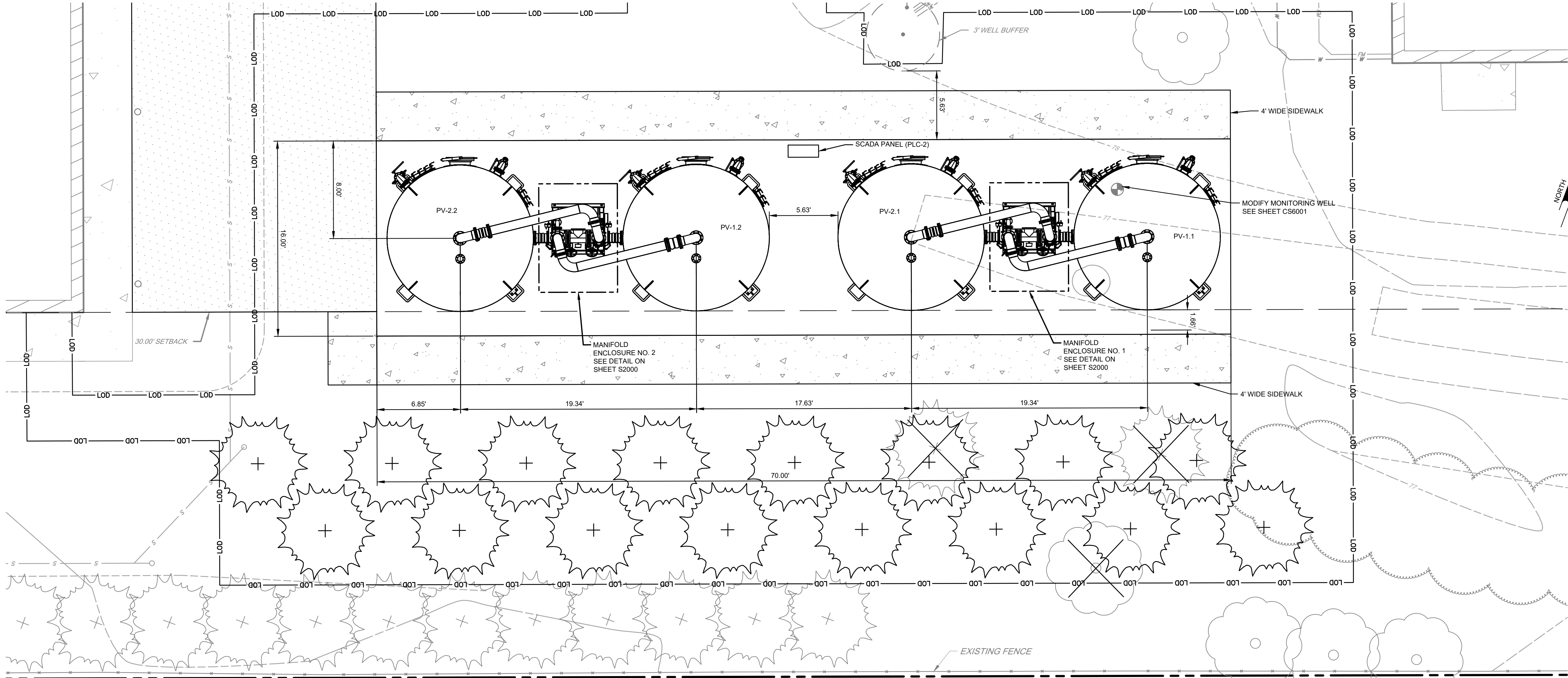
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SITE & SYSTEM LAYOUT

SCALE: 1" = 20'

0 20' 40'



ENLARGED SITE & SYSTEM LAYOUT

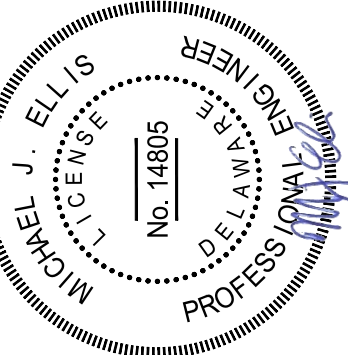
SCALE: 1" = 5'

0 5' 10'



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SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

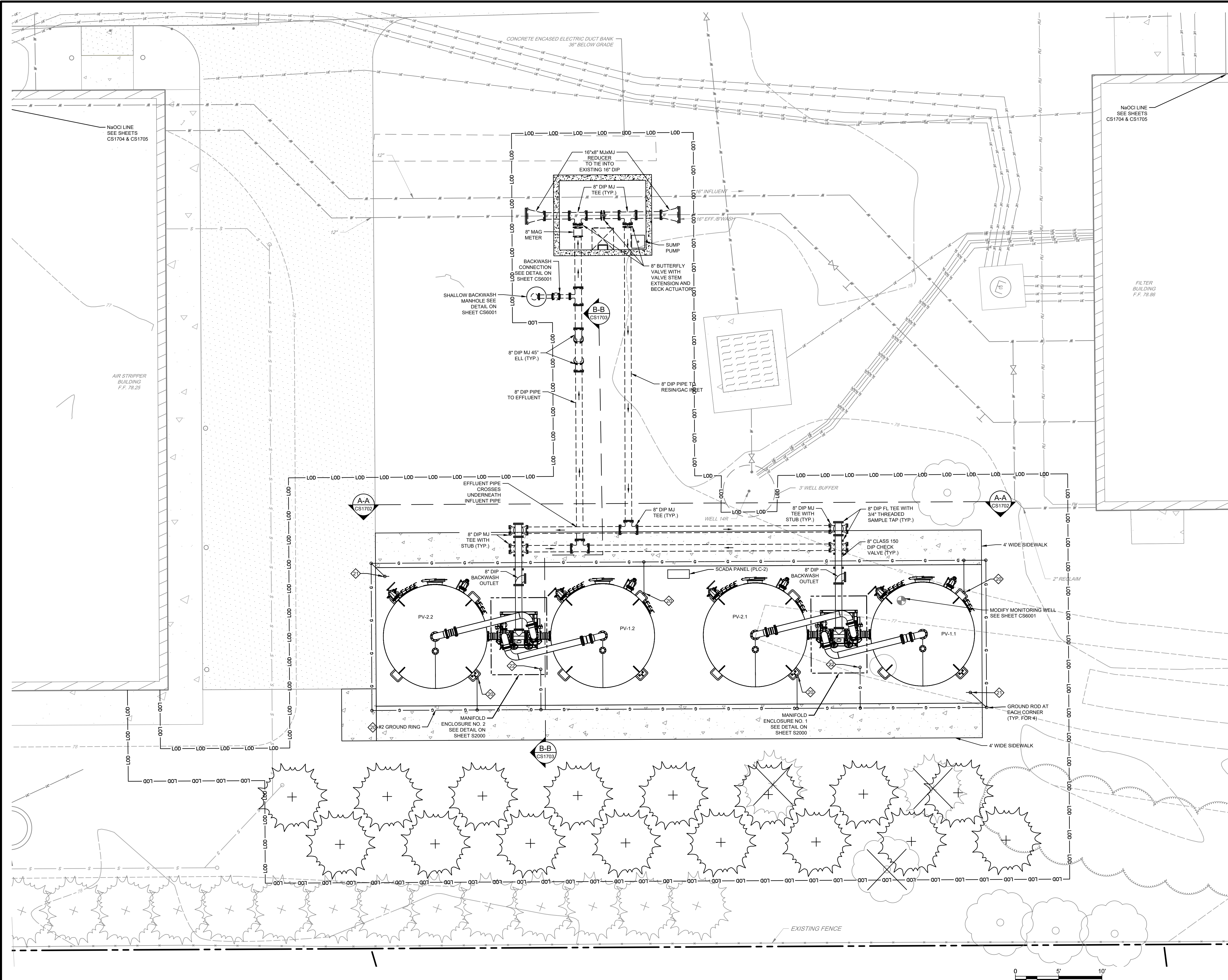
SITE & SYSTEM LAYOUT PLAN

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY
1	05/19/2023	BID PLAN SUBMISSION	ELA

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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	AS NOTED
DRAWN BY	ELA
APPROVED BY	MJE



SOUTH WELLFIELD RESIN-GAC SYSTEM

YARD PIPING PLAN

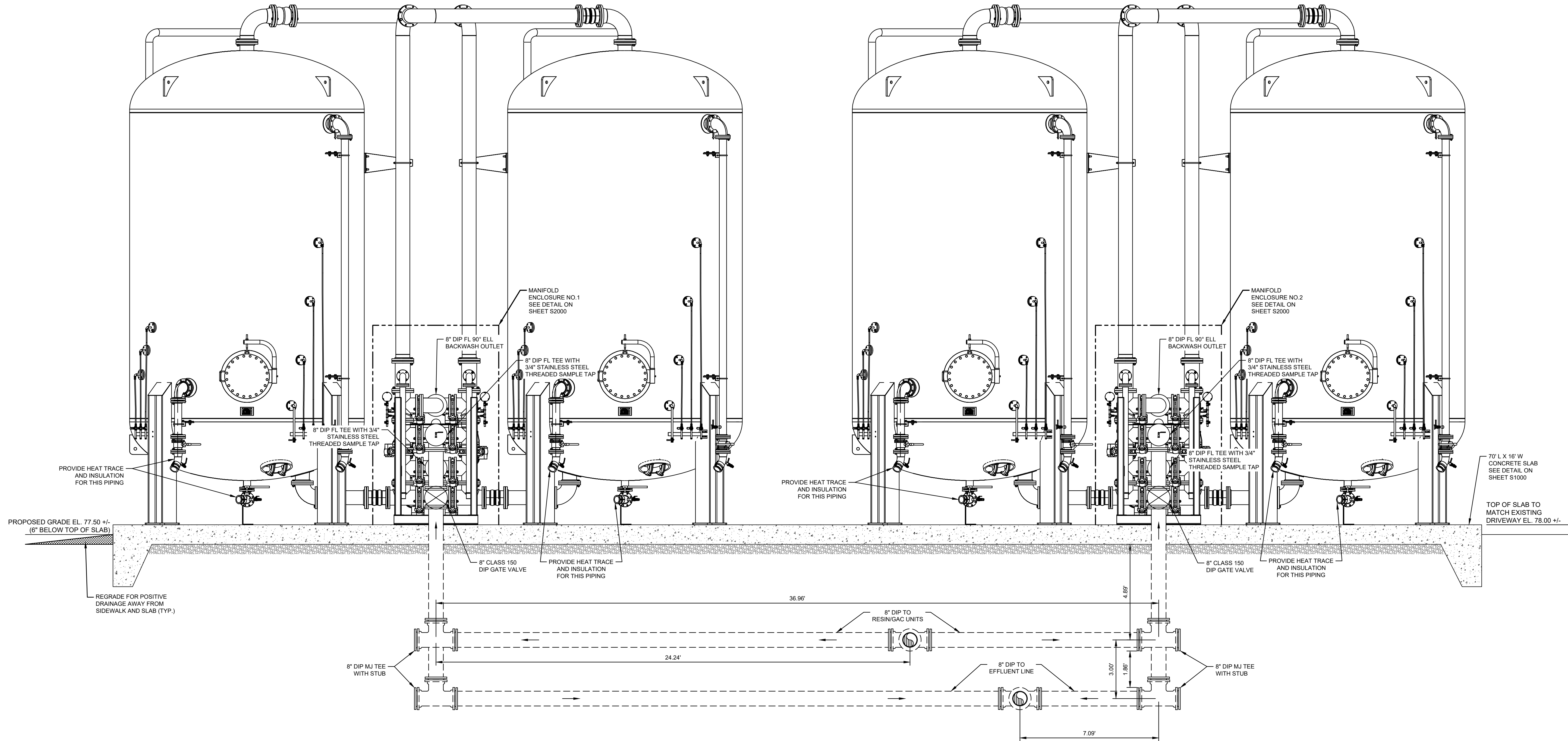
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PROJECT CNEWK22008

U:\accounts\CNEWK\CNEWK2002 - South Wellfield PFAS Treatment Study\DESIGN_SHEETS\C/S1701.dwg PLOTTED: 5/17/2023 2:53 PM BY: Erika Addison PLOTSTYLE: Pennoni NCS.stb PROJECT STATUS: --

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PROJECT STATUS: —
PLOTTED: 11/05/2023 1:41 PM BY: Elia Addison PLOT STYLE: Pennon V202.dwg



A YARD PIPING SECTION
CS1701 SCALE: 3/8" = 1'

NOTES:

- ALL DIMENSIONS ARE APPROXIMATE AND NEED TO BE FIELD VERIFIED AND ADJUSTED AS NECESSARY BY THE CONTRACTOR.
- ALL WATER PIPING MUST HAVE A MINIMUM OF 42" OF COVER.

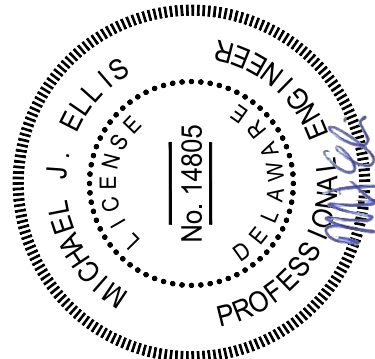
SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

PIPING SECTIONS

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

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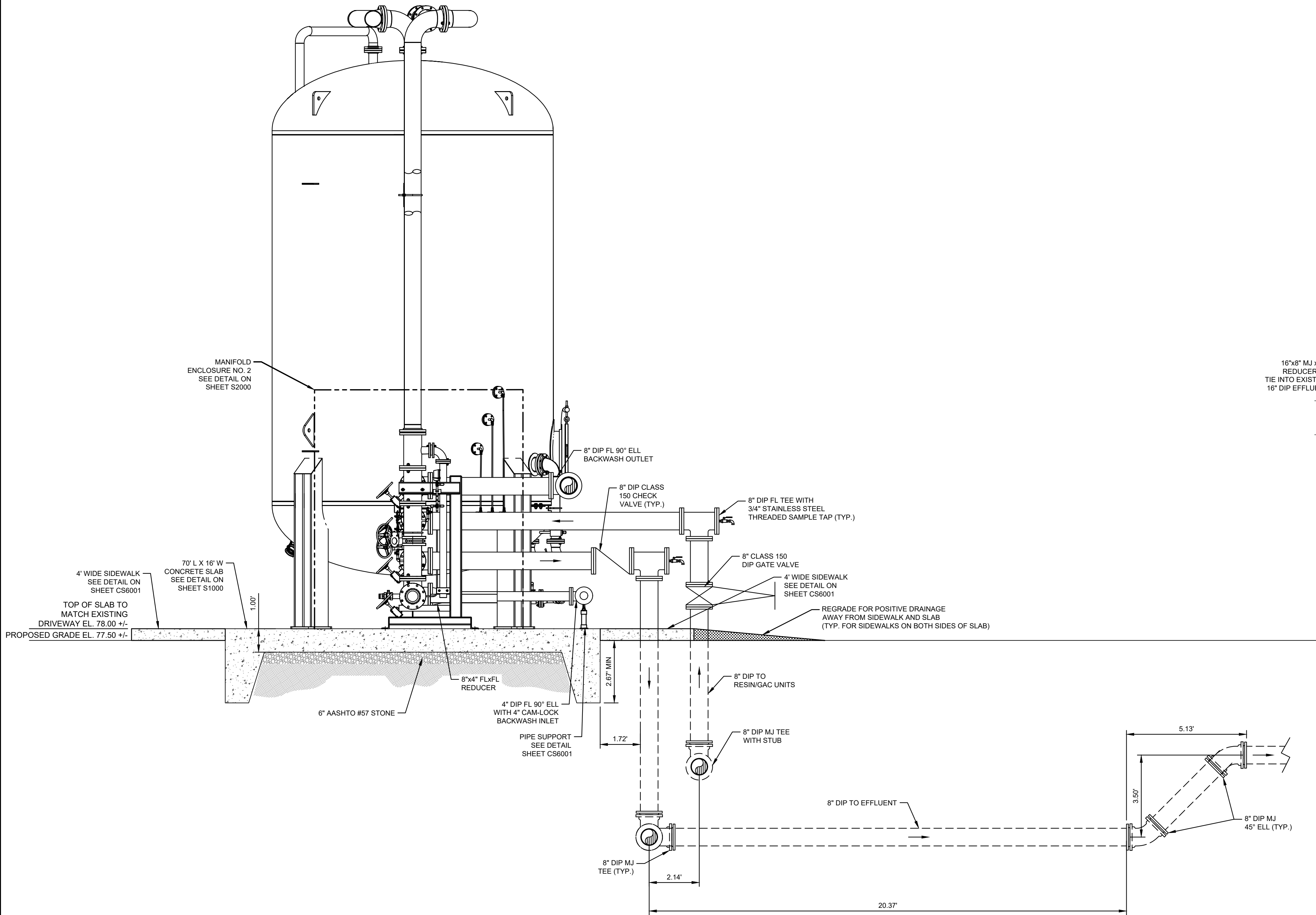
PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	3/8"=1'
DRAWN BY	ELA
APPROVED BY	MJE

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NO.	DATE	REVISIONS	BY
1	05/19/2023	BID PLAN SUBMISSION	ELA

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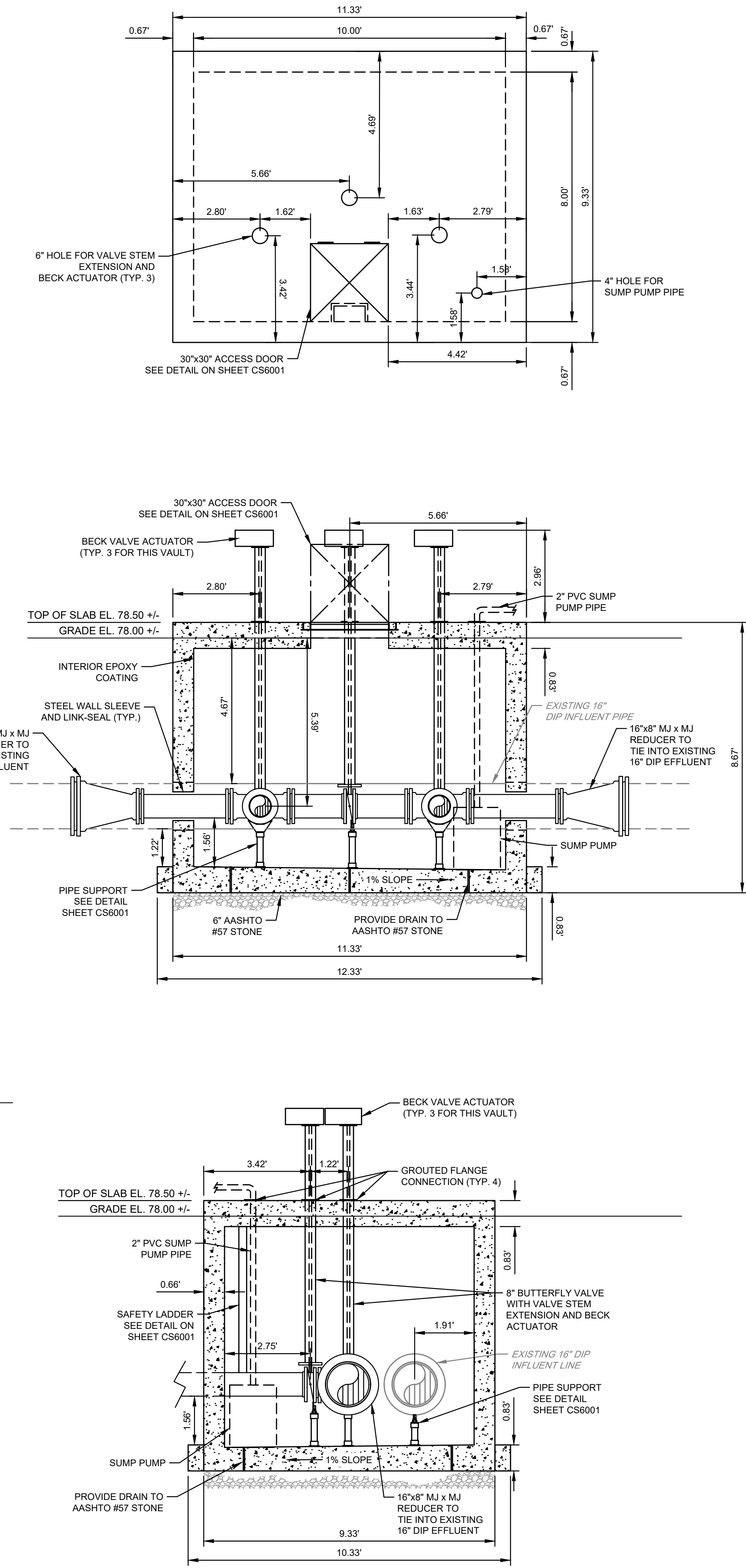
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B YARD PIPING SECTION
SCALE: 3/8" = 1'

NOTES:

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- ALL WATER PIPING MUST HAVE A MINIMUM OF 42" OF COVER.

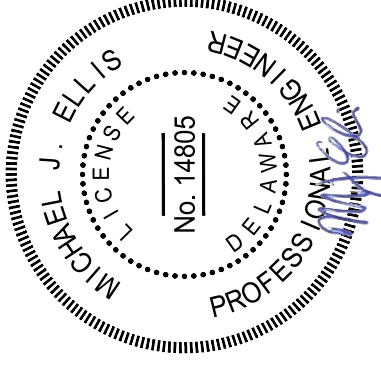


VALVE VAULT DETAIL
SCALE: 3/8" = 1'



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SOUTH WELLFIELD RESIN-GAC SYSTEM
912 SOUTH CHAPEL STREET
NEWARK, DE 19713

PIPING SECTIONS
CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY
1	05/19/2023	BID PLAN SUBMISSION	ELA

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PROJECTCNEWK22008

DATE2023-05-05

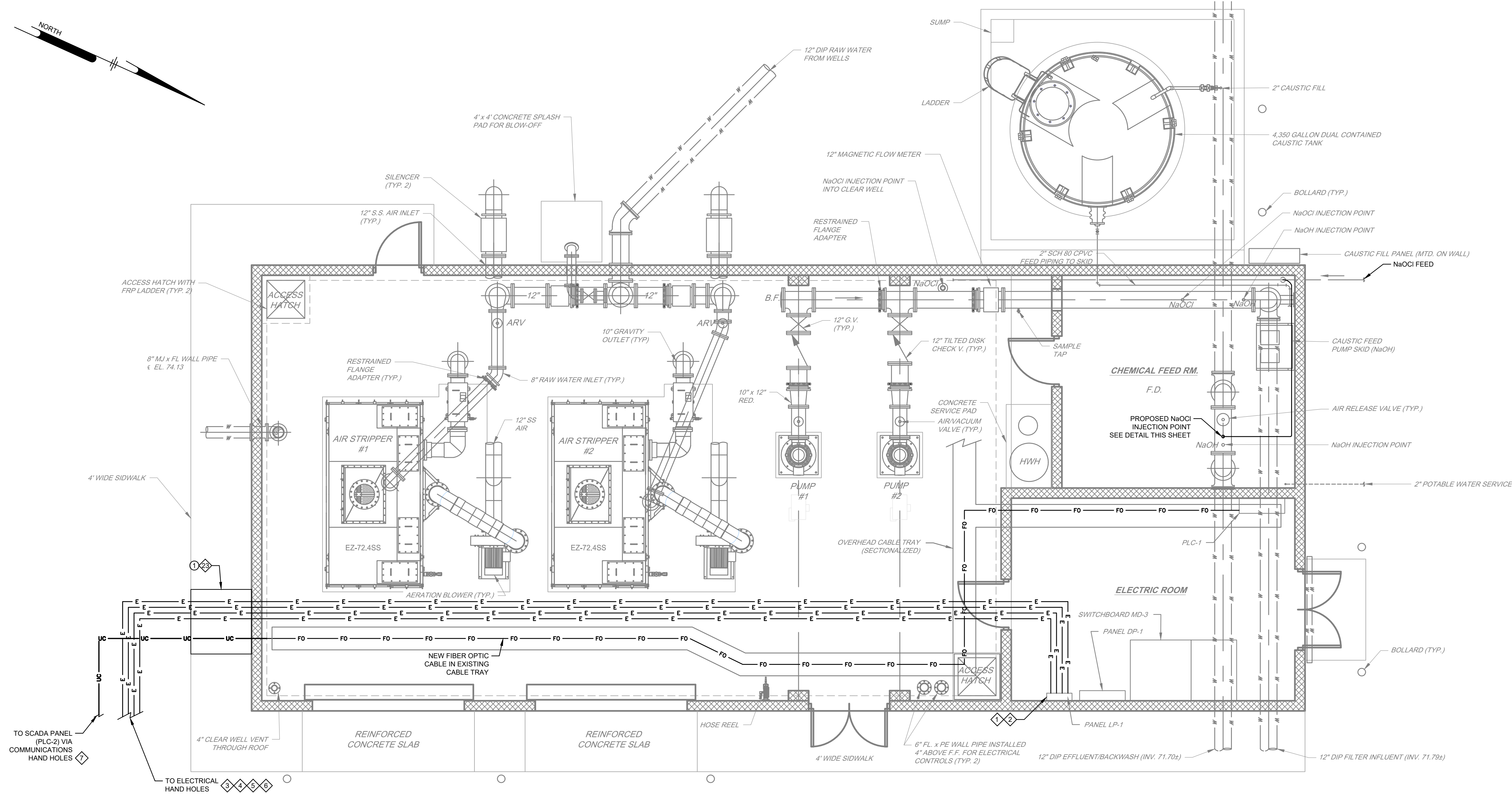
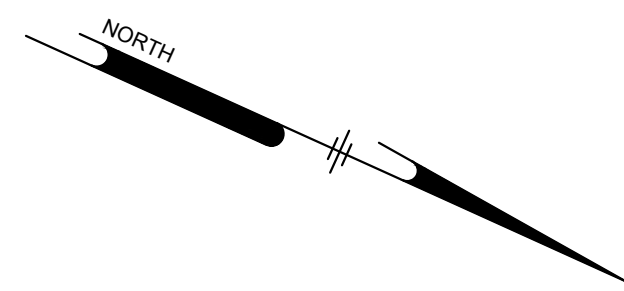
DRAWING SCALE3/8"=1'

DRAWN BYELA

APPROVED BYMJE

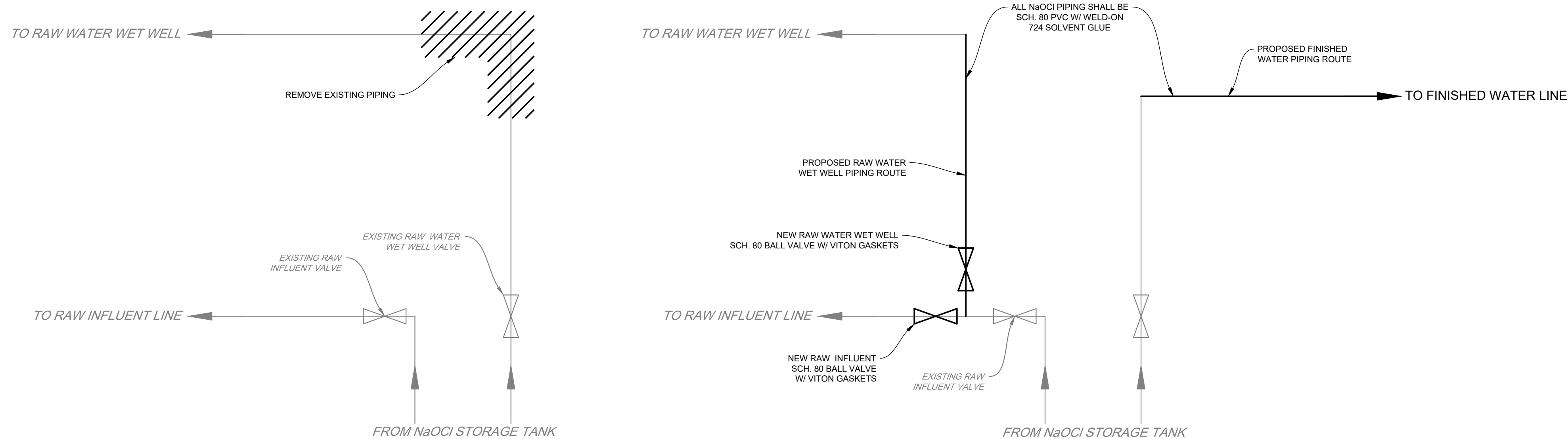
CS1703

SHEET8OF20



AIR STRIPPER FLOOR PLAN

SCALE: 1/4" = 1'

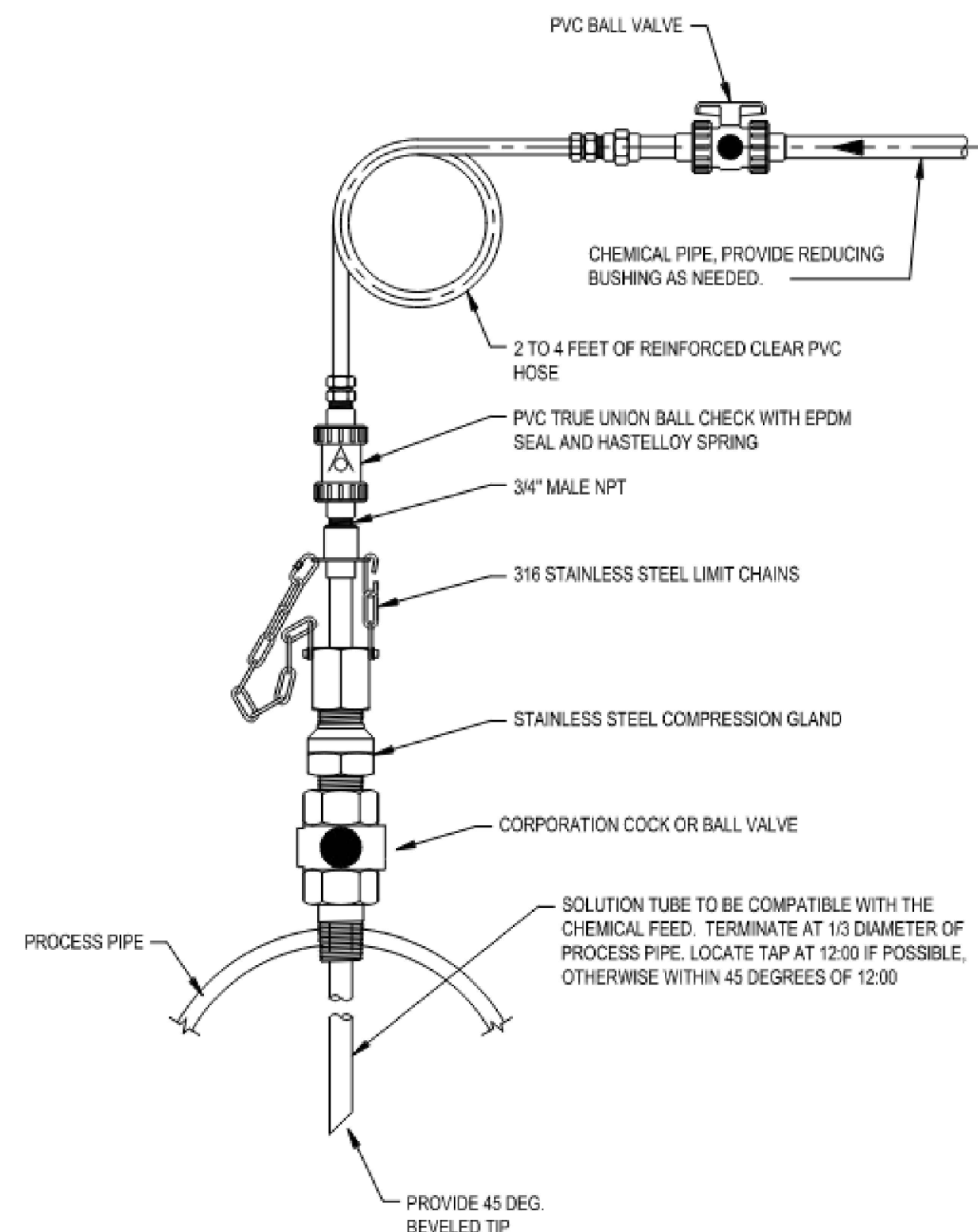


NaOCl PIPING DEMO SCHEMATIC

SCALE: NOT TO SCALE

PROPOSED NaOCl PIPING SCHEMATIC

SCALE: NOT TO SCALE



NaOCl INJECTION POINT

NOT TO SCALE

NOTES:

- AIR STRIPPER FLOOR PLAN DERIVED FROM PLANS TITLED "SOUTH WELL FIELD WATER TREATMENT PLANT UPGRADES", SHEET P-02, BY AECOM, LAST REVISED 1/17/2020.
- CONTRACTOR SHALL PROVIDE A SAF-T-FLO EB-145 SERIES RETRACTABLE CHLORINE INJECTION QUILL, BRASS VALVE, PVC SOLUTION TUBE, AND VITON CHECK VALVE SEAL.

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR
AND OWNER MUST BE NOTIFIED OF ANY
DISCREPANCIES BEFORE PROCEEDING WITH WORK

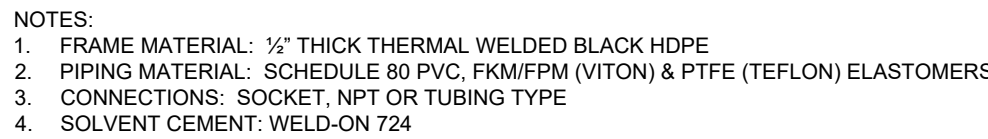


SOUTH WELLFIELD RESIN-GAC SYSTEM AIR STRIPPER BUILDING SODIUM HYPOCHLORITE PIPING PLAN

NO.	DATE	REVISIONS	BY
1	05/19/2023	BID PLAN SUBMISSION	ELA

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EXPOSURE TO PENNONI ASSOCIATES, AND OWNER
SHALL INDEMNIFY AND HOLD HARMLESS PENNONI
ASSOCIATES FROM ALL CLAIMS, DAMAGES, LOSSES AND
EXPENSES ARISING OUT OF OR RESULTING THEREFROM.

PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	AS NOTED
DRAWN BY	ELA
APPROVED BY	MJE



The diagram illustrates the piping system for NaOCl, showing both existing and proposed configurations. It includes two main storage tanks, a pump and skid, and various piping routes with valves.

Existing Components and Routes:

- EXISTING NaOCl PUMP AND SKID:** Represented by a grey rectangle on the left.
- EXISTING DISCHARGE PIPING ROUTE:** A line from the pump skid to the bottom left, labeled "SEPARATE EXISTING DISCHARGE LINE TO BE PUMP SPECIFIC".
- EXISTING SUCTION PIPING ROUTE:** A line from the bottom right to the pump skid, passing through an "EXISTING SUCTION VALVE".
- EXISTING DISCHARGE VALVE:** Two valves on the discharge line, one above the other.
- SPLIT EXISTING SUCTION LINE FROM NaOCl STORAGE TANK:** A line from the bottom right tank to the pump skid, passing through a "NEW SUCTION VALVE".

Proposed Components and Routes:

- PROPOSED DISCHARGE PIPING ROUTE ASSEMBLY:** A new line from the pump skid to the top right, labeled "NEW NaOCl PUMP AND SKID SEE DETAIL THIS SHEET".
- PROPOSED SUCTION PIPING ROUTE ASSEMBLY:** A new line from the top right tank to the pump skid, passing through a "NEW SUCTION VALVE".

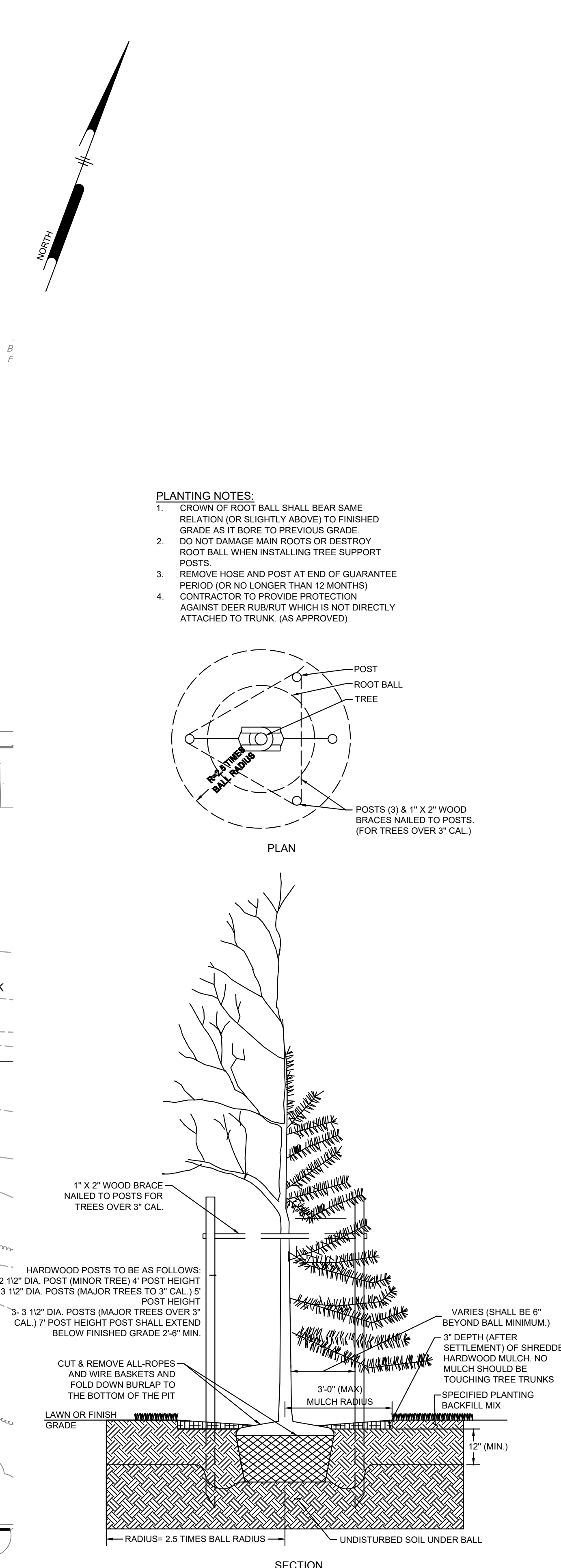
General Notes:

- ALL NaOCl PIPING SHALL BE SCH. 80 PVC W/ WELD-ON 724 SOLVENT GLUE
- ALL NaOCl PIPING SHALL BE SCH. 80 PVC W/ WELD-ON 724 SOLVENT GLUE

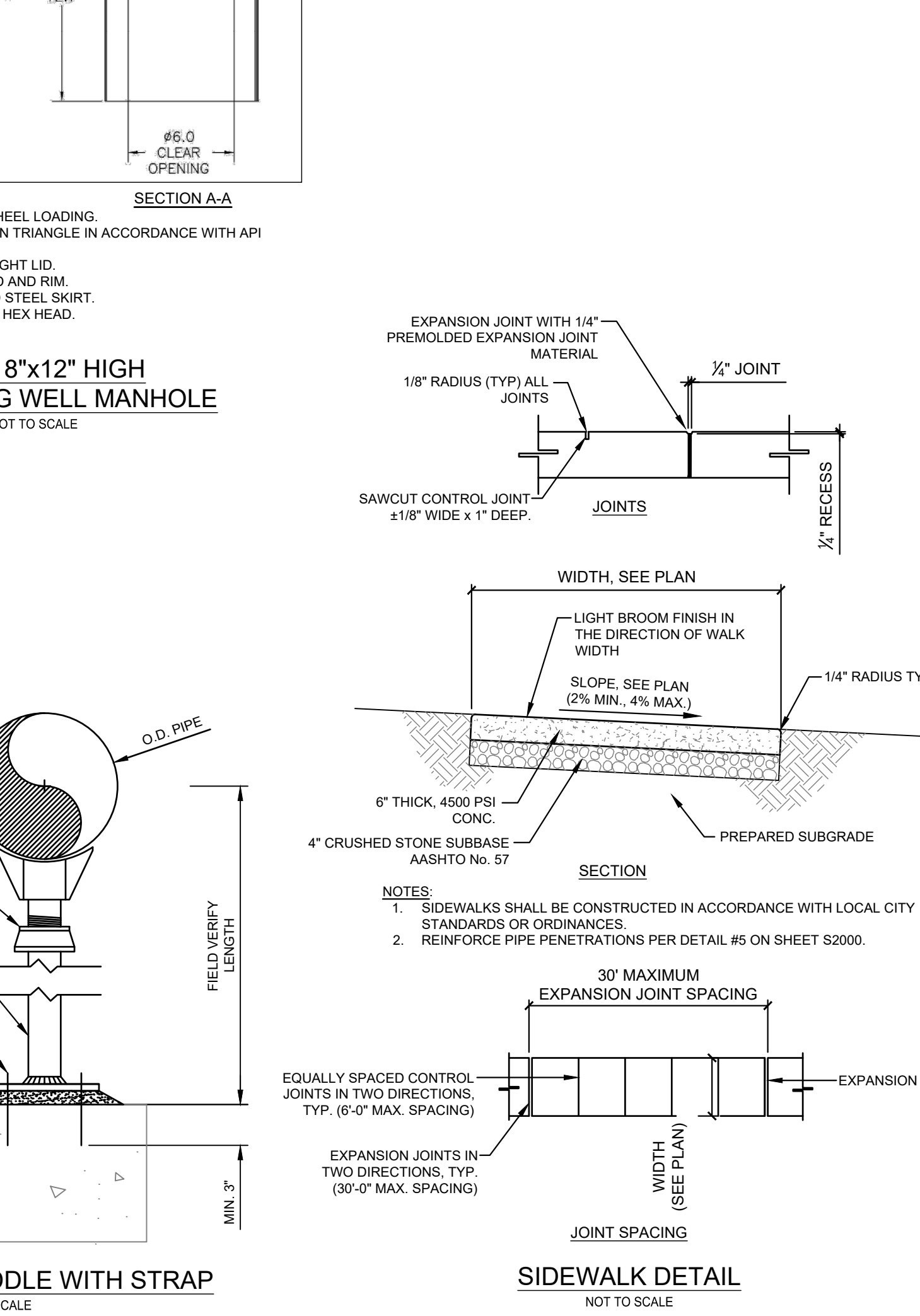
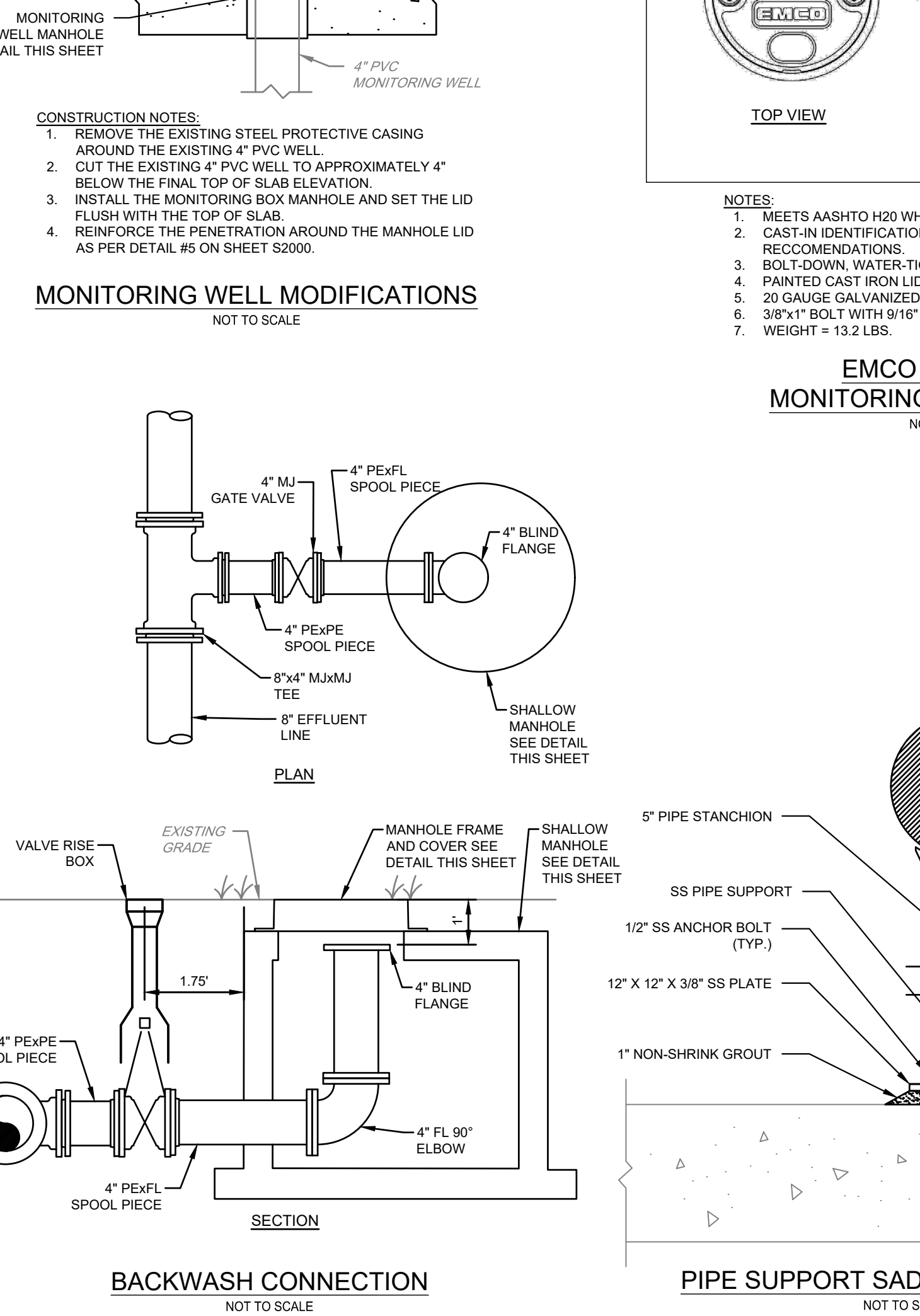
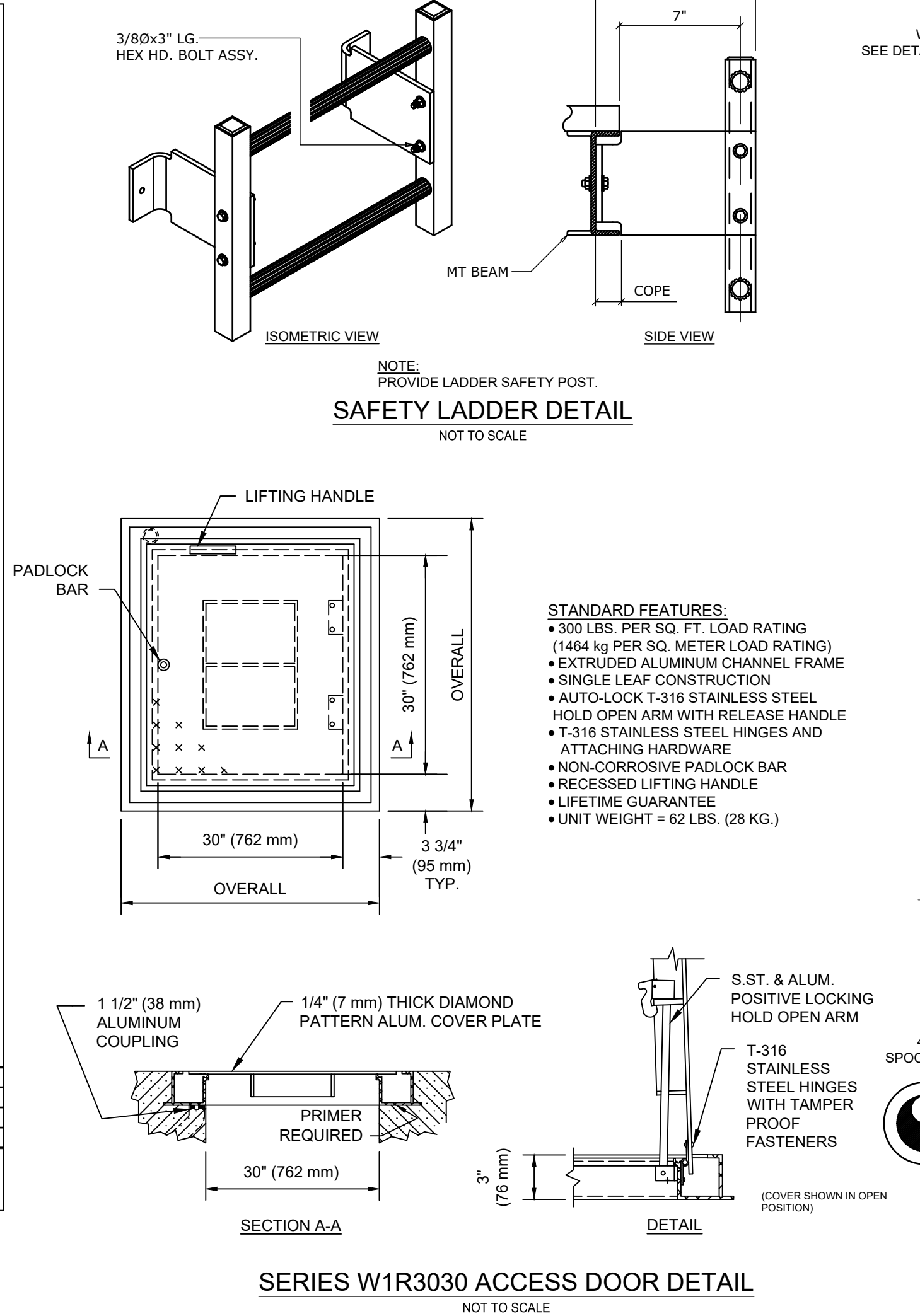
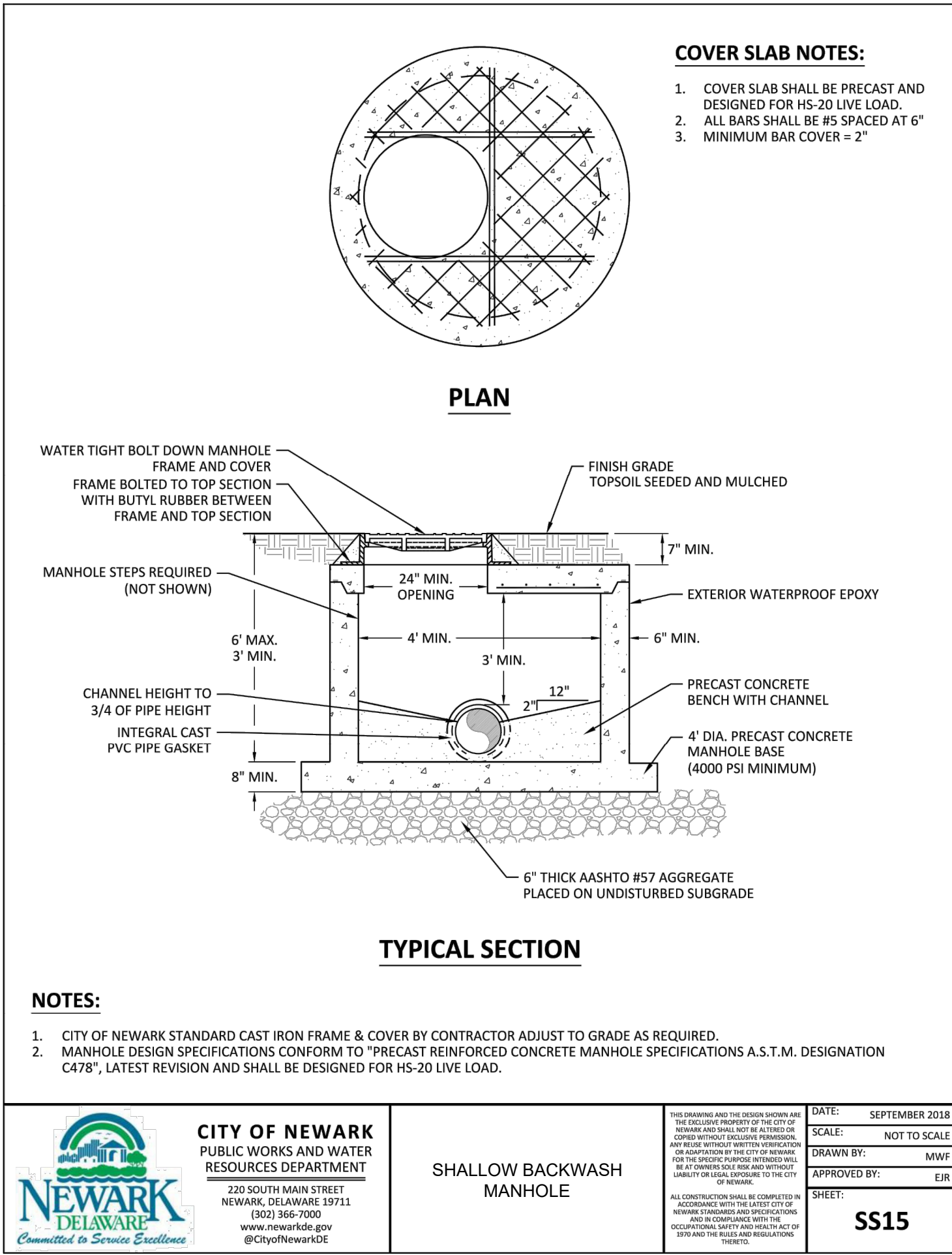
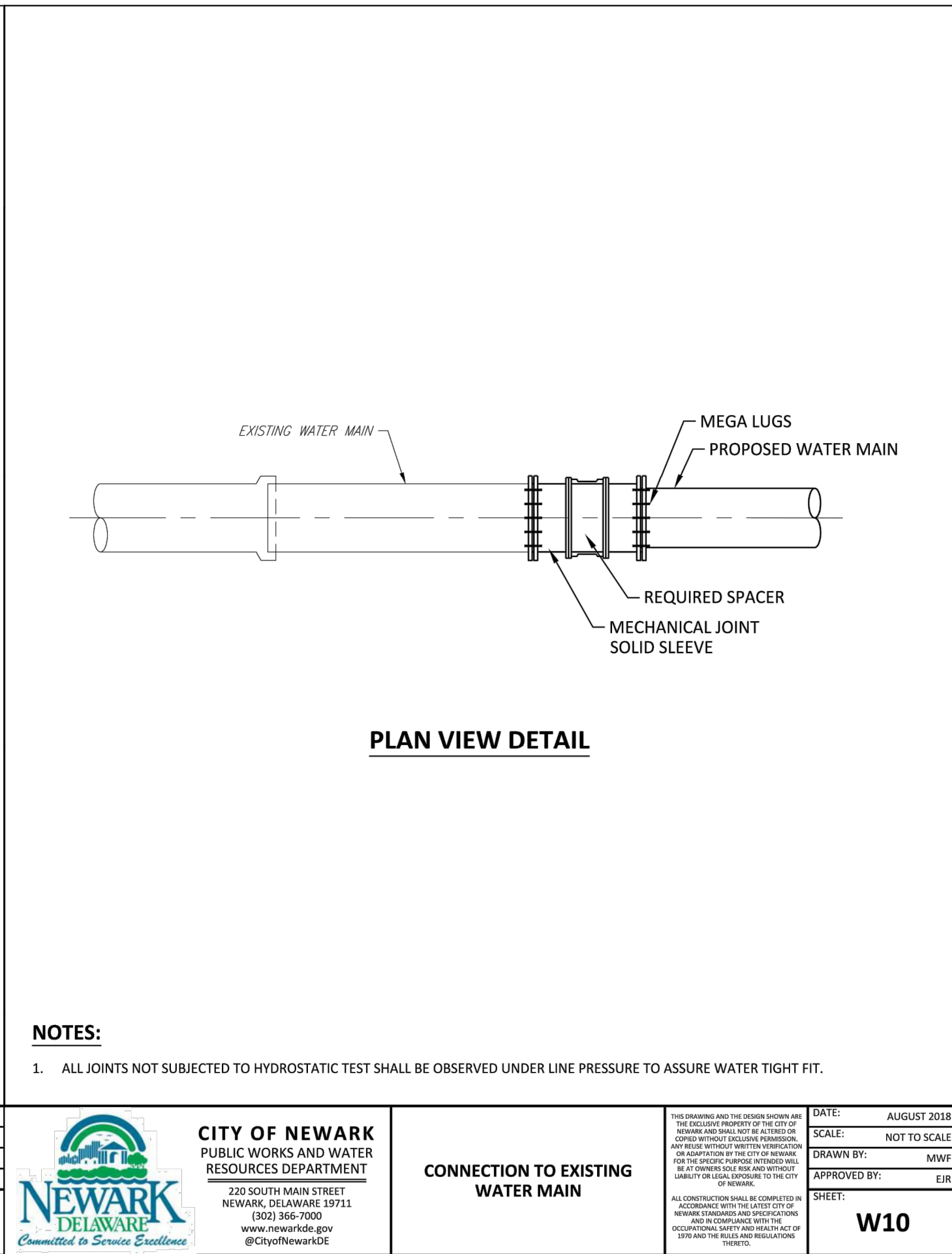
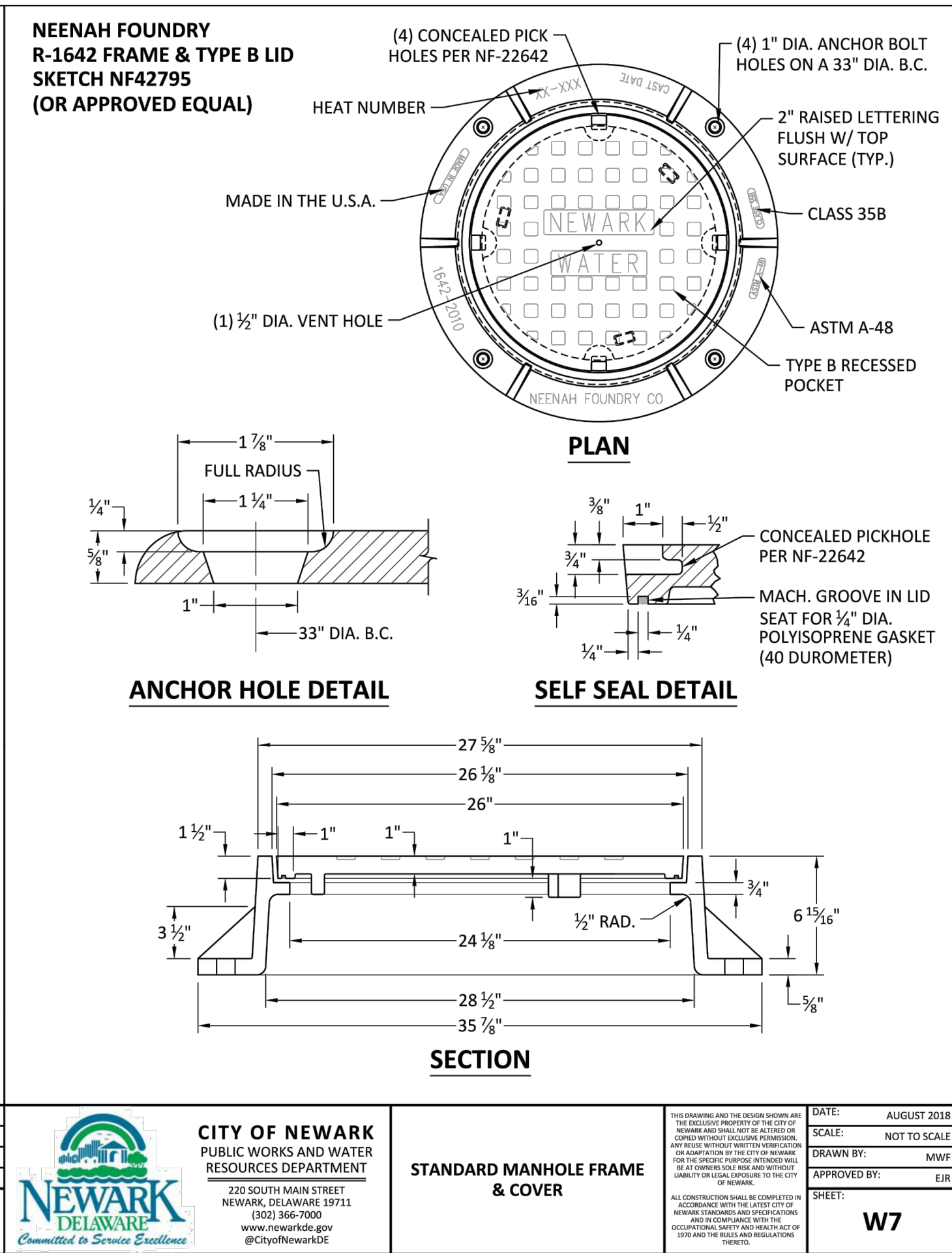
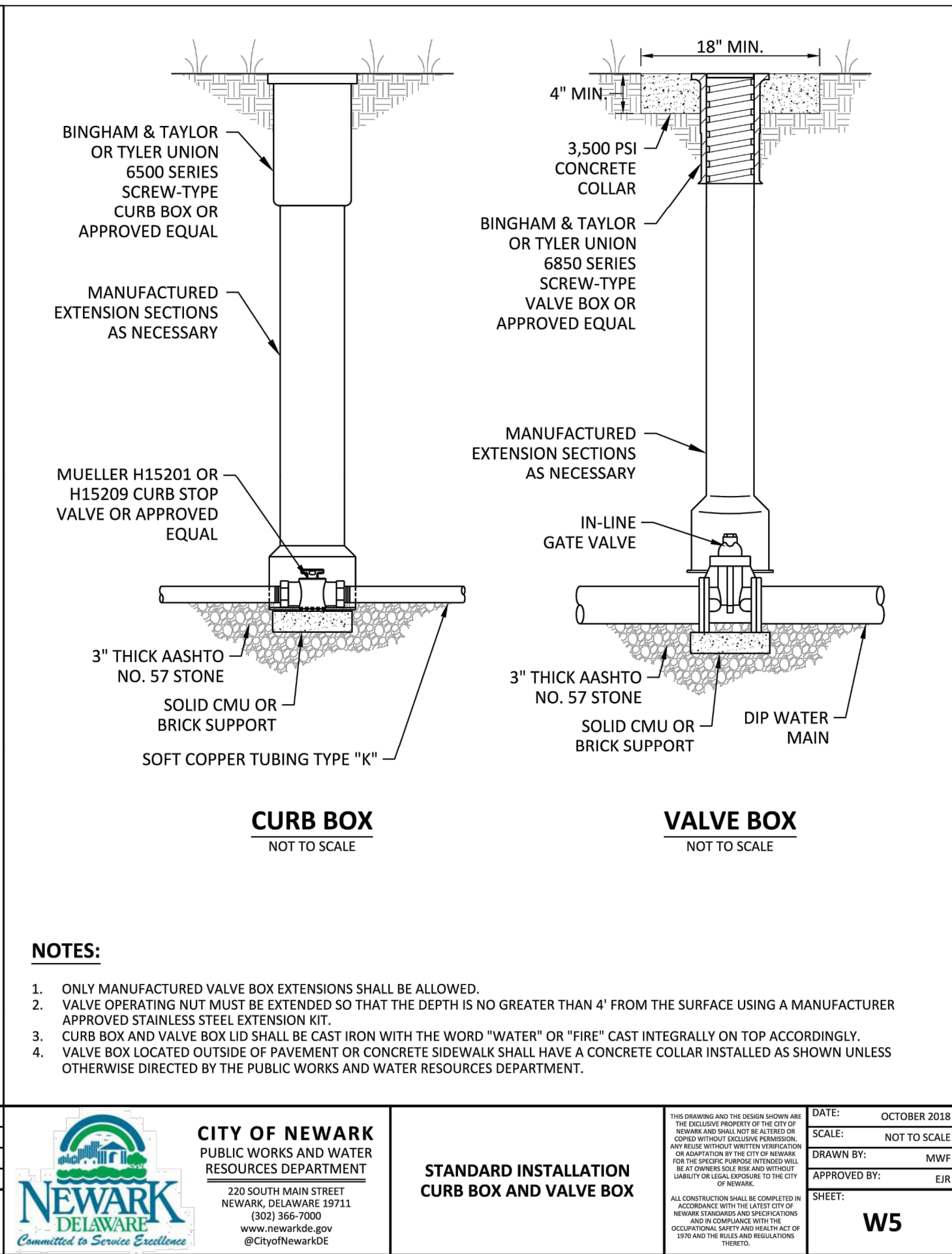
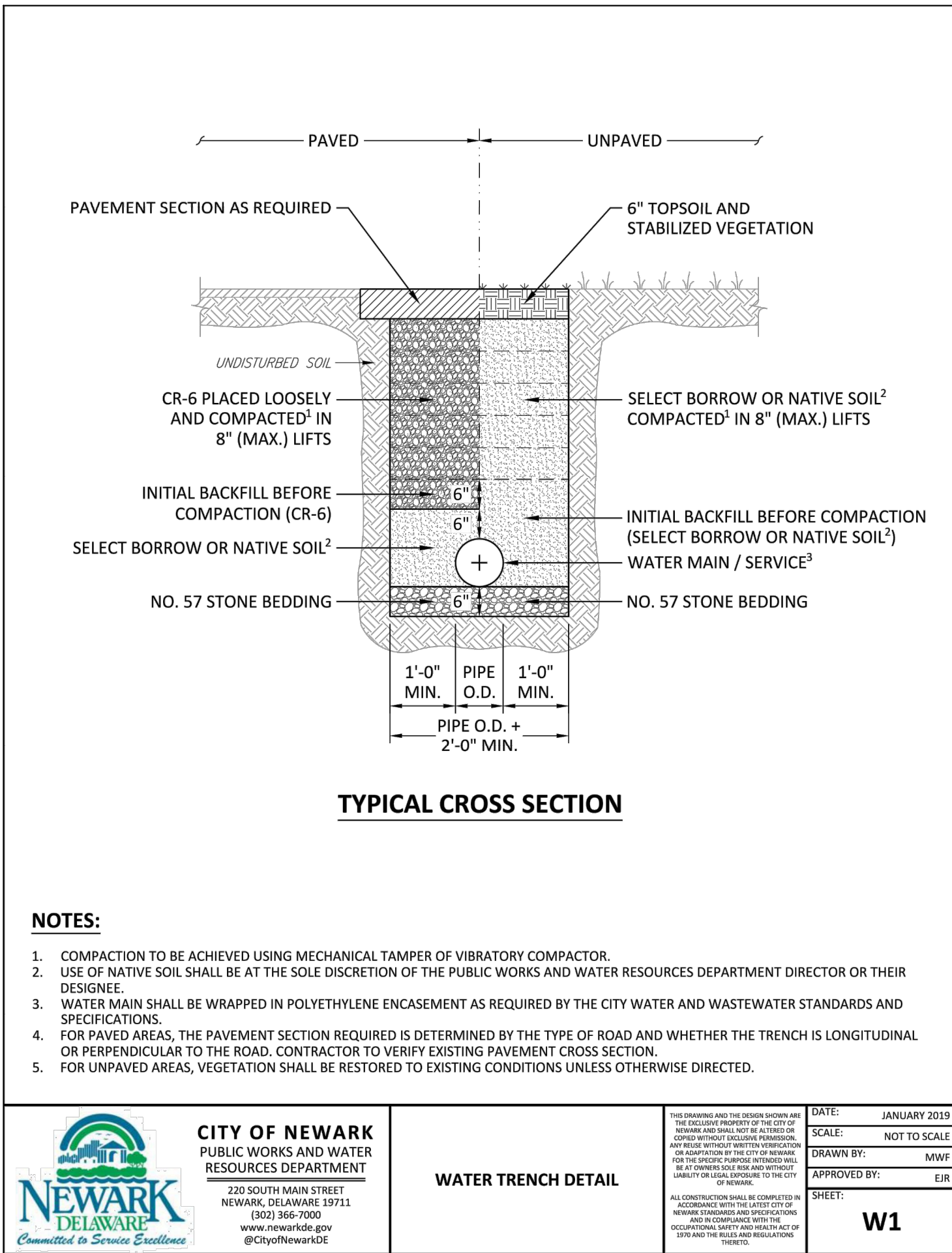
Final Discharge and Suction Points:

- DISCHARGE TO AIR STRIPPER BUILDING:** Indicated by an arrow pointing down from the bottom left.
- SUCTION LINE FROM NaOCl STORAGE TANK:** Indicated by an arrow pointing up from the bottom right.

NOTE:
 FILTER BUILDING PLAN AND SECTIONS DERIVED FROM PLANS
 TITLED "SOUTH WELL FIELD WATER TREATMENT PLANT
 IMPROVEMENTS" BY WR&A, RECORDED ON JANUARY 2004.



PLANT SCHEDULE						
SYMBOL	QUAN.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	TYPE
	16	THUJA PLICATA 'GREEN GIANT'	WESTERN ARBORVITAE	5-6' HT.	B&B	EVERGREEN



Penmon

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SOUTH WELLFIELD RESIN-GAC SYSTEM
912 SOUTH CHAPEL STREET
NEWARK, DE 19713

CONSTRUCTION DETAILS

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR AND OWNER MUST BE NOTIFIED OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK

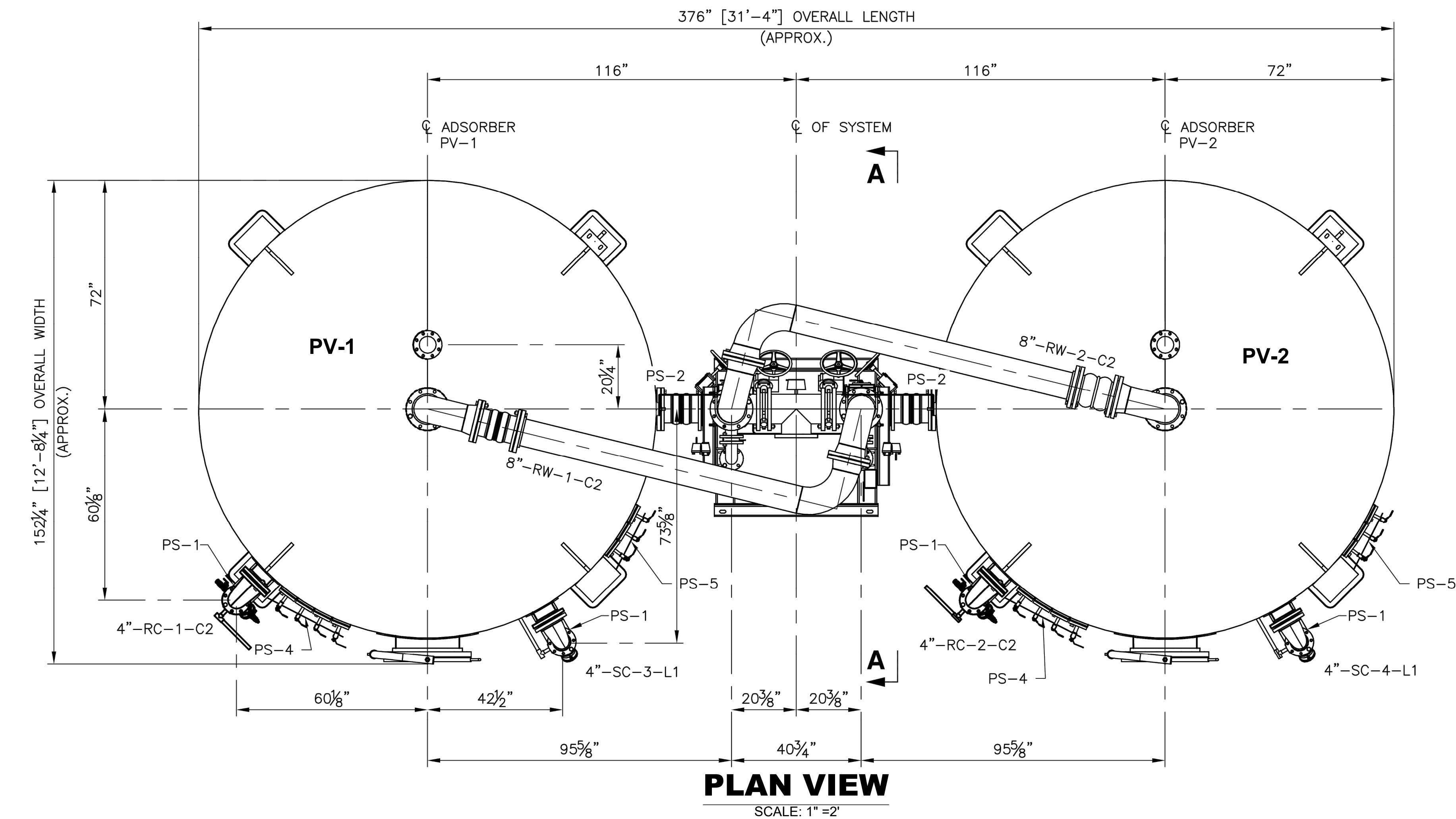
REVISIONS

NO.	DATE	BY	REVISIONS
1	05/16/2023	ELA	BID PLAN SUBMISSION

PROJECT CNEWK22008
DATE 2023-05-05
DRAWING SCALE AS NOTED
DRAWN BY ELA
APPROVED BY MJE

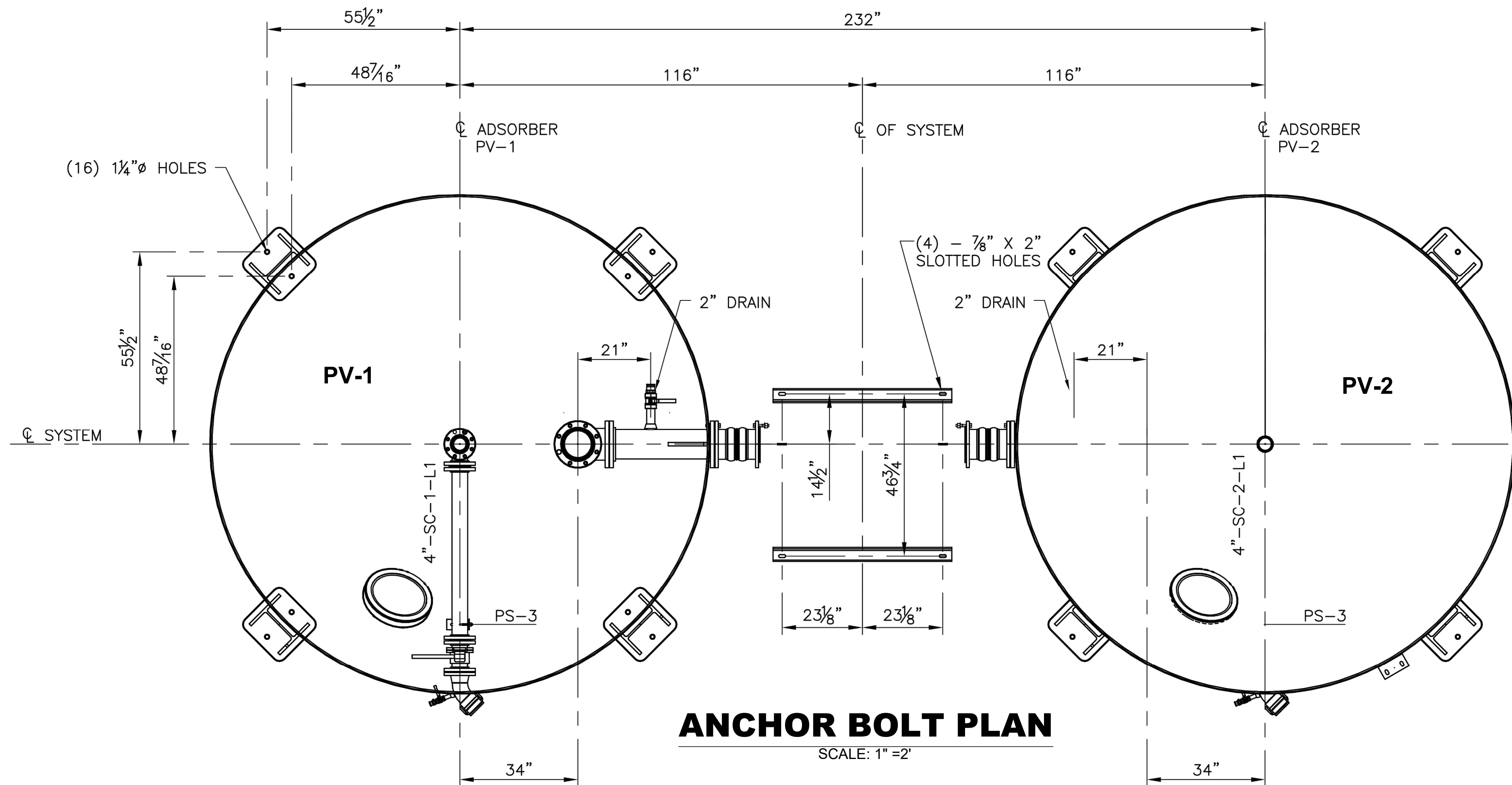
CS6001
SHEET 12 OF 20

U:\Account\CNEWK\CNEWK22002 - South Wellfield PFAS Treatment Study\DESIGN - S&E\CS6002.dwg PLOTTED: 4/17/2023 3:04 PM BY: Elia Addison PLOT STYLE: Pennoni V02.ctb PROJECT STATUS: —



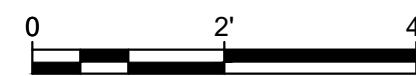
PLAN VIEW

SCALE: 1" = 2'



ANCHOR BOLT PLAN

SCALE: 1" = 2'



NOTE:

TANK DRAWING FROM CALGON PLAN TITLED "MODEL 12-40, 125 PSIG 12FT DIA. INTERNAL CONE VESSEL ARRANGEMENT, PV-1" LAST REVISED 2/21/2023.

SYSTEM DATA	
DESIGN CONDITIONS	125 PSIG @ 140' F
DESIGN CODE	ASME SECTION VIII DIVISION 1
APPROXIMATE WEIGHTS (LB.)	
VESSEL (EMPTY)	31,000
CARBON (PER VESSEL)	40,000
VESSEL (OPERATING)	191,000
SYSTEM (EMPTY)	69,000
SYSTEM (OPERATING)	391,000

PIPE SUPPORT SCHEDULE			
#	DRAWING NO.	DESCRIPTION	QTY.
PS-1	90160401	4" CARBON FILL 4" CARBON DISCHARGE (UPPER)	6
PS-2	90130162	8" INFLUENT	2
PS-3	90130158	4" CARBON DISCHARGE	2
PS-4	90170541	SAMPLE PORT (CARBON)/VENT	2
PS-5	90220796	SAMPLE PORT (RESIN)	2

SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

RESIN-GAC PFAS SYSTEM DETAILS 1

CITY OF NEWARK

220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY
1	05/10/2023	BID PLAN SUBMISSION	ELA

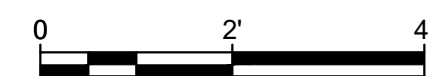
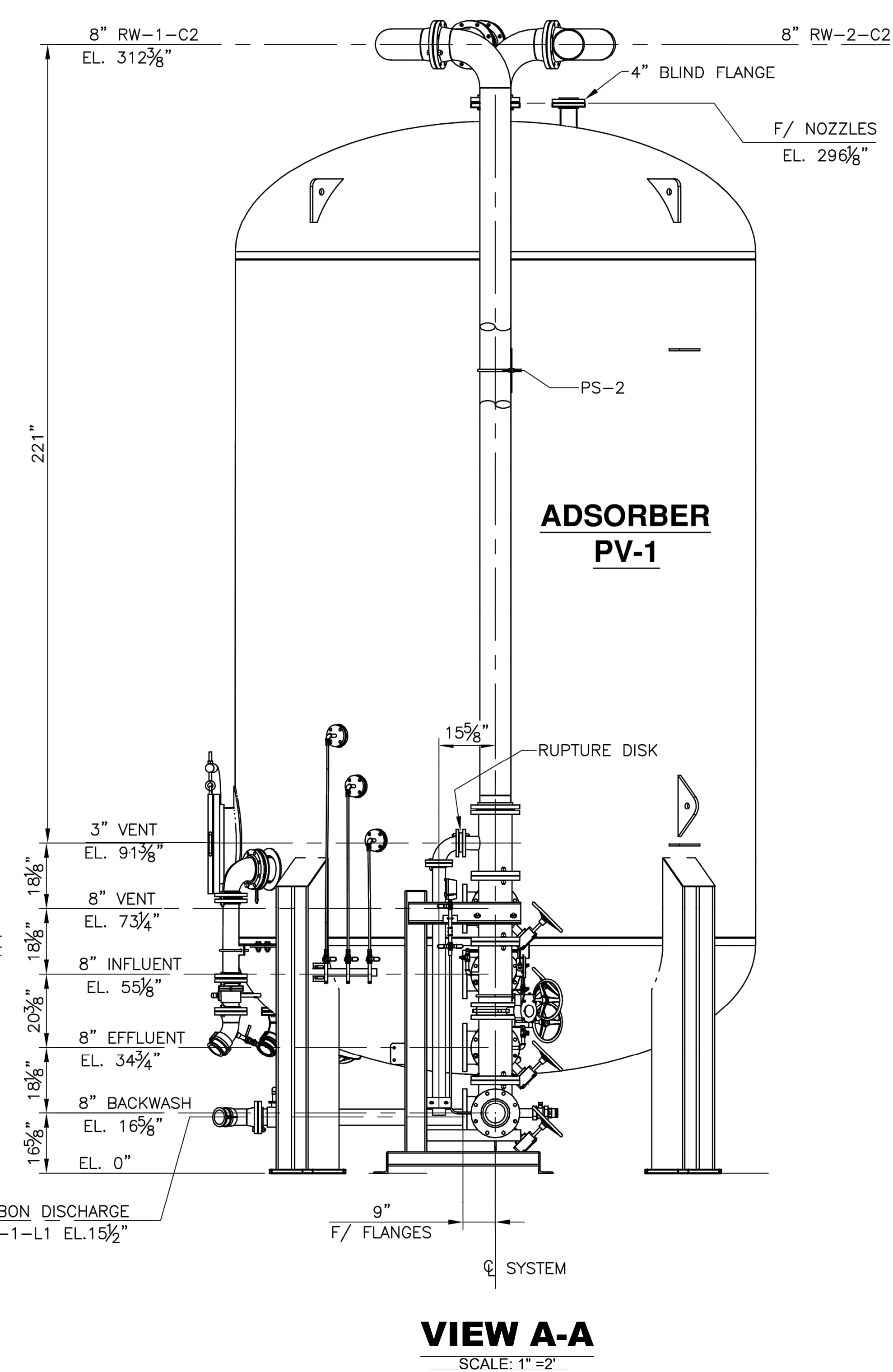
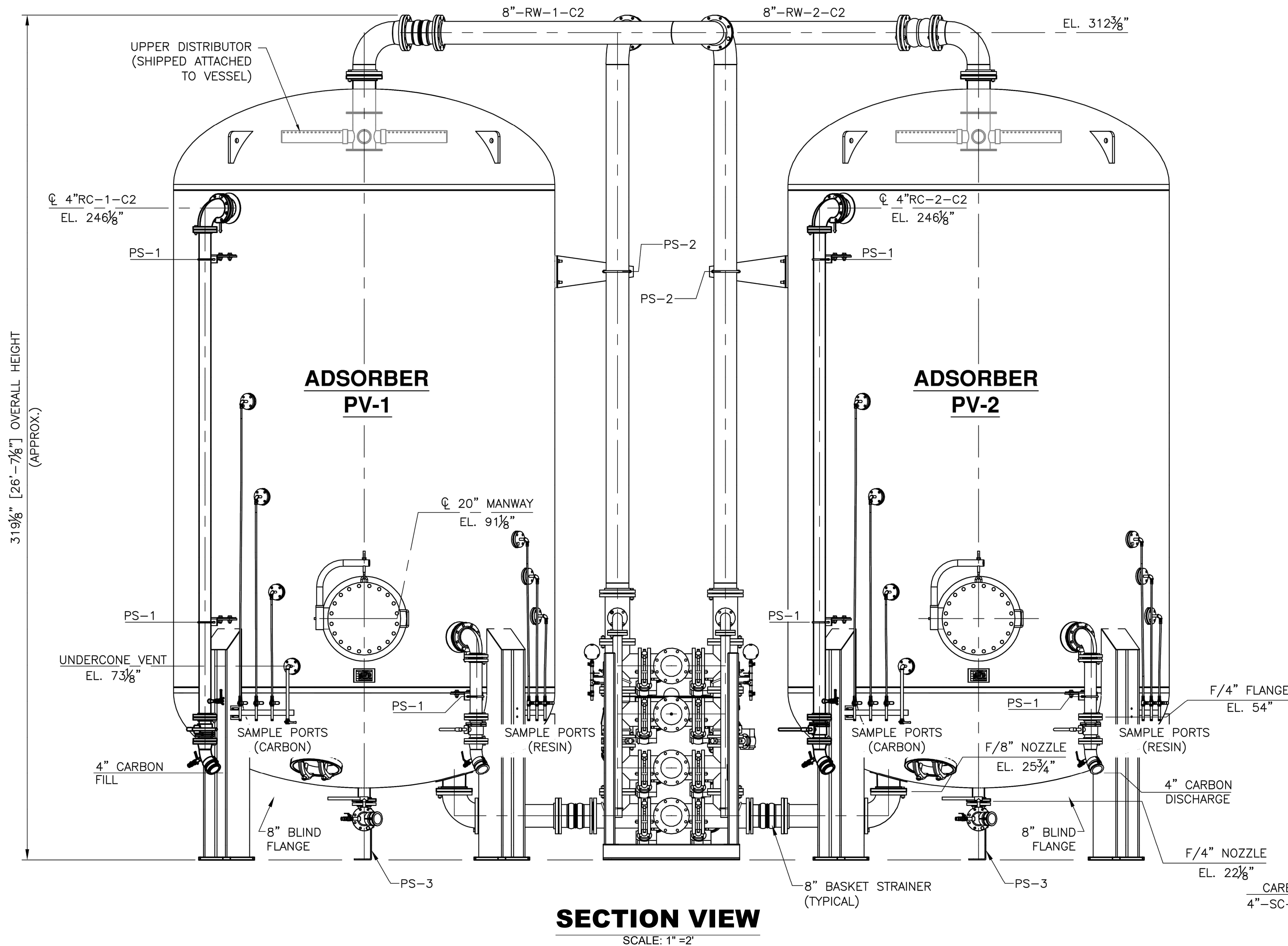
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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	1"=2'
DRAWN BY	ELA
APPROVED BY	MJE



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U:\Accounting\CNEWK\CNEWK22002 - South Wellfield PFAS Treatment Study\DESIGN - S&E\CS6003.dwg PLOTTED: 4/17/2023 3:05 PM BY: Elia Addison PLOT STYLE: Pennoni V03.ctb PROJECT STATUS: —



NOTE:
TANK DRAWING FROM CALGON PLAN TITLED "MODULAR ADSORBER SYSTEM MODEL 12-40 DWC, 8" PIPING GENERAL ARRANGEMENT" LAST REVISED 4/4/2023.

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SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

RESIN-GAC PFAS SYSTEM DETAILS 2

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220 SOUTH MAIN STREET
NEWARK, DE 19711

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PROJECT: CNEWK22008
DATE: 2023-05-05
DRAWING SCALE: 1"=2'
DRAWN BY: ELA
APPROVED BY: MJE

CS6003
SHEET 14 OF 20



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SHEET 15 OF 20

DESIGN CRITERIA

LATERAL LOAD DESIGN		
2018 INTERNATIONAL BUILDING CODE / ASCE 7-16		
WIND		
DESCRIPTION	SYMBOL	VALUE
BASIC WIND SPEED (3 SEC. GUST)	V	124 mph
RISK CATEGORY	--	III
WIND EXPOSURE CATEGORY	--	C
SEISMIC		
DESCRIPTION	SYMBOL	VALUE
IMPORTANCE FACTOR	I _s	1.25
RISK CATEGORY	--	III
MAPPED SPECTRAL RESPONSE SHORT PERIOD ACCELERATION	S _s	0.176g
MAPPED SPECTRAL RESPONSE 1-SECOND ACCELERATION	S ₁	0.046g
LONG-PERIOD TRANSITION PERIOD	T _L	6s
SITE CLASSIFICATION	--	D
DESIGN SPECTRAL RESPONSE SHORT PERIOD ACCELERATION	S _{ms}	0.188g
DESIGN SPECTRAL RESPONSE 1-SECOND ACCELERATION	S _{o1}	0.074g
SEISMIC DESIGN CATEGORY	S _{dc}	B
DESIGN BASE SHEAR (EQUIPMENT)	V	27.5 KIPS
SEISMIC RESPONSE CO-EFFICIENT	C _s	0.030g
RESPONSE MODIFICATION FACTOR	R _p	1.25

SNOW LOAD		
DESCRIPTION	SYMBOL	VALUE
GROUND SNOW LOAD	P _g	25 psf
SNOW EXPOSURE FACTOR	C _e	1.0
SNOW LOAD IMPORTANCE FACTOR	I _s	1.1
THERMAL FACTOR	C _t	1.0
SNOW SLOPE FACTOR	C _s	1.0
ROOF SNOW LOAD (*)	P _f	19.25 psf

(*) ACTUAL P_f USED FOR DESIGN = 25 PSF.

STRUCTURAL ABBREVIATIONS

AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	N.S.	NEAR SIDE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIAL	N.W.	NORMAL WEIGHT
ARCH.	ARCHITECT; ARCHITECTURAL	N.I.C.	NOT IN CONTRACT
B.P.	BASE PLATE; BRG. PLATE	N.T.S.	NOT TO SCALE
BM.	BEAM	O.C.	ON CENTER
B.F.	BOTH FACES	O.F.	OUTSIDE FACE
B.S.	BOTTOM OF FOOTING	OSH	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
B.O.F.	BOTTOM OF	P.J.F.	PREFORMED JOINT FILLER
B/	BOTTOM OF	P.T.	PRESSURE TREATED
CANT.	CANTILEVER	PROJ.	PROJECTION
CLR.	CLEAR	QTY.	QUANTITY
COL.	COLUMN	R	RADIUS, RISER
CONN.	CONNECTION	REF.	REFERENCE
CJ	CONSTRUCTION JOINT	REIN.	REINFORCE(D)
CONT.	CONTINUOUS	REQ'D	REQUIRED
DBA	DEFORMED BAR ANCHOR	REV.	REVISION
DL	DEAD LOAD	SER	STRUCTURAL ENGINEER
DSR	DOUBLE SIDE ROD	OF RECORD	OF RECORD
DWL	DOWEL	S.F.	STEPPED FOOTING
E.F.	EACH FACE	SSL	SHORT SLOTTED
E.W.	EACH WAY	SIM.	SIMILAR
EL.	ELEVATION	S.O.G.	SLAB ON GRADE
EMBT	EMBEDMENT	SST	STAINLESS STEEL
EXIST., EX.	EXISTING	STD.	STANDARD
EXP.	EXPANSION	SJ	STEEL JOIST INSTITUTE
E.J.	EXPANSION JOINT	STIR.	STIRRUP
F.S.	FAR SIDE	SYL.	SYMMETRICAL
FIN.	FINISHED	TBD	TO BE DETERMINED
FL.	FLANGE	THK	THICK
FTG.	FOOTING(S)	T&G	TONGUE AND GROOVE
FON.	FOUNDATION	T&B	TOP AND BOTTOM
GA.	GRADE	T.O.F.	TOP OF FOOTING
G.H.	HAND RAIL	T.O.S.	TOP OF SLAB
H.P.	HIGH POINT	T	TOP OF
I.D.	INSIDE DIAMETER	T	TREAD
I.F.	INSIDE FACE	TYP.	TYPICAL
I.J.	ISOLATION JOINT	U.N.O.	UNLESS NOTED OTHERWISE
KB	KNEE BRACE	V.I.F.	VERIFY IN FIELD
LL	LIVE LOAD	w/	WITH
LLH	LONG LEG HORIZONTAL	w/o	WITHOUT
LSL	LONG LEG VERTICAL	W.V.R.	WELDED WIRE REINFORCING
LVL	LONG SLOTTED	WF	WIDE FLANGE
LWP	LOW POINT	W.P.	WORKPOINT
L.W.	LIGHTWEIGHT	WNW	WALL TO WALL
MC	MOMENT CONNECTION		

EQUIPMENT LOADS (APPROXIMATE WEIGHTS)	
DESCRIPTION	UNFACTORED LOADS
VESSEL (EMPTY)	31 KIPS
CARBON (PER VESSEL)	40 KIPS
VESSEL (OPERATING)	191 KIPS
SYSTEM (EMPTY)	69 KIPS
SYSTEM (OPERATING)	391 KIPS

* EQUIPMENT LOADS PROVIDED BY CALGON CARBON CORPORATION.

EQUIPMENT COLUMN LOAD	
VERTICAL REACTIONS (EACH)	
DESCRIPTION	UNFACTORED LOADS
DEAD (MIN.)	18 KIPS
DEAD (MAX.)	54 KIPS
SNOW	± 2 KIPS
WIND (MIN.)	± 2.9 KIPS
WIND (MAX.)	±5.0 KIPS
LATERAL REACTIONS (EACH)	
DESCRIPTION	UNFACTORED LOADS
WIND	±1.3 KIPS
SEISMIC	±3.5 KIPS

GENERAL

- The structure is designed, and all work shall conform, to the "2018 International Building Code" and to all other applicable Federal, State, and Local regulations.
- All codes and standards referenced in these notes, including all specifications referenced within, and all federal, state and local regulations apply to the design, construction, demolition, quality control and safety of all work performed on the project. Use the latest adopted editions of the codes and standards.
- In case of conflict between the General Notes, Specifications, and drawings, the most rigid requirements must be followed.
- Minor details or incidental items not shown or specified, but necessary for a proper and complete installation, shall be included in the work.
- All costs of investigations, redesigns and re-installation due to improper installation of structural elements and other items not in conformance with the Contract Documents shall be at the Contractor's expense.
- The structural drawings shall be used in conjunction with the specifications, civil, and MEP drawings. If there is a discrepancy between drawings notify the Engineer prior to performing the work.
- Store and protect all construction materials from exposure to the elements.
- Acceptance of deviations from any of the requirements of these notes, the drawings, and specifications is at the sole discretion of the Engineer. Acceptance of a deviation from any requirement shall not be construed as permitting any other deviation.
- Construction materials shall be provided free from defect and installed plumb and true to the limits set forth on the Construction Documents by experienced tradesmen.
- Special Inspection is required of all work indicated on the Structural Drawings and/or specifications. Submit periodic reports to Engineer and the Construction Code Official within one business day after receipt. Submit a final Inspection report summary for each division of work, signed and sealed by a licensed professional Engineer in the state of jurisdiction, indicating that inspections were performed and that work was completed in accordance with the Contract Documents. The Owner will engage a qualified testing and inspection firm to perform the Special Inspections.
- Prior to construction, verify that the weight of superimposed loads from MEP equipment does not exceed the allowable MEP loads designated on the Contract Documents. The Notify the structural engineer if the weight of MEP equipment exceeds that shown on the Contract Documents and provide the required reinforcing at no cost to the owner
- Verify all existing information shown (dimensions, elevations, etc.) and notify the Engineer of any discrepancies prior to fabrication of any structural component.
- Verify and/or establish all existing conditions and dimensions at the site. Failure to notify the Engineer of unsatisfactory conditions constitutes acceptance of existing conditions.
- If the existing field conditions do not permit the installation of the work in accordance with the Contract Documents, notify the Engineer immediately and provide a sketch of the condition with a proposed modification of the details given on the Contract Documents. Do not commence work until the condition is resolved and the modification is approved by the Engineer.
- Determine the allowable construction loads and provide design and construction of falsework, formwork, staging, bracing, sheeting, and shoring, etc., to protect the existing structure. This work shall be designed by a Professional Engineer licensed in the project jurisdiction and engaged by the Contractor.
- Provide sheeting, bracing, and underpinning to prevent any lateral or vertical movements of existing buildings, streets, site structures, adjacent grade and any existing utilities. Prepare detailed signed and sealed shop drawings indicating all work to be performed. Submit shop drawings in accordance with the Contract requirements.
- In no case shall heavy equipment be permitted closer than 8'-0" from any foundation wall. If it is necessary to operate such equipment closer than 8'-0" to the wall, the Contractor shall be the sole responsible party and shall provide adequate supports or brace the wall to withstand the additional loads superimposed from such equipment.

GENERAL NOTES

GENERAL (CONTINUED)

- Methods, procedures and the sequences (other than that noted on the Construction Documents) of construction are the responsibility of the Contractor(s). Take all necessary precautions to maintain and insure the integrity of the structure at all stages of construction.
- Job site safety and construction procedures are the sole responsibility of the Contractor. Guidelines for construction safety shall be in accordance with, but not limited to OSHA Safety and Health Regulations for Construction and all local ordinances or codes that may be applicable.
- All Contractors and Subcontractors on this project are responsible for the proper performance of their work, selection of means and methods, coordination with other trades, safety, and security on the job site.
- All construction work shall be coordinated with the Owner to minimize interference with existing facility operations.
- All Subcontractors shall be provided and must work with a full set of contract documents.
- Submit for review, drawings and calculations for all assemblies identified to be designed by an Engineer engaged by the Contractor. The design of these assemblies is the responsibility of the Contractor's Engineer registered in the Project's jurisdiction. All submittals shall bear this Engineer's seal and signature. Review shall be for general conformance with the project requirements as indicated on the Construction Documents.
- SHOP DRAWINGS

A. Shop drawings for all structural materials shall be submitted to the Engineer for review prior to the start of fabrication and commencement of work. The review period shall be a minimum of two (2) weeks.

B. Reproduction of any portion of the Structural Contract Drawings for resubmittal as shop drawings is prohibited. Shop drawings produced in such a manner will be rejected and returned.

C. Shop drawings submitted in hard copy shall consist of (1) printed and (1) reproducible. Only one marked up reproducible will be returned. If shop drawings are submitted electronically, then only electronic copies of reviewed submittals will be returned. No paper copies will be returned.

D. Shop drawings shall bear the Contractor's stamp of approval which shall constitute certification that the Contractor has verified all construction criteria, materials, and similar data and has checked each drawing for completeness, coordination, and compliance with the Contract Documents.

E. The shop drawings shall include dimensioned floor and roof edges, openings and sleeves at all roofs, floors, and walls required for all trades.

F. All revisions to shop drawings after the first submission must be so identified on subsequent submissions with revision tags and clouds.

G. Review of shop drawings shall not relieve the Contractor of any contract requirement, even if such items are not shown on the shop drawings.

FOUNDATIONS

- Foundations have been designed for an allowable bearing capacity and footing elevations established in accordance with the Subsurface Investigation Report and recommendations prepared by Pennoni, dated April 21, 2023. The requirements contained in the geotechnical report are part of the Construction Documents. The Owner shall engage a licensed qualified Geotechnical Engineer to verify the soil information and bearing capacity during construction.
- Footings shall bear on undisturbed natural soils and/or engineered fill with a minimum bearing capacity of 3000 psf.
- Investigate existing foundation locations and elevations along adjacent structures, via test pits or other methods, prior to the commencement of work.
- Maintain a maximum 1:1 slope from the bottom edge of any excavation to adjacent excavations or bottom of foundations.
- The bottom of all excavations and compacted earthwork will be inspected and approved by a registered Geotechnical Engineer retained by the Owner prior to placing concrete and/or backfilling. Approval by the Geotechnical Engineer, in writing, shall indicate that the soil is adequate to safely support the specified design foundation pressures and that the soils meet the requirements noted on the Construction Documents. Unknown field conditions may require excavation below the anticipated bottoms of footings along with placement of compacted backfill or controlled low-strength material (CLSM). Over-excavations may be filled with lean concrete (1,000 psi).
- The bottom of exterior footings shall be a minimum of 2'-8" below exterior finished grade to provide frost protection, or as required by local Building Codes and building officials. Coordinate all proposed bottom of footing elevations indicated on the structural documents with the proposed finished grade elevations on the Civil and/or Architectural drawings to comply with the minimum depth.
- Place concrete for foundations on the same day the subgrade is approved by the Geotechnical Engineer. Protect subgrade from frost.
- Observe water conditions at the site and take the necessary precautions to ensure that the foundation excavations remain dry during construction. Install sheeting, shoring, and/or dewatering to protect foundation excavations.
- Compact soil to not less than the following percentages of maximum dry density of modified proctor (ASTM D1557) unless noted otherwise:

Under building foundations - 95%

Under building slabs, steps, pavements - 93%
- Protect walls, piers, anchor bolts, etc., from damage during backfilling and other construction activities.
- Do not backfill against vault walls until the walls have attained design strength or until they are adequately braced. Provide temporary shoring where required.
- Do not undermine foundations during excavating for utilities, etc.
- Utility lines shall not be placed through or below foundations without the Structural Engineer's approval.
- Slabs on grade shall bear on mechanically compacted material capable of supporting 150 psf. Drainage fill under slabs shall be compacted gravel or crushed stone.
- Provide continuous water stops at all horizontal and vertical construction joints in vault pit walls.

CAST-IN-PLACE CONCRETE

- Concrete work shall comply with the requirements of the latest adopted editions of ACI "Building Code Requirements for Structural Concrete and Commentary (ACI 318)", ACI "Specifications for Structural Concrete (ACI 301)", and ACI "Measuring, Mixing, Transporting, and Placing Concrete (ACI 304)".
- Reinforcing steel shall be detailed, fabricated and installed in accordance with the latest editions of CRSI "Manual of Standard Practice", CRSI "Placing Reinforcing Bars" and ACI "Detailing Manual (SP-66)".
- Concrete shall have a minimum 28-day compressive strength as follows:

Type

f_c (psi)

Foundation Slab, Vault, Sidewalk

4,500
- Concrete exposed to freeze/thaw conditions and/or weather (including exterior footings) shall have 4% to 6% air-entrainment in accordance with ACI.
- Maximum water/cement ratios:

Foundations

0.45
- All concrete, unless noted otherwise, shall be normal weight concrete (145 pcf +/-) with cement conforming to ASTM C150, Type I. Maximum aggregate size shall be 1-1/2" for footings and 3/4" for all other members, conforming to ASTM C33.
- Prepare concrete test cylinders from each day's pour. Cylinders shall be properly cured and stored. Sample fresh concrete in accordance with ASTM C172.
- Retain a laboratory to provide testing of concrete; slump per ASTM C143, air content per ASTM C231 or C173, cylinder tests per ASTM C31 and C39. One set of (4) 6x12 cylinders for each 50 cubic yards for each mix used. (5) cylinders are required if using 4x8 for testing, reference ACI. Reports of all tests to be submitted to the Engineer.
- Submit mix designs for each class of concrete for review and approval prior to placing any concrete. Compressive strength must be substantiated by a suitable experience record or by the method of laboratory trial batches. The pertinent ACI criteria shall apply to the proportioning of mix designs and to the acceptance of concrete produced for the job. If during construction, any class of concrete fails to meet the acceptance criteria, take such steps as are deemed necessary by the SER to improve subsequent test results at no additional cost to the Owner. The contractor shall also bear the cost of special investigation, testing or remedial work necessary because of evidence of low strength or non-conforming concrete or workmanship.
- Submit reinforcing steel shop drawings and mix designs to Engineer for review and approval prior to placing any concrete.
- The addition of water at the jobsite is prohibited, unless approved in writing by the SER. Coordinate the requirements of the concrete supplier and pump to ensure pumpable and workable mixes) without the addition of water at the jobsite. The use of plasticizers, retarders and other admixtures shall be at the option of the contractor and subject to the approval of the SER. Follow the recommendations of the manufacturer for proper use of retarders and other admixtures. Use of calcium chloride or other chloride bearing admixtures is not permitted.
- Reinforcing steel shall be manufactured from high-strength billet steel, deformed type, conforming to ASTM A615, Grade 60.
- No welding of reinforcing shall be permitted, unless specifically called for or approved by the SER. Where reinforcing bars are to be welded, they shall conform to ASTM A706 and AWS D1.4 (latest edition)
- Reinforcing steel clear cover shall be as follows unless noted otherwise:

Reinforcing steel in concrete cast against soil	3"
Reinforcing steel in formed concrete exposed to soil or weather	1 1/2"
#5 bars and smaller	2"
#6 bars and larger	

Refer to ACI 318 (latest edition) for conditions not noted.
- Reinforcing steel shall be accurately placed with clear cover in accordance with ACI 318, and adequately supported before the concrete is placed. Reinforcing steel shall be secured against displacement within permitted tolerances. Provide plastic tipped bolsters and chairs at exposed slabs and beams.
- Provide all high chairs, spacers, supports, etc., necessary for proper placement of reinforcing steel.
- Bottom steel, for concrete cast on grade, shall be supported on precast concrete block (minimum size 3"x3"x3") spaced at 4'-0" o.c. each way maximum. Top bars shall be supported from doweled concrete blocks or chairs equipped with sand plates. One way top steel shall be tied with #3 transverse bars at 4'-0" o.c. maximum. Use of split bricks is not permitted for support of reinforcement.
- All reinforcing steel shall be securely wired together in the forms. Two way mats of steel shall be tied at alternate intersections both ways.
- Splices in reinforcing steel shall be made only where shown on the structural drawings and where splices have been detailed on the reinforcing placement drawings that have been reviewed by the structural engineer. All splices shall be class "B" tension contact lap splices (see tables), except where indicated otherwise on the structural drawings. Mechanical splice couplers capable of developing 125% of the tensile strength of the reinforcing steel may be used instead of tension lap splices at the contractor's option. Compression lap splices per ACI 318 may be used only where such splices are specifically indicated. Stagger splices where required to provide 1 1/2" clear spacing between reinforcing steel at splice locations. Reinforcement shall be continuous around corners.
- Continuous top and bottom bars in walls, beams and grade beams shall be spliced as follows:

a. Top bars - at midspan

b. Bottom bars - over supports

c. Provide 2-#4 top support bars for length of stirrup spacing where top bars are not otherwise provided.

CAST-IN-PLACE CONCRETE (CONTINUED)

Reinf. Steel, Fy		Bar Location	Concrete Strength							
			3 ksi	4 ksi	5 ksi	6 ksi	7ksi	8 ksi	9 ksi	
#3	Top	2'-4"	2'-0"	1'-9"	1'-8"	1'-6"	1'-5"	1'-4"		
		1'-9"	1'-6"	1'-5"	1'-4"	1'-4"	1'-4"	1'-4"		
		3'-1"	2'-8"	2'-5"	2'-2"	2'-0"	1'-11"	1'-9"		
#4	Other	2'-4"	2'-1"	1'-10"	1'-8"	1'-7"	1'-5"	1'-4"		
		Top	3'-10"	3'-4"	3'-0"	2'-9"	2'-6"	2'-4"	2'-3"	
#5	Other	3'-0"	2'-7"	2'-4"	2'-1"	1'-11"	1'-10"	1'-8"		
		Top	4'-8"	4'-2"	3'-7"	3'-3"	3'-0"	2'-10"	2'-8"	
#6	Other	3'-7"	3'-1"	2'-9"	2'-6"	2'-4"	2'-2"	2'-1"		
		Top	6'-9"	5'-10"	5'-3"	4'-9"	4'-5"	4'-2"	3'-11"	
#7	Other	5'-2"	4'-6"	4'-0"	3'-8"	3'-5"	3'-2"	3'-0"		
		Top	7'-9"	6'-8"	6'-0"	5'-5"	5'-1"	4'-9"	4'-5"	
#8	Other	5'-11"	5'-2"	4'-7"	4'-2"	3'-11"	3'-8"	3'-5"		
		Top	8'-8"	7'-6"	6'-9"	6'-2"	5'-8"	5'-4"	5'-0"	
#9	Other	6'-8"	5'-10"	5'-2"	4'-9"	4'-5"	4'-1"	3'-10"		
		Top	7'-6"	6'-6"	5'-10"	5'-4"	4'-11"	4'-7"	4'-4"	
#10	Other	10'-11"	9'-5"	8'-5"	7'-8"	7'-2"	6'-8"	6'-3"		
		Top	9'-4"	7'-3"	6'-8"	5'-11"	5'-6"	5'-1"	4'-10"	
#11	Other	13'-8"	11'-3"	10'-8"	9'-7"	9'-0"	8'-4"	7'-10"		
		Top	10'-5"	9'-1"	8'-2"	7'-5"	6'-11"	6'-4"	6'-1"	

Table 1 Notes:

- A. "Top bars" are horizontal bars located where more than 12" of fresh concrete is cast in the member below the bars.
- B. Splice lengths shown in Table apply to splices with the following parameters:
- Normal weight concrete
 - Minimum bar spacing requirements are satisfied
 - Clear spacing between bars and clear concrete cover ≥ (1) bar diameter within length and stirrups or ties ≥ code minimum within the length of the splice
- OR
- Clear spacing between bars ≥ 2x bar diameter and clear cover ≥ (1) bar diameter within length of splice
- C. Indicated splice lengths shall be multiplied by the following factors where applicable:

Condition		Splice Length Multiplier
a	Lightweight concrete	1.5
b	Bar Spacing or clear cover less than required per note A	1.3
c	Epoxy coated reinforcing with cover <3x bar diameter or clear spacing <6x bar diameter	1.5**
d	All other epoxy coated bars	1.2

Table 2 Notes:

- * Where multiple conditions occur, apply each of the applicable factors to the basic tension lap splice lengths to obtain the required splice length.
- ** For condition c, epoxy coated top bars, use splice multiplier = 1.3.

- Prior to placing concrete, submit for review by the structural engineer, a concrete placement schedule/sequence showing locations of all proposed construction and control joints and water stops.
- Placing of concrete shall not start until the placement of reinforcing has been approved by the Owner's Inspection Agency.
- All concrete shall be formed, unless otherwise approved by the SER. All pours shall be terminated by forms. Provide keys between adjacent pours.
- All concrete, including foundation work, shall be vibrated. Proper use of vibrators is required. Vibrators shall not be used to transport concrete.
- Chamfer all exposed concrete corners/edges unless noted otherwise on Drawings.
- All embedments, including anchor rods, shall be in place prior to placing concrete.
- Concrete shall not be pumped through aluminum pipes and shall not be placed in contact with aluminum forms, mixing drums, buggies, chutes, conveyors or other equipment made of aluminum.
- All Inserts and sleeves shall be cast-in-place whenever feasible. Drilled or powder driven fasteners will be permitted when proven to the satisfaction of the SER that the fasteners will not spill the concrete and have the same capacity as cast-in-place inserts.
- No sleeve shall be placed through any concrete element unless shown on the approved shop drawings or specifically authorized in writing by the SER. Verify dimensions and locations of all slots, pipe sleeves, shafts, etc. as required for MEP trades before concrete is placed.
- Pipes or conduits placed in slabs on grade shall not have an outside diameter larger than 1/3 the slab thickness and shall not be spaced closer than 3 diameters on center. Aluminum conduits shall not be placed in concrete. No conduits shall be placed in slabs within 12 inches of column face or face of bearing wall. No conduits may be placed in exterior slabs or slabs subjected to fluids. Top of slab shall be broomed finished typical, and smooth when supporting enclosure walls.
- Concrete slabs shall be finished flat and level within tolerance, to the elevation indicated on the drawings. Provide additional concrete required due to formwork, metal deck, and framing deflection to achieve this finished top of slab elevation. Provide the means by which the maximum and minimum concrete slab thickness can be monitored and verified during and after the placing and finishing operations. Slab construction and floor flatness/levelness shall conform to the latest edition of "Guide for Concrete Floor and Slab Construction (ACI302.1R)".
- Repair concrete exhibiting voids due to snap ties, honeycombs, rock pockets, and runs, spalls or otherwise damaged surfaces, with dry pack or cement grout. Finish flush with adjoining surfaces. At the discretion of the SER, or as, qualified by lab testing, excessive honeycombs or exposed reinforcement that jeopardize the design, shall be removed and replaced at the expense of the contractor.

CAST-IN-PLACE CONCRETE (CONTINUED)

- Horizontal joints will not be permitted in concrete construction, except as shown on the Contract Documents.
- Provide 7 days of curing immediately after finishing using one of the following methods. Curing membranes must be compatible with floor finishes.

a. Continuously watered burlap

b. Waterproof membranes

c. Sprayed-on liquid membranes (Refer to the manufacturer's specifications for requirements)
- Protect the concrete surface between finishing operations on hot, dry days, or any time plastic shrinkage cracks may develop, using wet burlap, plastic membranes or fogging. Curing of concrete is to start as soon as finishes will not be damaged by curing operations. It is not permissible to delay the curing until the morning after the concrete is placed
- Cold weather concreting shall be in accordance with ACI-306. Hot weather concreting shall be in accordance with ACI-305R.
- Throughout construction, the concrete work shall be adequately protected against damage due to excessive loading, construction equipment and activities, materials or methods, sun, wind, ice, rain, flowing water, snow, excessive heat, fire, stains, abrasions, and freezing temperatures.
- When drilling concrete for expansion bolts, adhesive anchors, pipe penetrations, etc. avoid drilling or cutting of any reinforcing or causing damage to concrete. Holes shall be prepared to receive bolts per the manufacturer's specifications.
- Epoxy adhesives shall be used where dowels are to be installed into existing concrete. Submit manufacturer information for engineer review prior to installation.

WOOD CONSTRUCTION

- Extent of structural wood framing is shown or implied on drawings.
- Provide timber graded by a recognized agency (SPIB, WCLUB or WVPWA), with rules and service compliance with requirements of American Lumber Standard Committee and PS 20.
- Time delivery and installation of framing to avoid extended on-site storage and to avoid delaying work of others.
- Keep structural timber protected during delivery, storage, handling and erection. Do not store in areas with either excessively high or excessively low humidity.
- Provide hurricane anchors at each bearing point of each roof rafter.
- Timber and timber construction shall comply with the latest editions of the specifications and codes specified below:

a. American Institute of Timber Construction (AITC): "Timber Construction Manual"

b. ANSI/AF&PA: "National Design Specification for Wood Construction"

c. The Engineered Wood Association: "Plywood Design Specification"

d. American Wood Protection Association: "Book of Standards"
- Structural dimensional lumber shall be Spruce-Pine-Fir #2 or better with the following minimum material properties:

F_b = 875 PSI

F_t = 450 PSI

F_c (parallel) = 1,150 PSI

F_c (perpendicular) = 425 PSI

F_v = 135 PSI

E = 1,400,000 PSI
- Stamped in accordance with AITC's "Timber Construction Manual".
- Direct to maximum moisture content of 19%. Include "S-DRY" or similar indication in grade marking or certification of grade.
- Provide timber which has been dressed on 4 sides (S4S) at mill prior to grading. Comply with grade sizes.
- Framing members shall be set with crown up.
- Connection details show arrangements of structural members. Detailing of connections shall be the responsibility of the builder/fabricator.
- Wood sill plates shall be anchored to concrete foundations with 1/2" diameter anchors at 48" on center with a minimum of 2 anchors per member. Anchor bolts shall be embedded a minimum of 8" into cast-in-place concrete foundations.
- Timber connections shall be made using prefabricated connectors where possible. Toe nailing is not permitted. Submit manufacturer's data for review. Fasteners shall be as manufactured by USP Structural Connectors, Simpson Strong-Tie or approved equal.
- Wall studs shall be located directly under roof members, unless noted otherwise.
- Nail sawn lumber pieces of multiple member posts or beams together with 10d nails at 12" o.c.
- Provide double members around openings greater than 16" wide, unless shown otherwise.
- Provide all framing hardware as required to properly complete the framing.

- As an example:
- a. 1/2" diameter carriage bolts at 4'-0" o/c alt. for top nailers.

b. 3/4" diameter adhesive anchors with washers at 12" o.c. for ledgers.

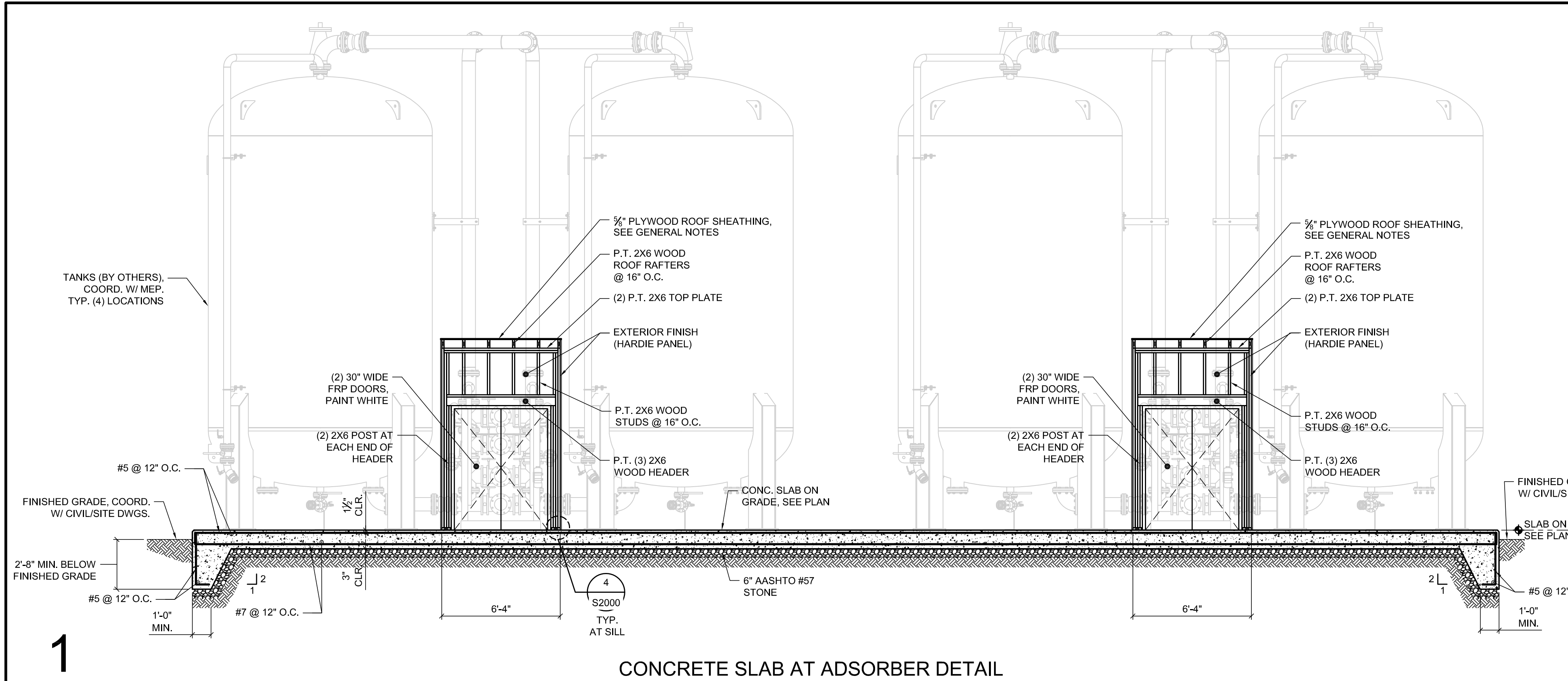
c. 1/2" diameter x 1'-0" long bolts at 4'-0" o.c. for wall plates.

- PLYWOOD SHEATHING
- Plywood for roof sheathing shall be minimum 5/8" and each shall conform to APA PSI rated sheathing. 32/16, exterior, 48" x 96" plywood shall be three span continuous. Face grain shall be perpendicular to supports. Provide one panel edge clip between supports.
 - Plywood or OSB for wall sheathing shall be a minimum of 5/8" thick and shall conform to APA PSI rated sheathing U.N.O. Wall sheathing shall be fastened with a minimum of 8D nails at 6" o.c. Perimeter spacing & 12" o.c. field spacing or as per local building codes unless noted otherwise.
 - Wall sheathing shall fasten to both the top and bottom (or sill) plate of the wall.
 - Joints in sheathing shall be staggered. For roof sheathing, use panel clips, tongue and groove, or lumber blocking edge supports as recommended by APA. Nailing and screwing of plywood shall comply with APA requirements for plywood roof diaphragms.



SOUTH WELLFIELD RESIN-GAC SYSTEM

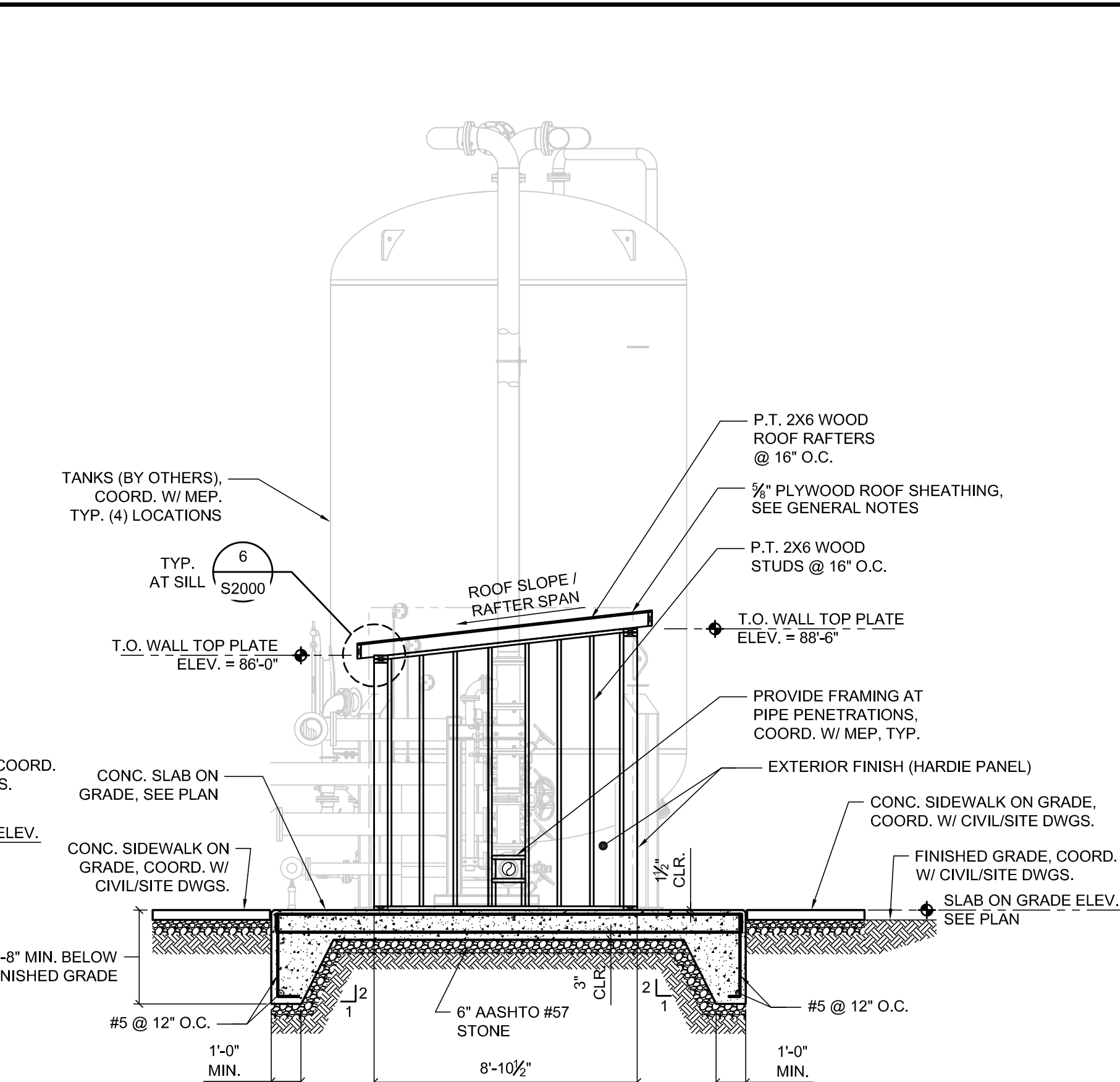
912 SOUTH CHAPEL STREET
NEWARK, DE 19713



CONCRETE SLAB AT ADSORBER DETAIL

SCALE: 1/4"=1'-0"

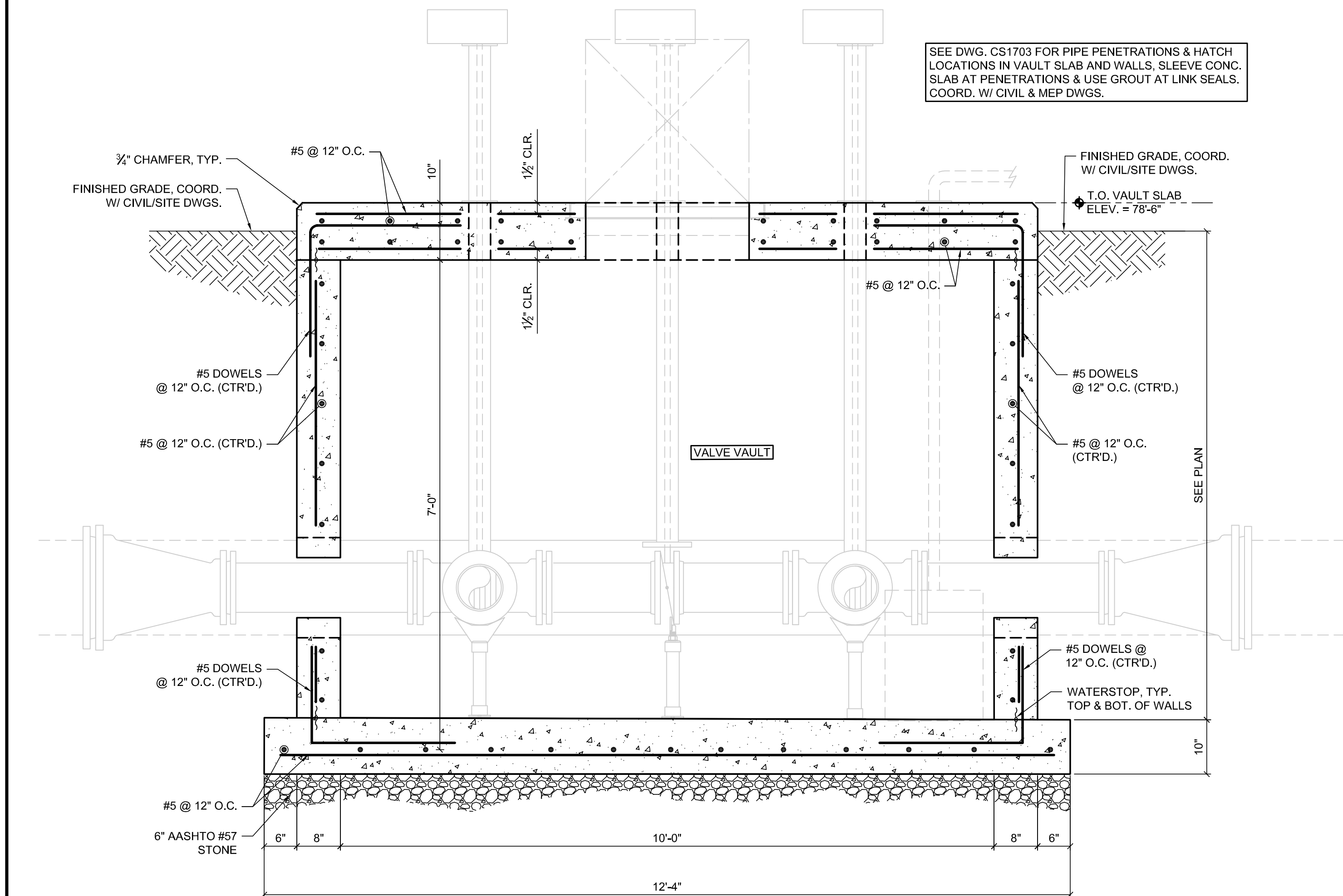
- NOTES
1. COORDINATE PAD SIZE, HEIGHT, EMBEDDED UTILITIES, ANCHOR RODS & PAD LOCATIONS WITH FINAL EQUIPMENT REQUIREMENTS, MANUFACTURER'S RECOMMENDATIONS AND MEP DRAWINGS.
 2. ALL PADS TO HAVE 1" CHAMFERED EDGES, ALL AROUND.
 3. ALL CONCRETE TO BE BROOMED FINISHED, 4,500 PSI AND 5-7% AIR ENTRAINED.
 4. ATTACHMENTS, CONNECTIONS, AND FASTENINGS OF ANY NATURE ARE TO BE PROPERLY AND PERMANENTLY (UNLESS OTHERWISE NOTED) SECURED IN CONFORMANCE WITH BEST PRACTICES (PLUMBS, LEVEL, SQUARE, SMOOTH, WITHOUT DEFECT, ETC.) ALL JOINTS SHALL BE CLOSE-FITTING AND JOINED TO CONFORM W/ EXPANSION AND CONTRACTION TO PREVENT CRACKING. THE DRAWINGS SHOW ONLY SPECIAL CONDITIONS TO ASSIST THE CONTRACTOR; THEY DO NOT ILLUSTRATE EVERY SUCH CONDITION AND DETAIL. CONTRACTOR SHALL PROVIDE ALL BLOCKING AND FRAMING NECESSARY TO ACHIEVE THESE CONDITIONS. BLOCKING AND FRAMING TO BE CONCEALED UNLESS OTHERWISE NOTED.



CONCRETE SLAB AT ADSORBER DETAIL

SCALE: 1/4"=1'-0"

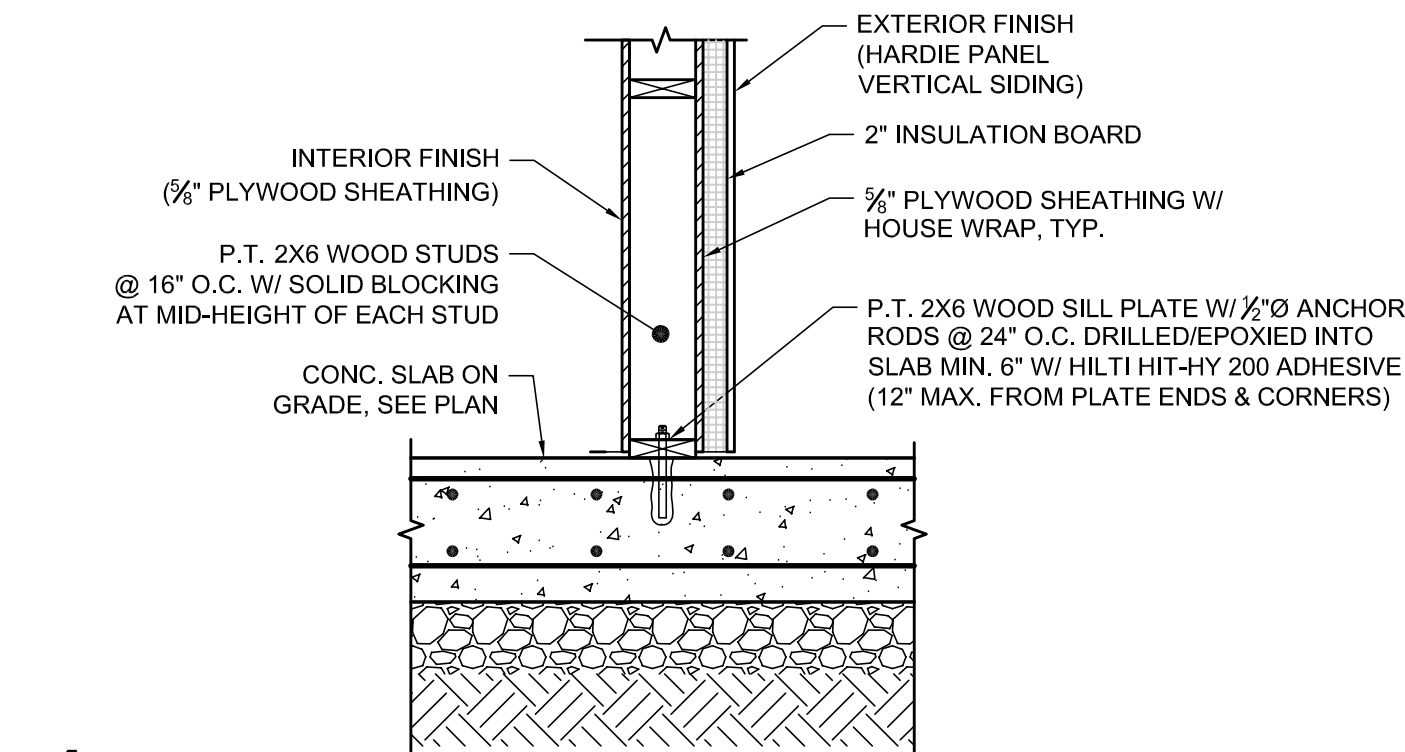
- NOTES
1. COORDINATE PAD SIZE, HEIGHT, EMBEDDED UTILITIES, ANCHOR RODS & PAD LOCATIONS WITH FINAL EQUIPMENT REQUIREMENTS, MANUFACTURER'S RECOMMENDATIONS AND MEP DRAWINGS.
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 3. ALL CONCRETE TO BE BROOMED FINISHED, 4,500 PSI AND 5-7% AIR ENTRAINED.



CONCRETE VALVE VAULT SECTION

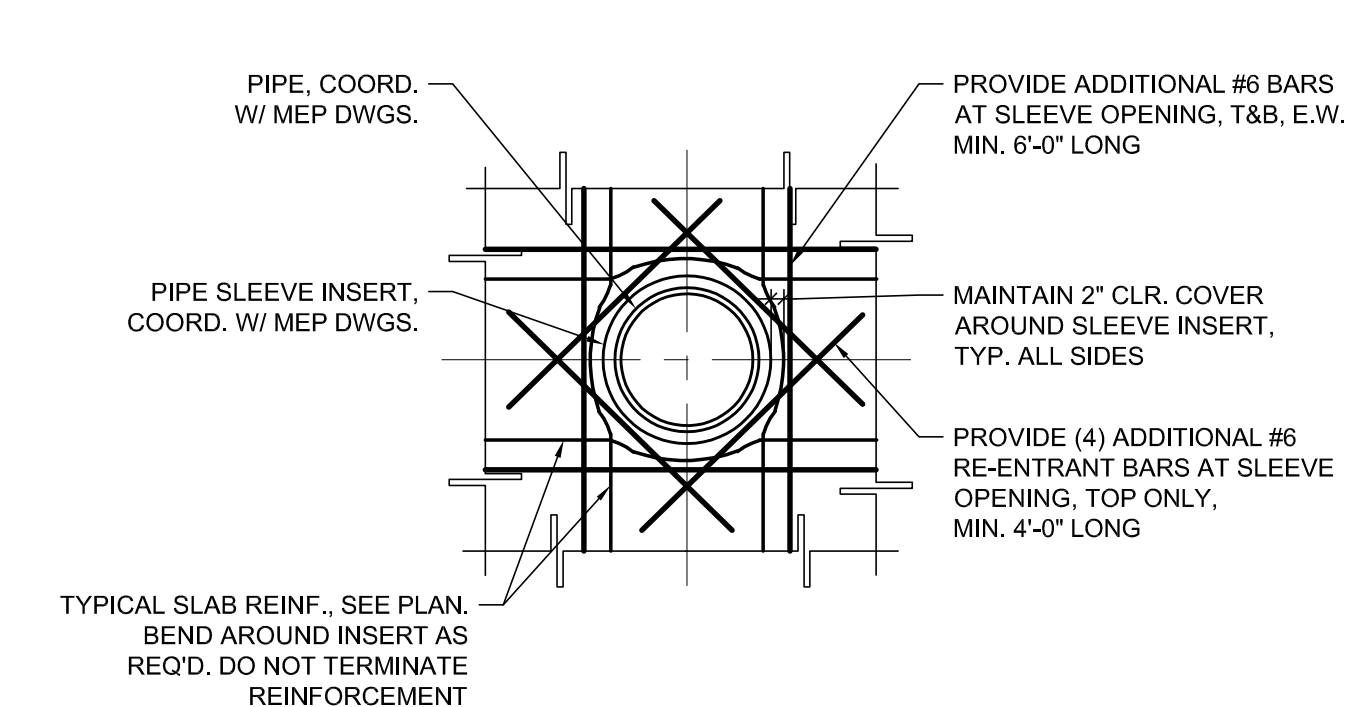
3

SCALE: 3/4"=1'-0"



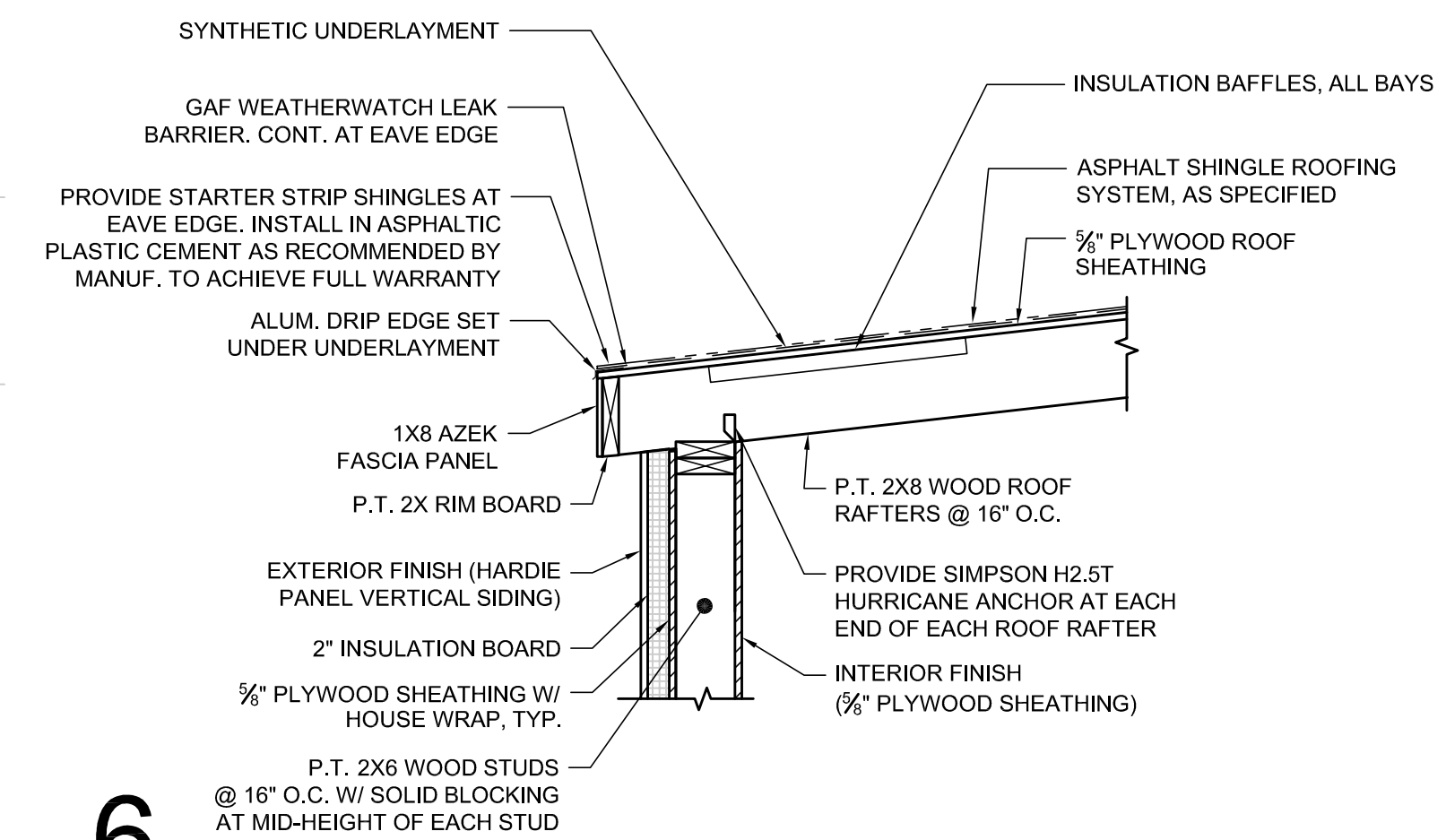
TYPICAL SILL CONNECTION DETAIL

SCALE: 3/4"=1'-0"



TYPICAL DETAIL AT CAST IN SLEEVES THRU SLAB

SCALE: 3/4"=1'-0"



TYPICAL RAFTER CONNECTION DETAIL

6

SCALE: 3/4"=1'-0"

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR
OWNER MUST BE NOTIFIED OF ANY
DISCREPANCIES BEFORE PROCEEDING WITH WORK



SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

ADSORBER SLAB DETAILS

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY
1	5-15-23	BID PLAN SUBMISSION	

ALL DOCUMENTS PREPARED BY PENNONI ASSOCIATES ARE INSTRUMENTS OF SERVICE IN RESPECT OF THE PROJECT. THEY ARE NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE BY OWNER OR OTHERS ON THE EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. ANY REUSE WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY PENNONI ASSOCIATES FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT OWNERS SOLE RISK AND WITHOUT LIABILITY OR LEGAL EXPOSURE TO PENNONI ASSOCIATE AND OWNER SHALL INDEMNIFY AND HOLD HARMLESS PENNONI ASSOCIATES FROM ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM.

PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	AS NOTED
DRAWN BY	RJK
APPROVED BY	TRG

S2000

SHEET 18 OF 20

U:\Automation\CNEWK\CNEWK22002 - South Wellfield P&ID Treatment Study\DESIGN\4-REVISIONS\202004.dwg PLOTTED: 4/23/2014 1:23 PM BY: Elia Adnan PLOT STYLE: Pennon V02a.dwt PROJECT STATUS: —

ELECTRICAL LEGEND

	LED LIGHTING FIXTURE UPPER CASE LETTER DENOTES TYPE IN SCHEDULE. LOWER CASE LETTER DENOTES SWITCH LEG NUMBER DENOTES CIRCUIT
	WALLPACK LIGHTING FIXTURE
	ALARM LIGHTING FIXTURE
	EMERGENCY LIGHTING FIXTURE
	THERMOSTAT
	EXIT SIGN
	GROUND ROD
	SELECTOR SWITCH; H-O-A = HAND-OFF-AUTOMATIC C-S-O = CLOSE-STOP-OPEN
	RUNNING TIME METER
	GROUND POINT
	NORMALLY OPEN CONTACT
	NORMALLY CLOSED CONTACT
	FUSE
	SWITCH
	COIL; C = CONTACTOR R = RELAY S = STARTER TD = TIME DELAY TR = TIMING RELAY CR = CONTROL RELAY AR = ALARM RELAY
	OVERLOADS
	PILOT LIGHT; R = RED G = GREEN A = AMBER B = BLUE Y = YELLOW
	TRANSFORMER
	ELECTRICAL LINES
	TELEPHONES LINES
	WATER LINES
	GROUND WIRING, NATURAL GAS LINES
	CONDUIT, EXPOSED
	CONDUIT, CONCEALED OR BURIED
	FUSED DISCONNECT SWITCH
	UNFUSED DISCONNECT SWITCH
	CIRCUIT BREAKER
	MOTOR, NUMBER DENOTES HP
	PANELBOARD
	JUNCTION BOX, SIZE AS REQUIRED
	SWITCH; LOWER CASE LETTER DENOTES SWITCH LEG
	3-WAY SWITCH
	4-WAY SWITCH
	SPECIAL RECEPTACLE
	SIMPLEX RECEPTACLE
	DUPLEX RECEPTACLE
	COMBINATION MOTOR STARTER
	MANUAL MOTOR STARTER
	TIMING CONTACT
	TELEPHONE OUTLET
	SV = SOLENOID VALVE, LS = LIMIT SWITCH, FS = FLOW SWITCH,
	P/S = PRESSURE SWITCH, L = LANYARD SWITCH, M/S = MOTION SWITCH
	CONTACTOR
	FIRE EXTINGUISHER, FLOW ELEMENT
	E-STOP PUSHBUTTON STATION
	PUSHBUTTON CONTROL STATION
	UTILITY POLE

ELECTRICAL ABBREVIATIONS

A, AMP	AMPERE
AC	ALTERNATING CURRENT
A/C	AIR COMPRESSOR
AE	AERIAL ELECTRIC LINE
AF	AMP FRAME
AFF	ABOVE FINISHED FLOOR
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALARM
AT	AMP TRIP
AUTO	AUTOMATIC
AUX	AUXILIARY
BE	BUCKET ELEVATOR
BFP	BELT FILTER PRESS
BKR	BREAKER
BWCP	BACKWASH CONTROL PANEL
BYP	BYPASS
C	CONDUIT, CONTACTOR
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CND	CONDUIT
COMB	COMBINATION
CONC	CONCRETE
CONT	CONTACT
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CTL	CONTROL
D	DAMPER
DC	DIRECT CURRENT, DUST COLLECTOR
DISC	DISCONNECT
EF	EXHAUST FAN
EHH	ELECTRICAL HAND HOLE
EL	ELEVATION
ENCL	ENCLOSURE
ETM	ELAPSED TIME METER
E-STOP	EMERGENCY STOP
EXIST	EXISTING
FCB	FEEDER CIRCUIT BREAKER
FOP	FILTER CONTROL PANEL
FJB	FILTER JUNCTION BOX
FL	FLOODLIGHT
FVNR	FULL VOLTAGE, NON-REVERSING
G,GND	GROUND
GEN	GENERAL
GFI	GROUND FAULT CIRCUIT INTERRUPTER
HOA	HAND-OFF-AUTOMATIC
HL	HIGH LEVEL
HP	HORSEPOWER
HT	HEAT TRACE
HV	HIGH VOLTAGE
IH	IMMERSION HEATER
IR	INFRA-RED
INST	INSTANTANEOUS
J, JB	JUNCTION BOX
KVA	KILOVOLT-AMPERE
KW	KILOWATT
LA	LIGHTNING ARRESTER
LL	LOW LEVEL
LO	LOCKOUT
LS	LIMIT SWITCH
LT	LIGHT, LEVEL TRANSMITTER
M	MOTOR
MAG	MAGNETIC
MAN	MANUAL
MCB	MAIN CIRCUIT BREAKER
MCP	MOTOR CIRCUIT PROTECTOR
MH	MOUNTING HEIGHT
MLO	MAIN LUG ONLY
MOD	MOTOR OPERATED DAMPER
MOV	MOTOR OPERATOR VALVE
MTD	MOUNTED
MTR	MOTOR
MS	MOTOR STARTER
NC	NORMALLY CLOSED
NCTO	NORMALLY CLOSED TIMED OPEN
NO	NORMALLY OPEN, NUMBER
NOTC	NORMALLY OPEN TIMED CLOSED
NTS	NOT TO SCALE
O.C.	ON CENTER
OHW	OVERHEAD WIRING
OIT	OPERATOR INTERFACE TERMINAL
OLS, O/L	OVERLOADS
P	POLE, PUMP
PB	PUSH BUTTON, PULL BOX
PNL	PANEL
PP	POWER PANELBOARD
P/S	PRESSURE SWITCH
PVC	POLYVINYL CHLORIDE
RECP	RECEPTACLE
REQ'D	REQUIRED
RGS	RIGID GALVANIZED STEEL
RMC	RIGID METAL CONDUIT
RMT	REMOTE
RP	RECEPTACLE PANELBOARD
RTM	RUNNING TIME METER
RTU	REMOTE TERMINAL UNIT
SEC	SECOND, SECONDARY
SEL	SELECTOR
SPD	SPEED
S/S	SELECTOR SWITCH
SPR	SPARE
STA	STATION
STR	STARTER
SV	SOLENOID VALVE
SYM	SYMMETRICAL
SZ	SIZE
T	TRANSFORMER
THH	TELEPHONE HAND HOLE
TSP	TWISTED SHIELDED PAIR
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION SYSTEM
TYP	TYPICAL
UE	UNDERGROUND ELECTRIC LINE
V, VOL	VOLT
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE, WATT
W/	WITH
WW	WIREWAY
WP	WEATHERPROOF
XP	EXPLOSIONPROOF
Ø	PHASE

GENERAL ELECTRICAL NOTES :

- ALL WORK SHALL BE DONE IN STRICT COMPLIANCE WITH THE REQUIREMENTS / REGULATIONS OF THE FOLLOWING CODES / AGENCIES / UTILITIES.
(A) THE NATIONAL ELECTRICAL CODE (NEC).
(B) LOCAL BUILDING AND FIRE CODES.
(C) ALL LOCAL, STATE, AND FEDERAL SAFETY REGULATIONS.
(D) ALL LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PROTECTION REGULATIONS.
(E) DESIGN SAFETY STANDARDS FOR ELECTRICAL SYSTEMS (OSHA).
(F) ANY OTHER PUBLIC AGENCIES HAVING JURISDICTION.
(G) CITY OF NEWARK - ELECTRICAL DEPARTMENT.
(H) VERIZON.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO INSURE "ON THE JOB" SAFETY FOR HIS EMPLOYEES. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE TO INSURE THAT HIS WORK SHALL BE PERFORMED IN A MANNER THAT SHALL PROVIDE SAFE CONDITIONS FOR OTHER PERSONS EMPLOYED ON THE PROJECT, EMPLOYEES OF THE OWNER, AND ALL OTHER PERSONS HAVING AUTHORIZED OR UNAUTHORIZED ACCESS TO THE WORK AND THE PUBLIC.
- THE ELECTRICAL DRAWINGS DO NOT INDICATE ALL OF THE EXISTING EQUIPMENT, DEVICES, WIRING, STRUCTURES, PIPING, ETC., EITHER EXPOSED OR CONCEALED. PRIOR TO COMMENCING CONSTRUCTION THE CONTRACTOR SHALL OBTAIN OR VERIFY THE EXACT LOCATION OF ALL THE EXISTING ITEMS THAT AFFECT THE WORK.
- THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE AND INDICATE THE GENERAL ARRANGEMENT OF THE VARIOUS SYSTEMS AND THE APPROXIMATE / RELATIVE LOCATIONS OF THE EQUIPMENT / DEVICES / ITEMS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THAT THERE IS ADEQUATE SPACE AT THE LOCATIONS INDICATED FOR ALL THE EQUIPMENT / DEVICES / ITEMS PRIOR TO INSTALLATION OF SAME.
- ALL WORK SHALL BE GROUNDED AS INDICATED ON THE DRAWINGS AND/OR AS REQUIRED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
- THE CONTRACTOR SHALL USE WHERE APPROPRIATE A MECHANICAL STRUT SYSTEM (1-5/8" CHANNEL WIDTH SERIES) AS A MEANS OF SUPPORT FOR THE INSTALLATION AND MOUNTING OF EQUIPMENT / DEVICES.
- ALL EQUIPMENT SHALL BE INSTALLED AND WIRED IN STRICT COMPLIANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OF THE EQUIPMENT MANUFACTURER.
- UPON COMPLETION OF THE INSTALLATION THE CONTRACTOR SHALL BALANCE THE LOAD ON ALL PARTS OF THE DISTRIBUTION SYSTEM.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR OR REPLACE ALL DAMAGE CAUSED BY THE INSTALLATION OF EQUIPMENT / DEVICES / MATERIALS AT THE PROJECT. REPAIRS OR REPLACEMENT WORK SHALL CONFORM TO THE EXISTING CONDITIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY/ALL CORE DRILLING AS REQUIRED FOR THE COMPLETION OF HIS WORK.
- SEE THIS SHEET FOR DEMOLITION NOTES AND CONSTRUCTION NOTES.

- ① REFERS TO DEMOLITION NOTES
② REFERS TO CONSTRUCTION NOTES

RESPONSIBILITY TABLE - INSTRUMENTATION

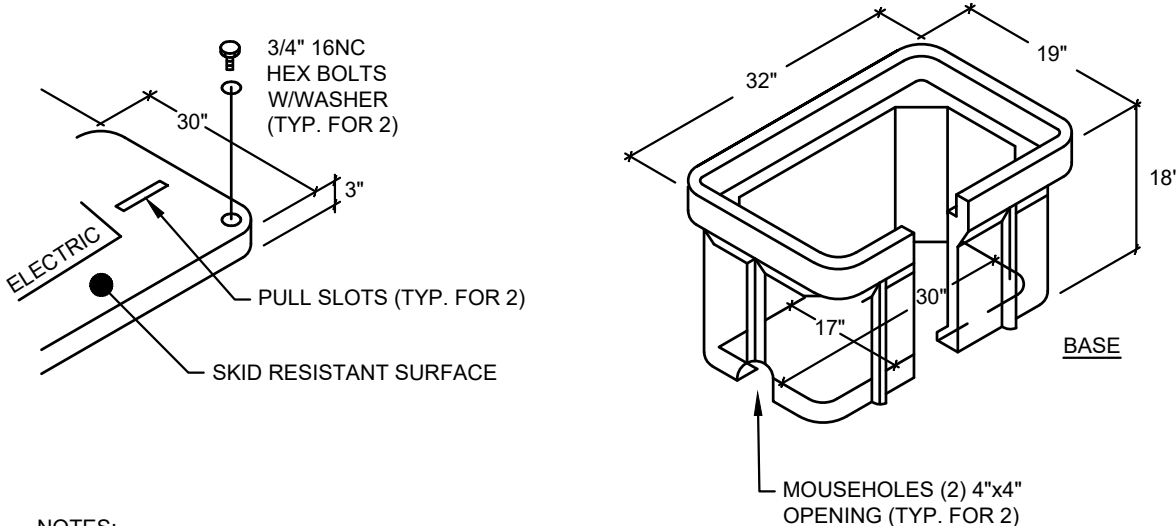
ITEM	TASK	GENERAL CONTRACTOR	SYSTEM INTEGRATOR
1	PROVIDE INSTRUMENTATION AND WIRING DEVICES		●
2	PROVIDE CONTROL PANEL WITH ALL REQUIRED COMPONENTS AND HMI		●
3	INSTALL INSTRUMENTATION & WIRING DEVICES	●	
4	INSTALL CONTROL PANEL	●	
5	PROVIDE AND INSTALL CONDUCTORS/WIRE/CABLE AND CONDUIT WITH FITTINGS AND SUPPORT HARDWARE	●	
6	PROVIDE AND INSTALL POWER TO INSTRUMENTATION AND WIRING DEVICES	●	
7	PROVIDE AND INSTALL POWER TO CONTROL PANEL	●	
8	PROVIDE HMI SCREENS AS REQUIRED BY OWNER		●
9	PROVIDE PROGRAMMING AND SYSTEMS START UP		●
10	PROVIDE SCADA SYSTEM INTEGRATION START UP AND TESTING		●

ELECTRICAL DEMOLITION NOTES:

- ① NEATLY SAWCUT AND REMOVE ONE SECTION OF THE EXISTING CONCRETE SIDEWALK TO ACCOMMODATE NEW UNDERGROUND CONDUIT INSTALLATION FROM THE NEW RESIN-GAC SYSTEM FACILITIES TO THE EXISTING AIR STRIPPER BUILDING.

ELECTRICAL CONSTRUCTION NOTES:

- ① PROVIDE NINE (9) NEW 20A-1P CIRCUIT BREAKERS FOR EXISTING PANEL LP-1 IN BLANK POSITIONS 23, 24, 25, 26, 27, 28, 29, 31, AND 34. PANEL LP-1 IS A SQUARE-D TYPE NQ PANELBOARD.
- ② PROVIDE TWO (2) NEW 20A-1P EPD CIRCUIT BREAKERS FOR EXISTING PANEL LP-1 IN BLANK POSITIONS 30 AND 32 FOR HEAT TRACING. PANEL LP-1 IS A SQUARE-D TYPE NQ PANELBOARD.
- ③ PROVIDE NEW WIRING (6-#12, 3-#12G; 3/4" C) FROM EXISTING PANEL LP-1 (CIRCUITS 23 AND 25) TO NEW MANIFOLD ENCLOSURE LIGHTS AND RECEPTACLES; AND (CIRCUIT 27) TO THE NEW SCADA PANEL (PLC-2).
- ④ PROVIDE NEW WIRING (6-#12, 3-#12G; 3/4" C) FROM EXISTING PANEL LP-1 (CIRCUITS 24, 26, AND 28) TO NEW BUTTERFLY VALVE MOTOR OPERATERS (BFV-1, BFV-2, BFV-3).
- ⑤ PROVIDE NEW WIRING (4-#10, 2-#10G; 3/4" C) FROM EXISTING PANEL LP-1 (CIRCUITS 29 AND 31) TO NEW MANIFOLD ENCLOSURE ELECTRIC UNIT HEATER RECEPTACLES.
- ⑥ PROVIDE NEW WIRING (6-#12, 3-#12G; 3/4" C) FROM EXISTING PANEL LP-1 (CIRCUITS 30 AND 32) TO NEW TANK PIPING HEAT TRACE CONTROLLERS; AND (CIRCUIT 34) TO NEW VALVE VAULT SUMP PUMP RECEPACLE.
- ⑦ PROVIDE NEW FIBER OPTIC CABLE (1-OM2, 6F; 1" C) FROM EXISTING PLC-1 TO NEW SCADA PANEL (PLC-2).
- ⑧ PROVIDE WIRING (9-#12; 1-#12G; 3/4" C) FROM PLC-2 TO BUTTERFLY VALVE MOTOR OPERATERS (BFV-1, BFV-2, BFV-3) FOR 120VAC CONTROLS. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑨ PROVIDE WIRING (22-#14; 1-#14G; 1" C) FROM PLC-2 TO BUTTERFLY VALVE MOTOR OPERATERS (BFV-1, BFV-2, BFV-3); VALVE VALUT LEVEL SWITCH (LSH-1042); AND VALVE VAULT HATCH SWITCH (ZSO-3) FOR 24VDC CONTROLS. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑩ PROVIDE WIRING (FLOWMETER CABLES; 1" C) FROM TRANSMITTER (FIT-1040) AT PLC-2 TO FLOWMETER (FE-1040).
- ⑪ PROVIDE WIRING (5 - #18-TSP CABLES; 1" C) FROM MANIFOLD ENCLOSURE NO. 1 INSTRUMENTATION (PIT-1.1, PIT-2.1, DPT-294-1.1, DPT-294-2.1, TT-1) TO PLC-2. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑫ PROVIDE WIRING (2-#14; 1-#14G; 3/4" C) FROM MANIFOLD ENCLOSURE NO. 1 DOOR SWITCH (ZSO-1) FOR 24VDC CONTROLS. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑬ PROVIDE WIRING (5 - #18-TSP CABLES; 1" C) FROM MANIFOLD ENCLOSURE NO. 2 INSTRUMENTATION (PIT-1.2, PIT-2.2, DPT-294-1.2, DPT-294-2.2, TT-2) TO PLC-2. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑭ PROVIDE WIRING (2-#14; 1-#14G; 3/4" C) FROM MANIFOLD ENCLOSURE NO. 2 DOOR SWITCH (ZSO-2) FOR 24VDC CONTROLS. TERMINATE WIRING WITHIN PLC-2 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑮ PROVIDE MANIFOLD ENCLOSURE PORTABLE ELECTRIC UNIT HEATER, 1.9KW, 120V; CHROMALOX MODEL NO. HF-203G AC OR AN ACCEPTABLE EQUIVALENT.
- ⑯ PROVIDE ONE (1) NEW 20A-1P CIRCUIT BREAKER FOR EXISTING PANEL RFB IN BLANK POSITION 38. PANEL RFB IS A SQUARE-D TYPE NQOD PANELBOARD.
- ⑰ PROVIDE NEW WIRING (2-#12, 1-#12G; 3/4" C) FROM EXISTING PANEL RFB (CIRCUIT 38) TO NEW CHEMICAL METERING PUMP (SHMP-122) RECEPTACLE.
- ⑱ PROVIDE NEW WIRING (2 - #18-TSP CABLES; 3/4" C) FROM EXISTING FCP-101 TO NEW CHEMICAL METERING PUMP (SHMP-122). TERMINATE WIRING WITHIN FCP-101 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑲ PROVIDE NEW WIRING (4-#14, 1-#14G; 3/4" C) FROM EXISTING FCP-101 TO NEW CHEMICAL METERING PUMP (SHMP-122) FOR 24VDC CONTROLS. TERMINATE WIRING WITHIN FCP-101 AS DIRECTED BY ALLIED CONTROL SERVICES (ACS).
- ⑳ PROVIDE #2 BARE COPPER CONDUCTOR GROUND LOOP. TO INCLUDE 4 - GROUND RODS WITH #2 BONDING LEADS BROUGHT UP UNDER EACH PV TANK (ADJACENT TO A SELECTED SUPPORT LEG).
- ㉑ BOND GROUND LOOP TO PV TANK CONCRETE PAD REBAR AT TWO (2) LOCATIONS (MINIMUM).
- ㉒ PROVIDE GROUND BAR ASSEMBLY AT MANIFOLD ENCLOSURE; BURNDY CATALOG NO. BBB14210A OR AN ACCEPTABLE EQUIVALENT. BOND GROUND BAR ASSEMBLY TO GROUND RING.
- ㉓ REPLACE CONCRETE SIDEWALK SECTION TO MATCH EXISTING.
- ㉔ PROVIDE A SPARE 1" CONDUIT WITH PULL STRING FROM MANIFOLD ENCLOSURE to SCADA PANEL (PLC-2) FOR FUTURE INSTRUMENTATION



- NOTES:
- PROVIDE QUAZITE/COMPOSOLITE #PG STYLE WITH MOUSEHOLES.
 - COORDINATE DEPTH OF HANDHOLES WITH EXISTING CONDITIONS IN THE FIELD.
 - CONTRACTOR SHALL PROVIDE EXTENSION BOXES AS REQUIRED.
 - PROVIDE CRUSHED STONE BELOW HANDHOLE FOR DRAINAGE.

TYPICAL HANDHOLE DETAIL

NOT TO SCALE

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER, SERIES: MODEL, CAT. #	DESCRIPTION	LIGHT SOURCE	COLOR TEMP.	CRI	DRIVER	LUMENS	INPUT VOLTAGE	INPUT WATTS	MOUNTING	FINISH
A	COLUMBIA, LXEM SERIES: LXEM4-35ML-RFA-EU-XEHC	4' ENCLOSED & GASKETED FIBERGLASS FIXTURE W/ RIBBED FROSTED ACRYLIC LENS.	LED	3500K	80	FIXED OUTPUT	4700	120	42	CHAIN; 8'-0" AFF	WHITE FIBERGLASS HOUSING

SOUTH WELLFIELD RESIN-GAC SYSTEM

912 SOUTH CHAPEL STREET
NEWARK, DE 19713

ELECTRICAL NOTES

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

NO.	DATE	REVISIONS	BY	ELA
1	05/19/2023	BID PLAN SUBMISSION		

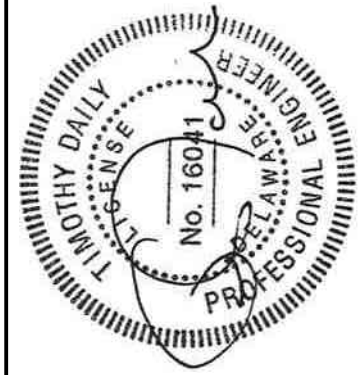
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PROJECT	CNEWK22008
DATE	2023-05-05
DRAWING SCALE	AS NOTED
DRAWN BY	ELA
APPROVED BY	TD

E0001

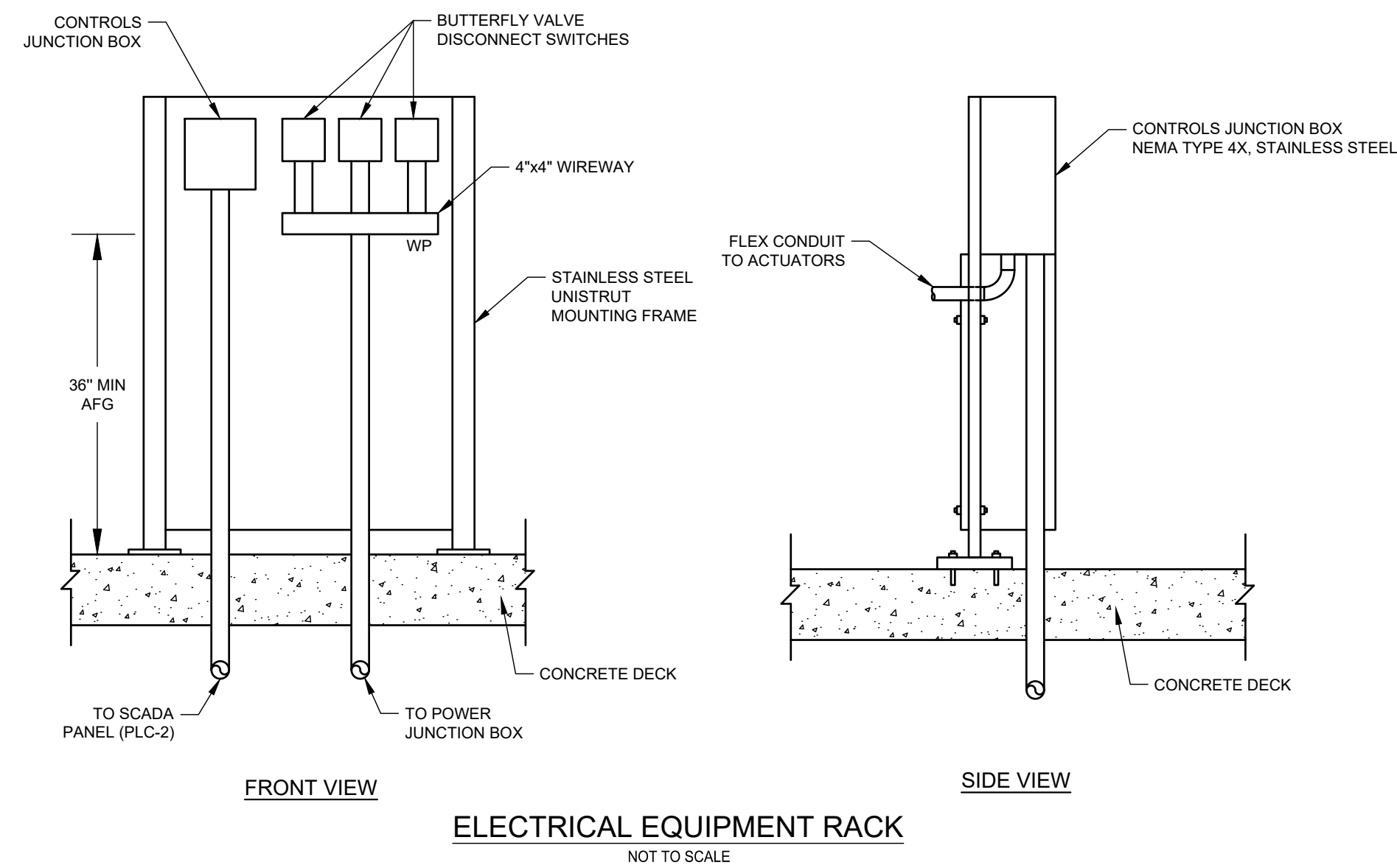
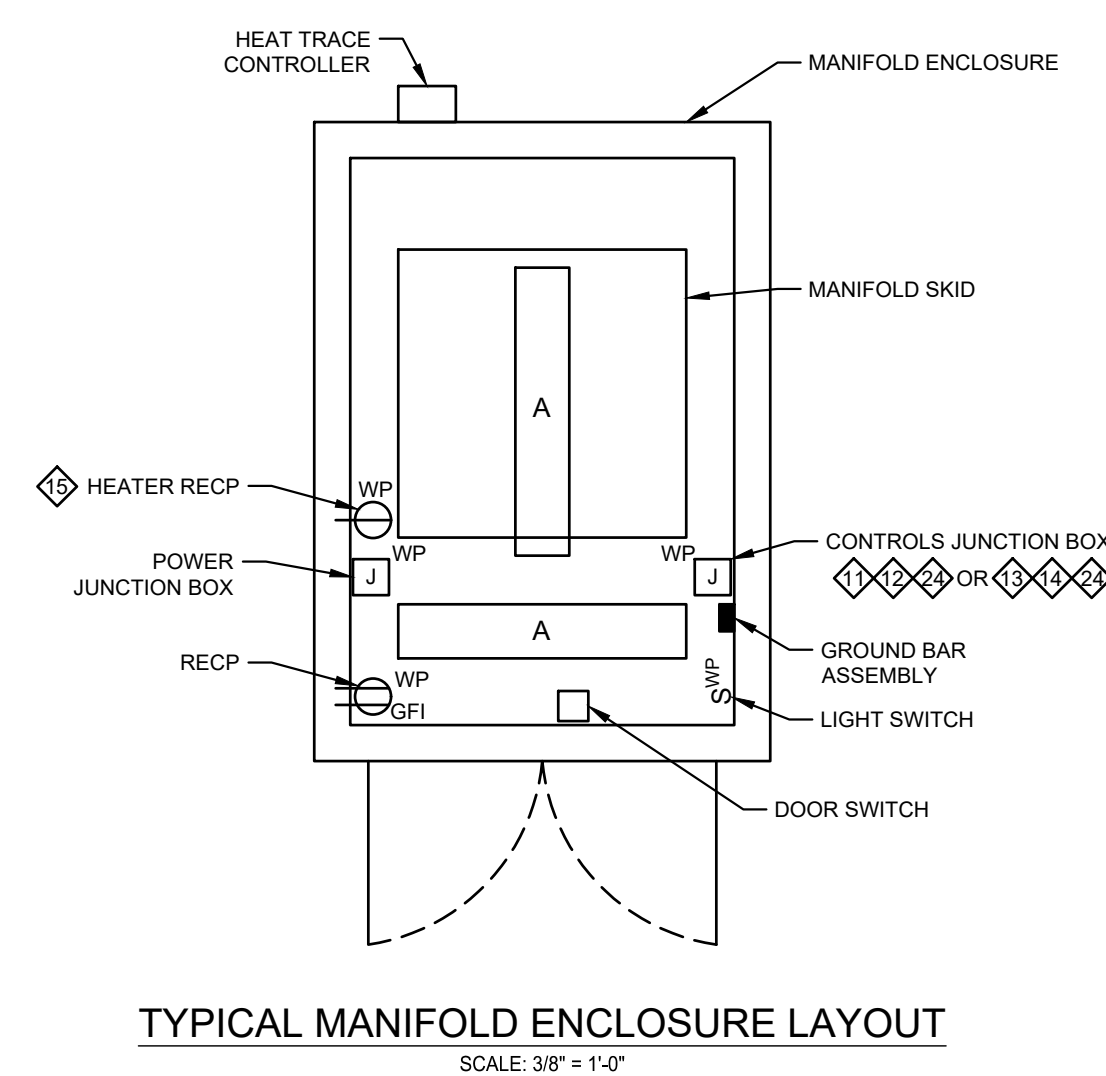
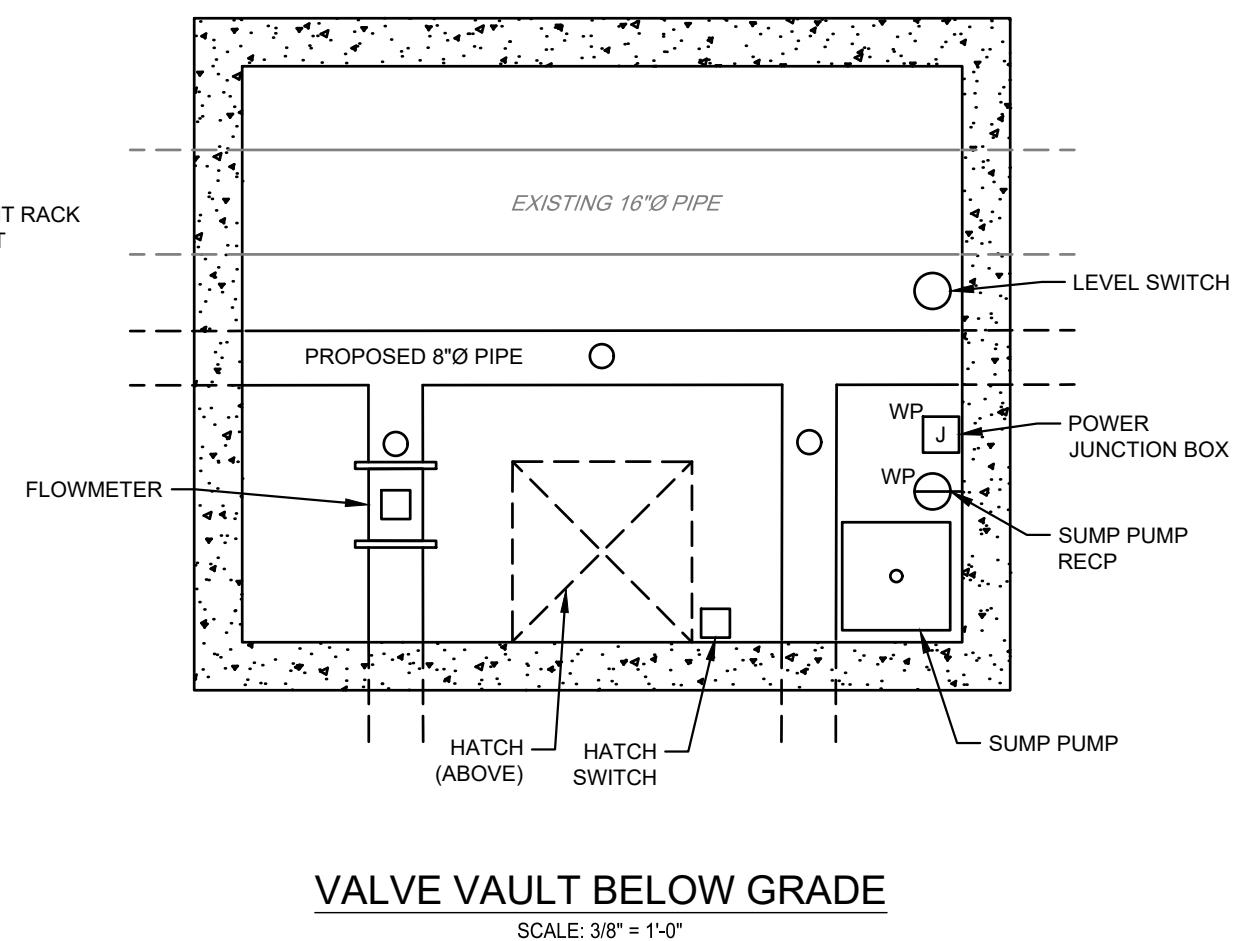
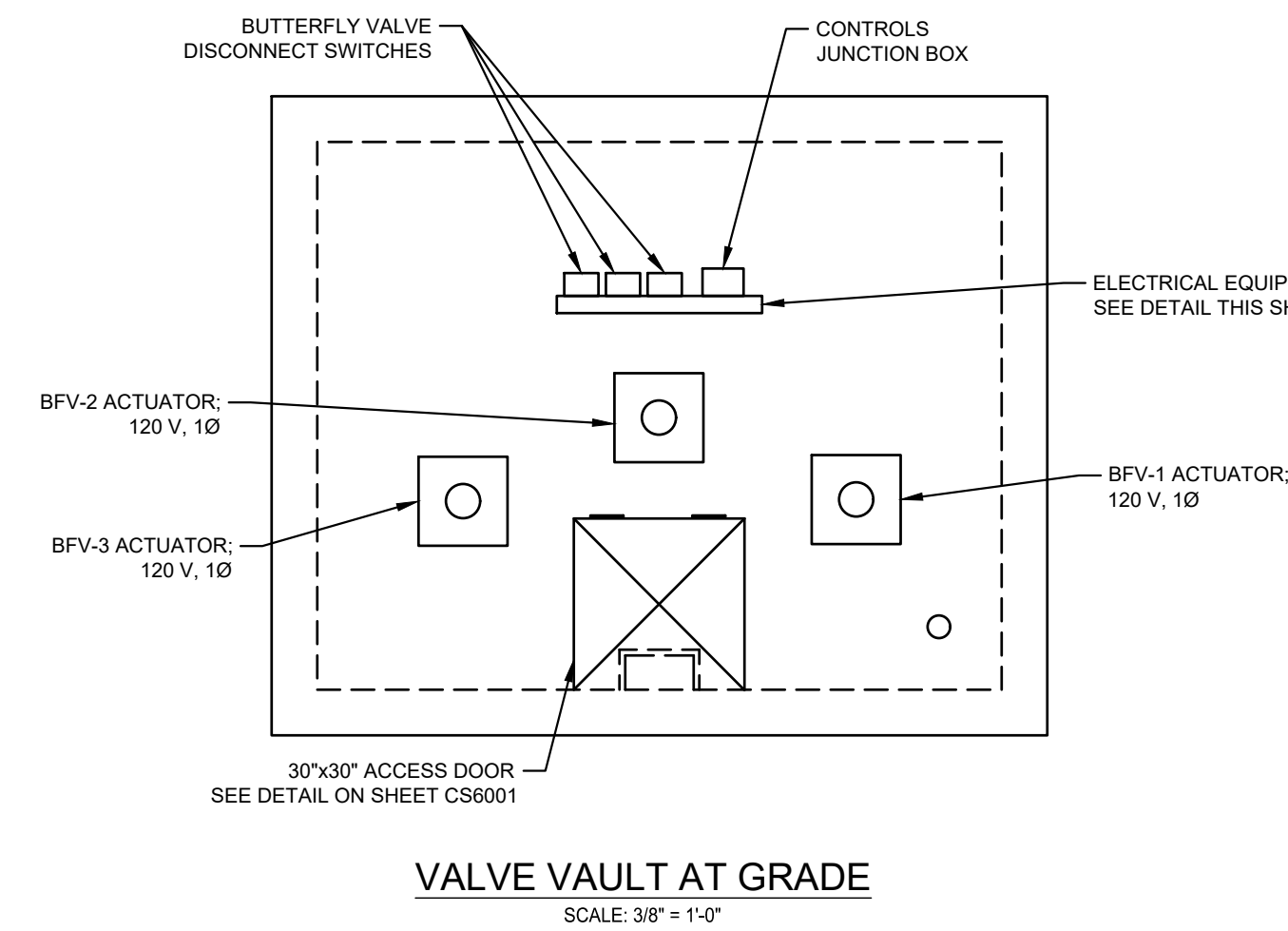
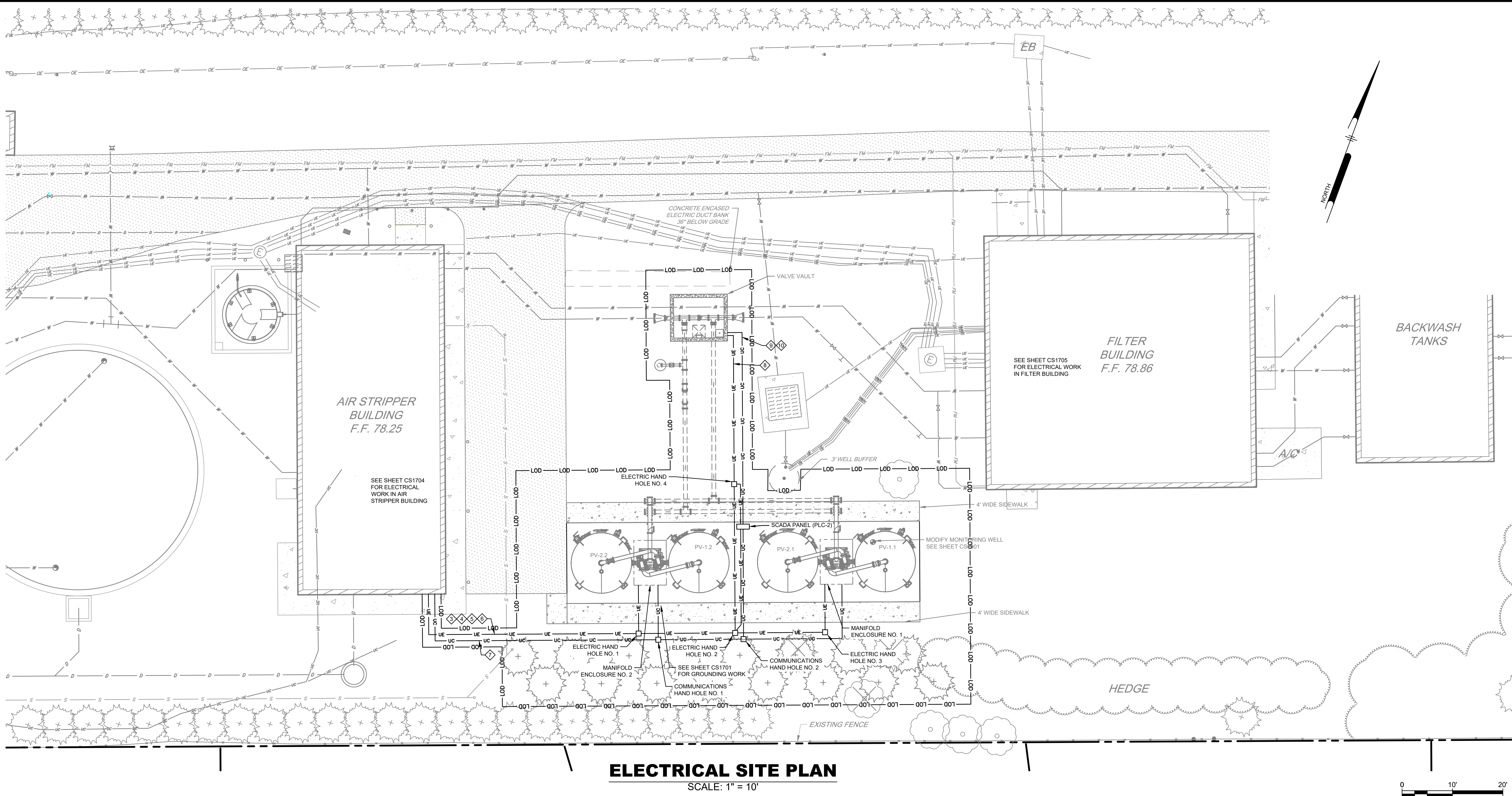
SHEET 19 OF 20

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR AND OWNER MUST BE NOTIFIED OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK



Pennoni
PENNONI ASSOCIATES INC.
Christiana Executive Campus
121 Continental Drive, Suite 207
Newark, DE 19713-4310
T 302.655.4451 F 302.654.2895

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PLOTTED: 4/17/2023 3:07 PM BY: Elia Addison PLOTTED: Pennoni V23.dwg PROJECT STATUS: —



NO.	DATE	REVISIONS	BY	ELA
1	05/19/2023	BID PLAN SUBMISSION		

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PROJECT: CNEWK22008
DATE: 2023-05-05
DRAWING SCALE: AS NOTED
DRAWN BY: ELA
APPROVED BY: TD

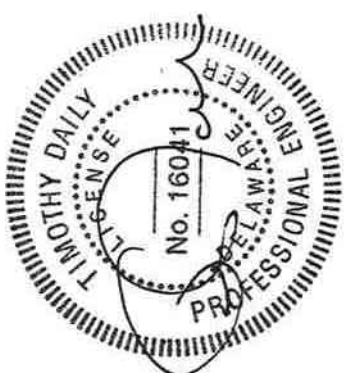
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SHEET 20 OF 20

SOUTH WELLFIELD RESIN-GAC SYSTEM
912 SOUTH CHAPEL STREET
NEWARK, DE 19713

ELECTRICAL SITE PLAN

CITY OF NEWARK
220 SOUTH MAIN STREET
NEWARK, DE 19711

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR AND OWNER MUST BE NOTIFIED OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK



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CITY OF NEWARK
DELAWARE

ACS CONTROLS INSTALLATION PROPOSAL



ALLIED CONTROL SERVICES, INC.

611 GARFIELD AVE. • P.O. BOX 234 • WEST POINT, PA 19486

Phone: 215-699-2855

Fax: 215-699-9030

NJ Electrical Contractor License 14734
DE Electrical Contractors License #T1-0004854
MD Electrical Contractors License #9097
WV Electrical Contractors License #043488

Alliance integration partner
with



May 04, 2023

Mr. Mark Neimeister City of Newark, DE
Newark Municipal Building 220 S. Main Street
Newark, DE 19711

Reference: Rev1 Proposal: South Well Field Resin-GAC System PLC Control Panel and Instrumentation
Revision 1: Addition PI-3.1, PI-3.2, TT-1, TT-2, ZSO-1, ZSO-2, ZSO-3

Dear Mark:

Per your request we are pleased to provide the following proposal for the above referenced project. Our proposal is based on the Pennoni plans and specifications, an on-site visit, and the list of instruments, PLC inputs, and outputs furnished to ACS. The following equipment and services will be provided:

Item	Qty	Description
1	1	Furnish new NEMA 4, 42"X 36"X12" PLC Control Panel with Coin proof Padlocking Handle and 3 Point latch, with 24" LED Light fixture, Rockwell Automation CompactLogix PLC with I/O modules required for all I/O plus a minimum of 20% spare, wired I/O; 15" Maple Systems Color touchscreen OIT; Fiber/Copper Ethernet switch, 750 VA UPS and field termination assemblies and wiring for all PLC I/O.
2	Lot	Furnish all PLC programming, startup and testing for all new I/O and system functionality per upcoming plans and specifications.
3	Lot	Furnish all Operator Interface Terminal programming, for new control panel including startup and testing for all new I/O and system functionality per plans and specifications.
4	Lot	Furnish all ClearSCADA HMI programming, startup and testing for all new I/O and system functionality per plans and specifications.
5	Lot	Furnish onsite termination of all instrumentation, valve actuators and PLC I/O Wiring associated with the new control panel and test point to point upon completion.

- | | | |
|----|-----|--|
| 6 | Lot | Furnish configuration, calibration, startup and testing of all instrumentation and valve actuators. Equipment, conduit and wiring to be furnished and installed by others. |
| 7 | Lot | Furnish all Topview Alarm Management software programming, startup and testing for all new I/O and system functionality per plans and specifications. |
| 8 | Lot | Furnish new system reports for new I/O per plans and specifications. |
| 9 | Lot | Furnish, install and test terminations for new Fiber Optic cable to be furnished and installed by others and furnish report of testing of fiber optic system upon completion of terminations. |
| 10 | Lot | Integrate existing and new PLC into treatment plant HMI application with all necessary control and monitoring displays. |
| 11 | Lot | Provide startup, testing and full control system Field Acceptance Test to calibrate, validate and document proper operation, configuration and integration with new HMI for all new equipment including PLC, OIT, field devices alarms and displays. |
| 12 | Lot | Provide onsite Operator training for new control system. |
| 13 | Lot | Coordinate with Penonni and Contractors on all SCADA, instrumentation and control submittals, planning and installation. |
| 14 | Lot | Provide instrumentations as follows: PIT-1.1, PIT-1.2, PIT-2.1, PIT-2.2 (pressure transmitters); FE/FIT-1040 (8" Mag Flow Meter); LSH-1042 (flood level switch); DPT-294-1.1, DPT-294-2.1, DPT-294-1.2, DPT-294-2.2 (differential pressure transmitters); PI-3.1, PI-3.2 (pressure gauges); TT-1, TT-2 (temperature transmitters); ZSO-1, ZSO-2, ZSO-3 (door/hatch limit switches) |
| 15 | Lot | Furnish color PDF O&M Manuals with documentation for all new equipment with wiring diagrams, panel layout diagrams and BOM to reflect as-built hardware and field wiring for treatment plant upgrade. |

Total Price: \$85,750.00

Delivery Schedule:

Delivery Schedule will be determined, and a firm delivery date will be provided after the project is awarded. The following is estimated.

Design Submittal Drawings:	8-10 Weeks
Completion of Panels, Integration and FAT:	10-12 Weeks after Approval of Submittal

Notes and Clarifications:

1. Costs for any applicable permitting fees will be invoiced separately at cost.
2. System Warranty is one-year onsite parts and labor included.
3. Payment Terms Net 30 Days

Please email or call me if you have any questions or if you would like to proceed with the project. You can reach me at 1-800-441-4844 or on my cell phone at 215-527-6142

Sincerely,



Matthew Wilson, PMP