



**SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
TERMINUS TREATMENT FACILITY
SAWS Job No. 18-8616
SAWS Solicitation No. CO-00185**

**ADDENDUM No. 3
August 24, 2018**

To Bidder of Record:

This addendum, applicable to work referenced above, is an amendment to the bidding documents and as such will be made a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the addendum number and issue date in the space provided in submitted copies of the proposal.

QUESTIONS AND ANSWERS

Refer to attached Question and Answer Form.

REVISIONS TO CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

REQUEST FOR COMPETITIVE SEALED PROPOSALS

- a) Remove paragraph four (4) from the Request for Competitive Sealed Proposals, page IV-1, and replace with the following:

For questions regarding this solicitation, technical questions or additional information, please contact Jessica Goforth, Contract Administrator, in writing via email to: Jessica.Goforth@saws.org or by fax to (210) 233-3849 until **2:00 PM (CDT) on August 28, 2018**. Answers to the questions will be posted to the web site by **2:00 PM (CDT) on September 5, 2018** as a separate document or included as part of an addendum. Be advised that firms responding to this RFCSP (Respondents) are prohibited from communicating with any other SAWS staff, the Consultant, the Developer, or COSA officials regarding this RFCSP up until the contract is awarded as outlined in the Instructions to Respondents.

REQUIRED DOCUMENTS MATRIX

- a) Remove and replace the Required Documents Matrix with the version included herein. The schedule out of the maximum page count has been removed.

SUPPLEMENTARY CONDITIONS

- a) Delete Paragraph 5.7.4 requiring Rigger’s Liability.

SECTION 10500

- a) Add new section provided herein for lockers in the restrooms.

SECTION 11217

- b) Delete Section 11217 in its entirety and replace with new Section 11217 provided herein. Revised paragraphs in this Section are highlighted in yellow.

SECTION 11241

- a) Delete Section 11241 in its entirety and replace with new Section 11241 provided herein. Revised paragraphs in this Section are highlighted in yellow.

SECTION 11242

- a) Delete Table 11242-A and replace with the following:

Service Description	Design Value
Number of Units	4
Material Being Pumped	0.8% Sodium Hypochlorite Solution
Required Pumping Range - Each Pump	75 - 650 gph
Operating Range	20:1
Maximum Pressure Rating, psi	50 psi
Minimum Pressure Rating, psi	15 psi
NPSHA	25 ft
Suction and Discharge Port Size	1.5-inch
Drive Type	Variable Speed
Maximum Motor Horsepower	2 hp
Maximum Motor Speed, rpm	1800 rpm
Equipment Numbers	65-CMP-11, 65-CMP-12, 65-CMP-13, 65-CMP-14
Service Description	Design Value

Number of Units	2
Material Being Pumped	23% Hydrofluosilicic Acid
Required Pumping Range- Each Pump	2.5 – 6.5 gph
Operating Range	100:1
Maximum Pressure Rating, psi	40 psi
Minimum Pressure Rating, psi	10 psi
NSPHA	29 ft
Suction and Discharge Port Size	1/2-inch
Drive Type	Variable Speed
Maximum Motor Horsepower	0.5 hp
Maximum Motor Speed, rpm	220 rpm
Equipment Number(s)	69-CMP-31, 69-CMP-32

SECTION 11363

- a) Page 11363-15, Paragraph 2.06.A. Item 1, delete this paragraph in its entirety.
1. Provide the centrifuge with a complete Allen-Bradley CompactLogix 1769-L35E control system completely configured and programmed by the Centrifuge Manufacturer as required for safe and satisfactory operation of the unit.

and replace with:

1. Provide the centrifuge with a complete Allen-Bradley CompactLogix control system as specified in Section 17500. The system shall be completely configured and programmed by the Centrifuge Manufacturer as required for safe and satisfactory operation of the unit.

SECTION 15100

- a) Delete Table 15100-1 Valve Schedule in its entirety and replace with the new Table 15100-1 provided herein. Revised cells are highlighted.

SECTION 15061

- a) Add the following paragraph to Part 1, 1.02, C:

5. AWWA C116/A21.16 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings

b) Delete paragraph 2.01, A, 1, c. in its entirety and replace with the following:

- c. All water pipes shall have an interior lining applied in accordance with ANSI/AWWA C104/A21.4 cement mortar lining. All sludge piping shall have an interior fusion bonded epoxy lining in accordance with AWWA C-116.

c) Delete paragraph 2.01, A, 2, f., 3) in its entirety and replace with the following:

- 3) Or, exposed exterior and interior lining: Fusion-bonded epoxy coated per AWWA C116 for all sludge piping.

SECTION 15076

a) Delete Section 15076 in its entirety and replace with new Section 15076 provided herein. Revised paragraphs in this Section are highlighted in yellow.

SECTION 15082

a) Delete Paragraph 3.02, B. entirely and replace with:

- A. Process piping – Insulate all process piping (including NPW and PW pipe) exposed to outdoor temperatures, 3-inches and smaller. Provide heat trace where shown on mechanical and/or electrical Drawings. Provide insulation for interior locations where indicated on the Drawings.

SECTION 16470

- a) Page 16470-5, Paragraph 2.03.B.1.e, delete this paragraph in its entirety.
 - e. All panels installed outdoors shall have a factory applied, suitable primer and final coat of weatherproof white paint.

and replace with:

- e. Not Used.

SECTION 17500

a) Delete Section 17500 in its entirety and replace with new Section 17500 provided herein. Revised paragraphs are highlighted.

DRAWINGS

- a) Delete sheet G-1007 and replace with G-1007 provided herein.
- b) Delete sheet C-1018 and replace with C-1018 provided herein.
- c) Delete sheet C-1019 and replace with C-1019 provided herein.
- d) Delete sheet C-1029 and replace with C-1029 provided herein.
- e) Delete sheet CP-1011 and replace with CP-1011 provided herein.
- f) Delete sheet CP-1012 and replace with CP-1012 provided herein.
- g) Delete sheet D-1001 and replace with D-1001 provided herein.
- h) Delete sheet D-1104 and replace with D-1104 provided herein.
- i) Delete sheet D-1106 and replace with D-1106 provided herein.
- j) Delete sheet D-1111 and replace with D-1111 provided herein.
- k) Delete sheet D-1112 and replace with D-1112 provided herein.
- l) Delete sheet D-1113 and replace with D-1113 provided herein.
- m) Delete sheet D-1205 and replace with D-1205 provided herein.
- n) Delete sheet D-1602 and replace with D-1602 provided herein.
- o) Delete sheet D-1906 and replace with D-1906 provided herein.
- p) Delete sheet I-1012 and replace with I-1012 provided herein.
- q) Delete sheet I-1017 and replace with I-1017 provided herein.
- r) Delete sheet I-1019 and replace with I-1019 provided herein.
- s) Add new sheet S-1007 provided herein.
- t) Delete sheet S-1501 and replace with S-1501 provided herein.
- u) Delete sheet S-1502 and replace with S-1502 provided herein.
- v) Delete sheet S-1504 and replace with S-1504 provided herein.
- w) Delete sheet S-1932 and replace with S-1932 provided herein.
- x) Sheet A-1502 Hypo (OSG) Building, revise Keynote #20 to the following:

“48" HIGH CHANNEL NUMBERS W/ 2-1/2" DEEP FABRICATED ALUMINUM REVERSE CHANNEL LETTER WITH 1/2" SPACERS; SATIN CLEAR ANODIZED FINISH; STUD AND SILICONE INSTALLATION TO METAL PANELS, COORDINATE WITH OWNER FOR FINAL SIGNAGE”

- y) Sheet A-1603 Dewatering Building, revise Keynote #14 to the following:

“48" HIGH CHANNEL NUMBERS W/ 2-1/2" DEEP FABRICATED ALUMINUM REVERSE CHANNEL LETTER WITH 1/2" SPACERS; SATIN CLEAR ANODIZED FINISH; STUD AND SILICONE INSTALLATION TO METAL PANELS, COORDINATE WITH OWNER FOR FINAL SIGNAGE”

- z) Sheet A-1702 Electrical Building, revise Keynote #14 to the following:

“48" HIGH CHANNEL NUMBERS W/ 2-1/2" DEEP FABRICATED ALUMINUM REVERSE CHANNEL LETTER WITH 1/2" SPACERS; SATIN CLEAR ANODIZED FINISH; STUD AND SILICONE INSTALLATION TO METAL PANELS, COORDINATE WITH OWNER FOR FINAL SIGNAGE”

- aa) Sheet A-1803 Control Building, revise Keynote #20 to the following:

“48" HIGH CHANNEL NUMBERS W/ 2-1/2" DEEP FABRICATED ALUMINUM REVERSE CHANNEL LETTER WITH 1/2" SPACERS; SATIN CLEAR ANODIZED FINISH; STUD AND SILICONE INSTALLATION TO METAL PANELS, COORDINATE WITH OWNER FOR FINAL SIGNAGE”

The remainder of the bid documents remain unchanged.

This addendum is comprised of a total of 94 pages (including attachments).



Jarrett Kinslow, P.E.
Tetra Tech, Inc.
Texas Registered Engineering Firm No. 3924
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San Antonio, Texas 78205

END OF ADDENDUM No. 3

Project: Central Water Integration Pipeline Terminus Treatment Facility

Question and Answer Form

Solicitation No.: CO-00185

Job No.: 18-8616

Question No.	Received	Question	Answer
1	8/15/2018	Please explain difference between evaluation points and percentages. In reference to Supplementary Instructions to Respondents, evaluation of proposals, Number 4, A & B- it notes that the meeting the 20% M/WBE goal will calculate as 10 points toward evaluation, but then in B states that the SBE goal of 5% can earn an additional 5 points towards evaluation. However, under A, MBE, WBE and SBE are all combined and only add up to 10%. Can additional information be provided to break this down?	The percentage is the amount of work a firm will perform on the contract; the points awarded are tied to the percentage to be performed by a SWMVB firm. The maximum amount of points that can be earned for this RFCSP is 10 points. However, a firm can meet the points by using a combination of MWBE or SBE for a maximum of 10. The SWMVB points can also be achieved by using 20% and over MBE's or 20% and over WBE's or a combination of MBEs and WBE's equaling or exceeding 20% of the work to be performed. If a firm is SBE certified and only using SBE firms on this contract the maximum amount of points that can be earned is 5. As a reminder, Respondent's may contact Susan Rodriguez, SMWVB Specialist, directly up until the proposal opening date if they are in need of guidance for their specific situation.
2	8/17/2018	We understand all electrical equipment purchased under each specification section is to be by the same manufacturer; but does all the electrical distribution equipment have to be of the same manufacturer as the MV SWGR & MV MCC's that are pre-purchased under E-3C? This will influence the Power Systems Study Specification 16105. Current E-3C supplier is not listed as an approved firm for the study, will SAWS consider Siemens Power Systems an acceptable equal?	No, the Contractor is not required to use the supplier of the pre-purchased equipment; however, every effort should be taken to supply the electrical distribution equipment through one (1) supplier. Each Approved Equal submission will be evaluated on a case by case basis.
3	8/17/2018	Specification Section 16000 1.05.A.3 implies that all outdoor installed electrical equipment is to be NEMA 4x 316 Stainless Steel enclosures. Panelboard Specification Section 16470, 2.03.B.1.e on (page 5) states "All Panels installed outdoors shall have factory applied, suitable primer and final coat of weatherproof white paint". Please verify if this is correct, as this would mean providing a factory painted 316SS panelboard, which is not an industry standard.	This paragraph will be deleted as described in Addendum No. 3.
4	8/17/2018	Drawing D-1109 identifies Valve # 25-MOV-01 as 8" Flg'd Motorized V-Port Ball Valve. Valve Schedule page 15100-37 identifies this valves as a Pressure Relief Valve Type VB4. Please advise correct type of valve required.	Valve 25-MOV-01 shall be a V-port ball valve as shown on D-1109. Refer to revised valve schedule provided herein.
5	8/17/2018	P&ID Drawing I-1004 identifies Valve # 25-MOV-11 and 25-MOV-21 as an 8" V-Port Ball Valve. Section B on drawing D-1104 identifies these valves as 8" Flg'd Motorized Butterfly Valves. Valve Schedule page 15100-37 shows these valves to be Butterfly valves under description but calls them out as Type VBV (V-Port Ball Valves) under Type/Style. Please advise what type of valves these should be.	Valves 25-MOV-11 and 25-MOV-21 shall be V-port ball valves as indicated on I-1004. Refer to revised D-1104 and valve schedule.
6	8/17/2018	4" Lug Dual Disc Check Valves 25-CV-19 & 29 and 4" Lug Butterfly Valves 25-BFV-19 & 29 shown in Section D on drawing D-1106 and on P&ID Drawing I-1004 is not shown in Valve Schedule Table 15100-1.	Refer to revised valve schedule.
7	8/17/2018	3" Motorized Lug Butterfly Valve 27-MOV-01 shown in Section B on drawing D-1106 and on P&ID Drawing I-1004 is not shown in Valve Schedule Table 15100-1.	Refer to revised valve schedule.
8	8/17/2018	Ref Spec Section 15061 2.01 A. 1. c. "...Sludge Piping from the plate settlers shall have an interior glass lining in accordance with AWWA standards." The pipe schedule on Plan Page D-1001 calls out all sludge piping to be cement lined. Please verify the lining on the sludge piping.	Sludge piping shall be Fusion Bonded Epoxy Lined. Revised language for Section 15061 is provided herein. Revised sheet D-1001 is provided herein.
9	8/17/2018	Please provide specifications for lockers required per sheet A-1807.	Lockers specification will be provided by Addendum No. 3 herein.
10	8/17/2018	When can we expect the signage schedule to come available?	Signage schedule will be provided in a future addendum.
11	8/17/2018	P & ID drawing I-1004 identifies Water Line to Flushing Spray Header in Sludge Blowdown Pit and to Lime Saturator Sludge Lines as NPW. The Water Line to the Hose Bibbs at the Lime Saturators shown in Section B and also in Detail Plan 2 on drawing D-1106 is identified as 1" PW however it feeds from the line identified as 3" & 4" NPW. Please advise if these 1" Water Lines feeding the Hose Bibbs should be NPW.	1" water lines feeding the lime saturator hose bibbs shall be NPW.
12	8/17/2018	Drawing D-1103 shows a Water Line running to each Lime Silo but there is no Line size shown and these lines do not appear to show anywhere else. I do not see a Water Line shown on P&ID drawing I-1003 feeding Storage Silo 20-SI-01. Please advise.	The water line running to each lime silo is a 2" NPW and feeds the lime slaking system within the storage silo. Contractor to coordinate with supplier for service connection.
13	8/17/2018	Drawing D-1103 shows a 2" PW Line feeding from a 2" Backflow Preventer on the Northwest corner of the drawing to the area of the Lime Silos but it is not clear where it goes to from there. Please advise.	The 2" PW line after the BFP (west) services the emergency eyewashes and hose bibbs at the poly/flurofide and CO2 facilities. The 2" PW after the BFP (south) services the eyewashes and hose bibbs at the lime silos.
14	8/17/2018	Please advise whether the 6" Water Line leaving the 6" Backflow Preventer and feeding the Lime System Air Compressor Building and the Lime Saturators should be identified as NPW or PW. The type of material required will differ depending on the Line designation.	The 6" water line after the BFP should be identified as NPW.
15	8/17/2018	Ref Drawings D-1604 & D-1605 – Several on the pipe systems on these pages are not identified.	All pipe systems are noted except Section D in D-1605. An annotated update for Section D will be provided in a future Addendum.

Project: Central Water Integration Pipeline Terminus Treatment Facility

Question and Answer Form

Solicitation No.: CO-00185

Job No.: 18-8616

Question No.	Received	Question	Answer
16	8/17/2018	Several vendors and manufacturers are very concerned as to the LD's on this project. Please review the LD's.	The Liquidated Damages on this project are as defined in the Supplementary Conditions based on the schedule constraints for the project and damages to SAWS should the project milestones not be met.
17	8/17/2018	According to the Steel Pipe Specifications 15055 steel pipe may either be lined with cement mortar or epoxy. However, according to the pipe schedule, sheet D-1001, the pipe listed as BWS, BWW, BYPASS, FLS, FLW, FTW, and FW all requires the pipe to have an epoxy lining. Which is correct?	Steel pipe lining shall be as defined in the drawings as Epoxy. Section 15055 will be clarified in a future Addendum.
18	8/17/2018	Please include the PW pipe to the list provided by Pat in the below email. Also, the Pipe Schedule on Sheet D-1001 has a "RW" (Raw Water) Line Description with Carbon Steel pipe indicated. This would also apply as well, if applicable (I did not see any RW pipe call-outs elsewhere in the Plans.). Please note that Plan Sheet CP-1012 shows "INSULATING FCA" in the vertical piping that connect buried pipe(s) to exposed pipe(s). However, Plan Sheet D-1402 shows "HARNESS MECHANICAL COUPLINGS". Please confirm which type of connection is required.	Steel pipe lining shall be as defined in the drawings as Epoxy. Section 15055 will be clarified. Harness Mechanical Coupling is required. CP-1012 revised herein.
19	8/20/2018	Addenda #2 Q&A's refer to a revised valve schedule, "Attached to this Addendum". Can you please provide the updated valve schedule?	Section 15100 valve schedule changes were detailed in Addendum 2. We will provide a revised attachment in Addendum 3.
20	8/21/2018	Specification 11363-Pg 15, 2.06 CONTROLS A. General 1states: Provide the centrifuge with a complete Allen Bradley CompactLogix 1769-L35E control system completely configured and programmed by the Centrifuge Manufacturer as required for safe and satisfactory operation of unit.	Section 11363 revised to reference Section 17500.
21	8/21/2018	Please consider replacing Allen Bradley Compact Logix 1769-L35E PLC model with current models either 1769-L30ER or 1769-L33ER, both are suitable and are current production models.	Per Addendum No. 3, the Allen-Bradley model number has been updated to CompactLogix 1769-L33ER.
22	8/21/2018	When can we expect the signage schedule to become available?	See answer No. 10
23	8/21/2018	Please provide specifications for lockers required per sheet A-1807	See answer No. 9
24	8/21/2018	Please provide limits of liability for required Rigger's Liability Insurance. This information is necessary to secure quotes.	The Rigger's Liability Insurance requirement is being removed per this Addendum.
25	8/21/2018	Please confirm that MWSB Certs should not be submitted with proposal but after or upon request.	Yes, MWSB certifications must be submitted with the proposal.
26	8/21/2018	Ref Drawing D-1604. Can you provide a section view through the telescoping valve 80-TV-01? Need to see elevations, supports & wall penetrations.	Section added to D-1604 to be provided in a future Addendum.
27	8/21/2018	Please provide Specification for Lighting Protection for the project.	Specification will be provided in a future Addendum.
28	8/21/2018	On Plan Sheet C-1023, the Plan and Profile Views show exposed "54-CPW-CS" (Carbon Steel), however the Piping Materials Schedule on D-1001 shows exposed CPW as "316 SS, SCH 10, WELDED JOINTS". Please confirm the required Pipe and Joint type for the exposed CPW Pipe.	The 54 inch pipe shall be carbon steel. The piping materials schedule shown on sheet D-1001 has been modified to reflect this information.
29	8/22/2018	When can we expect the signage schedule to become available?	See answer No. 10
30	8/22/2018	Please provide specifications for lockers required per sheet A-1807	See answer No. 9
31	8/22/2018	Please provide limits of liability for required Rigger's Liability Insurance. This information is necessary to secure quotes.	See answer No. 24
32	8/22/2018	Please confirm that the RFI cut-off date will remain on Friday August 24, 2018 or if there will be an extension on this with Addendum No. 3.	Per Addendum No. 3, the Request for Competitive Sealed Proposals is being updated to allow questions through August 28, 2018 at 2:00 PM.
33	8/22/2018	Can the date for questions be moved to the 30 th of August, due to the submission date being changed in the last Addendum?	See answer No. 32
34	8/22/2018	According to Specification Section 15055, and also noted on the Plans, ALL Carbon Steel Pipe 36" diameter and smaller shall have a minimum 1/4" wall thickness per SAWS Standards. What is the minimum wall thickness per SAWS Standards for 60" , 54" 48" and 42" Carbon Steel Pipe?	Section 15055 will be revised in a future addendum.

Required Documents Matrix

Documents	Required Document(s) <u>Does</u> Count Towards Page Limit	Required Document(s) <u>Does Not</u> Count Towards Page Limit	Include in Envelope 1	Include on CD or USB	Include in Envelope (or Box) 2 – Original Proposal	Include in Copies of Proposal - 7
Signed Price Proposal/Acknowledgement of Addendums ¹		X	X			
Signed Proposal Certification		X	X			
Bid Bond/Cashier's Check		X	X			
Proposal Checklist ¹		X		X	X	X
CD or USB of Original Proposal Packet (excluding the Price Proposal and Financial Statement)		X		X	X	
Statement on President's Executive Orders		X		X	X	
Good Faith Effort Plan		X		X	X	
Conflict of Interest Questionnaire		X		X	X	
W-9		X		X	X	
Proof of Insurability		X		X	X	
Respondent Questionnaire		X		X	X	X
Supplementary Instructions to Respondents Evaluation Criteria forms ¹	X			X	X	X
Organizational Chart	X			X	X	X
Financial Statement		X		X	X	
Resumes for Key Personnel, Key Subcontractors, and Alternates		X		X	X	X
Total Recordable Incident Rate Records		X		X	X	X
Experience Modification Rate Records		X		X	X	X
Other Safety Documents/Information		X		X	X	X
Narrative for Project Approach and Schedule, including summary of Quality Management Plan	X			X	X	X
Quality Management Plan		X		X	X	X
Project Schedule		X		X	X	X

1. Respondent shall check the SAWS website to verify the number of Addendums and ensure the correct version of the forms are being utilized prior to submitting their proposal.

SECTION 10500

METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Locker units with hinged doors.
- B. Filler panels and accessories

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry

1.03 REFERENCES

- A. ASTM A446/A446M- Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- B. ASTM A526/A526M- Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.04 SUBMITTALS FOR REVIEW

- C. Section 01300- Submittals: Procedures for submittals.
- D. Product Data: provide data on locker types, sizes and accessories.
- E. Shop Drawings: Indicate locker plan layout, numbering plan, combination lock code and finishes.

1.05 SUBMITTALS FOR INFORMATION

- A. Section 01300- Submittals: Procedures for submittals.
- B. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store and protect products under provisions of Section 01500.
- B. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Shanahan Delux, single point latch lockers, Two-tier, Three-tier and handicapped accessible lockers.

- B. Masterlock Model- 1515 LF.
- C. Section 01600- Materials and Equipment: Product options and substitutions. Substitutions permitted.

2.02 MATERIALS

- A. Sheet Steel: ASTM A446 Grade D, ASTM A526 coating designation G90, (ASTM A446M, Grade D, ASTM A526M coating designation Z275, stretcher leveled; to the following minimum thickness:
- B. Sheet Steel: Mild, cold rolled and leveled unfinished steel: to the following minimum thickness:
 - 1. Body and Shelf: 24 gage .024 inch (0.6 mm).
 - 2. Door Outer Face: 24 gage .024 inch (0.6 mm).
 - 3. Door Inner Face 20 gage .036 inch (0.9 mm).
 - 4. Door Frame: 16 gage .060 inch (1.5 mm).
 - 5. Hinges: 14 gage .075 inch (1.9 mm).
 - 6. Base: 20 gage .036 inch (0.9 mm).
 - 7. Sloping Top: 20 gage .036 inch (0.9 mm).
 - 8. Trim: gage .036 inch (0.9 mm).

2.03 ACCESSORIES

- A. For Each Locker Opening: One double prong wall hook, and two side wall hooks.
- B. Locker numbers, steel trim, closures, fittings and appurtenances of materials and finish to match lockers as necessary to neatly trim lockers.

2.04 FABRICATION

- A. Locker Units:
 - Width: 12 inches (300 mm).
 - Depth: 12 inches (300 mm).
 - Height Configuration: Single Two-tier as shown on the drawings.
 - Mounting: Surface mounted.
 - Base: On wood base.

Base Height: 4 inch (100 mm).

Top: Metal with top closure trim or sloped top as indicated on drawings.

Locking: Equipped for combination locks for padlocks hasps.

Ventilation Method: Door Louvers top and bottom of door.

- B. Locker Body: Formed and flanged: with steel stiffener ribs, electric spot welded.
- C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets. Bumper and latching for quiet operation.
- D. Doors: Hollow channel construction with laminated honeycomb core, 1 3/16 inch (30 mm) thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, acoustic insulation fill, grind and finish edges smooth.
- E. Hinges: Two for doors under 42 inches (1.050 mm) high; three for doors over 42 inches (1.050 mm) high; weld securely to locker body and door.
- F. Locking device supplied by Contractor, one per door.
- G. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1.5 inch (38 mm) high of block font style, with TAS designation, in contrasting color.
- H. Provide ventilation openings at top and bottom of each locker door.
- I. Form recess for operating handle and locking device.
- J. Finish edges smooth without burrs.
- K. Fabricate metal tops, ends and closure pieces.
- L. Provide perforated end panels and filler strips.

2.05 FINISHES

- A. Clean, degrease, and neutralize metal: prime and finish with two coats of baked enamel.
- B. Colors: Standard colors per manufacture's options.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01040- Coordination and Meetings: Verification of existing conditions before starting work.
- B. Verify that prepared bases are in correct positions and configuration.
- C. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullot Force: 100 lbs. (445 N).
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels and filler panels.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Section 01770- Contract Closeout: Cleaning installed work.
- B. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 11217

VERTICAL IN-LINE CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals, including Special Services, required to provide pumps, drivers, motors and drive arrangements with seals, couplings, base plates, guards, supports, anchor bolts and appurtenances as shown on the Drawings and specified in this Section.
 - 1. Provide two (2) vertical in-line centrifugal pumps for the carbon dioxide pressurized solution feed system.
 - a. Equipment Tags: 15-PMP-11 and 15-PMP-12
- B. The unit shall be furnished with all necessary accessory equipment and auxiliaries whether specifically mentioned in these Specifications or not, and as required for an installation incorporating the highest standards for the type of service, including field testing and instructing the regular operating personnel in the care, operation, and maintenance of all equipment.

1.02 RELATED WORK

- A. Section 01300 – Submittals
- B. Section 01600 – Material and Equipment
- C. Section 01730 – Operation and Maintenance Data
- D. Section 01752 – Facility Start Up Commissioning Requirements
- E. Section 03300 – Cast-In-Place Concrete
- F. Section 09900 – Painting and Coating (Except as Specified Herein)
- G. Division 15 – Mechanical Piping, Valves, Pipe Hangers, and Supports
- H. Division 16 – Electrical – General Provisions, Electrical Work, and Motors

1.03 DEFINITIONS

- A. Relevant terminology shall be defined according to the American National Standard for Centrifugal Pumps for Nomenclature, Definitions, Application and Operation. Hydraulic Institute ANSI/HI 1.1-1.5.

1.04 SUBMITTALS

- A. Submit required information in accordance with Section 01300 - Submittals. Submit catalog sheets showing pump characteristics and dimensions, including the following Dimensional and Layout Data:
1. Certified dimensional drawings of each item of equipment and auxiliary apparatus to be furnished, showing all important details of construction, dimensions, materials, space required, clearances, anchor bolt locations, piping and electrical connections and requirements, controls, type of finish, installation instructions, and other pertinent information.
 2. Certified sectional drawing of pumping unit with part numbers and material specifications.
 3. Manufacturer's literature and illustrations, bulletins, and/or catalogs of the equipment.
 4. In the event that it is impossible to conform with certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.
- B. Design Data:
1. Submit Prior to Manufacturing:
 - a. Submit Manufacturer's certified rating curves for each pump, showing pump characteristics for discharge head, capacity, brake horsepower, pump efficiency at the "rated" point, pump efficiency curve for pump, and guaranteed net positive suction head required (NPSHR). This information shall be prepared specifically for each pump provided, based on actual shop tests of similar units. Catalog sheets showing a family of curves will not be acceptable. Curves shall be submitted on 8-1/2-inch by 11-inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to pump capacity at minimum specified total head.
 - b. Submit complete motor data, including temperature switch information and wire termination diagrams. The following data shall be provided on the drive motors: rpm at full load, frequency, voltage, full load current, code and design, letter, efficiency, horsepower, number of phases, time rating, temperature rise, service factor, service duty, and bearing life rating. The submittal shall include motor manufacturer's recommended lubrication requirements.
 - c. Submit dry weights of pump, motor, and base plate, and weight of entire pumping unit.
 - d. Submit pump/motor coupling manufacturer, model number, AGMA 9002-A clearances and tolerances.
 - e. Certified dimensional outline drawing and weights of pump, motor, and base plate.
 - f. Cross-sectional drawings with detailed construction of each component in the pump along with the ASTM material designations.

- g. Bill of materials of all equipment including the weights of equipment furnished.
 - h. Shaft seal drawing, shaft coupling and bill of materials.
 - i. Certified pump support and anchor bolt plans and details.
 - j. Electrical and instrumentation schematics, wiring diagrams, arrangement drawings, list of connections, and bills of materials.
 - k. Shaft design calculations along with worst case shaft deflections at the impeller, wear rings, and mechanical seals.
 - l. Data sheets applicable to proposals, purchase, and as-built drawings.
 - m. Certified drawings of auxiliary systems.
 - n. Manufacturer's installation instructions.
 - o. Qualifications of pump manufacturer Service Engineer.
 - p. Factory test procedure.
 - q. Installation operations and maintenance manuals.
 - r. Preservation; packing, and shipping-procedures.
2. Submit Prior to Shipment:
- a. Materials certifications for castings, impellers, shafts, and shaft sleeves.
 - b. Certified hydrostatic test data.
 - ~~c. Certified test data for factory acceptance testing.~~
 - ~~d. Certified motor test data as specified in Division 16.~~
3. Submit Prior to Startup:
- a. Spare parts recommendations and price lists.
 - b. Material safety data sheets.
 - c. Operation and maintenance data in accordance with Section 01730 - Operation and Maintenance Data. Manuals shall include data for each pumping unit, including pump and motor.
 - d. Report of installation, inspection, testing, and observations for each pumping unit.
 - e. Letter of Certification.

- C. Test Reports:
 - 1. Submit certified test reports as specified in Part 2 of this Section.
 - 2. Submit certified motor test data as specified in Division 16.
- D. Submit a Manufacturer's field report, including the following:
 - 1. Report of installation, inspection, testing, and observations for each pumping unit.
 - 2. Letter of Certification. Furnish the Engineer with a written certification signed by the manufacturers' representative that the installed equipment:
 - a. Has been properly installed per the manufacturer's requirements.
 - b. Has been lubricated per the manufacturer's instructions.
 - c. Has been accurately aligned and proper running clearances set.
 - d. Is free from undue stress imposed by piping or mounting bolts.
 - e. Is ready to be operated on a continuous basis, and is free from any known defects.

1.05 REFERENCE STANDARDS

- A. Design, manufacture, and assembly of elements of the equipment herein specified shall be in accordance with, but not limited to, current published standards of the following, as applicable:
 - 1. American Bearing Manufacturer's Association (ABMA).
 - 2. American Gear Manufacturer's Association (AGMA).
 - 3. American Institute of Steel Construction (AISC).
 - 4. American Iron and Steel Institute (AISI).
 - 5. American Society of Mechanical Engineers (ASME).
 - 6. American National Standards Institute (ANSI).
 - 7. American Society for Testing Materials (ASTM).
 - 8. American Welding Society (AWS).
 - 9. Anti-Friction Bearing Manufacturer's Association (AFBMA).
 - 10. American Water Works Association (AWWA).
 - 11. Hydraulic Institute Standards (HI).

12. Institute of Electrical and Electronics Engineers (IEEE).
13. Instrumentation, Systems, and Automation Society (ISA).
14. International Standards Organization (ISO).
15. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
16. National Electrical Code (NEC).
17. National Electrical Manufacturer's Association (NEMA).
18. NSF International Strategic Registrations, Ltd (NSF).
19. NSF Standard 61 - Drinking Water System Components.
20. Occupational Safety and Health Administration (OSHA).
21. Society of Automotive Engineers (SAE).
22. Steel Structures Painting Council (SSPC).
23. Underwriters' Laboratories, Inc. (UL).

1.06 QUALITY ASSURANCE

- A. The equipment covered by these Specifications is intended to be standard pumping equipment of proven ability as manufactured by reputable companies having extensive experience in the production of such equipment. The equipment furnished shall be designed and constructed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings. Pump shall be manufactured in accordance with the Hydraulic institute standards. The manufacturer of the pump units shall have a quality management system in place and shall be ISO 9001 and 14001 certified.
- B. The Pump Manufacturer shall be fully responsible for the design, arrangement, and operation of all connected rotating components of the assembled pumping unit to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range.
- C. The new carbon dioxide solution pumping units shall be complete, including pump, motor, temperature switches, and terminal boxes. The Pump Manufacturer shall be responsible for the furnishing and performance of the complete pumping units.
- D. The Pump Manufacturer shall have furnished pumping units in the United States which are similar in design, type, and service, and comparable in size, head, and capacity to those specified to be furnished. Such comparable pumping units shall have been in satisfactory operation for a period of not less than five (5) years.
- E. The Pump and Motor Manufacturers shall currently have maintenance and repair facilities established and in operation in the United States for a period of not less than three (3) years. Such facilities shall be fully equipped and staffed with qualified personnel for making repairs to

damaged pumps and motors shall stock or have direct access to a full line of maintenance spare parts.

F. Vibration:

1. The Pump Manufacturer shall review the Specifications and Drawings, including piping, pipe supports, harnessing arrangements, and foundations to fully evaluate the field installation conditions prior to bidding.
2. Acceptable field vibration and factory vibration limits shall be in accordance with the Centrifugal Pump Hydraulic Institute Standards (ANSI/HI 1.1-1.2-2014, 1.3-2013, and 1.4-2014).

G. Services of Manufacturer's Representative:

1. Provide services of Pump Manufacturer's factory service Engineer specifically trained in the installation, operation, and maintenance of pumping units as specified herein. The services of the Manufacturer's Representative shall be made available during the installation period for assistance to the Contractor for adjusting and checking equipment.
2. Man-hour requirements tabulated below are exclusive of travel time and do not relieve the Contractor of obligation to provide sufficient service to place equipment in satisfactory operation.
3. The factory representative(s) shall be provided for trips and durations as shown below.

	<i>Services Provided by Factory Representative</i>	<i>Minimum Number of Trips ^(a)</i>	<i>Minimum Time at Site Per Trip (Hours)</i>
1	Supervise Installation of Pumps and Check Pump Leveling and Alignment ^(b)	1	168
2	Supervise Startup and Initial Run to Demonstrate Successful Operation	1	8
3	Instruct Engineer and Owner's Reps in Proper Startup and O&M ^{(c)(4)}	1 ^(d)	8 ^(d)
4	Additional Trips for Troubleshooting Following Installation ^(e)	-	-

- a. Representative(s) shall be present at frequent enough intervals to ensure proper installation, testing, and initial operation of the equipment.
- b. The Manufacturer's representative shall provide to the Engineer a written certification that each pump has been installed in accordance with the Manufacturer's recommendations.
- c. In the event the services of the Manufacturer's Representative are needed and requested by the Contractor for periods longer than indicated in these Contract Documents, payment for such services shall be made by the Contractor. No payment from Owner shall be due for time spent by the Representative due to faulty design, fabrication, or installation of the equipment.

- d. Instruction may be given upon completion of Item 3 and within the same trip and minimum time per trip, provided that the field testing by Owner's independent testing laboratory is successful and the O&M Manuals have been submitted to and accepted by the Engineer.
- e. Representative(s) shall be present as necessary to operate successfully following start-up, at no additional cost to Owner.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.
- B. Pumping units shall be shipped with the motor space heaters connected to a terminal board and ready to be energized.
- C. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.
- D. Each box or package shall be properly marked to show its contents and net weight.
- E. All equipment shall be delivered in good, sound condition, and free from damage. Equipment which has been damaged will be rejected.
- F. The Contractor shall be responsible for proper unloading, handling, and storage of equipment in accordance with the Manufacturer's instructions.

1.08 MAINTENANCE

- A. Pump Spare Parts: Furnish the Manufacturer's standard set of spare parts for each size pump, including at least the following for each pump station:
 - 1. One (1) set of pump bearings.
 - 2. One (1) complete mechanical seals.
 - 3. One (1) spare casing gasket and o-ring.
 - 4. ~~One (1) set of casing and impeller wear rings. One (1) set of shaft sleeves and nuts.~~
 - 5. ~~One (1) set of spare thrust bearings.~~
 - 6. 5. One (1) set of pressure gauges.
 - 7. 6. Additional spare parts shall be provided in accordance with manufacturer's recommendation.

Note: One (1) set comprises parts for inboard and outboard side of the pump.

B. Motor/Coupling Spare Parts: Furnish the Manufacturer's standard set of spare parts for each size pump, including at least the following for each pump station:

~~1. One spare gasket to fit between coupling hub flanges.~~

1. ~~2.~~One complete flexible couplings.

2. ~~3.~~One spare set of motor anti-friction bearings.

C. Lubricants: Pump and drive units shall be delivered with the equipment fully lubricated insofar as possible. If any point cannot be serviced, it shall be clearly marked to the effect that it is not lubricated and requires serving prior to operation. An adequate supply of proper lubricant, with instructions for its application, shall be supplied with the equipment for each point not lubricated prior to shipment.

D. Spare Parts Delivery/Storage: Crate and deliver spare parts in substantial wood boxes with hinged covers. Clearly and indelibly identify the contents of each box on its exterior. Each part shall be sealed, wrapped, or otherwise protected from corrosion during storage.

1.09 PERFORMANCE GUARANTEE

A. The Contractor shall guarantee the performance of each pumping unit to meet or exceed the specified performance. The guarantee shall include the complete pumping unit assembly, and shall cover speed, capacity, head, efficiency, brake horsepower, motor horsepower, and the performance curves for the pump. The capacity, head, and efficiency guarantee shall apply to the Rated Point (Primary Condition) on the pump's head capacity curve at the specified head and capacity specified herein. If the pumping units fail to meet the efficiency at Rated Point, corrective measures shall be taken as indicated in Part 3 - Execution.

~~1.10 OWNERSHIP OF PATTERNS~~

~~A. The Pump Manufacturer shall provide written documentation that the patterns for the pump casings and impeller are under their direct control and that patterns will be available for at least 15 years, in the event that duplicate pumps are desired by the Owner.~~

1.10 1.11 WARRANTY

A. Contractor shall provide a two-year Manufacturer warranty on the entire pump unit (pump/motor/etc.). The warranty period will commence at the time of final acceptance by the Owner which shall begin no later than April 15, 2020. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the Manufacturer and Contractor.

PART 2 PRODUCTS

2.01 GENERAL

- A. Pumps shall be of the vertical, in-line, centrifugal, single stage design for outdoor installation. Design shall comply with ANSI B73.2M, except as modified herein. The pumps shall be of standard dimensions; built to limit gauges or formed to templates, such that parts will be interchangeable between like units.
- B. Manufacturer List:
 - 1. Goulds
 - 2. Aurora
 - 3. Grundfos PACO
 - 4. Afton Pumps
- C. Coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.
- D. Pump curves shall be continuously rising and shall be free of dips and valleys from the design point to the shut-off head.
- E. Material Service Requirements: Pumps and all related equipment shall be constructed of materials suitable for the intended applications.
- F. All parts shall be so designed and proportioned as to have liberal strength and stiffness, and to be especially adapted from the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.
- G. Parts Numbering: Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Identical parts for separate units shall have the same number.
- H. The nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its pump is operating at any point on its characteristic curve at maximum speed.
- I. All pumps shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain. All pumps shall be designed for outdoor service.
- J. Miscellaneous Parts: The equipment shall be furnished with shims, stainless steel anchor bolts, couplings, motor flanges, and any other miscellaneous materials necessary to properly mount and install pump and motor.

2.02 PERFORMANCE AND DESIGN CRITERIA

A. Pumping units shall be designed for the operating conditions as follows:

Pump Tags	15-PMP-11 and 15-PMP-12
Quantity	2
Service	Carbon Dioxide Booster Pumps
Design Point:	
Capacity	900 gpm
Total Design Head (TDH)	150 ft
Minimum Efficiency	76%
Secondary Condition	
Capacity	1,080 gpm
TDH	135 ft
Minimum Efficiency	77%
Operating head range for full speed continuous operation	143-150 ft
Minimum shutoff head	165 ft
Maximum shutoff head	172 ft
Maximum nominal pump speed.	1,800 rpm
Maximum Motor Horsepower	75 hp
Pump designed for reverse rotation	No
Maximum NPSH Required at Design Point	12.5 ft
Minimum NPSH Available at Rated Head	55 ft
Maximum suction pressure	13.1 psig
Maximum unfiltered vibration velocity	Per Centrifugal Pump Hydraulic Institute Standards ANSI/HI 1.1-1.2-2014, 1.3-2013, and 1.4-2014
Pump rotation as viewed from driven end	See drawings
Minimum pump suction nozzle size	6 in
Minimum pump discharge nozzle size	4 in
Pump Manufacturers	A. Goulds B. Aurora

B. All specified conditions shall be at rated speed, unless otherwise indicated.

C. The minimum hydrostatic test pressure shall be 1.5 times the maximum design pressure for the pump or twice the pump shutoff head, whichever is greater.

~~D. Pumping units shall be designed so that maximum reverse rotation due to reverse flow at the head specified above will not cause damage to any component. Pump Manufacturer shall coordinate this provision with the motor supplier.~~

D. E.—When operating at the output speed of the drive supplied, each pump shall have a characteristic performance curve which meets all the minimum conditions listed in the Table above. The pumps and motors shall be capable of operating satisfactorily under the full range of conditions defined.

E. F.—Maximum motor speeds shall not exceed those listed in the Table above to satisfy the specified hydraulic duty requirements.

F. G.—The maximum brake horsepower required by the pumps shall not exceed the maximum horsepower listed. If the pumping units require more than the maximum horsepower listed at the motor output shaft at any full speed operation point between shut-off and secondary discharge head, they will be rejected.

2.03 CASINGS

A. Materials:

1. Pump casings shall be volute type casing design for the type of service herein specified and be constructed of Stainless Steel, AISI Type 316.
2. The design pressure of the casing, including the stuffing box and gland, shall be at least as great as the pressure-temperature rating of ANSI B16.1, Class 125 flanges. Design casing and cover to withstand a hydrostatic test of 1.5 times the maximum design pressure for the pump or twice the pump shutoff head, whichever is greater. Casings shall be fitted with the appropriate size ANSI Class 125 flange connection.

B. Design/Fabrication:

1. Casings shall be of sufficient thickness and suitably ribbed, if necessary, to withstand all stresses and strains to which it may be subjected during erection, testing, and operation.
2. Casings shall be of sufficient strength, weight and thickness to provide accurate alignments and prevent excessive deflection.
3. Free of blowholes, sand holes, and other detrimental defects, with smooth water passages.

C. Vertical-In-Line Provisions: Pump casings shall be volute type casing design for the type of service herein specified. The design shall permit removal of the rotating elements from the top of the casing without disturbing the suction and discharge connections or the pump driver through back pullout assembly. Provide threaded (ANSI B1.20.1) drain connections in the bottom of the casing. Provided threaded (ANSI B120.1) tapped openings for lantern ring connections, stuffing box drain, and casing drain. Minimum connection or outlet size shall be ¼-inch. Support the pump by a 316 stainless steel casing support.

D. Casing and glad shall have a corrosion allowance of at least 1/8-inch.

- E. Suction and discharge connections shall be flanged, ANSI B16.1, Class 125. Flanges shall be flat faced. The suction and discharge flanges shall be located on a common center line 180 degrees apart for mounting in-line. Bolt holes shall straddle the horizontal and vertical centerlines.

2.04 IMPELLERS

- A. Materials: Entirely made of Stainless Steel, AISI Type 316.
- B. Type: Open or closed type.
- C. Design/Fabrication:
 - 1. Designed with ample strength and stiffness for maintaining the maximum capacity of the unit.
 - 2. The impeller shall be a one-piece casting completely machined on all exterior surfaces. The interior water passage shall have uniform sections and smooth surfaces and shall be free from cracks and porosity.
 - 3. Statically and dynamically balanced to prevent whipping and vibration throughout the operating range, from shutoff head to run out. Perform a precision balance of entire rotating assembly to ISO Grade G2.5 and provide the balance certificate in the quality control section of the O&M Manual. The pump manufacturer shall be fully responsible for the vibration-free operation of the pumping unit throughout the entire operating range.
 - 4. No fillers of any type will be allowed.
- D. Mounting: The impeller shall be securely fastened to the shaft by means of a threaded connection or an impeller key and screw. Provide shaft and sleeve design such that the sleeves tighten with the rotation of the shaft. The shaft sleeve shall extend the length of the seal box.

2.05 WEAR RINGS (CASING AND IMPELLER)

- A. Each pump casing and impeller shall be fitted with removable wearing rings.
- B. Materials: Stainless Steel, AISI Type 316.

2.06 SHAFT

- A. Materials: Stainless Steel, ASTM A276, Type 416 or Stainless Steel, AISI Type 316.
- B. Design/Fabrication:
 - 1. Pump shaft shall have an impeller extension and be stress relieved, machined to true dimension, accurately ground and polished over the entire length.
 - 2. The pump shaft shall be protected from wear by a corrosion and wear resisting hardened stainless steel shaft sleeve having a 400 minimum brinell hardness.

3. Maximum allowable flexural shaft deflection shall be no greater than 0.002-inch through stuffing box with pump running at design condition and 0.002-inch at shut off condition.

2.07 SHAFT SLEEVES

- A. The pump shaft shall be protected from wear by a corrosion and wear resisting hardened stainless steel shaft sleeve having a 400 minimum brinell hardness. Stuffing boxes shall have hardware constructed of corrosion-resistant metals.
- B. Materials: Stainless Steel, ASTM A276, Type 416 or Stainless Steel, AISI Type 316.
- C. Design/Fabrication:
 1. The sleeves shall be secured in place, for both directions of pump rotation, with shaft nuts incorporating set screws for locking purposes.
 2. The standard hardened stainless steel shaft sleeve design shall be provided with an o-ring.
 3. Shaft sleeve nuts shall be threaded.

2.08 SHAFT MECHANICAL SEALS

- A. Pumps shall be supplied initially with mechanical bellows type seals which are interchangeable with conventional packing.
- B. Materials:
 1. Stationary Seal Face: Carbon.
 2. Rotary Holder: Stainless steel, grade 316.
 3. Rotary Seal Face: Reactive Silicon Carbide or Ceramic.
 4. Seal glands: Stainless steel, grade 316.
 5. Springs: Hastelloy C or Elgiloy.
 6. Elastomers: Viton or Ethylene Propylene
- C. Type:
 1. Chesterton Model 886 S10
 2. John Crane
- D. Design/Fabrication:
 1. Seal glands shall have a flush connection at the top and along the vertical centerline or at 30 to 45 degrees from the horizontal centerline.

2. Seal must consist of assemblies which fit together over a shaft to form a self-setting and aligning cartridge seal design.
3. The seal must eliminate the need for shims or dimensions to be taken for proper installation.
4. Provide water flushing per API Plan 11 with stainless steel seal water tubing, with stainless steel hand valve, from the pump casing to the gland flush connection. The hand valve shall be tagged with a stainless steel warning tag indicating the valve is to be open at all times during operation.
5. Any additional equipment required, such as pressure relief valve, flow switch, or flow indicator shall be provided by Manufacturer at no additional cost to the Owner. Any instrumentation required for these devices shall be provided by the Manufacturer.

2.09 MISCELLANEOUS FITTINGS

- A. Small fittings and accessories inside the pump and around the shaft sleeves, such as set screws, bolts, and nuts that are exposed to water or water spray, shall be of the hex head type 316 stainless steel (18-8).
- B. Materials: 316 stainless steel or other approved non-corrosive materials.

2.10 PUMP BEARINGS

- A. Pump bearings shall be antifriction, double row, deep-groove type ball bearings. They shall be designed and sized for at least 100,000 hours calculated minimum L10 rated bearing life at 25% BEP per ANSI/HI 1.3-2013. Each bearing shall be capable of carrying both line and thrust type loads. ~~All bearings shall be manufactured in the United States.~~
- B. Provide Inpro bearing isolators.
- C. Pump bearings shall be greased lubricated and shall allow for re-greasing of bearings. Pump design shall allow for the bearing to be removed without disturbing the upper casing for inspection and replacement of the bearings, seals and shafts.
- D. Bearing housing shall be designed to maintain shaft alignment and ensure long bearing and lubricate life.

2.11 BEARING BRACKETS

- A. The bearing brackets shall be accurately machined and doweled to the casing or with 360 degrees attachment to the upper and lower casing for a perfect shaft alignment by full register fit to the casing. The manufacturer shall have the option of constructing the bearing brackets integral to or separate from the pump casing.

2.12 PUMP BASE SUPPORT

- A. A support base for pump shall be provided.

- B. The support base shall be structurally capable of supporting the weight of the pump and motor and resisting torsional movement.
- C. The support base shall have adequate drainage.
- D. Submittal of support base design to the Engineer prior to fabrication is required.
- E. The pump shall be mounted on a 316 stainless steel base plate provided with anchoring to a concrete pedestal. Anchor bolts shall be provided as specified in Section 2.15. Pump mounting surfaces shall be machined for ease of realignment.
- F. The base shall be designed in accordance with the following seismic design parameters:
 - a. Site Classification:B
 - b. Site Coefficient (F_a): 1.0
 - c. Site Coefficient (F_v): 1.0
 - d. S_s : 0.074 g
 - e. S_1 : 0.030 g

2.13 ACCESSORIES

- A. Provide lifting lugs that are positioned to provide balance during lifting.
- B. Equipment base shall be manufactured and provided by the pump manufacturer and assembled together with the pump.

2.14 BALANCE

- A. All rotating parts shall operate smoothly without excessive vibration.
- B. Pump impeller assemblies shall be statically and dynamically balanced to within 1/2 percent of W times R squared, where W equals weight and R equals impeller radius.
- C. Contractor shall purchase a precision balance on the motor rotor, coupling, and the pump rotor from an independent tester at no additional cost to the Owner. Contractor shall provide the balance certificates from the manufacturer of the component.

2.15 ANCHOR BOLTS

- A. Materials: Type 316 Stainless steel.
- B. Design/Manufacturing:
 - 1. Pump Manufacturer shall provide the anchor bolts and an anchor bolt template to the Contractor prior to construction of the structural equipment pad. The template shall be stiff enough to maintain relative anchor bolt hole orientation. The template shall locate the pump suction and discharge connection centerline and projection line.

2. Anchoring system shall be appropriately sized and provided by the Pump Manufacturer to adequately handle all loads applied for the piping configuration shown on the drawings in accordance with the Hydraulic Institute Standards.
3. Bolts shall be of adequate length and design to transfer loads into the structural equipment pad.

2.16 PUMP/MOTOR COUPLINGS

- A. Couplings shall be heavy-duty flexible type, keyed, and locked to the shaft.
- B. Lubrication: Grease.
- C. Coupling Guards: Enclosed Type.
- D. Bolts and nuts on the exterior surfaces: Grade 5 or 8 fasteners.

2.17 PUMP MOTORS

- A. The pump manufacturer shall supply the electric motor and shall ensure proper coordination for mounting of the motor on the pump. The pump manufacturer shall properly select and size the drive unit for the pump inclusive of thrust bearing capacity for all conditions at start-up, runout, and shutoff. Motors shall meet the requirements of Section 16150 - NEMA Frame Induction Motors.
- B. The pump shall be a TEFC standard C face vertical motor. The motor shall be designed for continuous operation with a 480 volt; 3-phase, 60 Hertz power service; and with maximum horsepower and speed specified in Section 2.02.A.
- C. The motors shall not be overloaded at any point on the driven pump's performance curve.
- D. The pump motors shall be equipped with soft starters and temperature switches as specified in Division 16.

2.18 EQUIPMENT APPURTENANCES

- A. Pumping equipment shall be provided with all necessary equipment appurtenances to make the pumping units functional.
 1. Bolts, nuts, and washers shall be Type 316 stainless steel.
 2. Bolts and nuts shall conform to the requirements of ASTM F593 and ASTM F594.
 3. Threads shall be clean-cut and shall conform to ASME B1.1.
- B. Metal equipment guards shall be provided on all equipment driven by open shafts.
 1. Guards shall be designed to enclose the drive mechanism completely and be easily removable.

2.19 INFORMATION PLATES / MARKINGS

- A. Materials:
 - 1. Nameplate: Stainless steel.

- B. Pump Nameplate: The nameplate shall clearly show pump information and complete performance data, including:
 - 1. Manufacturer's name.
 - 2. Pump size and type.
 - 3. Serial number.
 - 4. Speed.
 - 5. Impeller diameter.
 - 6. Capacity and head rating.
 - 7. Bearing identification, name, and number.
 - 8. Pump weight, motor weight.
 - 9. Other pertinent data.

- C. Motor Nameplate: The nameplate shall clearly show motor information, including:
 - 1. Manufacturer's name.
 - 2. Model number.
 - 3. Serial number.
 - 4. Horsepower.
 - 5. Speed.
 - 6. Frequency.
 - 7. Voltage.
 - 8. Phase.
 - 9. Efficiency.
 - 10. Service factor.
 - 11. Other pertinent data.

2.20 ASSEMBLY, MOUNTING, & ALIGNMENT

- A. Factory Pre-mounting and Alignment. Pumps with their motors shall be pre-mounted and pre-aligned. Mounting holes for the pump, support feet or assembly, and base plate shall be drilled and tapped at Pump Manufacturer's factory. Factory alignment data shall be furnished to the Contractor. Pump Manufacturer shall not install anchor bolts at factory; but shall ship base support components and supply anchor bolts loose.
- B. Site Final Mounting and Alignment. **If alignment is necessary in the field,** the pump and motor shall be aligned using a laser alignment instrument and shall follow Hydraulic Institute Standards. Contractor to make several alignment checks in the process of installing each unit. First, align pump on base support prior to connecting piping, and check for soft-foot. Second, align (or check alignment of) pump and base support after piping is connected, and check for soft-foot. Finally, check alignment after operation for 30 days. The Pump Manufacturer shall set the alignment limit tolerance. Under the Pump Manufacturer's guidance **and supervision,** the Contractor shall install anchor bolts after Final alignment described above.
- C. Any delays caused by:
 - 1. Difficulty in pump/motor/base plate assembly due to inadequate coordination between the Motor Supplier and Pump Manufacturer, or
 - 2. Incorrect dimensional data relating to the base plate dimensions or anchor bolt configuration that are provided by the Pump Manufacturer to the Contractor shall subject the Pump Manufacturer to liquidated damages as provided for late delivery.

2.21 EXTERIOR FINISH

- A. Exterior of pumps, motors, frames, base plates, and appurtenances shall be painted prior to shipment from factory. Pump units shall be prepared and shop-primed in accordance with Section 09900 – Painting and Coating. Units shall receive finish coating in the field. All coatings used for shop painting shall be the products of the same manufacturer as the coating to be used for field painting to assure coating compatibility.

2.22 SHOP TESTING

- A. ~~Each pumping unit, including pump and motor, shall be witness tested at the Pump Manufacturer's factory.~~ Each pumping unit shall be hydrostatically tested in accordance with the Hydraulic Institute Standards.
- B. Hydrostatic Tests: Pump casings tested at 150 percent of shutoff head. Test pressure maintained for not less than 30 minutes.
- C. The pump Manufacturer shall dynamically balance rotating parts of each pump and its driving unit before final assembly.
- D. ~~Performance Tests: Each pumping unit shall be performance tested in accordance with the Hydraulic Institute standards. The pump Manufacturer shall provide a Factory Test Report certified by a licensed professional engineer for review by the Owner prior to shipment. The~~

Factory Test Report shall include performance curve test results and performance test logs per the Hydraulic Institute Standards.

PART 3 EXECUTION

3.01 STORAGE & EXERCISE

- A. The Contractor shall provide any required maintenance, exercise, and storage for all pumping units included in this Specification, in accordance with Manufacturer recommendations, until final project acceptance at no additional cost to the Owner.

3.02 INSTALLATION

- A. The Contractor shall install pumping units as shown on the Drawings and in accordance with the Manufacturer's instructions and approved shop drawings. The Manufacturer shall provide Special Services as specified.
- B. Installation of the pump and motor shall be in accordance with American National Standard for Centrifugal Pumps for Nomenclature, Definitions, Application, and Operation Hydraulic Institute ANSI/HI 1.1-1.5 and Manufacturer's printed instructions. The pump shall be aligned using a laser alignment instrument.
- C. The pump Manufacturer shall approve and sign-off on proper installation.
- D. A qualified factory-trained manufacturer's representative shall personally inspect the equipment at the jobsite and shall certify in writing that the equipment has been installed, adjusted, and tested, in accordance with the manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL AND TESTING

- A. After pump has been completely installed, the Contractor shall conduct, in the presence of the pump Manufacturer, the Engineer, and the Owner, demonstration testing of all mechanical equipment and piping in operation to demonstrate capacity, correct alignment, smooth operation, proper adjustment, and freedom from noise, vibration, over-heating and leaking, and to ensure satisfactory compliance with the Specifications. All defects shall be corrected. The Contractor shall supply all grease, electric power, water, and all other material necessary to complete the field tests.
- B. The demonstration testing shall demonstrate that all items of these Specifications have been met by the equipment, as installed.
- C. If the pump performance during the demonstration testing does not meet the Specifications, corrective measures shall be taken by the Contractor, or pump shall be removed and replaced with a pump which satisfies the conditions specified. The Contractor shall conduct further tests until written certification is received from the Engineer.
- D. All piping, fittings, and valves shall be hydrostatically tested in accordance with Section 15085 – Water Pipeline Testing.

END OF SECTION

SECTION 11241

POLYMER FEED SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provide package emulsion polymer preparation systems for conditioning lime saturator influent, pressure filter influent, gravity thickener influent sludge, and thickened lime sludge to centrifuge for dewatering.
- B. Including: Skid mounted liquid polymer preparation system, controls, piping, peristaltic neat polymer metering pumps, valves, and appurtenances.

1.02 RELATED SECTIONS

- A. Section 09900—Painting
- B. Section 11200—Water Filtration System
- C. Section 11220 – Lime Saturator Solids Contact Units
- D. Section 11450—Gravity Thickener
- E. Section 11363—Centrifuge
- F. Division 16—Electrical
- G. Division 17—Instrumentation

1.03 REFERENCES

- A. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps, 13th Edition.
- B. NEC—National Electrical Code.
- C. NEMA—National Electrical Manufacturer's Association.

1.04 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Polymer system for lime saturators:
 - 1. Number of units: Two (2)
 - 2. Influent flow: 0.5, 1.4, 1.7 MGD (Min, Avg, Max)
 - 3. Polymer concentration: 0.2 to 1.0 mg/l

4. Operating schedule: 24 hours/day, 7 days per week
 5. Emulsion polymer neat activity: 40 percent
 6. Emulsion polymer consumption (gal/hr): 0.01 – 0.17
 7. Final solution feed concentration: 0.1 to 0.5 percent active
 8. Neat polymer metering pumps:
 - a. Number of units: Two (2); One (1) per system
 - b. Operating capacity range (gal/hr): 0.02 to 0.2
 - c. Maximum inlet pressure: 10 psi
 - d. Type: Peristaltic
 9. Dilution water: 0.05 to 3.0 gpm at 50 psi, potable
- B. Polymer system for pressure filter:
1. Number of units: 2
 2. Influent flow: 6.5 MGD (Min), 32 MGD (Avg.), 34.9 MGD (Max)
 3. Polymer concentration: 0.1 to 1.0 mg/l
 4. Operating schedule: 24 hours/day, 7 days per week
 5. Emulsion polymer neat activity: 40 percent
 6. Emulsion polymer consumption (gal/hr): 0.07 – 3.60
 7. Final solution feed concentration: 0.1 to 0.2 percent active
 8. Neat polymer metering pumps:
 - a. Number of units: 1 per system
 - b. Operating capacity range (gal/hr): 0.2 to 6.0
 - c. Maximum inlet pressure: 10 psi
 - d. Type: Peristaltic
 9. Dilution water: 0.6 to 27.2 gpm at 50 psi, potable

C. Polymer system for gravity thickener:

1. Number of units: 1 (standby unit is shared with the polymer system for centrifuges defined below) + 1 spare polymer pump.
2. Feed solids concentration (percent): 0.5 to 4.0
3. Maximum solids loading rate (ppd): 6,900
4. Active Polymer dosage (lbs/dry ton): 8
5. Operating schedule: 24 hours/day, 7 days per week
6. Emulsion polymer neat activity: 40 percent
7. Emulsion polymer consumption (gal/hr): 0.35
8. Final solution feed concentration: 0.1 to 0.2 percent active
9. Neat polymer metering pumps:
 - a. Number of units: 1 per system plus 1 shelf spare
 - b. Operating capacity range (gal/hr): 0.2 to 0.5
 - c. Maximum inlet pressure: 10 psi
 - d. Type: Peristaltic
10. Dilution water: 0.7 to 2.7 gpm at 50 psi, potable

D. Polymer system for centrifuge:

1. Number of units: 2 (1 + 1, standby shared with the polymer system for gravity thickener)
2. Feed solids concentration (percent): 10 to 15
3. Solids loading rate (ppd): 6,900
4. Active Polymer dosage (lbs/dry ton): 15 to 25 (average: 20)
5. Operating schedule: 8 hours/day, 5 days per week
6. Emulsion polymer neat activity: 40 percent
7. Emulsion polymer consumption (gal/hr): 4.2
8. Final solution feed concentration: 0.1 to 0.2 percent active

9. Neat polymer metering pumps:
 - a. Number of units: 1 per system
 - b. Operating capacity range (gal/hr): 2.5 to 5.0
 - c. Maximum pump speed (rpm): 300
 - d. Maximum inlet pressure: 10 psi
 - e. Type: Peristaltic
10. Dilution water: 8.3 to 28 gpm at 50 psi, potable

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop drawings: Provide complete prefabrication, assembly, and installation drawings; piping and instrumentation diagrams; interconnecting diagrams; and electrical schematics and panel layouts.
- C. Product data: Provide manufacturer's literature for components including general assembly, materials of construction, performance characteristics, coatings, power requirements, wiring diagrams, service connections, and additional information necessary to determine compliance with these Specifications.
 1. Verify compatibility of system components
 2. Verify that all devices necessary have been provided
 3. Pumps:
 - a. Manufacturer
 - b. Type and model
 - c. Materials of construction
 - d. Complete performance tables showing:
 - 1) Capacity
 - 2) Head
 - 3) Efficiency
 - 4) Power required
 - e. Drive type, size, temperature rating, service factor, full-load current
- D. Manufacturer's installation instructions: Provide step-by-step instructions, connection requirements, and startup procedures.

- E. Manufacturer's field report: Indicate personnel present, actual tests and start-up procedures that were performed by manufacturer's representative.
- F. Manufacturer's certificate: Provide certificate stating equipment and subsystems are installed in accordance with the manufacturer's instructions and inspected by a manufacturer's authorized representative, serviced with the proper initial lubricants, applicable safety equipment is properly installed, proper electrical and mechanical connections are properly made, and installation meets the manufacturer's requirements for a valid warranty.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01730.
- B. Operation data: Include manufacturer's instructions, description of system operation, start-up data, trouble-shooting check lists, and repair data for polymer activation equipment, components, and pumps.
- C. Maintenance data: Include manufacturer's literature, cleaning procedures, replacement parts lists, wiring diagrams, and repair data for polymer activation equipment, pumps, and all other components.

1.07 QUALITY ASSURANCE

- A. Verify that each system component is compatible with all other components of the system, that pumps and motors are appropriately sized, that all pipe materials and sizes are appropriate, and provide all devices necessary for a properly functioning system.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Polymer preparation systems to be delivered to job site fully assembled to the greatest extent possible.
- B. Installing contractor to store, protect and handle products on site under provisions of Section 01600:
 - 1. Accept polymer activation and feed equipment and components on site and inspect for damage. Comply with manufacturer's instructions.
 - 2. Protect polymer activation and feed equipment and components from physical damage including effects of weather, water, and construction debris.
 - 3. Provide temporary inlet and outlet caps and maintain all equipment in place until installation.

1.09 WARRANTY

- A. Provide lifetime warranty on liquid mixing chambers, excluding motors and wearing parts.

- B. Provide two (2) year warranty from the date of substantial completion for the polymer blending system, excluding the mixing chambers.

1.10 MAINTENANCE MATERIALS

- A. Provide the following spare parts:
 - 1. One (1) year supply of lubrication as recommended by manufacturer.
 - 2. One (1) corrosion inhibitor for each unit.
 - 3. Four (4) indicator lights for each unit.
 - 4. Three (3) fuses for each unit.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. UGSI Chemical Feed Solutions: Polyblend
- B. VeloDyne
- C. Prominent
- D. UGSI polyblend is the basis of design and other named suppliers must submit documentation that meets the stated design criteria of G-value prior to approval.

2.02 MATERIALS

- A. Package preparation system:
 - 1. Skids and frames: Stainless steel, Type 304.
 - 2. Fasteners, clamps: Stainless steel.
 - 3. Piping: Schedule 80 PVC, stainless steel, and flexible hose.
 - 4. Mixing chamber: PVC, acrylic.
 - 5. Inlet pressure gauge: Stainless steel.
 - 6. Control valve: Stainless steel and brass.
 - 7. Neat polymer check valve: Teflon, stainless steel, and Viton.

2.03 FABRICATION

- A. Frame/skid:
 - 1. All structural members 10 ga. stainless steel minimum.

2. Mounting panels minimum 12 ga.
 3. Gusseted members longer than 36 inch shall be tubing.
 4. Provide mounting holes for installation on concrete pad.
 5. Suitable for lifting by fork-lift.
- B. Multi-zone mixing chamber and post dilution
1. Polymer and water shall be mixed in a chamber designed to create sufficient mixing energy.
 - a. High shear zone of the mixing chamber shall have a mechanical mixing impeller for successful initial activation and the low shear zone shall not have a mixing impeller to avoid damaging polymer molecules.
 - b. Solution shall undergo a tapered mixing intensity slope as it exits the initial high shear zone and passes through a second low shear zone, isolated by a baffle.
 - c. The design shall have primary mixing and post-dilution to maximize the value of breaker surfactant present in emulsion polymer, as per the AWWA Standard for Polyacrylamide (ANSI/AWWA B453-06).
 - d. Polymer activation efficiency shall be consistent over the dilution water range.
 - e. The volume of the mixing chamber shall be a minimum of 1.0 gallon to provide sufficient residence time for activating and disentangling polymer molecules.
 2. Mixing chamber shall be transparent with acrylic barrel to allow viewing of mixing intensity. Opaque mixing chamber shall be unacceptable.
 3. Impeller shall be driven by a 1 HP maximum washdown duty motor.
 - a. Motor: TEFC.
 - b. Impeller speed: 3450 rpm, minimum.
 - c. Motor shall be direct-coupled to impeller shaft.
 4. Mixing chamber shall include a stainless steel injection check valve.
 5. Mixing impeller shall be cast brass construction with holes drilled on the backside of the impeller. The impeller, when rotating, shall pull fluid from around the mechanical seal pocket to eliminate the need for a separate mechanical seal flushing system.

6. In order to quantify the mixing intensity in the mix chamber, the applied horsepower shall be defined by measuring the difference in torque when the mix chamber is empty versus being full of water. This value shall be the basis of determining the mixing intensity defined as "G" value.
 7. The G-value in the high shear mixing zone shall exceed 14,000 sec⁻¹ to effectively disperse polymer gels to prevent fisheye formation.
 8. The G-value in the low shear mixing zone shall be lowered to 3,500 sec⁻¹ to avoid damaging polymer chains.
- C. Neat polymer metering pumps:
1. Pump shall be peristaltic type.
 2. Polymer tubing shall be fabricated of tygothane.
 3. Pump shall include integral keypad for local control
 4. A calibration cylinder sized for 60 seconds draw down at maximum pump flow shall be mounted to the frame with PVC isolation ball valves. Cylinder shall be calibrated in mL, and be constructed of clear PVC with slip on cap and ½ inch NPT vent connection.
 5. Pump shall be self priming.
 6. Pump shall be Blue-White M3 Series with integral leak detection.
- D. Dilution water control
1. Dilution water shall be split into two streams.
 - a. Primary water flow shall supply the mixing chamber.
 - b. Secondary water flow shall be used to post dilute the activated polymer stream.
 - c. These two streams shall be completely blended by a static mixer prior to exiting the unit.
 - d. Flow indicators and flow control valves shall be provided for each dilution water stream.
 2. Unit shall have an electric solenoid valve for on/off control of total dilution water flow. Valve shall have brass body with NBR seals and NEMA 4X rated coil enclosure.
 3. Dilution water and solution output connections shall include 304 stainless steel unions connected to the chassis.

2.04 ACCESSORIES

- A. Pressure gages:
 - 1. Pressure rating (psi): 0-160
 - 2. Stainless steel, liquid filled
- B. Polymer inlet assembly:
 - 1. 1-inch NPT neat polymer inlet connection with true union, full port ball valve.
 - 2. Installing contractor to provide 12 feet of 1 inch diameter reinforced flexible hose between polymer supply tote and preparation system inlet connection, with isolation ball valves at connections, where totes or drums are used for storage.
 - 3. Thermal type loss of polymer flow sensor, interlocked with control panel.
 - 4. Neat polymer check valve:
 - a. Integral to blending unit.
 - b. Designed to isolate concentrated emulsion polymer and dilution water.
 - c. Readily accessible for cleaning by single pin with lanyard.
 - 5. Calibration columns:
 - a. Supplied for periodic calibration of each neat polymer metering pump.
 - b. Each column shall be graduated in GPH based on a one minute draw-down and in 5 mL increments and also include discharge isolation valve. Calibration column must be integral to equipment skid and rigidly mounted to skid with pipe clamps. Mounting calibration column to plumbing alone shall not be acceptable.
 - 6. Provide a tote truck to allow transportation of the tote to the point of use. The tote truck shall provide a mechanical tilting mechanism to allow the tote to be tilted to drain entire contents. Tote truck shall be capable of moving a full tote weighing a minimum of 3500 lbs.
 - 7. Provide a tote mixer with adjustable timer, GFCI, resettable thermal overload, adjustable stainless steel frame and wall mounting bracket with drip pan.
- C. Discharge assembly:
 - 1. 1-1/2 inch NPT discharge connection
 - 2. Pressure relief valve
 - 3. Discharge pressure gauge

D. Static Mixers

2.05 CONTROLS PANEL

- A. Provide manufacturer's standard control package meeting the minimum requirements specified herein.
- B. ~~A.~~ Factory install and pre-test control panels and all devices. Provide and tag terminal blocks as required for power and motor leads, remote control inputs, status and alarm outputs, sensors, alarms, and protective devices.
- C. ~~B.~~ Enclosures: NEMA 4X
- ~~D. Pilot lights: Off (green), On (red)~~
- D. Power supply per unit: 120V, single phase, 60 Hz, provided complete with main fused disconnect switch, relays, transformers, motor starters, SCR controllers and appurtenances required for manual and automatic operation.
- E. Minimum operator controls and monitoring per unit:
1. Circuit breaker protected main power ON-OFF with indicator light.
 2. Terminal blocks sized for 14 ga. wire, numbered and with legend.
 3. LOCAL-OFF-REMOTE handswitch with contacts to receive remote start/stop and 4-20mA metering pump signal in REMOTE mode.
 4. ON-OFF and speed control through the keypad and display integral to the pump handswitch and potentiometer for manual speed adjustment on each pump.
 5. Adjustment of metering pump speed will be done by 4-20mA signal for remote adjustment, and manually for local adjustment.
 6. When called to run the system will start the polymer pump, start the mixer and open the dilution water solenoid valve.
 7. ~~6.~~ Alarms:
 - a. Loss of dilution water flow: Signal sent to PCS. ~~Local alarm and light upon loss of water flow.~~
 - b. Loss of polymer flow: Signal sent to PCS. ~~Local alarm and light upon loss of polymer flow.~~
 8. ~~7.~~ Alarm reset pushbutton (integral to LOCAL OFF REMOTE switch).
 8. Common alarm and run status signals to plant computer for monitoring.

F. Centrifuge system operation:

1. Each polymer preparation system will be started and stopped based on a timed sequence controlled from a signal from the matching centrifuge control panel in REMOTE operating mode.
2. When energized, the polymer preparation system controls panel will open the dilution feed water solenoid valve, start the mixer, and start the selected neat polymer metering pump. DUTY/STANDBY skid selection is through the PCS.
3. Adjustment of metering pump speed will be done by 4-20mA signal for remote adjustment, and manually for local adjustment.
4. The Contractor will coordinate with the installation and start-up with the manufacturer of the Centrifuge Equipment Operating and Control System that will be used to optimize the polymer dose.

2.06 CORROSION PROTECTION

- A. Electrically isolate dissimilar metals or connectors in direct contact.
- B. Use corrosion resistant materials and color code all piping, equipment and coat materials with epoxy paint system under provisions of Section 09900.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installing contractor to install all equipment and appurtenances in accordance with manufacturer's instructions:
 1. Provide all plumbing and electrical connections necessary for complete, functional, polymer activation systems.
 2. Mount pump bases on skid to form level assembly.
 3. Fit and align connecting piping to eliminate all stress on pump flanges.
 4. After initial fitting and alignment, place non-shrink grout under skids, fill voids, and allow to set.

3.02 TESTING AND ADJUSTING

- A. Check for proper vibration isolation and high-bearing temperature.
- B. Check for motor overload by measuring amperage and voltage on each phase.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Provide under provisions of Sections 01752.

B. Field Services:

1. Factory service personnel only.
2. Approve equipment installation.
3. Calibrate and make necessary adjustments as required for satisfactory operation and final acceptance of installation.
4. Provide a minimum of eight (8) hours, not including travel time, for inspection, functional testing, certification of the installation, startup and performance testing.
5. The polymer dilution and feed system shall be tested to demonstrate proper operation.
6. Polymer for the testing will be supplied by the OWNER.
7. Pumping rates of the neat emulsion metering pumps shall be verified.
8. If the performance of any item of equipment does not meet the requirements of the Contract Documents, corrective measures shall be taken or the unit shall be removed and replaced with one which satisfies the conditions specified.
9. A 24 hour operating period shall be required before acceptance.
10. Clean and flush system after testing and prepare for operation by OWNER.

C. Instruct Owner's operating personnel in the operation and maintenance of the system. Provide a minimum of eight (8) hours of training after start-up is complete.

D. Training

1. Provide manufacturer's services for training of plant personnel in operation and maintenance of the equipment furnished under this Section.
2. The training shall be for a period of not less than one eight-hour day.
3. The cost of training program to be conducted with Owner's personnel shall be included in the Contract price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.
4. Provide detailed O&M manuals to supplement the training course. The manual shall include specific details of equipment supplied and operations specific to the project.
5. The training session shall be conducted by a manufacturer's qualified representative.

E. Service of manufacturer's Representative:

1. Provide services of equipment Manufacturer's factory service Engineer specifically trained in the installation, operation, and maintenance of units as specified herein. The service of the manufacturer's Representative shall be made available during the installation period for assistance to the Design Builder for adjusting and checking equipment.
2. The factory representative(s) shall be provided for trips and durations as shown below.

	<i>Services Provided by Factory Representative</i>	<i>Minimum Number of Trips ^(a)</i>	<i>Minimum Time at Site Per Trip (Hours)</i>
1	Supervise Installation of equipment ^{(b)(c)}	1	8
2	Supervise Startup and Initial Run to Demonstrate Successful Operation	1	8
3	Instruct Engineer and Owner's Reps in Proper Startup and O&M	1	8
4	Additional Trips for Troubleshooting Following Installation ^(d)	-	-

- (a). Representative(s) shall be present at frequent enough intervals to ensure proper installation, testing, and initial operation of the equipment.
- (b). This assumes all equipment is installed together. Additional trips shall be included for additional installations.
- (c). After piping connection. The Manufacturer's representative shall provide to the Engineer a written certification that each equipment has been installed in accordance with the Manufacturer's recommendations.
- (d). Representative(s) shall be present as necessary to operate successfully following start-up.

END OF SECTION

SECTION 15076

DOUBLE WALL CONTAINMENT PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish all labor, materials, equipment and incidentals required, and install and test the double wall containment piping, fittings and appurtenances specified herein.
2. Double wall containment piping systems are required for the hydrofluosilicic acid feed piping, containment drains, polymer, and for the sodium hypochlorite solution feed piping. The double wall containment piping shall be used when the piping is in contact with the ground, located in the trenches or overhead, or any other location indicated on the drawings.

B. Related Work Described Elsewhere:

1. Section 09900 – Painting and Coating
2. Section 15011 – Pipe Hangers and Supports for Process Piping
3. Section 15015 – Identification for Process Piping and Valves
4. Section 15085 – Water Pipeline Testing

C. General Design:

1. Double wall containment piping shall be installed in the locations as shown on the Drawings. All plastic pipe and fittings shall conform to this specification section whether provided as a part of an equipment "package" or purchased separately by the Contractor.
2. Double wall containment pipe for hydrofluosilicic acid feed piping shall be made of Schedule 80 polyvinyl chloride (PVC) with Perfluoroalkoxy (PFA) tubing conforming to this specification or in locations specifically called for on the drawings, shall be double containment hard piping constructed of Schedule 80 CPVC.
3. Double wall containment pipe for polymer and sodium hypochlorite shall be made of Schedule 80 PVC with PVC tubing conforming to this specification or in some locations, where shown on the drawings, double wall pipe of Schedule 80 PVC construction.

3. Double wall chemical containment floor drains and drain piping shall be installed from the chemical feed rooms to their respective bulk storage containment areas as shown in the Drawings. Double containment drain piping shall be of schedule 80 PVC construction for sodium hypochlorite and polymer and schedule 80 CPVC construction for hydrofluosilicic acid conforming to this specification.

1.02 QUALITY ASSURANCE

- A. All Schedule 80 PVC and PFA tubing double containment piping including fittings and appurtenances shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.
- B. Solvent welder shall be qualified in accordance with Chapter VII of the ASME B31.3-93 Code, Part 9, Paragraph A328.
- C. Piping shall be marked with nominal size, type, class, schedule or pressure rating, manufacturer and all markings required by applicable ASTM and AWWA standards.
- D. PVC Schedule Type Piping shall be Schedule 80 unless otherwise indicated on the Drawings. Pipe and fittings shall be extruded from Type I, Grade I, Class 12454-B material in accordance with ASTM D 1784.

1.03 SUBMITTALS

- A. Materials and Shop Drawings:
 1. Shop drawings shall be submitted to the Engineer for approval in accordance with the General Requirements and Section 01300 and shall include dimensioning and the technical specification for all piping to be furnished.
- B. Additional Information:
 1. Submit to the Engineer, for approval, samples of all materials specified herein, along with the manufacturer's Certificates of Inspection, descriptive literature, illustrations, specifications, installation instructions and related information.
- C. Operating Instructions (Not Applicable)

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. PVC containment pipe and PFA carrier tubing shall be delivered to the site in unbroken bundles packaged in such manner as to provide protection against damage. When possible, pipe should be stored at the job site in the unit packages until ready for use.

Packaged units shall be handled using a fork lift or a spreader bar with fabric straps. Packaged units shall not be stacked at the job site higher than two units high.

- B. When it is necessary to store PVC containment pipe and PFA tubing for more than 30 days, exposure to direct sunlight shall be prevented by covering the pipe with an opaque material. Adequate air circulation above and around the pipe shall be provided as required to prevent excessive heat accumulation. Double wall containment pipe shall not be stored close to heat sources or hot objects such as heaters, fires, boilers or engine exhaust. Pipe gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. The interior and all sealing surfaces of pipe, fittings and other appurtenances shall be kept clean and free of dirt and foreign matter.
- C. Care shall be taken in handling and laying pipe and fittings to avoid severe impact blows, crushing, abrasion damage, gouging or cutting. Pipe shall be lowered, not dropped, from trucks or into trenches. All cracked, damaged or defective pipe and fittings, or any length of pipe having a gouge, scratch or other permanent indentation of more than 10 percent of the wall thickness in depth, shall be rejected and removed at once from the work and replaced with new acceptable pipe at no additional cost to the Owner.

1.05 WARRANTY AND GUARANTEES

- A. Provide equipment warranty in accordance with Section 01740: Warranties and Bonds.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All double wall containment piping system components shall be pre-engineered, factory fabricated, tested, and assembled such that field assembly is minimized to primarily that of straight joints.

2.02 MATERIALS AND EQUIPMENT

- A. PFA Tubing and Fittings:
 - 1. Materials:
 - a. Small Bore PFA Tubing: Carrier pipe shall be of flexible **black** PFA tubing, suitable for flaring and available in continuous lengths of 25, 50, 100, 250, and 1,000 feet.
 - b. PFA tubing wall thickness shall be as follows:
 - i. For NS 1/4-inch, 0.047-inches.
 - ii. For NS 3/8-inch, 0.062-inches.
 - iii. For NS 1/2-inch, 0.062-inches.
 - iv. For NS 3/4-inch, 0.062-inches.

- v. For NS 1-inch, 0.062-inches.
 2. Pressure ratings for PFA tubing shall be as follows:
 - i. For 1/2-inch (hydrofluosilicic acid), no less than 230 psi.
 3. Fittings: PFA tubing fittings shall be flare-type (no threads exposed to fluid).
 4. Manufacturers: Tubing shall be manufactured by Chemline Plastics Unlimited or engineer approved equal. Fittings shall be manufactured by FlareLINK by Fit-LINE, Inc., or engineer approved equal.
- B. PVC Tubing
 1. Materials:
 - a. Tubing shall be NSF 61 listed.
 - b. Provide PVC tubing with nylon braid reinforcement embedded in the wall of the tubing with smooth inside bore and smooth outside.
 - c. Minimum operating pressure shall be 200 psi for tubing 3/4 inch and smaller, 150 psi for 1 inch, 100 psi for 1-1/4 and 1-1/2 inches, and 75 psi for 2 inches. Burst pressure shall be at least 4.0 times the specified operating pressure.
 - d. Products: Kuriyama “Kuri-Tech Clearbraid K3130 Series BF Heavy Wall PVC Food and Beverage Hose”, Ryan-Herco “Herco-Braid Heavy Duty Food Grade Clear PVC Tubing”.
 2. Fittings:
 - a. Join tubing to pipe with a single-barb male adapter fitting. Secure tubing to the fitting with a stainless steel hose clamp. Connect tubing sections by means of single or multi-barb thermoplastic couplings with titanium hose clamps. Use single barb PVC fittings for 1/2 inch tubing and smaller and multiple barb PVC fittings for larger tubing.
- C. Double Containment Drain Piping:
 1. Materials:
 - a. Chemical containment drain piping shall be a prefabricated double containment piping system with 4-inch diameter primary drain piping with 6-inch diameter secondary containment piping. Each contained piping system shall consist of Schedule 80 PVC primary piping system supported within a Schedule 80 PVC secondary containment housing for polymer and sodium hypochlorite and schedule 80 CPVC primary piping

system supported within a Schedule 80 CPVC secondary containment housing for hydrofluosilicic acid.

2. Fittings:

- a. All primary fittings shall be schedule 80 PVC according to ASTM D-2467 specifications for polymer and sodium hypochlorite. All listed pressure fittings shall be schedule 80 according to ASTM D-2467.
- b. All primary fittings shall be schedule 80 CPVC according to ASTM F-439 specifications for hydrofluosilicic acid. All secondary containment fittings shall be schedule 80 CPVC according to ASTM F-439.

3. The double containment piping system shall be a Guardian prefabricated system as manufactured by IPEX, or equal.

D. PVC Containment Piping:

1. Materials:

- a. Pipe shall be made of polyvinyl chloride, Schedule 80, conforming to ASTM D1784-92.

2. Fittings:

- a. Fittings for Schedule 80 pipe shall be socket type, solvent welded in conformance with ASTM D2467. Solvent welded joints shall be watertight.

3. Solvent Cement:

- a. PVC solvent cement shall be in compliance with ASTM D2564.

E. Double Containment (Hard) Piping

1. Materials:

- a. Chemical containment hard piping shall be a prefabricated double containment piping system with sizes as shown on the drawings. Each contained piping system shall consist of Schedule 80 PVC primary piping system supported within a Schedule 80 PVC secondary containment housing for polymer and sodium hypochlorite and schedule 80 CPVC primary piping system supported within a Schedule 80 CPVC secondary containment housing for hydrofluosilicic acid.

2. Fittings:
 - a. All primary fittings shall be schedule 80 PVC according to ASTM D-2467 specifications for polymer and sodium hypochlorite. All listed pressure fittings shall be schedule 80 according to ASTM D-2467.
 - b. All primary fittings shall be schedule 80 CPVC according to ASTM F-439 specifications for hydrofluosilicic acid. All secondary containment fittings shall be schedule 80 CPVC according to ASTM F-439.
3. The double containment piping system shall be a Guardian prefabricated system as manufactured by IPEX, or equal.

2.03 ACCESSORIES

A. Leak Detection System

1. Install in strict accordance with the system manufacturer's instructions and recommendations. Leak detection shall be installed with a sensor located in each Chemical Containment Pull Box sump, with all pipe sloping to the Chemical Containment Pull Boxes. The leak detection system shall sound an alarm when a leak event occurs.
2. Signal wires from the leak detection sensor shall terminate in an adjacent terminal cabinet and shall then be connected to the local leak detection output panel. Contact with any aqueous chemical shall result in an audible alarm and a LED indication at the leak detection output panel. The local output panel shall be housed in a NEMA 4X FRP enclosure. The Leak Detection Control Panel shall be the Centra-Guard Electronic Low Point Leak Detection Control Panel. Power supply shall be 120VAC, 60 Hz. Panel shall be provided with HMI screen for viewing alarm date, time, type and location as manufactured by IPEX. The leak detection output panel shall be located directly outside the chemical feed pumping facility where the pipe first penetrates the ground surface. For any miscellaneous control component data see Divisions 16 – Electrical and 17 – Instrumentation. The output relays shall be capable of interfacing with the plant PCS.
3. Where shown on the drawings, where double wall containment piping is provided and not connected to a containment pull box, the manufacturer shall provide leak detection station at low points in the line. Station shall include internal, non-intrusive sensor, drip leg and pump-out port. Sensor shall include LED testing lamp, adjusting potentiometer, and shall be removable for periodic testing. These sensors shall be tied into the leak detection panel.

B. Centering Devices

1. Centering and support carrier pipe within the containment pipe with centering devices. Locate not less than every 9 feet or within 24 inches of the termination of the containment pipe on all fabricated pieces.
2. Install centering devices such that the system maintains free drainage.

2.04 SPARE PARTS

- A. All special tools, solvents, lubricants, and cements required for normal installation shall be furnished with the pipe.

2.05 QUALITY CONTROL

- A. Contractor shall follow Manufacturer's and Supplier's recommended product quality control specifics as required for project.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install double wall containment pipe where shown on the Drawings and in strict accordance with the manufacturer's technical data and printed instructions.
2. All piping shall have sufficient number of unions to allow convenient removal and shall be as approved by the Engineer.
3. All valves and equipment shall be supported independently from the pipe. Anchor valves such that the turning moment resulting from their operation will not be transmitted to the pipe.

B. Installation of PVC Piping, Schedule Type:

1. Joints for double wall containment pipe and fittings shall be solvent welded. All joints shall be made watertight. All pipe cutting and jointing procedures for solvent welded pipe joints shall be in strict accordance with the pipe and fittings manufacturer's printed installation instructions. In making solvent welded connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth, if necessary and apply solvent cement of proper grade.
2. Installation of valves and fittings shall be strictly in accordance with the manufacturer's instructions. In making solvent weld connections the solvent shall not be spilled on valves or allowed to run from joints.

3. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be set in accordance with the requirements of the piping layout and the Contractor shall verify their locations from approved piping layout Drawings and the structural Drawings.

C. Installation of Flexible Non-Metallic Tubing and Fittings:

1. Install small bore flexible tubing in accordance with manufacturer's printed instructions, in neat straight lines, supported at close enough intervals to avoid sagging, and in continuous runs wherever possible.
2. Bundle tubing in groups of parallel tubes within protective sheath.
3. Tubes within protective sheath may be color coded, but protect tubing other than black outside the sheath by wrapping with black plastic electrician's tape.
4. For buried tubing in chemical service, tubing shall be installed in Schedule 80 PVC carrier pipe to serve as double containment. Requirements are as follows:
 - i. Carrier pipe shall utilize long radius elbows to facilitate pulling of tubing.
 - ii. Carrier pipe system shall run through H-20 precast vault structures in the yard, watertight (cast with waterstops), and no smaller than 4-feet by 4-feet by 4-feet deep, unless otherwise shown on the drawings, with an H-20 rated access hatch.
 - iii. Leak detection sensor shall be Flowline Switch-Tek Optic Leak detection switch, Model L010-2305, or equal. Sensor shall be installed in the Chemical Containment Pull Box sump using a side-mount bracket.
 - iv. Drain valves (Type BV320) for each carrier pipe shall also be installed in the vault to allow for draining of accumulated chemicals.
 - v. Tubing shall be coiled inside each box to account for expansion and contraction. Coil radius shall be kept larger than the tubing manufacturer's recommended minimum radius.

D. Field Painting:

1. Pipe normally exposed to view shall be painted and marked as specified in Section 15015 – Identification for Process Piping and Valves.
2. Outdoor above grade PVC and CPVC piping shall be painted with a UV resistant coating.

3.02 INSPECTION AND TESTING

- A. All PVC piping shall be hydrostatically pressure tested and flushed in accordance with the requirements in Section 15085 – Water Pipeline Testing.
- B. Following installation and testing:
 - 1. Flush clean the carrier and containment piping system.
 - 2. Purge the annular space of moisture with clean, dry air.

3.03 START-UP AND INSTRUCTION

- A. Provide manufacturer’s representative to assist with the unloading of the double wall containment piping system, system tests, containment pipe joint closure, installation and testing of the leak detection system, and training of owner’s personnel in the operation and maintenance of the leak detection system. Manufacturer’s representative shall complete a Manufacturer’s Certificate of Proper Installation. Inspection and examination practices shall be according to ASME B31.3-93 for normal fluid service.

END OF SECTION

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
1	I-1002	10-BV-01-1, 10-BV-02-1, 10-BV-01-2, 10-BV-02-2	4	BALL VALVE	2	BV3	CO2 TANK BALANCE LINES	PROCESS	CO2	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
2	I-1002	10-PRV-10-1, 10-PRV-10-2	2	PRESSURE RELIEF VALVE	2	PRV2	CO2 TANK BALANCE LINES	PROCESS	CO2	BRASS	500	THREADED	NONE	NONE		CONTRACTOR	15100
3	I-1002	15-BFV-01	1	BUTTERFLY VALVE	10	BFV3	CO2 BOOSTER PUMP SUCTION	PROCESS	CPW	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
4	I-1002	15-BFV-11-1 15-BFV-12-1	2	BUTTERFLY VALVE	10	BFV3	CO2 BOOSTER PUMP SUCTION	PROCESS	CPW	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
5	I-1002	15-BV-11-1, 15-BV-12-1	2	BALL VALVE	1	BV3	ARV ISOLATION	PROCESS	CPW	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
6	I-1002	15-ARV-11-1, 15-ARV-12-1	2	AIR RELIEF VALVE	1	ARV3	CO2 BOOSTER PUMP SUCTION	PROCESS	CPW	COMPOSITE	230	THREADED	NONE	NONE	NO	CONTRACTOR	15100
7	I-1002	15-BV-11-2, 15-BV-12-2	2	BALL VALVE	1	BV3	ARV ISOLATION	PROCESS	CPW	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
8	I-1002	15-ARV-11-2, 15-ARV-12-2	2	AIR RELIEF VALVE	1	ARV3	CO2 BOOSTER PUMP DISCHARGE	PROCESS	CPW	COMPOSITE	230	THREADED	NONE	NONE	NO	CONTRACTOR	15100
9	I-1002	15-CV-11, 15-CV-12	2	CHECK VALVE	8	CV2	CO2 BOOSTER PUMP DISCHARGE	PROCESS	CPW	CF8M	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
10	I-1002	15-BFV-11-2 15-BFV-12-2	2	BUTTERFLY VALVE	8	BFV3	CO2 BOOSTER PUMP DISCHARGE	PROCESS	CPW	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
11	I-1002	15-BFV-20	1	BUTTERFLY VALVE	8	BFV3	PRESSURIZED SOLUTION FEED PANEL FEED	PROCESS	CPW	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	OPEN	CONTRACTOR	15100
12	I-1002	15-MOV-21, 15-MOV-22	2	BUTTERFLY VALVE	8	BFV5	PRESSURIZED SOLUTION FEED PANEL FEED	PROCESS	CPW	CF8M	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	CONTRACTOR	15100
13	I-1002	15-BFV-81, 15-BFV-82	2	BUTTERFLY VALVE	8	BFV3	PRESSURIZED SOLUTION FEED PANEL DISCHARGE	PROCESS	CAS	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
14	I-1002	15-BFV-90-1, 15-BFV-90-2	2	BUTTERFLY VALVE	8	BFV3	CO2 SOLUTION DIFFUSION ASSEMBLY	PROCESS	CAS	RUBBER-LINED DI	See D-1001	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
15	I-1002	15-GV-90-1, 15-GV-90-2	2	GATE VALVE	8	GV1	CO2 SOLUTION DIFFUSION ASSEMBLY	PROCESS	CAS	316SS	150	LUGGED	WHEEL	NONE	NO	CONTRACTOR	15100
16	I-1002	05-BFV-01	1	BUTTERFLY VALVE	54	BFV4	PC TANK / TREATMENT BYPASS	PROCESS	BYPASS	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100
17	I-1002	05-BFV-02	1	BUTTERFLY VALVE	54	BFV4	CO2 SOLUTION INJECTION POINT	PROCESS	PW	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100
18	I-1002	05-BFV-03	1	BUTTERFLY VALVE	10	BFV4	FEED LINE TO LIME SATURATORS	PROCESS	PW	DUCTILE IRON	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
19	I-1003	21-AOV-11, 21-AOV-12, 21-AOV-31, 21-AOV-32	4	PNEUMATIC BUTTERFLY VALVE	3	-	LIME SILO	PROCESS	LIME	-	-	-	PNEUMATIC	ON/OFF	OPEN	LIME PROVIDER	15100 11292
20	I-1003	20-PV-90, 23-PV-51, 23-PV-21-1, 23-PV-21-2, 24-PV-01, 20-PV-91, 23-PV-52, 23-PV-22-1, 23-PV-22-2, 24-PV-02	10	PLUG VALVE	3	PV3	LIME SILO	PROCESS	VARIES	CAST IRON	175	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
21	I-1003	23-BV-01, 23-BV-02	2	BALL VALVE	1	BV1	LIME SILO	PROCESS	NPW	PVC	150	SOCKET	HANDLE	NONE	NO	CONTRACTOR	15100
22	I-1003	24-PIV-11, 24-PIV-21, 24-PIV-12, 24-PIV-22	4	PINCH VALVE	3	-	LIME SILO	PROCESS	SLURRY	-	-	-	MOTOR	MODULATING	NO	LIME SUPPLIER	15100 11292
23	I-1003	21-SV-21-2, 21-SV-21-3, 21-SV-21-4, 21-SV-22-2, 21-SV-22-3, 21-SV-22-4	6	SOLENOID VALVE	1	-	LIME SILO	PROCESS	LIME	-	-	-	SOLENOID	OPEN/CLOSE	NO	LIME SUPPLIER	15100 11292

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
24	I-1003	24-BV-11, 24-BV-21, 24-BV-12, 24-BV-22,	4	BALL VALVE	3	-	LIME SILO	PROCESS	SLURRY	-	-	-	HANDLE	NONE	NO	LIME SUPPLIER	15100 11292
25		23-BFV-01, 23-BFV-02	2	BUTTERFLY VALVE	2	BFV1	LIME SILO	PROCESS	DRAIN	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
26		24-PRV-01, 24-PRV-02	2	PRESSURE RELIEF VALVE	2	-	LIME SILO	PROCESS	NPW	-	-	-	HANDLE	NONE	NO	LIME SUPPLIER	15100 11292
27		24-SV-01, 24-SV-02	2	SOLENOID VALVE	2	-	LIME SILO	PROCESS	NPW	-	-	-	ELECTRIC	ON/OFF	OPEN	LIME SUPPLIER	15100 11292
28	I-1004	25-MOV-01	1	V-PORT BALL VALVE	8	VBV	LIME SATURATORS	PROCESS	PW	CF8M	150	FLANGE	MOTOR	MODULATING	ON/OFF	CONTRACTOR	15100
29	I-1004	25-MOV-11, 25-MOV-21	2	V-PORT BALL VALVE	8	VBV	LIME SATURATORS	PROCESS	PW	CF8M	150	FLANGE	MOTOR	MODULATING	ON/OFF	CONTRACTOR	15100
30	I-1004	25-PV-19-1, 25-PV-29-1	2	PLUG VALVE	8	-	LIME SATURATORS	PROCESS	SLUDGE	-	-	-	HANDLE	NONE	NO	SATURATOR SUPPLIER	15100 11220
31	I-1004	25-PV-19-2, 25-PV-29-2	2	PLUG VALVE	6	-	LIME SATURATORS	PROCESS	SLUDGE	-	-	-	HANDLE	NONE	NO	SATURATOR SUPPLIER	15100 11220
32	I-1004	25-BV-11-6, 25-BV-11-5, 25-BV-11-4, 25-BV-11-3, 25-BV-11-2, 25-BV-11-1, 25-BV-21-6, 25-BV-21-5, 25-BV-21-4, 25-BV-21-3, 25-BV-21-2, 25-BV-21-1	12	BALL VALVE	3/4	-	LIME SATURATORS	PROCESS	PW	-	-	-	HANDLE	NONE	NO	SATURATOR SUPPLIER	15100 11220
33	I-1004	25-DV-19, 25-DV-29	2	DIAPHRAGM VALVE	4	-	LIME SATURATORS	PROCESS	SLUDGE	-	-	-	HANDLE	NONE	NO	SATURATOR SUPPLIER	15100 11220
NEW	I-1004	25-CV-19, 29-CV-29	2	CHECK VALVE	4	CV2	LIME SLUDGE	PROCESS	SLUDGE	CF8M	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
NEW	I-1004	25-BFV-19, 25-BFV-29	2	BUTTERFLY VALVE	4	BFV1	LIME SLUDGE	PROCESS	SLUDGE	DI	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
NEW	I-1004	25-MOV-01	1	BUTTERFLY VALVE	3	BFV5	LIME SLUDGE	PROCESS	SLUDGE	CF8M	150	LUGGED	MOTOR	ON/OFF	NO	CONTRACTOR	15100
34	I-1004	27-CV-11, 27-CV-12	2	CHECK VALVE	4	CV3	LIME SLUDGE	PROCESS	SLUDGE	DUCTILE IRON	175	FLANGE	NONE	NONE	NO	CONTRACTOR	15100
35	I-1004	27-PV-11, 27-PV-12, 27-PV-20	3	PLUG VALVE	4	PV3	LIME SLUDGE	PROCESS	SL	CAST IRON	175	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
36	I-1005	25-PRV-19, 25-PRV-29	2	PRESSURE RELIEF VALVE	4	PRV3	LIME SLUDGE	PROCESS	NPW	DUCTILE IRON	250	FLANGE	SOLENOID	ON/OFF	NO	CONTRACTOR	15100
37	I-1004	29-MOV-11, 29-MOV-12	2	SEGMENTED BALL VALVE	6	BV4	LIME SOLUTION	PROCESS	CHS	CF8M	150	FLANGE	MOTOR	MODULATING	ON/OFF	CONTRACTOR	15100
38	I-1004	29-CV-11, 29-CV-12	2	CHECK VALVE	10	CV2	LIME SOLUTION	PROCESS	CHS	CF8M	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
39	I-1004	29-PV-11-2, 29-PV-12-2, 29-PV-20	3	PLUG VALVE	10	PV3	LIME SOLUTION	PROCESS	CHS	CAST IRON	175	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
NEW	I-1004	29-BFV-11, 29-BFV-12	2	BUTTERFLY VALVE	10	BFV1	LIME SOLUTION	PROCESS	CHS	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
40	I-1004	29-BFV-91, 29-BFV-92	2	BUTTERFLY VALVE	10	BFV1	LIME SOLUTION	PROCESS	CHS	DUCTILE IRON	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
41	I-1004	29-GV-91, 29-GV-92	2	KNIFE GATE VALVE	10	GV1	LIME SOLUTION	PROCESS	CHS	316 SS	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
42	I-1004	29-BFV-01	1	BUTTERFLY VALVE	6	BFV1	LIME SOLUTION	PROCESS	CHS	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
43	I-1004	25-BV-01	1	BALL VALVE	1	BV1	SATURATOR FEED HEADER	PROCESS	PW	PVC	150	SOCKET	HANDLE	NONE	NO	CONTRACTOR	15100
44	I-1005	30-ARV-01	1	AIR RELIEF VALVE	2	ARV1	FILTER FEED HEADER	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
45	I-1005	30-BFV-01	1	BUTTERFLY VALVE	42	BFV2	FILTER FEED HEADER	PROCESS	FLS	DUCTILE IRON	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100 11200

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
46	I-1005	30-BV-01-1	1	BALL VALVE	1	BV1	FILTER FEED INSTRUMENT AND SAMPLE PANEL FEED LINE	PROCESS	FLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
47	I-1005	30-BV-01-2, 30-BV-01-3	2	BALL VALVE	1	BV1	FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
48	I-1005	30-BFV-85	1	BUTTERFLY VALVE	42	BFV2	FILTER DISCHARGE HEADER	PROCESS	FLW	DUCTILE IRON	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100 11200
49	I-1005	35-BFV-01, 35-BFV-02	2	BUTTERFLY VALVE	6	BFV5	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
50	I-1005	35-CV-05-1, 35-CV-05-2	2	CHECK VALVE	6	CV2	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
51	I-1005	35-BV-05-1, 35-BV-05-2, 35-BV-05-3, 35-BV-05-4	4	BALL VALVE		BV3	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
52	I-1005	35-SV-05	1	SOLENOID BALL VALVE	1	SV2	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	304 SS	150	NPT	SOLENOID	ON/OFF	NO	CONTRACTOR	15100 11200
53	I-1005	37-BFV-01-1	1	BUTTERFLY VALVE	16	BFV4	BACKWASH SUPPLY FROM BYPASS	PROCESS	BYPASS	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100 11200
54	I-1005	37-BFV-01-2	1	BUTTERFLY VALVE	16	BFV4	BACKWASH SUPPLY FROM FILTERS	PROCESS	FLW	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100 11200
55	I-1005	37-BFV-05-1, 37-BFV-05-2, 37-BFV-06-1, 37-BFV-06-2	4	BUTTERFLY VALVE	16	BFV1	BACKWASH SUPPLY PUMPS	PROCESS	BWS	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100 11200
56	I-1005	37-ARV-05-1, 37-ARV-05-2, 37-ARV-06-1, 37-ARV-06-2	4	AIR RELIEF VALVE	2	ARV1	BACKWASH SUPPLY PUMPS	PROCESS	BWS	DUCTILE IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
57	I-1005	37-CV-05, 37-CV-06	2	CHECK VALVE	16	CV1	BACKWASH SUPPLY	PROCESS	BWS	DUCTILE IRON	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100 11200
58	I-1005	37-BV-09-1	1	BALL VALVE	1	BV1	BACKWASH SUPPLY INSTRUMENT AND SAMPLE PANEL FEED LINE	PROCESS	BWS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
59	I-1005	37-BV-09-2, 37-BV-09-3	2	BALL VALVE	1	BV1	BACKWASH SUPPLY INSTRUMENT AND SAMPLE PANEL	PANEL	BWS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
60	I-1006	30-MOV-11, 30-MOV-21, 30-MOV-31, 30-MOV-41, 30-MOV-51, 30-MOV-61, 30-MOV-71, 30-MOV-81	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 1 FEED ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CL OSE	FILTER SUPPLIER	15100 11200
61	I-1006	30-MOV-12, 30-MOV-22, 30-MOV-32, 30-MOV-42, 30-MOV-52, 30-MOV-62, 30-MOV-72, 30-MOV-82	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 2 INLET ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CL OSE	FILTER SUPPLIER	15100 11200
62	I-1006	30-MOV-13, 30-MOV-23, 30-MOV-33, 30-MOV-43, 30-MOV-53, 30-MOV-63, 30-MOV-73, 30-MOV-83	8	BUTTERFLY VALVE	16	BFV1	FILTER CONTROL VALVE	PROCESS	FLW	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
63	I-1006	30-ARV-11, 30-ARV-21, 30-ARV-31, 30-ARV-41, 30-ARV-51, 30-ARV-61, 30-ARV-71, 30-ARV-81	8	AIR RELIEF VALVE	3	ARV1	FILTER CELL NO. 1	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
64	I-1006	30-ARV-12, 30-ARV-22, 30-ARV-32, 30-ARV-42, 30-ARV-52, 30-ARV-62, 30-ARV-72, 30-ARV-82	8	AIR RELIEF VALVE	3	ARV1	FILTER CELL NO. 2	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
65	I-1006	35-MOV-11, 35-MOV-21, 35-MOV-31, 35-MOV-41, 35-MOV-51, 35-MOV-61, 35-MOV-71, 35-MOV-81	8	BUTTERFLY VALVE	4	BFV5	FILTER CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	PROCESS	AIR	CF8M	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	FILTER SUPPLIER	15100 11200
66	I-1006	35-MOV-12, 35-MOV-22, 35-MOV-32, 35-MOV-42, 35-MOV-52, 35-MOV-62, 35-MOV-72, 35-MOV-82	8	BUTTERFLY VALVE	4	BFV5	FILTER CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	PROCESS	AIR	CF8M	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	FILTER SUPPLIER	15100 11200
67	I-1006	37-MOV-11, 37-MOV-21, 37-MOV-31, 37-MOV-41, 37-MOV-51, 37-MOV-61, 37-MOV-71, 37-MOV-81	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 1 BACKWASH WASTE ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	FILTER SUPPLIER	15100 11200
68	I-1006	37-MOV-12, 37-MOV-22, 37-MOV-32, 37-MOV-42, 37-MOV-52, 37-MOV-62, 37-MOV-72, 37-MOV-82	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 2 BACKWASH WASTE ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	FILTER SUPPLIER	15100 11200
69	I-1006	37-MOV-13, 37-MOV-23, 37-MOV-33, 37-MOV-43, 37-MOV-53, 37-MOV-63, 37-MOV-73, 37-MOV-83	8	BUTTERFLY VALVE	14	BFV1	FILTER BACKWASH SUPPLY CONTROL VALVE	PROCESS	BWS	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200
70	I-1006	37-MOV-14, 37-MOV-24, 37-MOV-34, 37-MOV-44, 37-MOV-54, 37-MOV-64, 37-MOV-74, 37-MOV-84	8	BUTTERFLY VALVE	14	BFV1	FILTER BACKWASH WASTE CONTROL VALVE	PROCESS	FLW	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	OPEN/CLOSE	FILTER SUPPLIER	15100 11200
71	I-1007	40-MOV-10-1	1	BUTTERFLY VALVE	42	BFV2	ABOVE GROUND PIPING TO GST	PROCESS	BYPASS	DUCTILE IRON	See D-1001	FLANGE	MOTOR	MODULATING	OPEN/CLOSE	CONTRACTOR	15100

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch? OPEN/CL OSE	Comments	Spec Section
72	I-1007	40-MOV-10-2	1	V-PORT BALL VALVE	16	VBV	ABOVE GROUND PIPING TO GST	PROCESS	BYPASS	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING		CONTRACTOR	15100
73	I-1007	40-ARV-30	1	AIR RELIEF VALVE	2	ARV1	ABOVE GROUND PIPING TO GST	PROCESS	FLW	DUCTILE IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
74	I-1007	40-BFV-30-1	1	BUTTERFLY VALVE	60	BFV4	GST BYPASS ISOLATION	PROCESS	FLW	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100
75	I-1007	40-BFV-30-2	1	BUTTERFLY VALVE	60	BFV4	GST INLET ISOLATION	PROCESS	FLW	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100
76	I-1007	40-BFV-30-3	1	BUTTERFLY VALVE	54	BFV4	TREATMENT FACILITY BYPASS ISOLATION	PROCESS	BYPASS	DUCTILE IRON	See D-1001	FLANGE	VALVE BOX	NONE	NO	CONTRACTOR	15100
77	I-1007	40-BFV-50	1	BUTTERFLY VALVE	60	BFV4	GST DISCHARGE ISOLATION	PROCESS	FW	DUCTILE IRON	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
78	I-1008	40-BFV-90	1	BUTTERFLY VALVE	60	BFV4	GST BYPASS INLET ISOLATION	PROCESS	BYPASS	DUCTILE IRON	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
79	I-1008	40-ARV-60	1	AIR RELEASE VALVE	4	ARV2	HIGH SERVICE PUMP SUCTION / BITTERS PS	PROCESS	FW	CAST IRON	150	FLANGE	NONE	NONE	NO	CONTRACTOR	15100
80	I-1008	40-BV-60-1	1	BALL VALVE	4	BFV2	ARV ISOLATION	PROCESS	PW	Cl or DI	150	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
81	I-1008	50-ARV-05	1	AIR RELEASE VALVE	4	ARV2	HIGH SERVICE PUMP SUCTION / BITTERS PS	PROCESS	FW	CAST IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
82	I-1008	50-BV-05	1	BALL VALVE	4	BV3	ARV ISOLATION	PROCESS	FW	CF8M	150	FNPT	HANDLE	NONE	NO	CONTRACTOR	15100
83	I-1008	50-BFV-06-1, 50-BFV-06-2	2	BUTTERFLY VALVE	16	BFV2	PUMP STATION PRESSURE RELIEF / BYPASS	PROCESS	PW	Cl or DI	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
84	I-1008	50-PRV-06	1	PRESSURE RELIEF VALVE	16	PRV4	PUMP STATION PRESSURE RELIEF / BYPASS	PROCESS	PW	Cl or DI	150	FLANGE	NONE	NONE	CLOSED	CONTRACTOR	15120
85	I-1008	50-BFV-01-1, 50-BFV-02-1, 50-BFV-03-1, 50-BFV-04-1	4	BUTTERFLY VALVE	20	BFV2	HIGH SERVICE PUMP SUCTION ISOLATION	PROCESS	FW	Cl or DI	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
86	I-1008	50-BV-01-3, 50-BV-02-3, 50-BV-03-3, 50-BV-04-3	4	BALL VALVE	2	BV3	ARV ISOLATION	PROCESS	PW	CF8M	150	FNPT	HANDLE	NONE	NO	CONTRACTOR	15100
87	I-1008	50-ARV-01, 50-ARV-02, 50-ARV-03, 50-ARV-04	4	COMBINATION AIR RELEASE/ VACUUM VALVE	2	ARV1	HIGH SERVICE PUMP DISCHARGE	PROCESS	PW	CAST IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
88	I-1008	50-CV-01, 50-CV-02, 50-CV-03, 50-CV-04	4	CHECK VALVE	14	CV1	HIGH SERVICE PUMP DISCHARGE	PROCESS	PW	DUCTILE IRON	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
89	I-1008	50-MOV-01, 50-MOV-02, 50-MOV-03, 50-MOV-04	4	MOTORIZED BALL VALVE	14	MBV	HIGH SERVICE PUMP DISCHARGE	PROCESS	PW	DUCTILE IRON	150	FLANGE	MOTOR	MODULATING	OPEN/CL OSE	CONTRACTOR	15103
90	I-1008	50-BFV-01-2, 50-BFV-02-2, 50-BFV-03-2, 50-BFV-04-2	4	BUTTERFLY VALVE	14	BFV2	HIGH SERVICE PUMP DISCHARGE ISOLATION	PROCESS	PW	Cl or DI	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
91	I-1008	50-BFV-90-1, 50-BFV-90-2	2	BUTTERFLY VALVE	48	BFV2	PUMP STATION FLOW METER ISOLATION	PROCESS	PW	Cl or DI	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
92	I-1008	50-ARV-05	1	AIR RELEASE VALVE	2	ARV2	HIGH SERVICE PUMP SUCTION / BITTERS PS	PROCESS	FW	Cl or DI	150	NPT	HANDLE	NONE	NO	CONTRACTOR	15100
93	I-1008	50-BV-05	1	BALL VALVE	2	BV3	ARV ISOLATION	PROCESS	FW	CF8M	150	NPT	HANDLE	NONE	NO	CONTRACTOR	15100
94	I-1008	50-ARV-90	1	AIR RELEASE VALVE	4	ARV2	PUMP STATION BYPASS TO BITTERS PS	PROCESS	PW	Cl or DI	See D-1001	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
95	I-1008	50-ARV-90	1	BUTTERFLY VALVE	4	BFV2	ARV ISOLATION	PROCESS	PW	Cl or DI	150	FLANGE	HANDLE	NONE	NO	CONTRACTOR	15100
96	I-1009	60-BV-01-1, 60-BV-02-1	2	BALL VALVE	3/4	-	BRINE TANK FILL (FLUSHING WATER CONNECTION)	PROCESS	BR	PVC	-	-		NONE	NO	OSG SYSTEM SUPPLIER	15100
97	I-1009	60-BV-01-2, 60-BV-02-2	2	BALL VALVE	1	BV1	BRINE TANK SOFTENED WATER INLET	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
98	I-1009	60-BV-01-3, 60-BV-02-3	2	BALL VALVE	1	-	BRINE TANK LIT ISOLATION	PROCESS	BR	PVC	-	-	HANDLE	NONE	NO	OSG SYSTEM SUPPLIER	11366

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
99	I-1009	60-BV-01-4, 60-BV-02-4	2	BALL VALVE	3	-	BRINE TANK DRAIN ISOLATION	PROCESS	BR	PVC	-	-	HANDLE	NONE	NO	OSG SYSTEM SUPPLIER	11366
100	I-1009	60-BV-01-5, 60-BV-02-5	2	BALL VALVE	2	-	BRINE TANK OUTLET ISOLATION	PROCESS	BR	PVC	-	-	HANDLE	NONE	NO	OSG SYSTEM SUPPLIER	11366
101	I-1009	61-BV-11-1, 61-BV-12-1	2	BALL VALVE	1.5	BV1	BRINE FILTERS INLET ISOLATION	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
102	I-1009	61-BV-11-2, 61-BV-12-2	2	BALL VALVE	1.5	BV1	BRINE FILTERS OUTLET ISOLATION	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
103	I-1009	61-BV-20	0.5	BALL VALVE	1	BV1	BRINE FILTERS OUTLET PI ISOLATION	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
104	I-1009	61-BV-30	1	BALL VALVE	1	BV1	WATER SOFTENERS SYSTEM ISOLATION	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
105	I-1009	61-BV-31-1, 61-BV-32-1, 61-BV-33-1	3	BALL VALVE	1	BV1	WATER SOFTENER WATER SUPPLY ISOLATION	PROCESS	NPW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
106	I-1009	61-BV-31-2, 61-BV-32-2, 61-BV-33-2	3	BALL VALVE	1	BV1	WATER SOFTENER BYPASS ISOLATION	PROCESS	NPW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
107	I-1009	61-BV-31-3, 61-BV-32-3, 61-BV-33-3	3	BALL VALVE	1	BV1	WATER SOFTENER INLET ISOLATION	PROCESS	NPW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
108	I-1009	61-BV-31-4, 61-BV-32-4, 61-BV-33-4	3	BALL VALVE	1	BV1	WATER SOFTENER OUTLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
109	I-1009	61-BV-31-5, 61-BV-32-5, 61-BV-33-5	3	BALL VALVE	1	BV1	WATER SOFTENER BRINE INLET	PROCESS	BR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
110	I-1009	61-BV-31-6, 61-BV-32-6	2	BALL VALVE	1	BV1	WATER SOFTENER OUTLET	PROCESS	SW	PVC	100	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
111	I-1009	61-PRV-31, 61-PRV-32	2	PRESSURE REGULATING VALVE	1	-	WATER SOFTENER OUTLET TO OSG SKID	PROCESS	SW	PVC	100	-	NONE	NONE	NO	OSG SYSTEM SUPPLIER	11366
112	I-1009	61-PRV-41, 61-PRV-42	2	PRESSURE REGULATING VALVE	1	-	SW TO BRINE TANK	PROCESS	SW	PVC	-	-	NONE	NONE	NO	OSG SYSTEM SUPPLIER	11366
113	I-1009	61-BV-41-2, 61-BV-42-2	2	BALL VALVE	1	BV1	SW TO BRINE TANK SV INLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
114	I-1009	61-SV-41, 61-SV-42	2	SOLENOID VALVE	1	-	SW TO BRINE TANK	PROCESS	SW	PVC	150	TRUE UNION	SOLENOID	OPEN/CLOSE	OPEN/CLOSE	OSG SYSTEM SUPPLIER	11366
115	I-1009	61-BV-41-3, 61-BV-42-3	2	BALL VALVE	1	BV1	SW TO BRINE TANK SV OUTLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
116	I-1009	61-BV-50-1, 61-BV-50-2	2	BALL VALVE	1	BV1	WATER SOFTENER OUTLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
117	I-1009	61-BV-61-1, 61-BV-62-1	2	BALL VALVE	1.5	BV1	WATER FILTER INLET ISOLATION	PROCESS	NPW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
118	I-1009	61-BV-61-2, 61-BV-62-2	2	BALL VALVE	1.5	BV1	WATER FILTER OUTLET ISOLATION	PROCESS	NPW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
119	I-1009	61-PRV-70	1	PRESSURE REGULATING VALVE	1.5	-	WATER SOFTENER WATER SUPPLY	PROCESS	PW	PVC	-	-	NONE	NONE	NO	OSG SYSTEM SUPPLIER	11366
120	I-1009	62-BV-11-4, 62-BV-12-4	2	BALL VALVE	1	BV1	FUTURE WATER CHILLERS BYPASS	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
121	I-1009	62-BV-41-2, 62-BV-42-2	2	BALL VALVE	1	BV1	OSG SKID SOFTENED WATER FILTER INLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
122	I-1009	62-BV-41-3, 62-BV-42-3	2	BALL VALVE	1	BV1	OSG SKID SOFTENED WATER FILTER OUTLET ISOLATION	PROCESS	SW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
123	I-1009	62-BV-41-4, 62-BV-42-4	2	BALL VALVE	3	BV2	OSHG SKID OUTLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	OPEN/CLOSED	CONTRACTOR	15100
124	I-1009	62-BV-50-1, 62-BV-50-2	2	BALL VALVE	1	BV1	ROOF LEVEL - VENT PIPING DRAIN	PROCESS	VNT	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
125	I-1009	62-BV-50-3, 62-BV-50-4	2	BALL VALVE	1	BV1	BLOWER DISCHARGE DRAIN	PROCESS	AIR	PVC	100	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
126	I-1009	62-BFV-51, 62-BFV-52, 62-BFV-53, 62-BFV-54	4	BUTTERFLY VALVE	4	BFV6	HYDROGEN VENT BLOWER ISOLATION	PROCESS	AIR	PVC	100	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100

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CENTRAL WATER INTEGRATION PIPELINE
VALVES AND APPURTENANCES

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
127	I-1010	63-BV-01	1	BALL VALVE	3	BV2	SHC STORAGE TANK FILL INTERCONNECT	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
128	I-1010	63-BV-11-1, 63-BV-12-1	2	BALL VALVE	3	BV2	SHC STORAGE TANK SECONDARY FILL ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
129	I-1010	63-BV-11-2, 63-BV-12-2	2	BALL VALVE	3	BV2	SHC STORAGE TANK DRAIN ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
130	I-1010	63-BV-11-5, 63-BV-12-5	2	BALL VALVE	1	BV2	SHC STORAGE TANK LIT ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
131	I-1010	63-BV-11-6, 63-BV-12-6	2	BALL VALVE	3	BV2	SHC STORAGE TANK OUTLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
132	I-1010	63-BFV-31, 63-BFV-32, 63-BFV-33, 63-BFV-34	4	BUTTERFLY VALVE	6	BFV6	HYDROGEN DILUTION BLOWER ISOLATION	PROCESS	AIR	PVC	100	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
133	I-1010	63-BV-80-1, 63-BV-80-2	2	BALL VALVE	3	BV2	SHC STORAGE TANK CONTAINMENT AREA SUMP PUMP DISCHARGE ISOLATION	PROCESS	DR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
134	I-1010	63-BV-30-1, 63-BV-30-2	2	BALL VALVE	1	BV1	HYDROGEN DILUTION BLOWER DISCHARGE DRAIN	PROCESS	AIR	PVC	100	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
135	I-1010	63-CV-80	1	CHECK VALVE	4	CV4	SHC STORAGE TANK CONTAINMENT ARE SUMP PUMP DISCHARGE CHECK	PROCESS	DR	PVC	150	FLANGE	NONE	NONE	NO	CONTRACTOR	15100
136	I-1010	65-BV-01	1	BALL VALVE	3	BV2	BASKET STRAINER INLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
137	I-1010	65-BV-02	1	BALL VALVE	3	BV2	BASKET STRAINER OUTLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
138	I-1010	65-BV-03	1	BALL VALVE	3	BV2	BASKET STRAINER BYPASS	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
139	I-1010	65-BV-04	1	BALL VALVE	0.75	BV2	TEMPORARY SODIUM HYPOCHLORITE FEED SUCTION CONNECTION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
140	I-1010	65-BV-05	1	BALL VALVE	3	BV2	TEMPORARY SODIUM HYPOCHLORITE FEED SUCTION CONNECTION DOWNSTREAM ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
141	I-1010	65-BV-11-1, 65-BV-12-1, 65-BV-13-1, 65-BV-14-1	4	BALL VALVE	2	BV2	SHC METERING PUMP SUCTION ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
142	I-1010	65-BV-11-2, 65-BV-12-2, 65-BV-13-2, 65-BV-14-2	4	BALL VALVE	2	BV2	SHC METERING PUMP CALIBRATION COLUMN ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
143	I-1010	65-BV-11-3, 65-BV-12-3, 65-BV-13-3, 65-BV-14-3	4	BALL VALVE	1	BV2	SHC METERING PUMP DISCHARGE PULSATION DAMPENER ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR, COORDINATE WITH PULSATION DAMPENER CONNECTION SIZE	15100
144	I-1010	65-BV-11-4, 65-BV-12-4, 65-BV-13-4, 65-BV-14-4	4	BALL VALVE	2	BV2	SHC METERING PUMP DISCHARGE ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
145	I-1010	65-BV-11-5, 65-BV-12-5, 65-BV-13-5, 65-BV-14-5	4	BALL VALVE	2	BV2	SHC METERING PUMP DISCHARGE	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
146	I-1010	65-BV-11-6, 65-BV-12-6, 65-BV-13-6, 65-BV-14-6	4	BALL VALVE	1	BV2	SHC METERING PUMP DRAIN	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
147	I-1010	65-BV-11-8, 65-BV-12-8, 65-BV-13-8, 65-BV-14-8	4	BALL VALVE	2	BV2	SHC METERING PUMP SYSTEM ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
148	I-1010	65-PRV-11, 65-PRV-12, 65-PRV-13, 65-PRV-14	4	PRESSURE RELIEF VALVE	2	-	SHC METERING PUMP	PROCESS	SHC	PVC	-	-	NONE	NONE	NO	BY SODIUM HYPOCHLORITE METERING PUMP SUPPLIER	11242

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Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
149	I-1010	65-BV-40	1	BALL VALVE	2	BV2	SHC METERING PUMP INTERCONNECT	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
150	I-1010	65-BV-51-1, 65-BV-52-1	2	BALL VALVE	2	BV2	SHC FEED POINT FLOW METER INLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
151	I-1010	65-BV-51-2, 65-BV-52-2	2	BALL VALVE	2	BV2	SHC FEED POINT FLOW METER OUTLET ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
152	I-1010	65-BV-51-3, 65-BV-52-3	2	BALL VALVE	2	BV2	SHC FEED POINT FLOW METER BYPASS	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
153	I-1010	65-BV-51-4 65-BV-52-4	2	BALL VALVE	2	BV2	CONNECTION OF TEMPORARY SODIUM HYPOCHLORITE SYSTEM INTO FEED LINES	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
154	I-1010	65-BV-61, 65-BV-62	2	BALL VALVE	2	BV2	SHC FEED POINT ISOLATION	PROCESS	SHC	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
155	I-1011	69-BV-01-1	1	BALL VALVE	2	BV5	BULK STORAGE TANK FILL ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
156	I-1011	69-BV-01-2, 69-BV-01-3	2	BALL VALVE	1	BV5	BULK STORAGE TANK OVERFLOW	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
157	I-1011	69-BV-01-4	1	BALL VALVE	2	BV5	BULK STORAGE TANK SIGHT GLASS (LOWER)	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
158	I-1011	69-BV-01-5	1	BALL VALVE	2	BV5	BULK STORAGE TANK SIGHT GLASS (UPPER)	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
159	I-1011	69-BV-01-6	1	BALL VALVE	3	BV5	BULK STORAGE TANK OUTLET ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
160	I-1011	69-BV-01-7	1	BALL VALVE	3	BV5	BULK STORAGE TANK DRAIN ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
161	I-1011	69-MOV-10	1	MOTORIZED BALL VALVE	2	BV5	BULK STORAGE TANK OUTLET	PROCESS	HFA	CPVC	150	TRUE UNION	MOTOR	OPEN/CLOSE	OPEN/CLOSE	CONTRACTOR	15100
162	I-1011	69-BV-10-1	1	BALL VALVE	1	BV5	BASKET STRAINER INLET ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
163	I-1011	69-BV-10-2	1	BALL VALVE	1	BV5	BASKET STRAINER OUTLET ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
164	I-1011	69-BV-10-3	1	BALL VALVE	1	BV5	BASKET STRAINER BYPASS	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
165	I-1011	69-BV-20-1	1	BALL VALVE	3/4	BV5	PUMP SKID SYSTEM INLET ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
166	I-1011	69-BV-20-2	1	BALL VALVE	3/4	BV5	CALIBRATION COLUMN ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
167	I-1011	69-BV-31-1, 69-BV-32-1	2	BALL VALVE	3/4	BV5	METERING PUMP SUCTION ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
168	I-1011	69-BV-60-1	1	BALL VALVE	1	BV5	FLUSHING WATER ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
169	I-1011	69-BV-60-2	1	BALL VALVE	1	BV5	FLUSHING WATER PI ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
170	I-1011	69-BCV-60	1	BALL CHECK VALVE	1	CV6	FLUSHING WATER ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	NONE	NONE	NO	CONTRACTOR	15100
171	I-1011	69-BV-60-3	1	BALL VALVE	1	BV5	FLUSHING WATER ISOLATION	PROCESS	HFA	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
172	I-1011	69-CV-80	1	CHECK VALVE	3	CV4	CONTAINMENT SUMP PUMP DISCHARGE	PROCESS	DR	CPVC	150	FLANGE	NONE	NONE	NO	CONTRACTOR	15100
173	I-1011	69-BV-80-1	1	BALL VALVE	2	BV5	CONTAINMENT SUMP PUMP DISCHARGE	PROCESS	DR	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
174	I-1011	69-BV-80-2, 69-BV-80-3	2	BALL VALVE	3	BV5	CONTAINMENT SUMP PUMP DISCHARGE	PROCESS	DR	CPVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
175	I-1012	67-BV-01-1	1	BALL VALVE	2	BV1	BULK STORAGE TANK FILL ISOLATION	PROCESS	POLY	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
176	I-1012	67-BV-01-2, 67-BV-01-3	2	BALL VALVE	1	BV1	BULK STORAGE TANK OVERFLOW	PROCESS	OF	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
177	I-1012	67-BV-01-6	1	BALL VALVE	2	BV1	BULK STORAGE TANK OUTLET ISOLATION	PROCESS	POLY	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
178	I-1012	67-BV-01-7	1	BALL VALVE	2	BV1	BULK STORAGE TANK DRAIN ISOLATION	PROCESS	POLY	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
179	I-1012	67-BV-41-3, 67-BV-42-3	2	BALL VALVE	1	BV1	WATER SUPPLY TO POLYMER BLENDING UNIT	PROCESS	PW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
180	I-1012	67-BCV-41, 67-BCV-42	2	BALL CHECK VALVE	1	CV5	WATER SUPPLY TO POLYMER BLENDING UNIT	PROCESS	PW	PVC	150	TRUE UNION	NONE	NONE	NO	CONTRACTOR	15100
181	I-1012	67-BV-41-2, 67-BV-42-2	2	BALL VALVE	1	BV1	WATER SUPPLY PI ISOLATION	PROCESS	PW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100

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VALVES AND APPURTENANCES

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Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
182	I-1012	67-BV-41-1, 67-BV-42-1	2	BALL VALVE	1	BV1	WATER SUPPLY TO POLYMER BLENDING UNIT	PROCESS	PW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
183	I-1012	67-BV-70	1	BALL VALVE	1	BV1	POLYMER SOLUTION SYSTEM ISOLATION	PROCESS	POLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
184	I-1012	67-CV-80	1	CHECK VALVE	3	CV4	CONTAINMENT SUMP PUMP DISCHARGE	PROCESS	DR	PVC	150	FLANGE	NONE	NONE	NO	CONTRACTOR	15100
185	I-1012	67-BV-80-1, 67-BV-80-2	2	BALL VALVE	3	BV1	CONTAINMENT SUMP PUMP DISCHARGE	PROCESS	DR	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
186	I-1013	71-MOV-01	1	MOTORIZED BUTTERFLY VALVE	18	BFV1	BACKWASH RECOVERY BASIN	PROCESS	BWWS	DUCTILE IRON	150	LUGGED	MOTOR	OPEN/CLOSE	OPEN/CLOSE	CONTRACTOR	15100
187	I-1013	71-CV-11, 71-CV-12	2	CHECK VALVE	6	CV7	BACKWASH RECOVERY BASIN	PROCESS	BWW	DUCTILE IRON	150	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
188	I-1013	71-PV-11, 71-PV-12	2	PLUG VALVE	6	PV1	BACKWASH RECOVERY BASIN	PROCESS	BWW	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
189	I-1014	73-PV-01	1	PLUG VALVE	8	PV1	GRAVITY THICKENER	PROCESS	GTS	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
190	I-1014	73-PV-02	1	PLUG VALVE	6	PV1	SLUDGE HOLDING TANK	PROCESS	BWW	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
191	I-1014	73-PV-03	1	PLUG VALVE	4	PV1	GRAVITY THICKENER	PROCESS	BWW	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
192	I-1014	73-BV-01	1	BALL VALVE	1	BV3	GRAVITY THICKENER DECANT SAMPLE	PROCESS	GTD	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
193	I-1014	81-PV-01-1, 81-PV-01-2	2	PLUG VALVE	4	PV1	GRAVITY THICKENER SLUDGE FEED ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
194	I-1014	81-BV-01-1, 81-BV-01-2	2	BALL VALVE	1	BV3	GRAVITY THICKENER SLUDGE FEED FLUSHING CONNECTION	PROCESS	SL	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
195	I-1014	81-PV-01-3	1	PLUG VALVE	4	PV1	CENTRIFUGE FEED PUMP INTERCONNECT	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
196	I-1014	81-PV-11-1, 81-PV-12-1	2	PLUG VALVE	4	PV1	CENTRIFUGE FEED PUMP SUCTION ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
197	I-1014	81-CV-11, 81-CV-12	2	CHECK VALVE	4	CV7	CENTRIFUGE FEED PUMP DISCHARGE	PROCESS	SL	DUCTILE IRON	150	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
198	I-1014	81-PV-11-2, 81-PV-12-2	2	PLUG VALVE	4	PV1	CENTRIFUGE FEED PUMP DISCHARGE ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
199	I-1014	81-BV-11, 81-BV-12	2	BALL VALVE	1	BV3	GRAVITY THICKENER SLUDGE FEED FLUSHING CONNECTION	PROCESS	SL	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
200	I-1014	81-PV-13-1, 81-PV-14-1	2	PLUG VALVE	4	PV1	CENTRIFUGE PUMP SUCTION ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
201	I-1014	81-CV-13, 81-CV-14	2	CHECK VALVE	4	CV7	CENTRIFUGE FEED PUMP DISCHARGE	PROCESS	SL	DUCTILE IRON	150	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
202	I-1014	81-PV-13-2, 81-PV-14-2	2	PLUG VALVE	4	PV1	CENTRIFUGE FEED PUMP DISCHARGE ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
203	I-1014	81-PV-50-3,	1	PLUG VALVE	4	PV1	CENTRIFUGE FEED PUMP DISCHARGE INTERCONNECT	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
204	I-1014	81-BV-50-1, 81-BV-50-2	2	BALL VALVE	4	BV3	CENTRIFUGER FEED PIPING FLUSHING CONNECTION	PROCESS	SL	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
205	I-1014	81-PV-50-1, 81-PV-50-2	2	PLUG VALVE	4	PV1	CENTRIFUGE FEED PIPING	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
206	I-1014	81-PV-02-1, 81-PV-02-2	2	PLUG VALVE	4	PV1	GRAVITY THICKENER SLUDGE FEED ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
207	I-1014	81-PV-02-3	1	PLUG VALVE	4	PV1	LIQUID SLUDGE LOADING PUMP INTERCONNECT	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
208	I-1014	81-BV-02-1, 81-BV-02-2	2	BALL VALVE	1	BV3	GRAVITY THICKENER SLUDGE FEED FLUSHING CONNECTION	PROCESS	SL	316SS	300	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
209	I-1014	81-PV-15-1, 81-PV-16-1	2	PLUG VALVE	4	PV1	LIQUID SLUDGE LOADING PUMP SUCTION ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
210	I-1014	81-CV-15, 81-CV-16	2	CHECK VALVE	4	CV7	LIQUID SLUDGE LOADING PUMP DISCHARGE	PROCESS	SL	DUCTILE IRON	150	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
211	I-1014	81-PV-15-2, 81-PV-16-2	2	PLUG VALVE	4	PV1	LIQUID SLUDGE LOADING PUMP DISCHARGE ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
212	I-1014	81-PV-90-1, 81-PV-90-2	2	PLUG VALVE	4	PV1	LIQUID SLUDGE LOADING DISCHARGE PIPING ISOLATION	PROCESS	SL	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
213	I-1015	77-MOV-01	1	MOTORIZED BUTTERFLY VALVE	16	BFV1	WASTE RECOVERY BASIN	PROCESS	DREC	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100

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CENTRAL WATER INTEGRATION PIPELINE
VALVES AND APPURTENANCES

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
214	I-1015	77-CV-11, 77-CV-12	2	CHECK VALVE	6	CV7	WASTE RECOVERY PUMP DISCHARGE	PROCESS	DREC	DUCTILE IRON	150	FLANGE	LEVER	NONE	NO	CONTRACTOR	15100
215	I-1015	77-BFV-11, 77-BFV-12	2	BUTTERFLY VALVE	6	BFV1	WASTE RECOVERY PUMP DISCHARGE PI ISOLATION	PROCESS	DREC	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
216	I-1016	68-BV-91, 68-BV-92	2	BALL VALVE	1	BV1	CENTRIFUGE POLYMER FEED	PROCESS	POLY	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
217	I-1016	68-BCV-91, 68-BCV-92	2	BALL CHECK VALVE	1	CV4	CENTRIFUGE POLYMER FEED	PROCESS	POLY	PVC	150	TRUE UNION	NONE	NONE	NO	CONTRACTOR	15100
218	I-1016	85-BV-11-1, 85-BV-21-1	2	BALL VALVE	1	BV3	CENTRIFUGE WATER FEED SOLENOID INLET ISOLATION	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
219	I-1016	85-SV-11, 85-SV-21	2	SOLENOID BALL VALVE	1	SV1	CENTRIFUGE WATER FEED	PROCESS	NPW	BRONZE	150	THREADED	ELECTRIC	ON/OFF	NO	CONTRACTOR	15100
220	I-1016	85-BV-11-2, 85-BV-21-2	2	BALL VALVE	1	BV3	CENTRIFUGE WATER FEED SOLENOID OUTLET ISOLATION	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
221	I-1016	85-BV-11-3, 85-BV-21-3	2	BALL VALVE	1	BV3	CENTRIFUGE WATER FEED SOLENOID BYPASS	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
222	I-1016	85-BV-12-1, 85-BV-22-1	2	BALL VALVE	1	BV3	SCREW CONVEYOR WATER FEED ISOLATION	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
223	I-1016	85-SV-12, 85-SV-22	2	SOLENOID BALL VALVE	1	SV1	SCREW CONVEYOR WATER FEED	PROCESS	NPW	BRONZE	150	THREADED	ELECTRIC	ON/OFF	NO	CONTRACTOR	15100
224	I-1016	85-BV-12-2, 85-BV-22-2	2	BALL VALVE	1	BV3	SCREW CONVEYOR WATER FEED SOLENOID BYPASS	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
225	I-1016	85-BV-12-3, 85-BV-22-3	2	BALL VALVE	1	BV3	SCREW CONVEYOR FLUSHING	PROCESS	NPW	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
226	I-1016	85-BV-11-4, 85-BV-21-4	2	BALL VALVE	1	BV3	CENTRIFUGE SAMPLE PORT	PROCESS	CSUP	316SS	150	THREADED	HANDLE	NONE	NO	CONTRACTOR	15100
227	I-1016	85-PV-11, 85-PV-21	2	PLUG VALVE	4	PV1	CENTRIFUGE FEED PIPING	PROCESS	CSUP	CAST IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
228	I-1016	85-SG-11-1, 85-SG-11-2	2	SLIDE GATE	2 FT X 2 FT	SG	LOADOUT BIN DEWATERED CAKE DISCHARGE	PROCESS	CSUP	CAST IRON		FLANGE	MOTOR	OPEN/CLOSE	OPEN/CLOSE	BIN MANUFACTURER SUPPLY	13250
229	I-1017	68-BV-01, 68-BV-02, 68-BV-03, 68-BV-04	4	BALL VALVE	1	BV1	POLYMER TOTE ISOLATION	PROCESS	POLY	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
230	I-1017	68-BV-41-3, 68-BV-42-3, 68-BV-43-3	3	BALL VALVE	1	BV1	POLYMER BLENDING SKID WATER SUPPLY	PROCESS	PW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
231	I-1017	68-BCV-41, 68-BCV-42, 68-BCV-43	3	BALL CHECK VALVE	1	CV4	POLYMER BLENDING SKID WATER SUPPLY	PROCESS	PW	PVC	150	TRUE UNION	NONE	NONE	NO	CONTRACTOR	15100
232	I-1017	68-BV-41-1, 68-BV-42-1, 68-BV-43-1	3	BALL VALVE	1	BV1	POLYMER BLENDING SKID WATER SUPPLY ISOLATION	PROCESS	PW	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
233	I-1017	68-BV-70-1, 68-BV-70-3	2	BALL VALVE	1	BV1	POLYMER SOLUTION FEED ISOLATION	PROCESS	POLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
234	I-1017	68-BV-70-2, 68-BV-70-4	2	BALL VALVE	1	BV1	POLYMER SOLUTION FEED INTERCONNECT	PROCESS	POLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100

END OF SECTION

SECTION 17500

PROGRAMMABLE LOGIC CONTROLLER

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section of the specifications describes the requirements for Programmable Logic Controllers (PLCs) to be furnished as listed in the related work paragraphs of this section and the Drawings.
- B. Some of the PLC equipment is provided as part of an integrated control system on a vendor-supplied equipment package as shown on the Drawings. The PLC equipment used in these control systems must comply and be consistent with the requirements outlined in this document.
- C. All equipment described herein shall be submitted and furnished as an integral part of Control System equipment specified herein and elsewhere within other specification sections. The PLC system configuration as described in the Contract Documents was developed to list the major elements. Some variations in the configuration will be considered provided the physical and functional constraints as intended for the various system components are met. Complete PLC system design, I/O configuration, module/rack arrangement, construction and additional coordination shall be provided by the packaged equipment manufacturer or the Process Control System Integrator (PCSI) as appropriate.
- D. Provide equipment, materials, software, calibrations, training, and services required to successfully interface and interconnect the system and associated equipment that are specified or designated in drawings or provisions of these specifications for providing a fully integrated and functional control system as specified.
- E. Furnish and install cabling and cable accessories, including tools necessary for connecting the system and peripherals, Programmable Logic Controllers (PLCs), data highway, and input/output devices.
- F. Furnish startup, training, and system commissioning services.
- G. Furnish and install all items necessary for the proper functioning of the equipment even if omitted at no additional cost to the Owner.
- H. The Drawings and related Specification sections supplement this Section and provide additional details showing panel elevations, instrument device schedules, functional requirements of the system, and interaction with other equipment.
- I. Coordinate and schedule all testing procedures with the General Contractor.
- J. All software packages provided shall be licensed under the Owner's name and address. The PCSI shall coordinate with the Owner for correct name and address.

1.02 RELATED WORK

- A. Section 17300 Process Control Systems General Provisions
- B. Section 17325 Process Control System Control Panels

1.03 SUBMITTALS

- A. Submittals for equipment specified herein shall be made as a part of equipment furnished under Section 17300, in accordance with the requirements of Section 01300.
- B. Submit catalog data for all items specified as applicable. Submittal shall include catalog data, functions, ratings, inputs, outputs, displays, etc., sufficient to confirm that the equipment provides all specified requirements. Any options or exceptions shall be clearly indicated and shall follow the terms within the General Conditions of Division 1.
- C. Submit a bill of materials for each PLC clearly identifying all components and quantities.
- D. Submit catalog data sheets for all software licenses provided under this specification section.

1.04 REFERENCE CODES AND STANDARDS

- A. Instrumentation equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
 - 1. National Electrical Safety Code (NESC)
 - 2. Underwriters Laboratories (UL)
 - 3. UL 508, the Standard of Safety for Industrial Control Equipment
 - 4. All equipment and installations shall conform to applicable Federal, State, and local codes.
- B. All equipment shall comply with the requirements of the National Electric Code and Underwriters Laboratories (UL) where applicable.
- C. Each specified device shall also conform to the standards and codes listed in the individual device paragraphs.

1.05 QUALITY ASSURANCE

- A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of five years. When requested by the Owner and/or Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- B. Equipment submitted shall fit within the space or location shown on the Drawings. Equipment which does not fit within the space or location is not acceptable.

1.06 COMMUNICATIONS PROTOCOL

- A. The PLC System shall communicate utilizing Ethernet/IP Protocol with the following as minimum capabilities:
 - 1. Transfer of basic I/O data via User Datagram Protocol (UDP)-based implicit messaging.
 - 2. Uploading and downloading of parameters, set points, programs and recipes via TCP (i.e., explicit messaging).

3. Polled, cyclic and change-of-state monitoring via UDP, such as RPI and COS in Allen Bradley's ControlLogix control systems.
 4. One-to-one (unicast), one-to-many (multicast), and one-to-all (broadcast) communication via TCP.
 5. Use of well-known TCP port number 44818 for explicit messaging and UDP port number 2222 for implicit messaging.
- B. The PLC shall be capable of peer-to-peer communications that provide for the direct transfer of process data between controllers on request of the controller needing a value requesting the source controller of the value to send the value without the use of gateways or servers.

PART 2 PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLER SYSTEM

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Rockwell Automation ControlLogix Series using Studio 5000 ENU software
 2. Rockwell Automation CompactLogix Series using Studio 5000 ENU software
 3. No others Approved
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Programming Languages
1. Each PLC shall support IEC Standard 61131-3 including the following programming languages:
 - a. Ladder (LD)
 - b. Function Block Diagram (FBD)
 - c. Sequential Functional Chart (SFC)
 - d. Structured Text (ST)
 - e. Instruction List (IL)
 2. Provide one (1) copy of the manufacturer's programming software for this class of PLC, with the highest-level capability, fully licensed in the Owner's name. Request Owner's contact information during the first PCSI construction meeting.
 3. PLC shall support user defined functions for customization and user defined tag structures
 4. PLC shall have application-specific instructions for process, drive, batch, motion and safety applications built into the controller.
- D. Central Processor Unit
1. **Master and DMZ PLC processors shall be Allen Bradley 1756-L75 ~~4756-L72~~.**

2. ~~Field PLC processors shall be Allen Bradley 1769-L33ER 1769-L30ER.~~
 3. Provide hardware employing identical revisions of software and firmware as applicable.
- E. Physical Construction (Rack)
1. The PLC shall be of modular construction, consisting of a back plane, plug in modules for the processor, communications modules, I/O modules and expansion modules.
 2. Provide appropriate PLC I/O end cap / terminators as required.
 3. Provide Allen Bradley blank filler modules in empty rack slots as required.
 4. Provide the ability to monitor and override I/O.
 5. Provide I/O modules in the base bid.
 6. Provide the ability to preselect the failure mode of each output point in the event of CPU failure.
 7. I/O modules shall support wiring interface devices that allow the removal and reinstallation of I/O modules without removing wires from terminals. All required wiring interface devices shall be included in the bid.
- F. Power Supply (PS)
1. The Master PLC power supply shall be 120 Volt 60 Hz, and shall be Allen Bradley 1756- PA7x.
 2. The field PLC power supply shall be 120 Volt 60 Hz, and shall be Allen Bradley 1769- PA4. Provide additional power supplies as required for specific I/O requirements.
- G. Analog Input and Output Modules (AI and AO)
1. Master PLC
 - a. Analog Input Modules shall be Allen Bradley 1756 ControlLogix 8 Channel Analog Input Modules 1756-IF8 (Current)
 - 1) ~~Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1756-IF8 module.~~
 - b. Analog Output Modules shall be Allen Bradley 1756 ControlLogix 8 Channel Analog Output Modules 1756-OF8 (Current).
 - 1) ~~Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1756-OF8 module.~~
 2. Field PLC
 - a. Analog Input Modules shall be Allen Bradley 1769 CompactLogix 8 Channel Analog Input Modules 1769-IF8 (Current).
 - 1) ~~Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1769-IF8 module.~~

- b. Analog Output Modules shall be Allen Bradley 1769 CompactLogix 8 Channel Analog Output Modules 1769-OF8 (Current).
 - 1) Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for 1769-OF8 module.
- B. Discrete Input Modules (DI)
1. Master PLC
 - a. Discrete inputs shall be Allen Bradley 1756 16 Channel Digital DC Input Model 1756-IB16.
 - 1) Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1756-IB16 module. Interface module should be supplied with integral channel status LEDs.
 2. Field PLC
 - a. Discrete inputs shall be Allen Bradley 1769 Compact 32 Channel Digital DC Input Model 1769-IQ32.
 - 1) Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1769-IQ32 module. Interface module should be supplied with integral channel status LEDs.
- B. Discrete Output Modules (DO)
1. Master PLC
 - a. Discrete outputs shall be Allen Bradley 1756 16 Channel Digital DC Output module 1756-OB16E.
 - 1) Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1756-OB16E module. Interface module should be supplied with integral channel status LEDs.
 2. Field PLC
 - a. Discrete outputs shall be Allen Bradley 1769 Compact 32 Channel Digital DC Output module 1769-OB32.
 - 1) Provide Allen Bradley Bulletin 1492 wiring system pre-wired cables and Interface Modules (IFMs) appropriate for the 1769-OB32 module. Interface module should be supplied with integral channel status LEDs.
- B. Data Historian Module
1. The Data Historian module shall accept and store time-stamped data readings from plant-floor equipment. These data readings are forwarded to the FactoryTalk Historian SE servers. If the main data server WAN link is unavailable, the module shall have sufficient capacity to store the data readings until the network connection is restored.

2. Data Historian module shall be Allen Bradley FactoryTalk Historian ME module.
 - a. Part number: 1756-HIST2G
 - b. Installed in ControlLogix backplane of Master PLC.
 3. Coordinate configuration of data transfer with administrator of FactoryTalk Historian SE data servers. The tag license on the Historian SE servers must accommodate the number of tags configured for data transfer from the Historian ME module to the Historian SE servers.
- C. Communications Modules
1. All PLCs shall include an integral Ethernet interface or a communications adapter module with at least one Ethernet interface port. Ethernet interface ports shall accept a standard Ethernet patch cable via RJ-45 connector.
 - a. Master PLC and DMZ PLC communications adapter module shall be Allen Bradley 1756-EN2T.
- D. Active Spare Requirement
1. Provide a minimum of 20 percent wired spare I/O channels of each type furnished. All I/O points provided shall be wired to DIN rail mounted terminals.

2.03 SPARES REQUIREMENTS

- A. Comply with the requirements of Section 01600.
- B. Provide the following additional spare items for each PLC-based control panel:
 1. One box replacement fuses, all types and sizes used.
 2. One replacement cable of each type used
 3. One of each Backplane used in the system.
 4. One power supply of each type used.
 5. One CPU module of each type used.
 6. One I/O module of each type used.
- C. Spare parts shall be boxed or packaged for long term storage. Identify each item with manufacturer's name, description and part number on the exterior of the package.

PART 3 EXECUTION

3.01 INSTALLATION

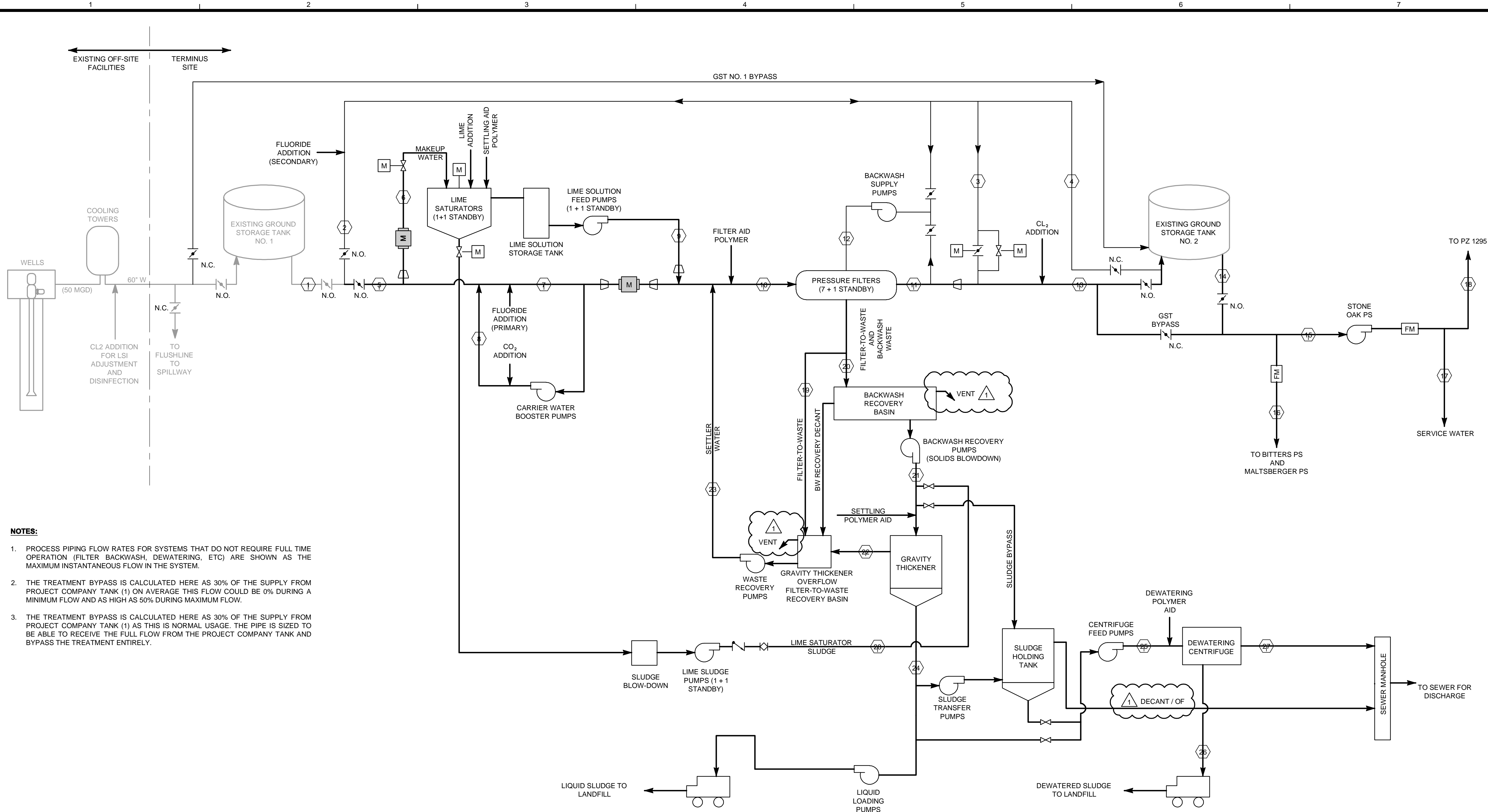
- A. Install all equipment and components in accordance with the Contract Documents, approved Shop Drawings, and installation instructions furnished by the PCSI.
- B. Inspect each instrument, panel and other items for damage and defects before installation. Replace deficient items.
- C. PLC components, modules, etc., shall be installed such that all LED indicators and switches are readily visible with the panel door open and such that repair and/or

replacement of any component can be accomplished without disconnecting any wiring or removing any other components.

- D. Comply with other specific installation, start-up, and testing requirements as specified in Section 17300, Instrument and Controls – General Provisions.

END OF SECTION

8/22/2018 2:15:25 PM - O:\PROJECTS\ORLANDO\09308\09308-18001-B\CAD\SSHEET\TREATMENT_FACILITY\G-1007\OVERALL PROCESS FLOW DIAGRAM.DWG - EVANS, JON



- NOTES:**
1. PROCESS PIPING FLOW RATES FOR SYSTEMS THAT DO NOT REQUIRE FULL TIME OPERATION (FILTER BACKWASH, DEWATERING, ETC) ARE SHOWN AS THE MAXIMUM INSTANTANEOUS FLOW IN THE SYSTEM.
 2. THE TREATMENT BYPASS IS CALCULATED HERE AS 30% OF THE SUPPLY FROM PROJECT COMPANY TANK (1) ON AVERAGE THIS FLOW COULD BE 0% DURING A MINIMUM FLOW AND AS HIGH AS 50% DURING MAXIMUM FLOW.
 3. THE TREATMENT BYPASS IS CALCULATED HERE AS 30% OF THE SUPPLY FROM PROJECT COMPANY TANK (1) AS THIS IS NORMAL USAGE. THE PIPE IS SIZED TO BE ABLE TO RECEIVE THE FULL FLOW FROM THE PROJECT COMPANY TANK AND BYPASS THE TREATMENT ENTIRELY.

FLOW STREAM NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
PROCESS PIPING IDENTIFICATION	SUPPLY FROM PROJECT COMPANY (PC) TANK (PW)	PC TANK BYPASS, SEGMENT 2 (BYPASS)	TREATMENT BYPASS (BYPASS)	PC TANK BYPASS, SEGMENT 1 (BYPASS)	TREATMENT SUPPLY (PW)	LIME SATURATOR MAKE-UP WATER (PW)	CARBONATED SUPPLY (CPW)	CARBONIC ACID SUPPLY (CAS)	CALCIUM HYDROXIDE SOLUTION (CHS)	FILTER SUPPLY (FLS)	FILTERED WATER (FLW)	BACKWASH SUPPLY (BWS) (NOTE 1)	FINISHED WATER TO GST (FW)	FINISHED WATER FROM GST (FW)	HSP SUCTION (FW)	GRAVITY TRANSMISSION TO BITTERS PS (FW)	PW SERVICE TO TERMINUS SITE (PW)	POTABLE WATER TO DISTRIBUTION (PZ 1295) (PW)	FILTER TO WASTE (FTW) (NOTE 1)	BACKWASH TO RECOVERY (BWW) (NOTE 1)	GRAVITY THICKENER SUPPLY (GTS) (NOTE 1)	GRAVITY THICKENER DECANT (GTD) (NOTE 1)	DECANT / FTW RECYCLE (DREC) (NOTE 1)	SETTLED SOLIDS (SL) (NOTE 1)	CENTRIFUGE SUPPLY (CSUP) (NOTE 1)	SOLIDS TO WASTE (STW) (NOTE 1)	CENTRATE (CEN) (NOTE 1)	LIME SATURATOR SLUDGE BLOWDOWN (NOTE 1)
MIN (MGD)	30	0	0	0	30	1.05	30	1.3	1.05	30	30	6.48	30	30	30			1.66	6.48	0.56	0.99	0.74	0.16	0.16	0	0	0.43	
AVG (MGD)	45	13.5 (NOTE 2)	13.5	0	31.5	1.57	31.5	1.3	1.57	31.5	31.5	6.48	45	45	45			3.32	6.48	0.56	0.99	0.74	0.16	0.16	0.24	0.16	0.43	
MAX (MGD)	48.62	48.62 (NOTE 3)	13.72	48.62	34.9	1.7	34.9	1.3	1.7	34.9	34.9	6.48	48.62	48.62	48.62	30		20	3.32	6.48	0.56	0.99	0.74	0.48	0.48	0.72	0.48	0.43
PIPE SIZE (IN)	60	54	54	54	54	10	54	8	10	54	42	16	60	60	48	54	8	36	18	18	8	8	6	4	4		4	4



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BID SET

SAN ANTONIO WATER SYSTEM

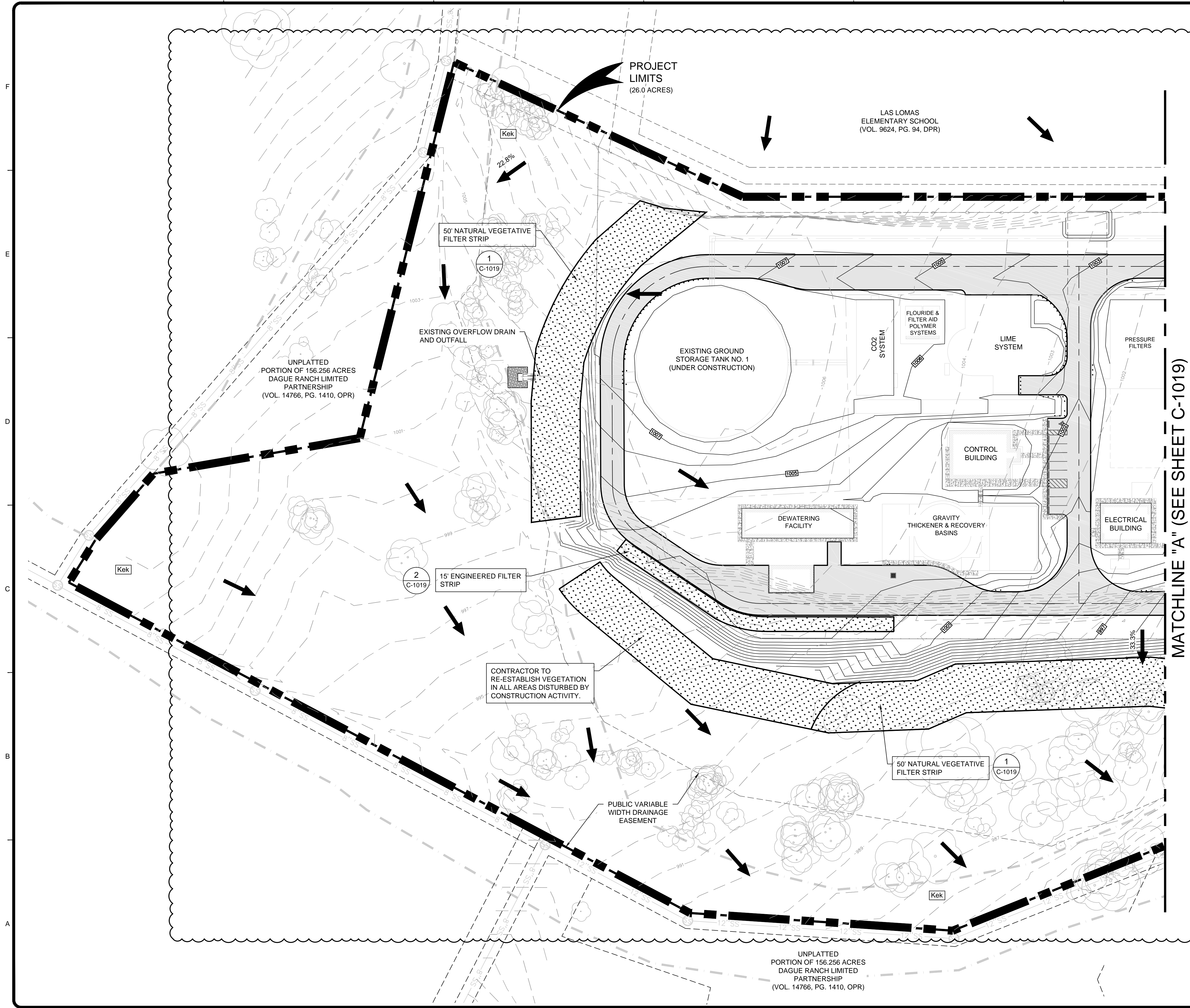
MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
OVERALL PROCESS FLOW DIAGRAM & DESIGN CRITERIA

PROJ:	200-09308-18001
DESN:	JKK
DRWN:	JTE
CHKD:	JPT

G-1007

8/23/2018 4:06:30 PM - W:\WORK\C-1471 SAVIS VISTA RIDGE INTEGRATION PROJECT (TETRA TECH)\DESIGN\CIVIL_TERMINUS FACILITY\CONSTRUCTION DOCUMENTS\PERMANENT POLLUTION ABATEMENT PLAN.DWG - NICHOLAS RAMONES



MATCHLINE "A" (SEE SHEET C-1019)

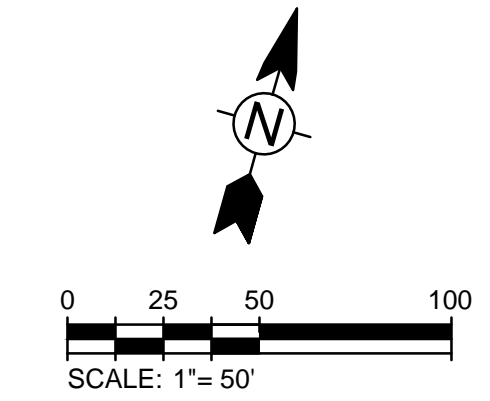
LEGEND

- PROJECT LIMITS [Dashed Line]
- EXISTING CONTOURS [Dashed Line]
- PROPOSED CONTOURS [Solid Line]
- FLOW ARROW [Arrow]
- KAINER FORMATION [Kek]
- VEGETATIVE FILTER STRIP [Pattern]
- EXISTING TREE (CONTRACTOR TO PROTECT) [Tree Symbol]



PERMANENT POLLUTION ABATEMENT NOTES:

- 1.) TEMPORARY BMP'S WILL BE MAINTAINED UNTIL THE SITE IMPROVEMENTS ARE COMPLETED AND THE SITE HAS BEEN STABILIZED, INCLUDING SUFFICIENT VEGETATION BEING ESTABLISHED.
- 2.) DURING CONSTRUCTION, TO THE EXTENT PRACTICAL, CONTRACTOR SHALL MINIMIZE THE AREA OF SOIL DISTURBANCE. AREAS OF DISTURBED SOIL SHALL BE REVEGETATED TO STABILIZE SOIL. SEE DETAIL ON TEMPORARY POLLUTION ABATEMENT DETAIL SHEET AND REFER TO SECTION 1.3.11 IN TCEQ'S TECHNICAL GUIDANCE MANUAL RG-348 (2005). SOD SHOULD BE USED IN CHANNELS AND ON SLOPES > 15%. THE CONTRACTOR MAY SUBSTITUTE THE USE OF SOD WITH THE PLACEMENT OF TOP SOIL AND A FRIABLE SEED BED WITH A PROTECTIVE MATTING OR HYDRAULIC MULCH ALONG WITH WATERING UNTIL VEGETATION IS ESTABLISHED. APPLICATIONS AND PRODUCTS SHALL BE THOSE APPROVED BY TxDOT AS OF FEBRUARY 2001 AND IN COMPLIANCE WITH THE TGM RG-348 (2005). SEED MIXTURE AND/OR GRASS TYPE TO BE DETERMINED BY OWNER AND SHOULD BE IN COMPLIANCE WITH TGM RG-348 (2005) GUIDELINES. IRRIGATION MAY BE REQUIRED IN ORDER TO ESTABLISH SUFFICIENT VEGETATION.
- 3.) FOR DISTURBED AREAS WHERE INSUFFICIENT SOIL EXISTS TO ESTABLISH VEGETATION, CONTRACTOR SHALL PLACE A MINIMUM OF 6" OF TOPSOIL PRIOR TO REVEGETATION.
- 4.) PERMANENT BMP'S FOR THIS SITE INCLUDE NATURAL AND ENGINEERED VEGETATIVE FILTER STRIPS. THESE PERMANENT BMP'S HAVE BEEN DESIGNED TO REMOVE AT LEAST 80% OF THE INCREASED TOTAL SUSPENDED SOLIDS (TSS) FOR THE 26.1 ACRES IN ACCORDANCE WITH THE TCEQ'S TECHNICAL GUIDANCE MANUAL (TGM) RG-348 (2005).
- 5.) TYPICAL SLOPES ON THIS PROJECT RANGE FROM APPROXIMATELY 1.4% TO 34%.
- 6.) SILT FENCING AND ROCK BERMS, WHERE APPROPRIATE, WILL BE MAINTAINED UNTIL THE ROADWAY, UTILITY, DRAINAGE IMPROVEMENTS, AND BUILDING CONSTRUCTION ARE COMPLETED.
- 7.) ENERGY DISSIPATORS (TO HELP REDUCE EROSION) WILL BE PROVIDED AT POINTS OF CONCENTRATED DISCHARGE WHERE EXCESSIVE VELOCITIES MAY BE ENCOUNTERED.
- 8.) CONTRACTOR SHALL INSTALL AND ESTABLISH VEGETATION FOR SOIL STABILIZATION PRIOR TO SITE CLOSEOUT.
- 9.) ALL PERMANENT BMP'S MUST BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER.



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TDRS No. F-1712 www.mbbain.com

SAN ANTONIO WATER SYSTEM

SPA

MARK	DATE	DESCRIPTION	BY
1	8/23/18	PER ADDENDUM #3	NR

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE PROJECT TERMINUS FACILITY

PERMANENT POLLUTION ABATEMENT PLAN

8/23/18

NICHOLAS M. RAMONES
REGISTERED PROFESSIONAL ENGINEER

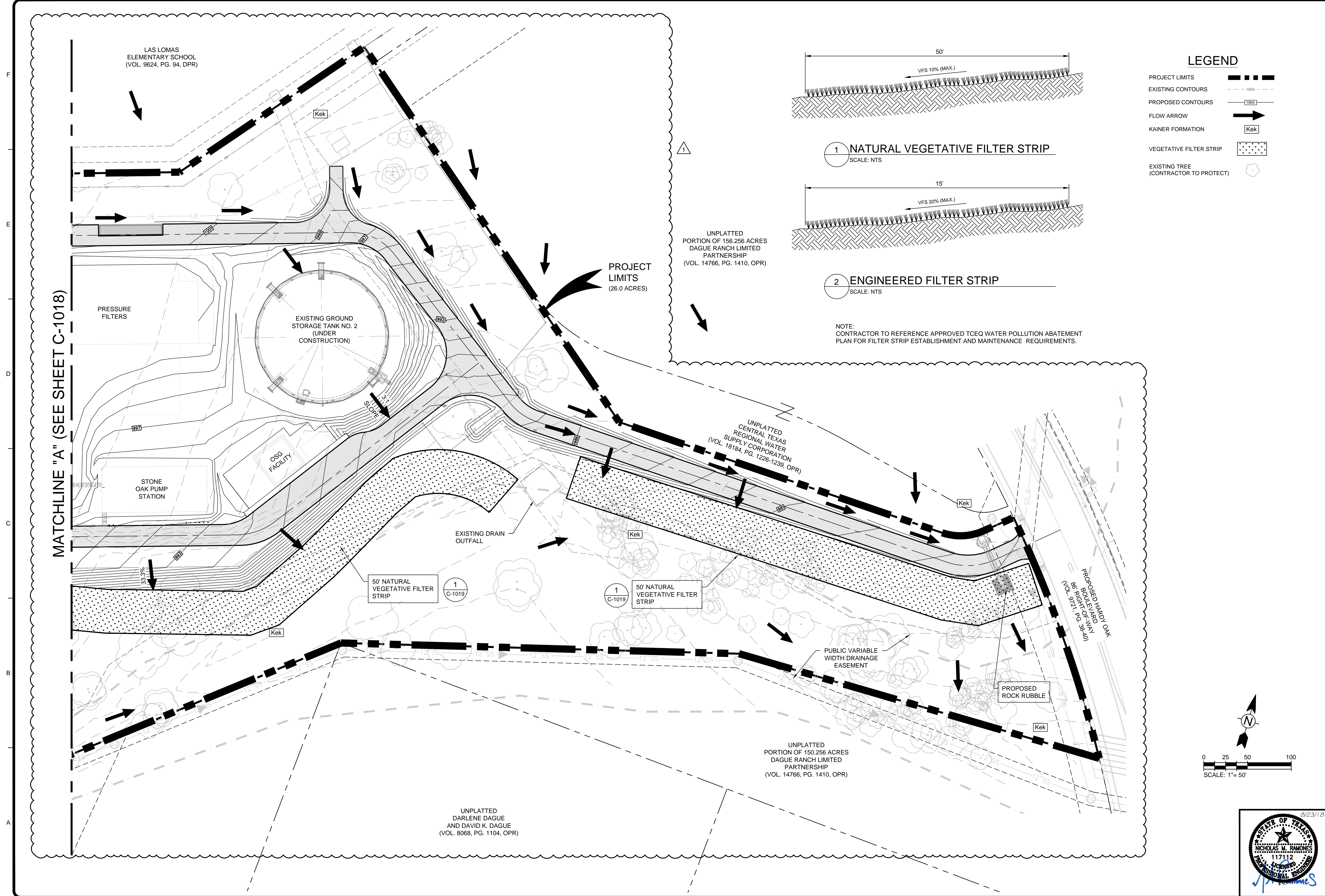
PROJ: 200-09308-18001

DESN:	NR
DRWN:	VS, ML
CHKD:	CB

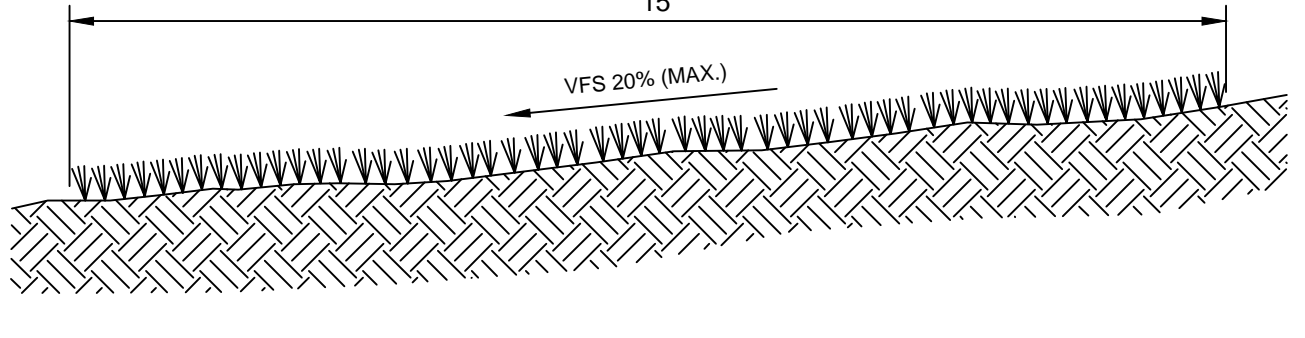
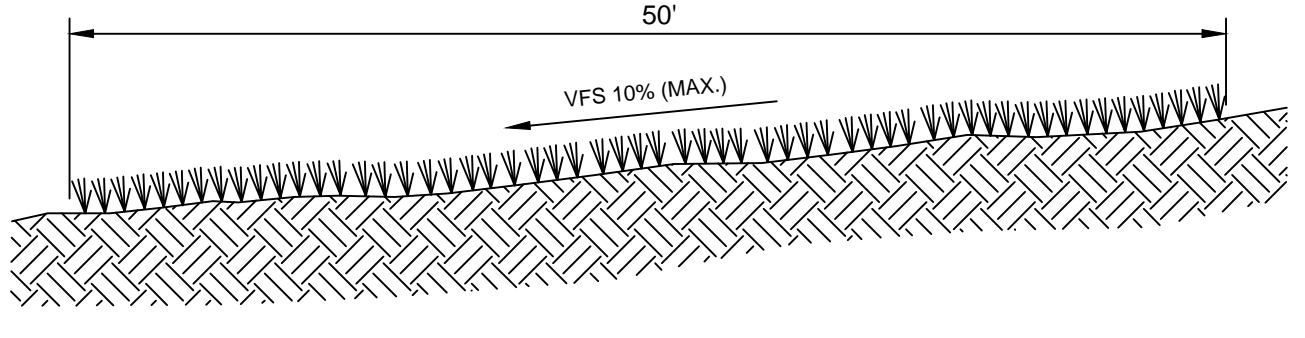
C-1018

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8/23/2018 4:08:04 PM - W:\WORK\C-1471 SAVIS VISTA RIDGE INTEGRATION PROJECT (TETRA TECH)\DESIGN\CIVIL_TERMINUS FACILITY\CONSTRUCTION DOCUMENTS\PERMANENT POLLUTION ABATEMENT PLAN.DWG - NICHOLAS RAMONES



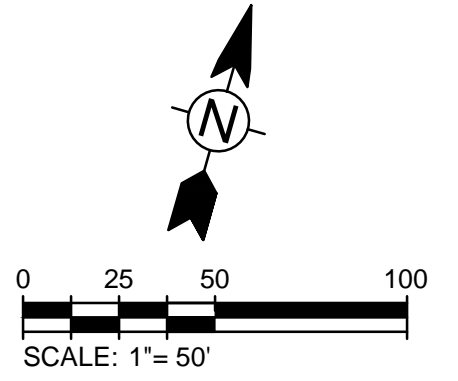
MATCHLINE "A" (SEE SHEET C-1018)



NOTE:
CONTRACTOR TO REFERENCE APPROVED TCEQ WATER POLLUTION ABATEMENT PLAN FOR FILTER STRIP ESTABLISHMENT AND MAINTENANCE REQUIREMENTS.

LEGEND

PROJECT LIMITS	
EXISTING CONTOURS	
PROPOSED CONTOURS	
FLOW ARROW	
KAINER FORMATION	
VEGETATIVE FILTER STRIP	
EXISTING TREE (CONTRACTOR TO PROTECT)	



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TABS No. F-1772 www.baininc.com

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY	NR
1	8/23/18	PER ADDENDUM #3		

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY

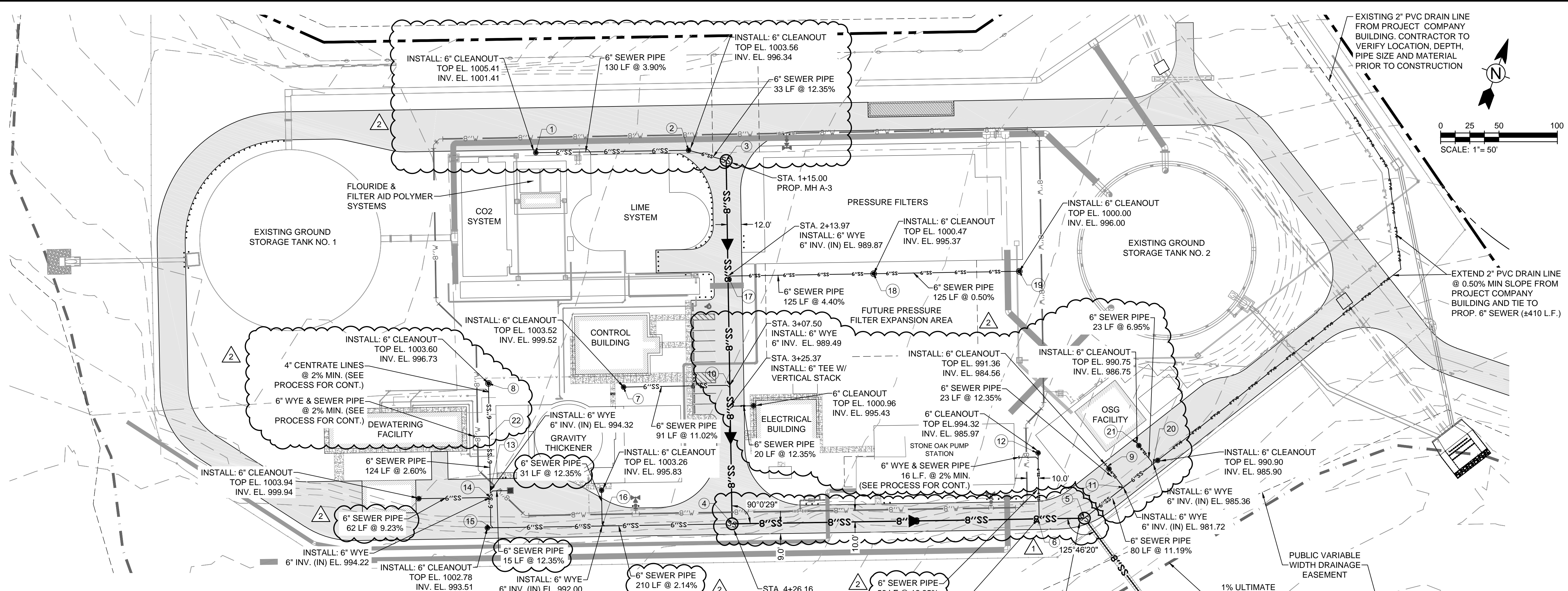
**PERMANENT POLLUTION
ABATEMENT PLAN**

PROJ: 200-09308-18001
DESN: NR
DRWN: VS, ML
CHKD: CB

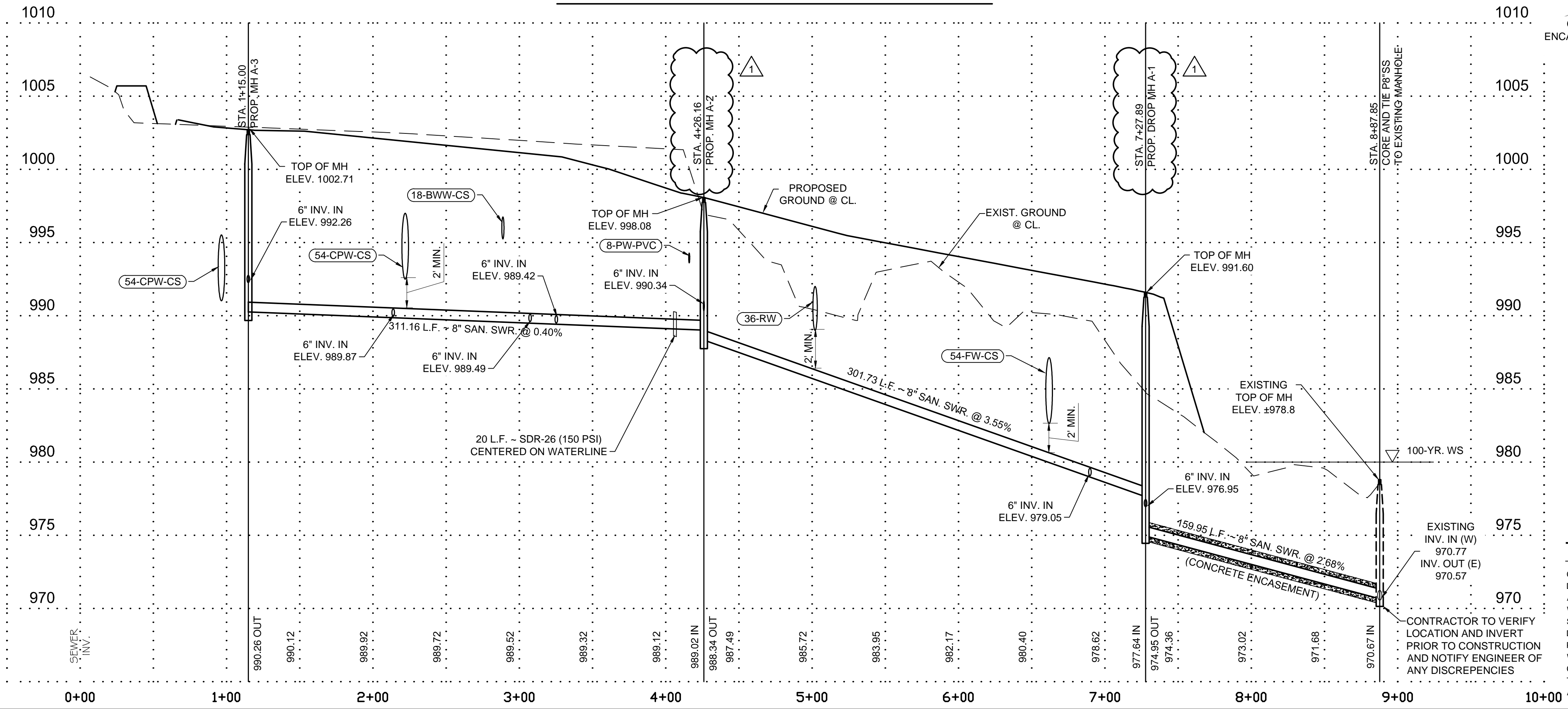
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8/24/2018 1:17:17 PM - W:\WORK\1471 SAVIS VISTA RIDGE INTEGRATION PROJECT (TETRA TECH)\DESIGN\CIVIL_TERMINUS FACILITY\CONSTRUCTION DOCUMENTS\C-1029 SANITARY SEWER PLAN AND PROFILE.DWG - VICTORIA SANCHEZ

Point #	Northing	Easting
1	13778694.66	2133289.27
2	13778730.60	2133415.14
3	13778730.47	2133448.49
4	13778431.27	2133533.92
5	13778514.06	2133824.07
6	13778503.17	2133785.90
7	13778520.37	2133413.82
8	13778493.44	2133301.27
9	13778561.78	2133831.56
10	13778545.36	2133501.34
11	13778548.25	2133849.65
12	13778557.55	2133770.38
13	13778404.90	2133326.55
14	13778399.53	2133328.08
15	13778374.54	2133335.22
16	13778400.70	2133426.86
17	13778635.31	2133475.66
18	13778669.56	2133595.63
19	13778703.81	2133715.60
20	13778574.24	2133869.10
21	13778587.77	2133851.02
22	13778449.96	2133313.68



8" SANITARY SEWER



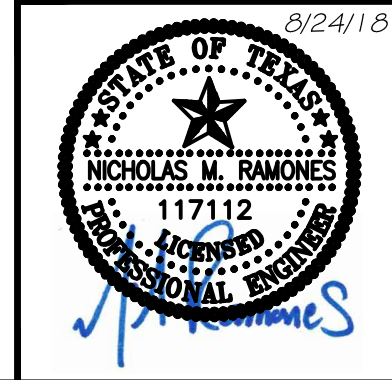
LEGEND

- EXISTING SANITARY SEWER MANHOLE
- EXISTING CHAIN LINK FENCE
- EXISTING CONTOURS
- EXISTING 12" WATER LINE
- EXISTING 8" SANITARY SEWER LINE
- EXISTING 12" SANITARY SEWER LINE
- PROPERTY LINE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED SANITARY SEWER CLEANOUT
- PROPOSED 8" SANITARY SEWER
- PROPOSED 8" WATERLINE
- PROPOSED CONTOURS
- PROPOSED 6" SANITARY SEWER PIPE

TYPICAL SANITARY SEWER/WATER CROSSING DETAIL

TRENCH EXCAVATION SAFETY PROTECTION

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND ANY AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITES WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES FOR THE PROJECT DESCRIBED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR'S IMPLEMENTATION OF THESE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLY WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.



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SAN ANTONIO WATER SYSTEM

BY	DATE	DESCRIPTION
NR	8/16/18	PER ADDENDUM #2
NR	8/24/18	PER ADDENDUM #3

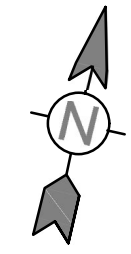
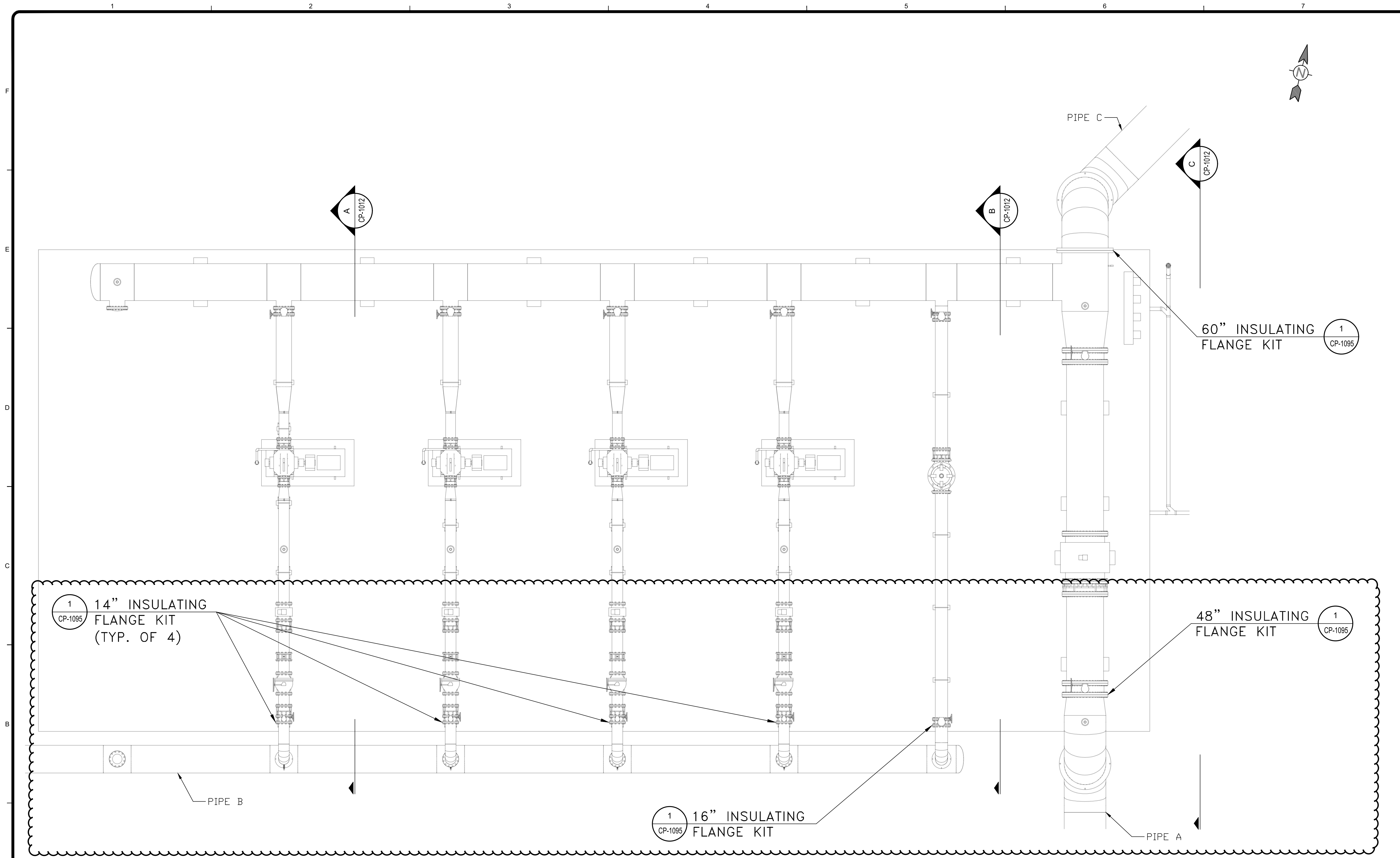
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE PROJECT TERMINUS FACILITY

SANITARY SEWER PLAN AND PROFILE

PROJ: 200-09308-18001
DES: NR
DRW: VS, ML
CHKD: CB

C-1029

8/2/2018 11:24:20 AM - C:\USERS\STEPAN.EERO\ENGINEERING\PROJECTS - DOCUMENTS\PROJECTS\100179 - CHAPMAN ENGINEERING\02 - TETRA TECH CWP\ (CE 1089)\CAD\TERMINUS\ACTIVE\SANUS CWP\ CP DESIGN SECTIONS - TERMINUS [DRAFT DESIGN SUBMITTAL].DWG - STEPAN EERO



1
-
CP SYSTEM LAYOUT - PUMP STATION PAD
SCALE: NONE



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Austin, TX 77706
TBP# FIRM No. F-16324

CHAPMAN ENGINEERING
213 Commerce Ave
San Antonio, TX 78206
(850) 616-3311

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY
1	08/24/18	PER ADDENDUM #3	JKK

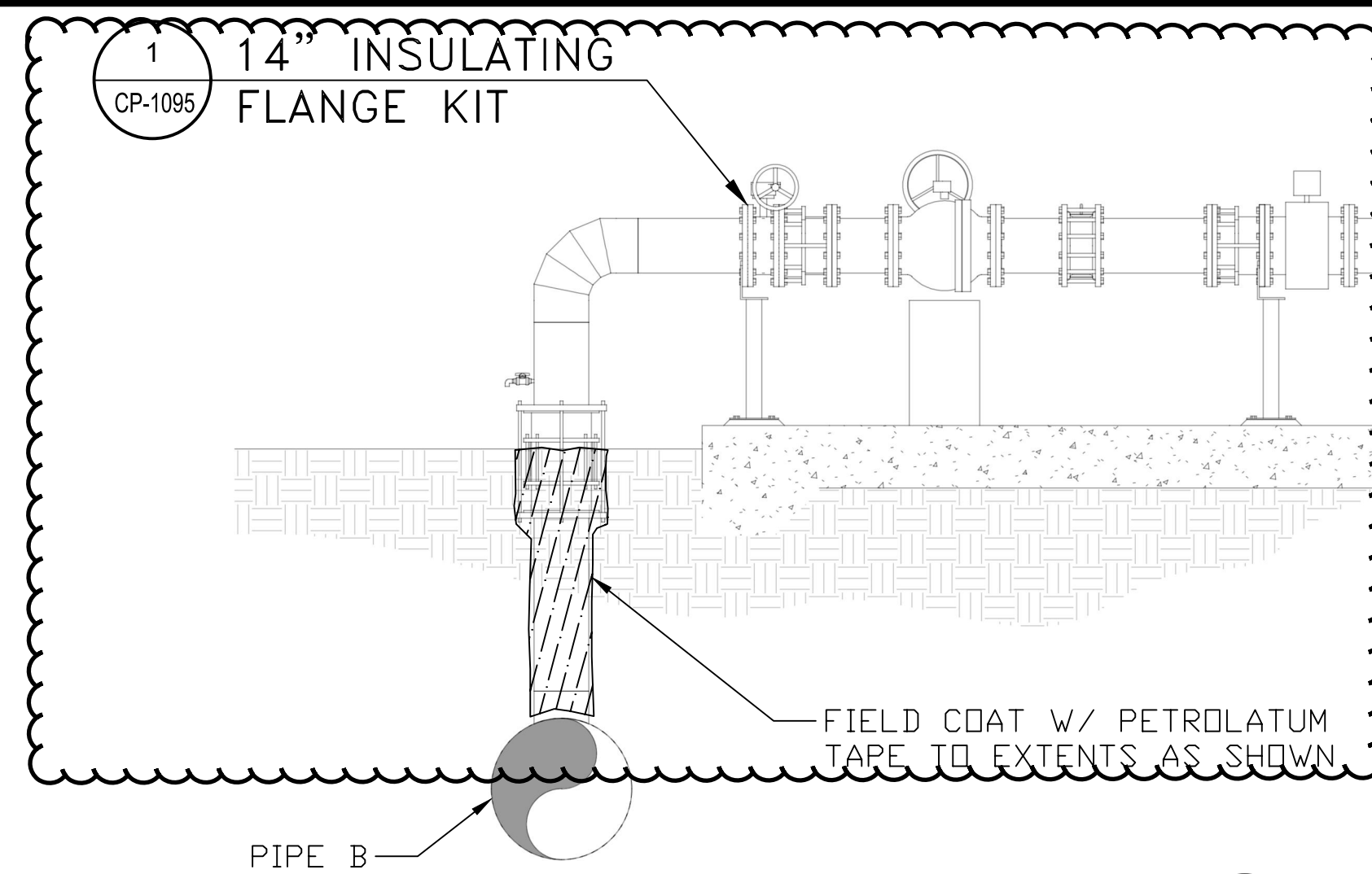
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
**CATHODIC PROTECTION
PUMP STATION PAD
LAYOUT**

PROJ:	200-09308-18001
DESN:	SVE
DRWN:	SVE
CHKD:	BJB

CP-1011

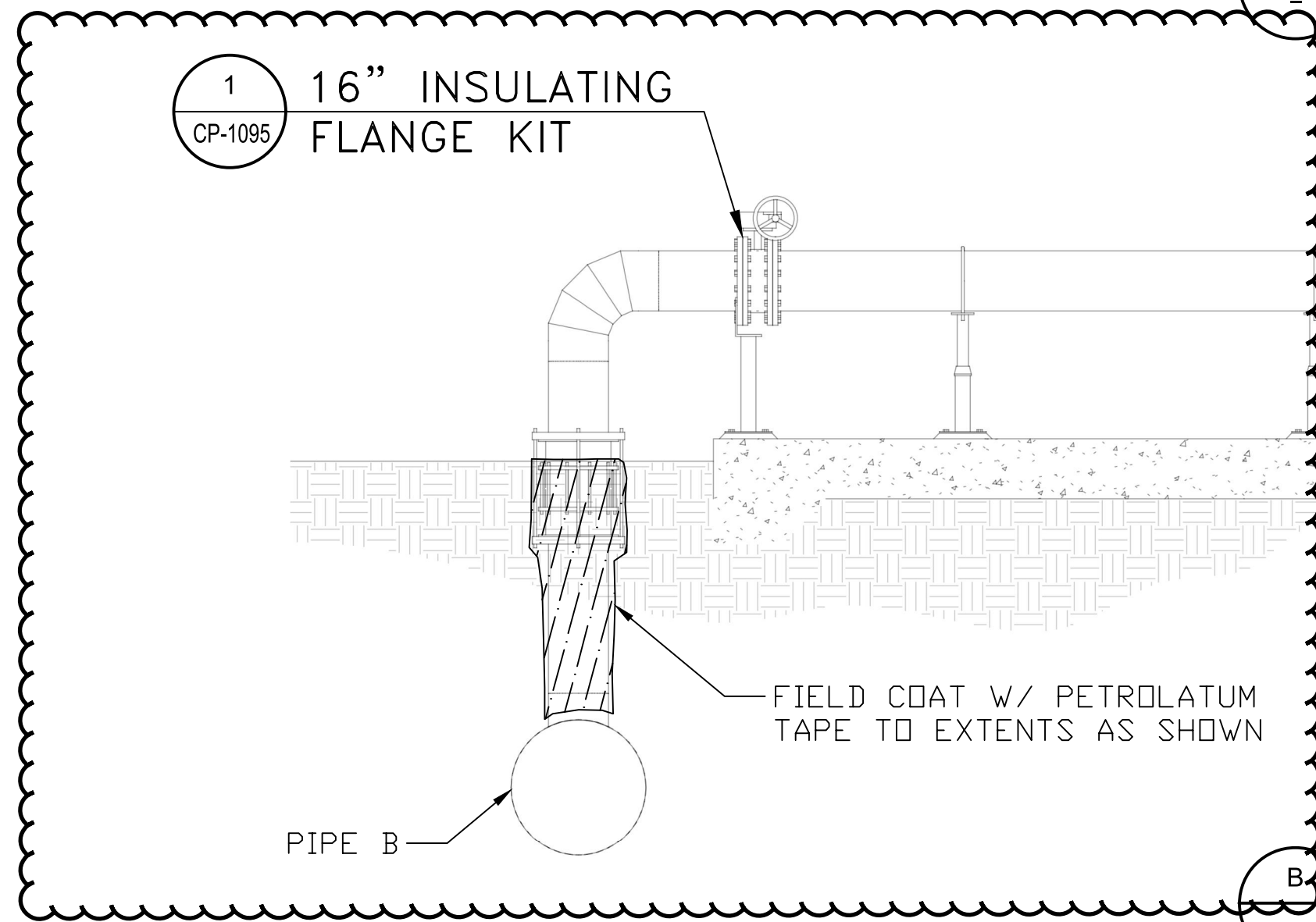
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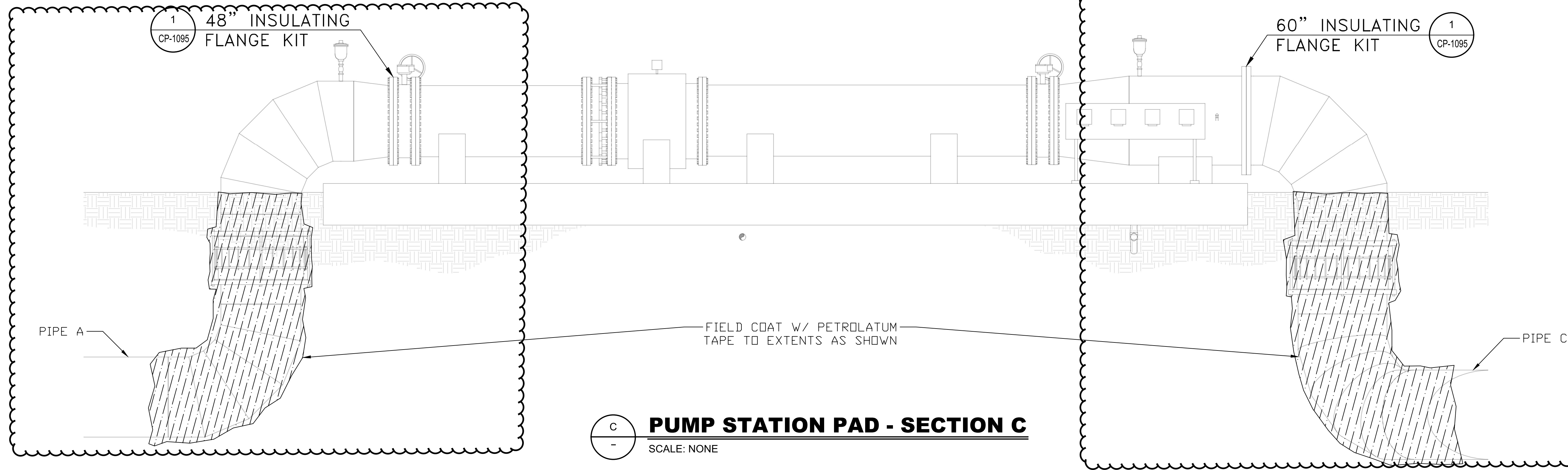
PUMP STATION PAD - SECTION A

SCALE: NONE



PUMP STATION PAD - SECTION B

SCALE: NONE



PUMP STATION PAD - SECTION C

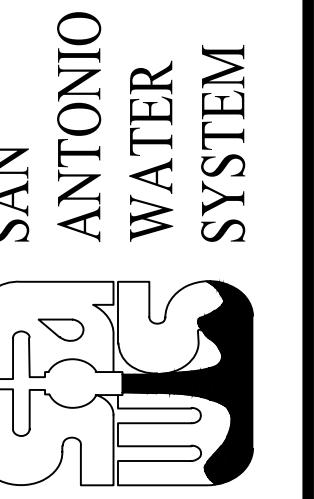
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Ste 240-1500
Austin, TX 77062
TBP# FIRM No. F-16324

CHAPMAN ENGINEERING
213 Commerce Ave
San Antonio, TX 78206
(850) 916-3311



MARK	DATE	DESCRIPTION	BY
1	08/24/18	PER ADDENDUM #3	JKK

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
CATHODIC PROTECTION
PUMP STATION PAD
SECTIONS

PROJ: 200-09308-18001
DESN: SVE
DRWN: SVE
CHKD: BJB

CP-1012



8/24/18

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8/24/2018 9:47:02 AM - C:\PROJECTS\ORLANDO\IER09308\200-09308-18001-B\CADD\PROJECT SHEET\ESTRETTMENT_FACILITY\D-1001 PROCESS LEGEND & ABBREVIATIONS.DWG - EVANS, JON

PIPING MATERIALS SCHEDULE

Main table with columns: ABBREVIATION, DESCRIPTION, BURIED, EXPOSED, EXPOSED COLOR, MAX. WORKING PRESSURE, TEST PRESSURE, SPECIFICATIONS.

- NOTES: 1. ALL PIPELINES TO BE AS LISTED IN THE PIPE MATERIAL SCHEDULE UNLESS NOTED OTHERWISE IN THE DRAWINGS. 2. ALL CHEMICAL FEED PIPING CONSISTING OF SCH 80 PVC TO BE MINIMUM 3/4" DIA UNLESS OTHERWISE SHOWN ON THE DRAWINGS.

PROCESS EQUIPMENT IDENTIFICATION table with columns: ABBREVIATION, DESCRIPTION, ABBREVIATION, DESCRIPTION.

PROCESS PIPE MATERIAL CODES table with columns: ABBREVIATION, DESCRIPTION.



TETRA TECH logo and address: 700 N. St Mary's, Suite 300, San Antonio, TX 78205.

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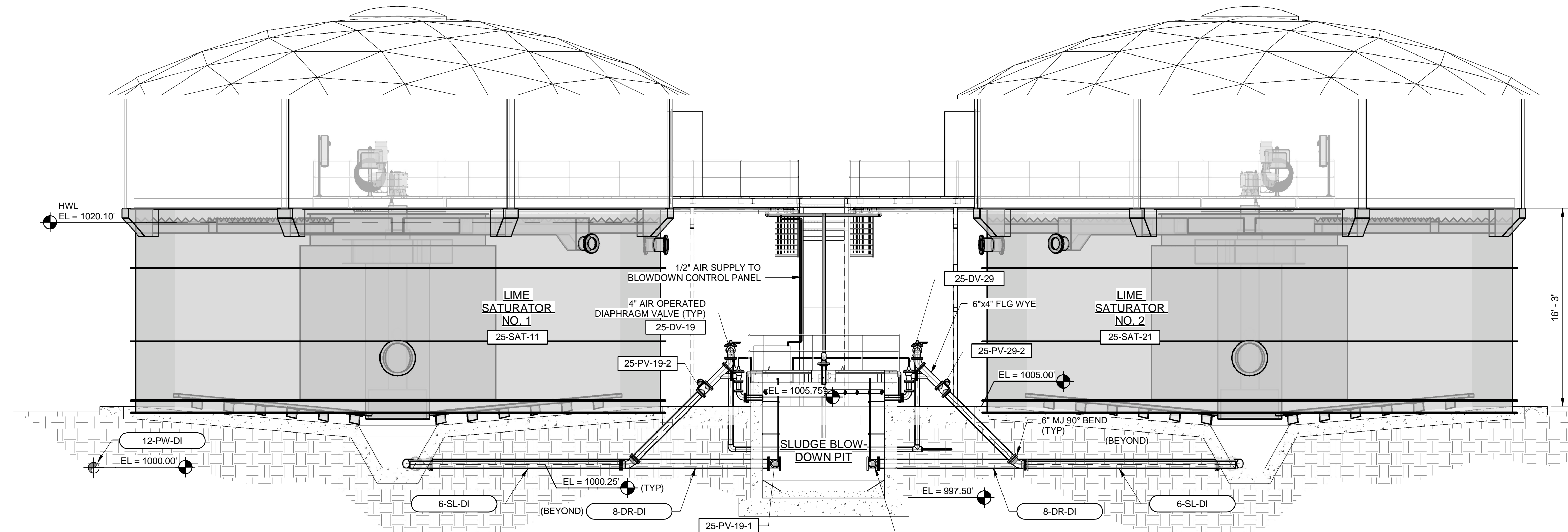
SAN ANTONIO WATER SYSTEM logo.

MARK table with columns: BY, DATE, DESCRIPTION, MARK.

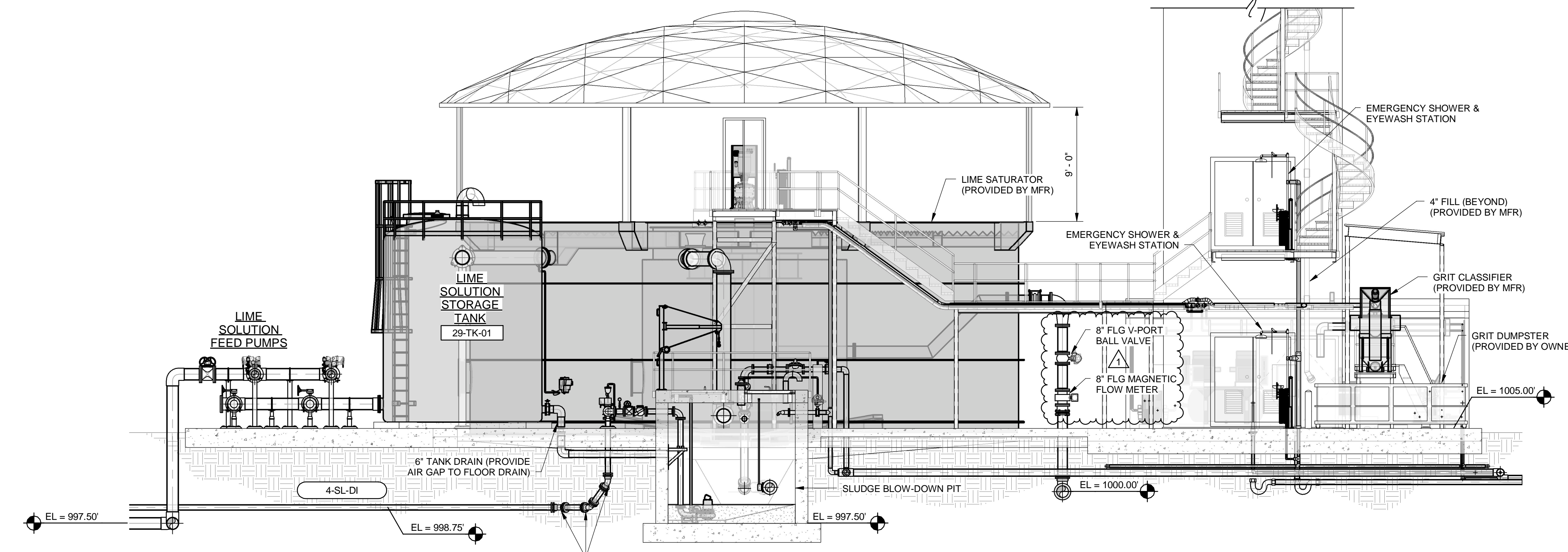
SAN ANTONIO WATER SYSTEM CENTRAL WATER INTEGRATION PIPELINE PROJECT TERMINUS FACILITY PROCESS PIPE SCHEDULE

PROJ: 200-09308-18001, DESN: JKK, DRWN: JTE, CHKD: JEC

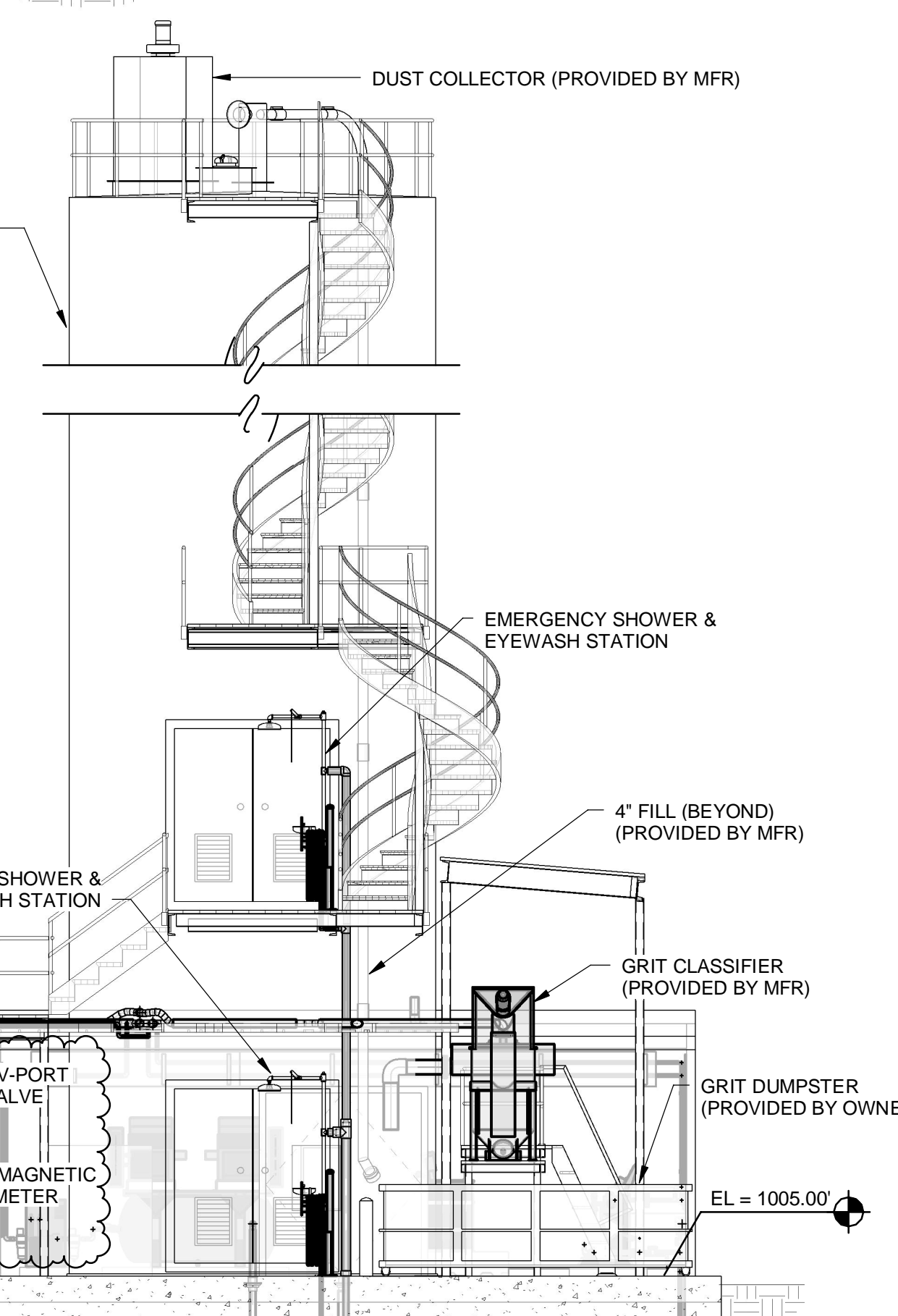
D-1001



A SECTION
D-1103 SCALE: 3/16" = 1'-0"



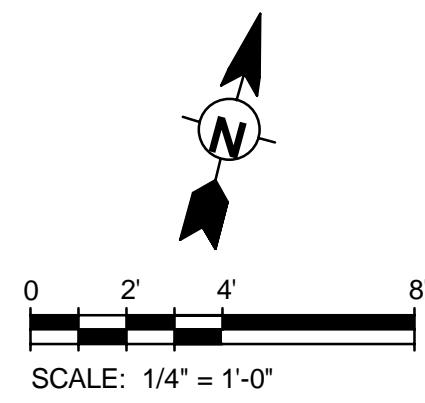
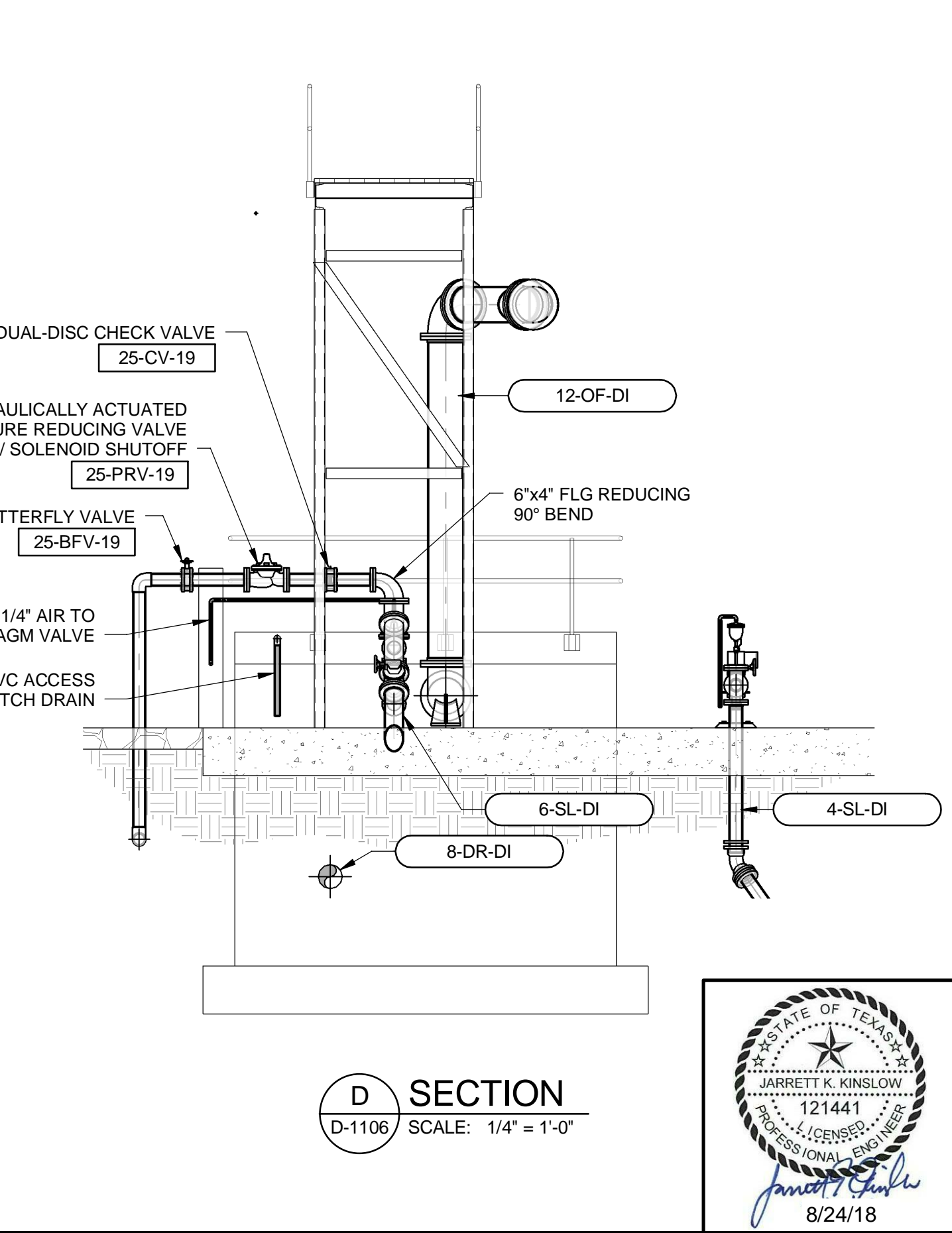
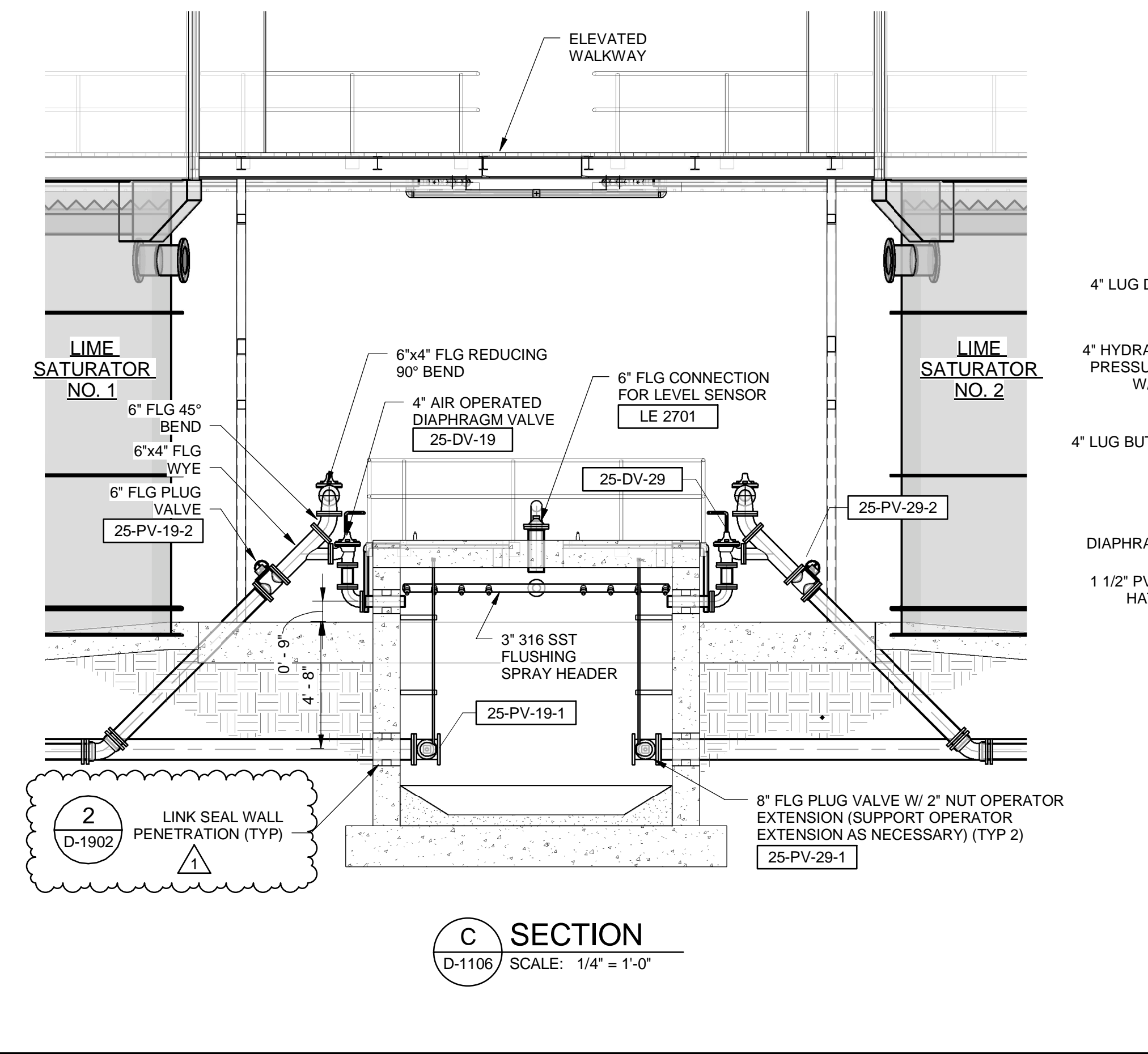
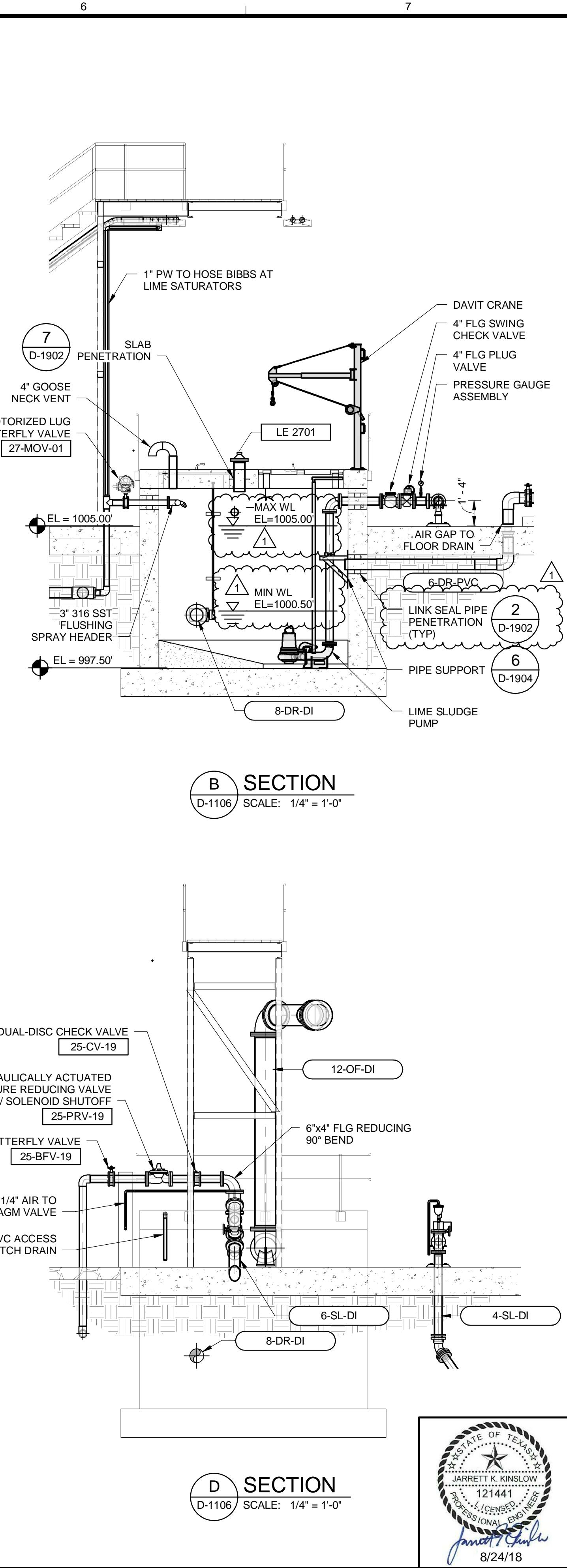
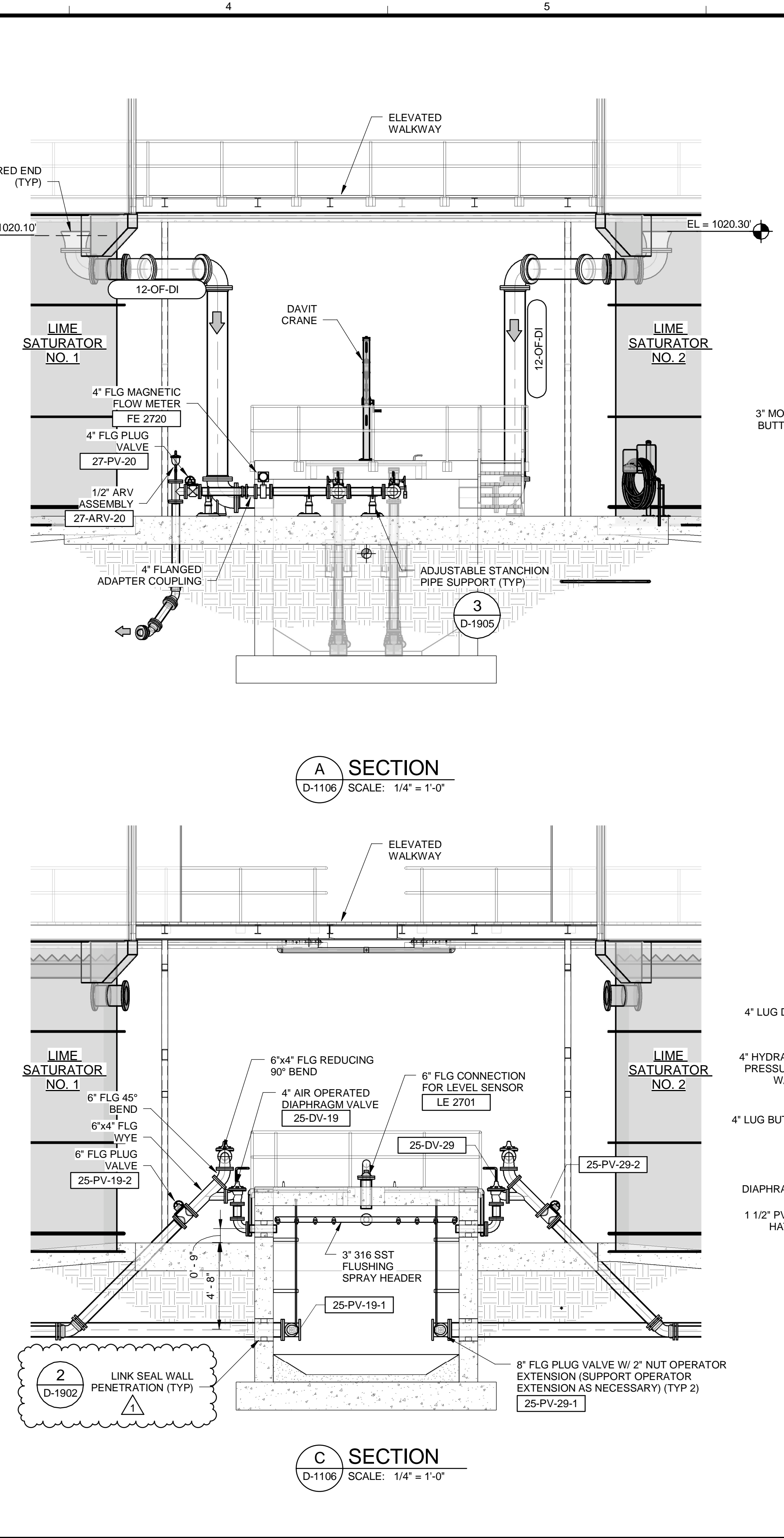
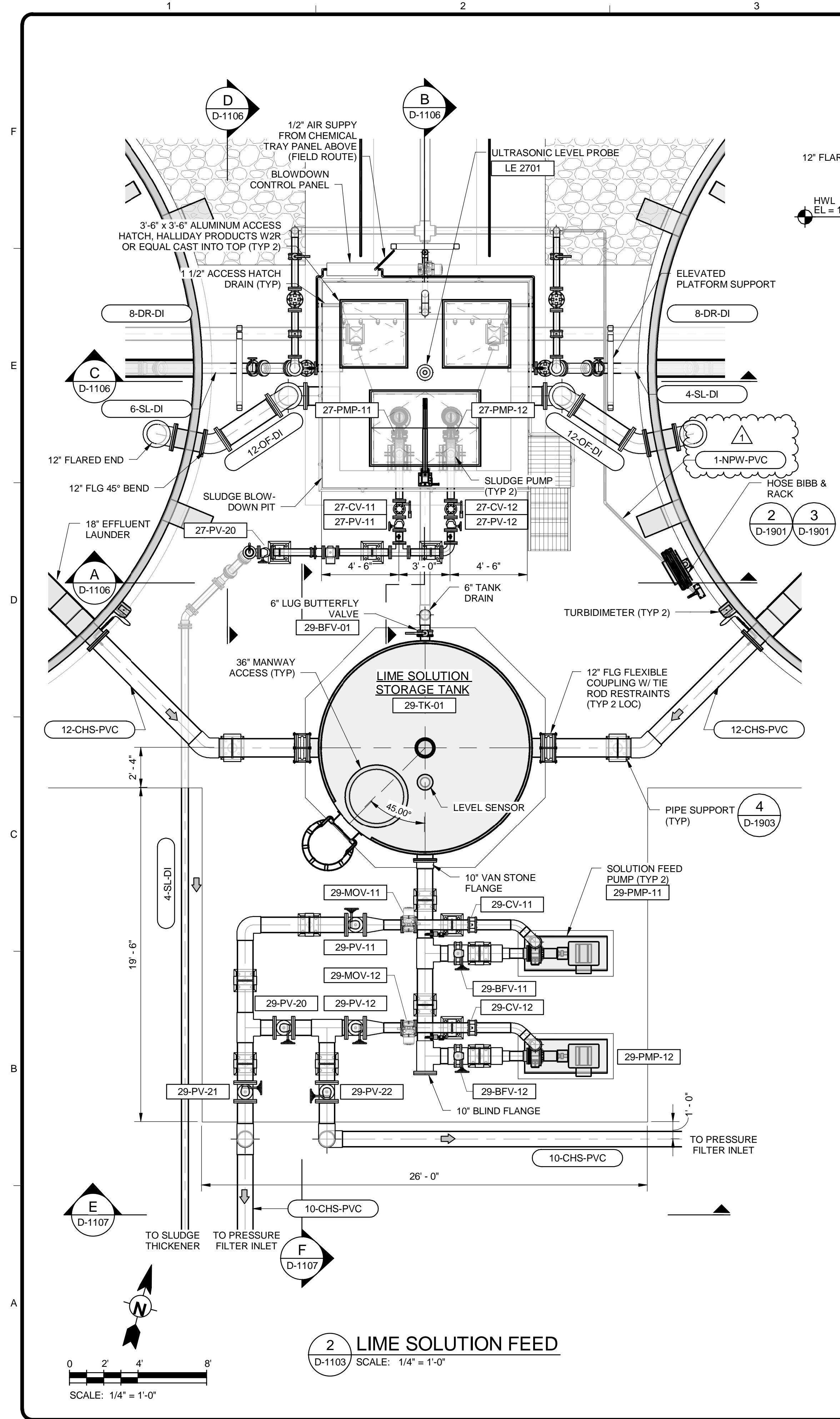
B SECTION
D-1103 SCALE: 3/16" = 1'-0"



MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

PROJ:	200-09308-18001
DESN:	JEC
DRWN:	JTE
CHKD:	JKK

8/22/2018 2:48:20 PM BIM 360://200-09308-18001 CWP/PP/09308-01-01-USAT-D-2017.rvt



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BID SET

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

BY: JKK

DATE: 08/24/18

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
LIME SYSTEM SLUDGE & SOLUTION FEED PLAN & SECTIONS

PROJ: 200-09308-18001

DESN: JEC

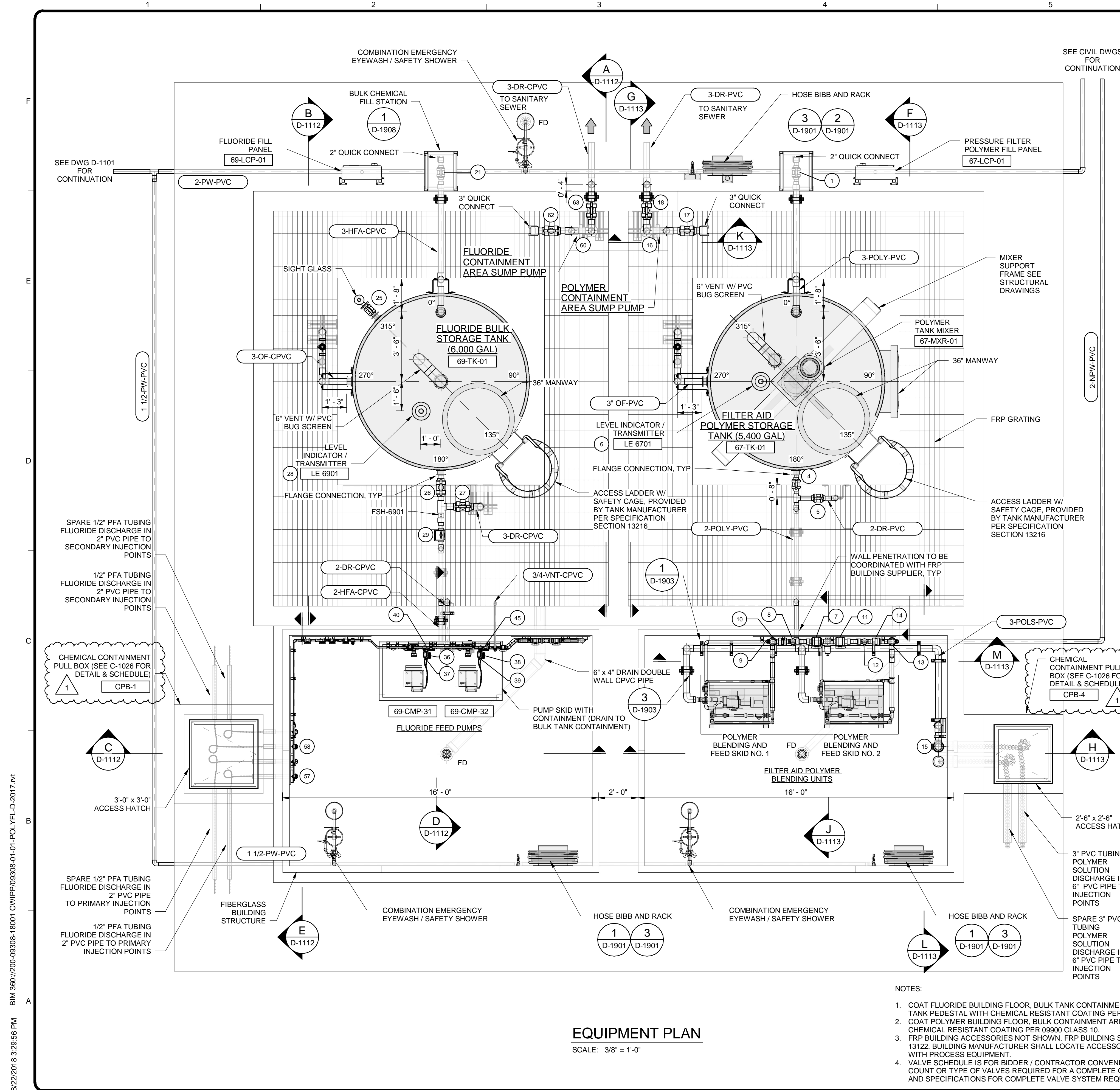
DRWN: JTE

CHKD: JKK

8/24/18

D-1106

Bar measures 1 inch, otherwise drawing is not to scale



POLYMER VALVE & PIPE ACCESSORY TABLE

NUMBER	DESCRIPTION	COMMENTS	TAG NUMBER
1	2" PVC BALL VALVE	BULK STORAGE TANK FILL ISOLATION	67-BV-01-1
2	1" PVC BALL VALVE	BULK STORAGE TANK OVERFLOW	67-BV-01-2
3	1" PVC BALL VALVE	BULK STORAGE TANK OVERFLOW	67-BV-01-3
4	2" PVC BALL VALVE	BULK STORAGE TANK OUTLET ISOLATION	67-BV-01-4
5	2" PVC BALL VALVE	BULK STORAGE TANK DRAIN ISOLATION	67-BV-01-5
6	LEVEL SENSOR	BULK STORAGE TANK	LE 6701
7	2" PVC BALL VALVE	WATER SUPPLY TO PB UNIT NO. 1	67-BV-41-1
8	1" PVC BALL VALVE	WATER SUPPLY PRESSURE GAUGE ISOLATION	67-BV-41-2
9	2" PVC BALL VALVE	WATER SUPPLY TO PB UNIT NO. 1	67-BV-41-3
10	2" PVC BALL CHECK VALVE	WATER SUPPLY TO PB UNIT NO. 1	67-BCV-41
11	2" PVC BALL VALVE	WATER SUPPLY TO PB UNIT NO. 2	67-BV-42-1
12	1" PVC BALL VALVE	WATER SUPPLY PRESSURE GAUGE ISOLATION	67-BV-42-2
13	2" PVC BALL VALVE	WATER SUPPLY TO PB UNIT NO. 2	67-BV-42-3
14	2" PVC BALL CHECK VALVE	WATER SUPPLY TO PB UNIT NO. 2	67-BCV-42
15	3" PVC CHECK VALVE	POLYMER SOLUTION SYSTEM ISOLATION	67-BV-70
16	3" PVC CHECK VALVE	CONTAINMENT SUMP PUMP DISCHARGE	67-CV-80
17	3" PVC BALL VALVE	CONTAINMENT SUMP PUMP DISCHARGE	67-BV-80-1
18	3" PVC BALL VALVE	CONTAINMENT SUMP PUMP DISCHARGE	67-BV-80-2

(SEE NOTE 4)

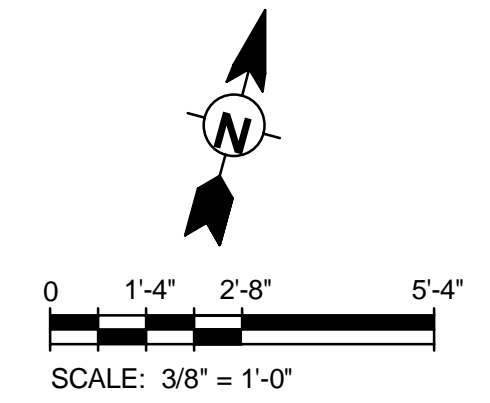
FLUORIDE VALVE & PIPE ACCESSORY TABLE

NUMBER	DESCRIPTION	COMMENTS	TAG NUMBER
21	2" CPVC BALL VALVE	BULK STORAGE TANK FILL ISOLATION	69-BV-01-1
22	1" CPVC BALL VALVE	BULK STORAGE TANK OVERFLOW	69-BV-01-2
23	1" CPVC BALL VALVE	BULK STORAGE TANK OVERFLOW	69-BV-01-3
24	2" CPVC BALL VALVE	BULK STORAGE TANK SIGHT GLASS (LOWER)	69-BV-01-4
25	2" CPVC BALL VALVE	BULK STORAGE TANK SIGHT GLASS (UPPER)	69-BV-01-5
26	3" CPVC BALL VALVE	BULK STORAGE TANK OUTLET ISOLATION	69-BV-01-6
27	3" CPVC BALL VALVE	BULK STORAGE TANK DRAIN ISOLATION	69-BV-01-7
28	LEVEL SENSOR	BULK STORAGE TANK	LE 6901
29	2" CPVC BALL VALVE	BULK STORAGE TANK OUTLET (MOTORIZED)	69-MOV-10
30	1" CPVC BALL VALVE	BASKET STRAINER INLET ISOLATION	69-BV-10-1
31	1" CPVC BALL VALVE	BASKET STRAINER OUTLET ISOLATION	69-BV-10-2
32	1" CPVC BALL VALVE	BASKET STRAINER BYPASS	69-BV-10-3
33	3/4" CPVC BALL VALVE	PUMP SKID SYSTEM INLET ISOLATION	69-BV-20-1
34	3/4" CPVC BALL VALVE	CALIBRATION COLUMN ISOLATION	69-BV-20-2
35	3/4" PVC CALIBRATION COLUMN		69-CAL-20
36	3/4" CPVC BALL VALVE	METERING PUMP NO. 1 SUCTION ISOLATION	69-BV-31-1
37	1/2" CPVC BALL VALVE	METERING PUMP NO. 1 DISCHARGE ISOLATION	69-BV-31-2
38	3/4" CPVC BALL VALVE	METERING PUMP NO. 2 SUCTION ISOLATION	69-BV-32-1
39	1/2" CPVC BALL VALVE	METERING PUMP NO. 2 DISCHARGE ISOLATION	69-BV-32-2
40	1/2" CPVC BALL VALVE	METERING PUMP NO. 1 DISCHARGE DRAIN	69-BV-41-1
41	1/2" CPVC BALL VALVE	METERING PUMP NO. 1 DISCHARGE PRESSURE GAUGE ISOLATION	69-BV-41-3
42	1/2" CPVC BALL VALVE	METERING PUMP NO. 1 DISCHARGE	69-BV-41-4
43	1/2" CPVC BALL CHECK VALVE	METERING PUMP NO. 1 DISCHARGE	69-BCV-41
44	1/2" PRESSURE RELIEF VALVE	METERING PUMP NO. 1 DISCHARGE	69-PRV-41
45	1/2" CPVC BALL VALVE	METERING PUMP NO. 2 DISCHARGE DRAIN	69-BV-42-1
46	1/2" CPVC BALL VALVE	METERING PUMP NO. 2 DISCHARGE PRESSURE GAUGE ISOLATION	69-BV-42-3
47	1/2" CPVC BALL VALVE	METERING PUMP NO. 2 DISCHARGE	69-BV-42-4
48	1/2" CPVC BALL CHECK VALVE	METERING PUMP NO. 2 DISCHARGE	69-BCV-42
49	1/2" PRESSURE RELIEF VALVE	METERING PUMP NO. 2 DISCHARGE	69-PRV-42
50	1/2" CPVC BALL VALVE	PUMP SKID SYSTEM OUTLET ISOLATION	69-BV-50
51	1" CPVC BALL VALVE	FLUSHING WATER ISOLATION	69-BV-60-3
52	1" PVC BALL CHECK VALVE	FLUSHING WATER ISOLATION	69-BCV-60
53	1/2" CPVC BALL VALVE	PUMP SKID SYSTEM DISCHARGE	69-BV-70-1
54	1/2" CPVC BALL VALVE	FLUORIDE FLOW METER INLET ISOLATION	69-BV-70-2
55	1/2" CPVC BALL VALVE	FLUORIDE FLOW METER OUTLET ISOLATION	69-BV-70-3
56	1/2" CPVC BALL VALVE	FLUORIDE FLOW METER BYPASS	69-BV-70-4
57	1/2" CPVC BALL VALVE	FLUORIDE PRIMARY FEED ISOLATION	69-BV-70-5
58	1/2" CPVC BALL VALVE	FLUORIDE SECONDARY FEED ISOLATION	69-BV-70-6
59	1/2" FLOW METER		FE 6970
60	3" PVC CHECK VALVE	CONTAINMENT SUMP PUMP DISCHARGE	69-CV-80
61	2" CPVC BALL VALVE	CONTAINMENT SUMP PUMP DISCHARGE	69-BV-80-1
62	3" CPVC BALL VALVE	CONTAINMENT SUMP PUMP DISCHARGE	69-BV-80-2
63	3" CPVC BALL VALVE	CONTAINMENT SUMP PUMP DISCHARGE	69-BV-80-3

(SEE NOTE 4)

EQUIPMENT PLAN
SCALE: 3/8" = 1'-0"

- NOTES:**
1. COAT FLUORIDE BUILDING FLOOR, BULK TANK CONTAINMENT AREA (FLOOR AND WALLS TO TOP OF WALLS), AND TANK PEDESTAL WITH CHEMICAL RESISTANT COATING PER 09900 CLASS 10.
 2. COAT POLYMER BUILDING FLOOR, BULK CONTAINMENT AREA (FLOOR AND WALLS TO TOP OF WALLS) WITH CHEMICAL RESISTANT COATING PER 09900 CLASS 10.
 3. FRP BUILDING ACCESSORIES NOT SHOWN. FRP BUILDING SHALL BE PROVIDED WITH ACCESSORIES AS SPECIFIED IN 13122. BUILDING MANUFACTURER SHALL LOCATE ACCESSORIES SO THEY ARE ACCESSIBLE AND DO NOT INTERFERE WITH PROCESS EQUIPMENT.
 4. VALVE SCHEDULE IS FOR BIDDER / CONTRACTOR CONVENIENCE AND SHALL NOT BE CONSIDERED THE FINAL VALVE COUNT OR TYPE OF VALVES REQUIRED FOR A COMPLETE OPERATIONAL SYSTEM. SEE INDIVIDUAL SYSTEM P&ID'S AND SPECIFICATIONS FOR COMPLETE VALVE SYSTEM REQUIREMENTS.



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SAN ANTONIO WATER SYSTEM

SAN ANTONIO WATER SYSTEM

CENTRAL WATER INTEGRATION PIPELINE PROJECT TERMINUS FACILITY

FLUORIDE & FILTER AID POLYMER SYSTEMS PLAN

PROJ:

DESN:

DRWN:

CHKD:

200-09308-18001

LEH

JTE

JCB

BY:

DATE:

DESCRIPTION:

MARK:

JJK

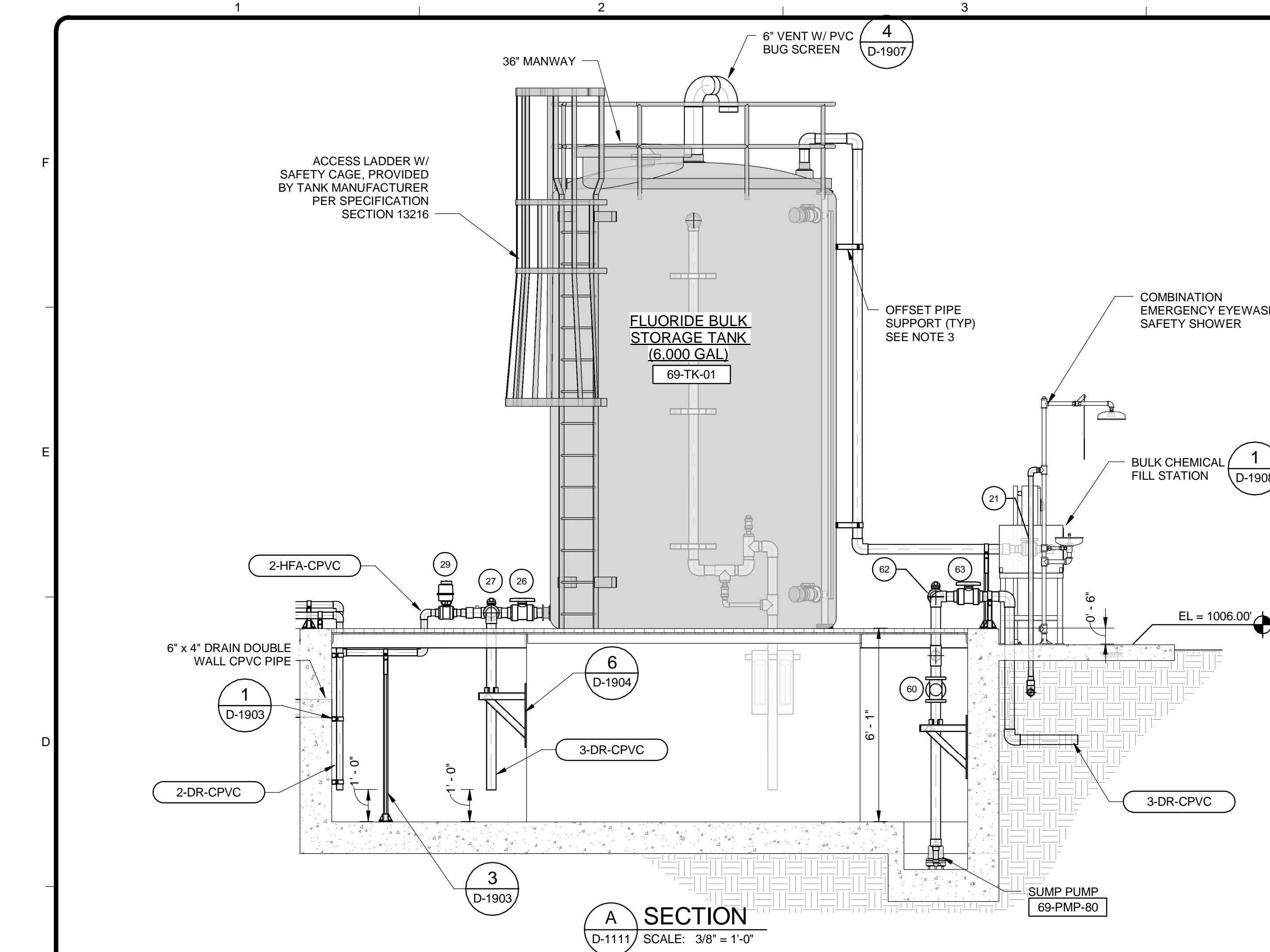
08/24/18

PER ADDENDUM #3

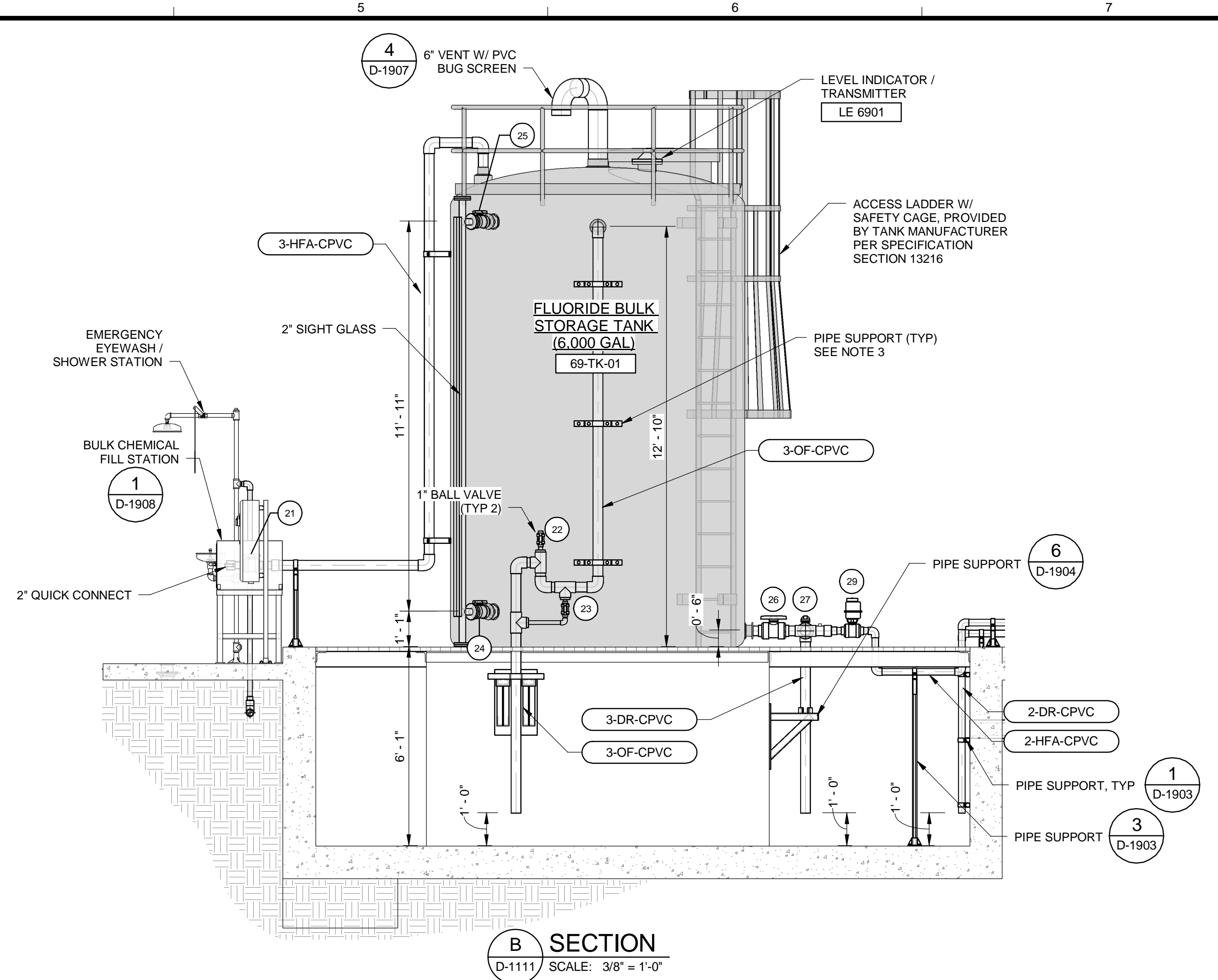
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D-1111

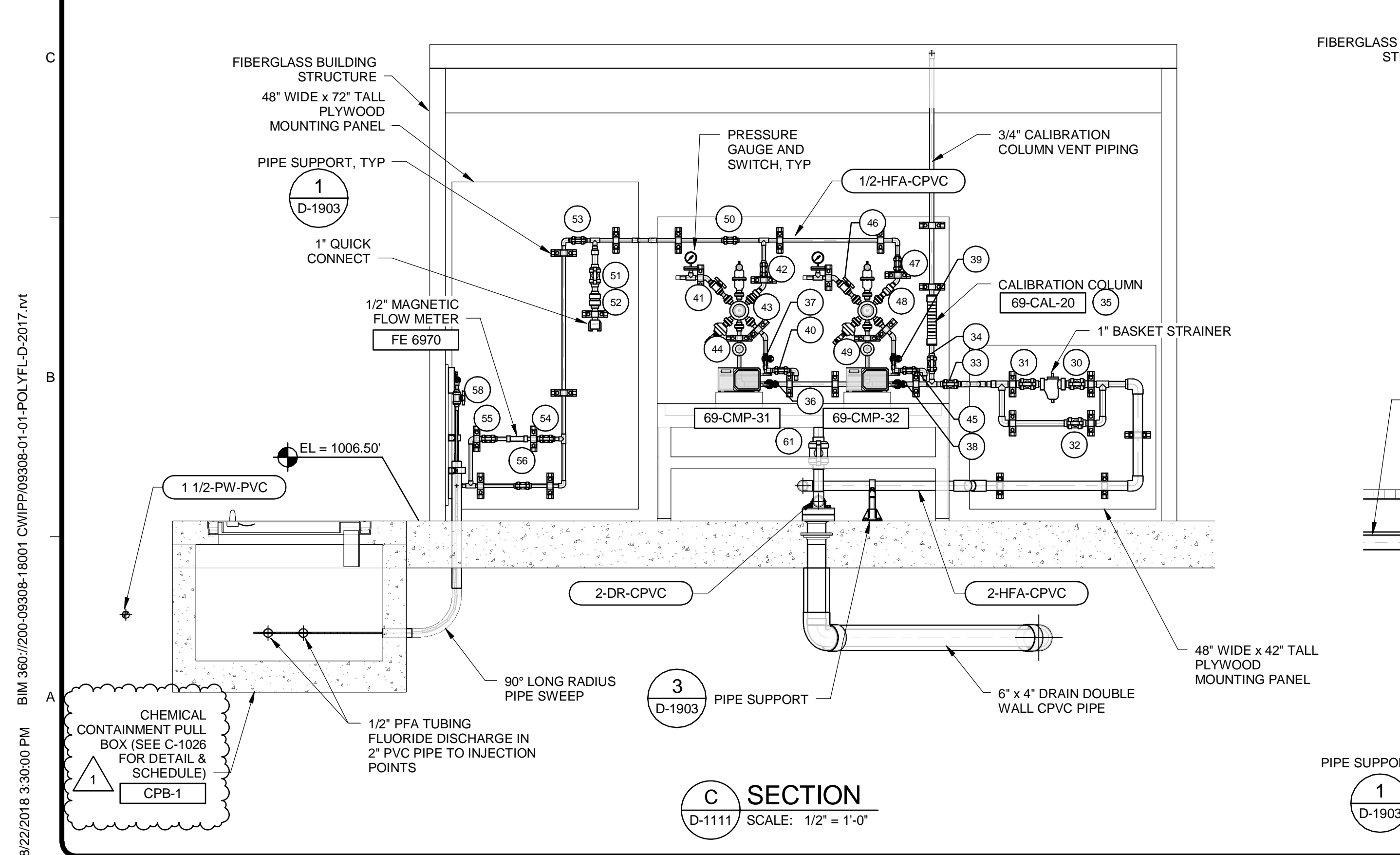
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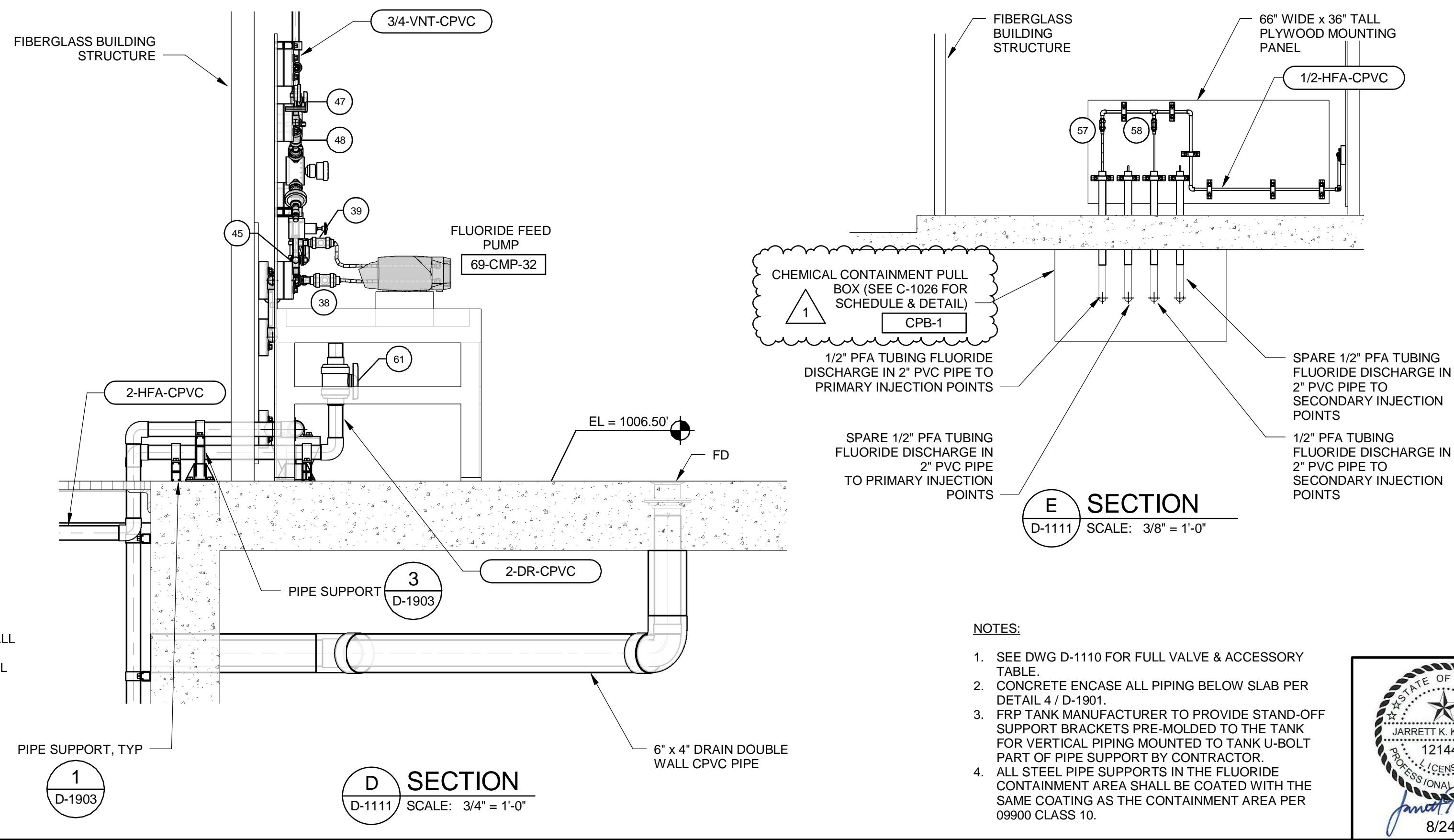
A SECTION
D-1111 SCALE: 3/8" = 1'-0"



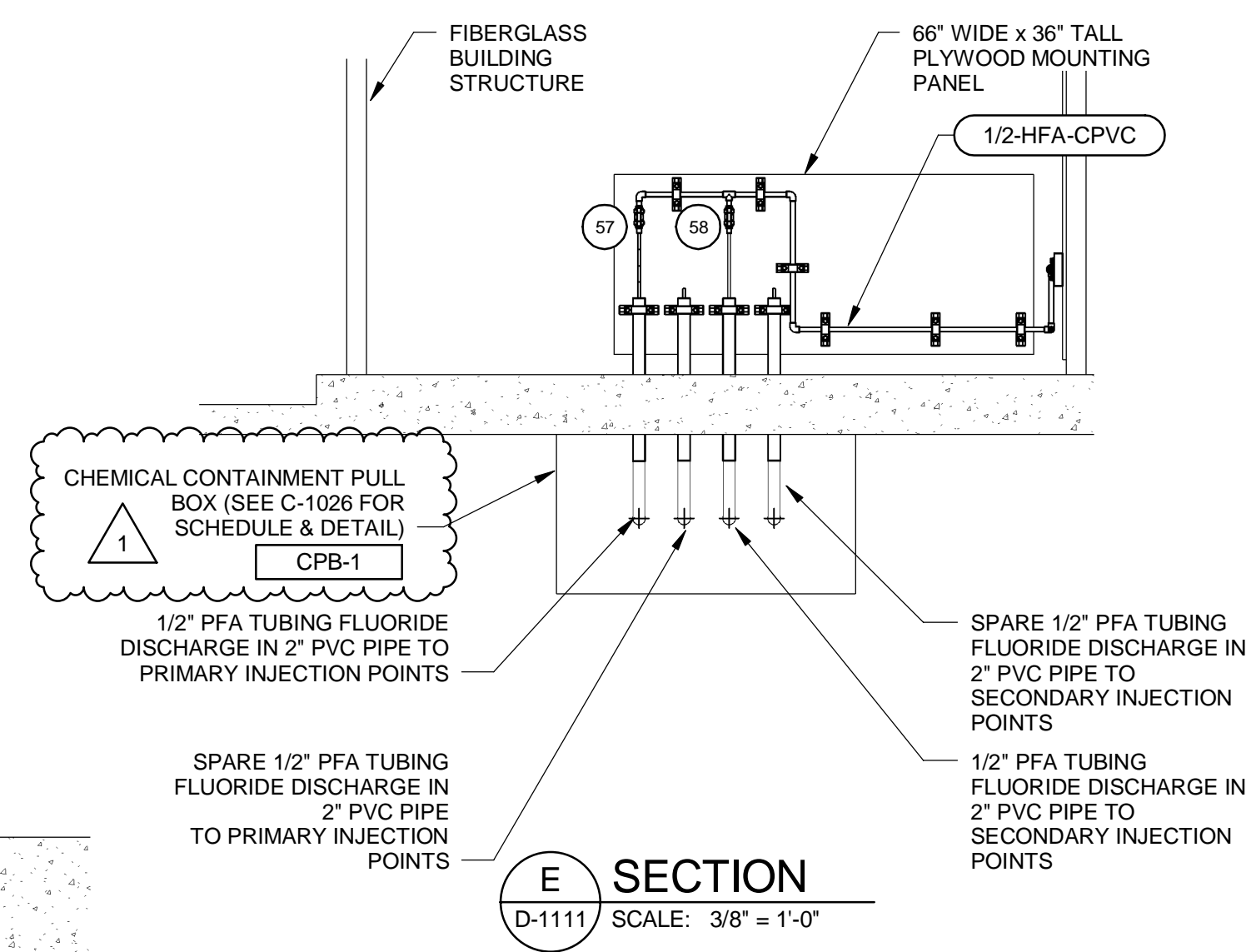
B SECTION
D-1111 SCALE: 3/8" = 1'-0"



C SECTION
D-1111 SCALE: 1/2" = 1'-0"



D SECTION
D-1111 SCALE: 3/4" = 1'-0"



E SECTION
D-1111 SCALE: 3/8" = 1'-0"

- NOTES:**
- SEE DWG D-1110 FOR FULL VALVE & ACCESSORY TABLE.
 - CONCRETE ENCASE ALL PIPING BELOW SLAB PER DETAIL 4 / D-1901.
 - FRP TANK MANUFACTURER TO PROVIDE STAND-OFF SUPPORT BRACKETS PRE-MOLDED TO THE TANK FOR VERTICAL PIPING MOUNTED TO TANK U-BOLT PART OF PIPE SUPPORT BY CONTRACTOR.
 - ALL STEEL PIPE SUPPORTS IN THE FLUORIDE CONTAINMENT AREA SHALL BE COATED WITH THE SAME COATING AS THE CONTAINMENT AREA PER 09900 CLASS 10.



8/22/2018 3:30:00 PM BIM 360://200-09308-18001 C:\P\09308-01-01-POL-YFL-D-2017.rvt

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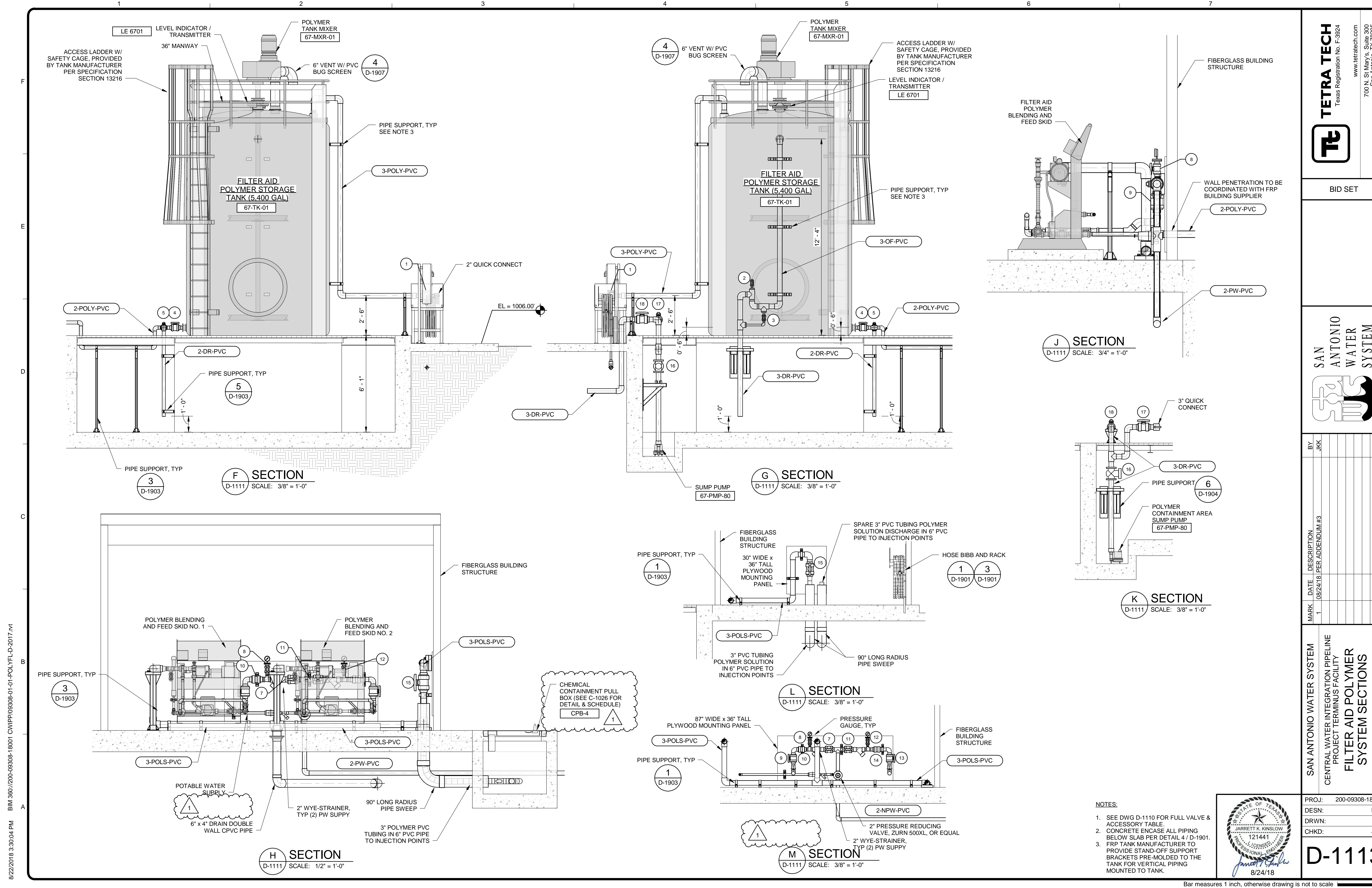
SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
FLUORIDE SYSTEM
SECTIONS

PROJ:	200-09308-18001
DESN:	LEH
DRWN:	JTE
CHKD:	JCB

D-1112



8/22/2018 3:30:04 PM BIM 360://200-09308-18001 C:\P\09308-01-01-POL-YEL-D-2017.rvt

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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
 CENTRAL WATER INTEGRATION PIPELINE
 PROJECT TERMINUS FACILITY
 FILTER AID POLYMER
 SYSTEM SECTIONS

PROJ:	200-09308-18001
DESN:	LEH
DRWN:	JTE
CHKD:	JCB

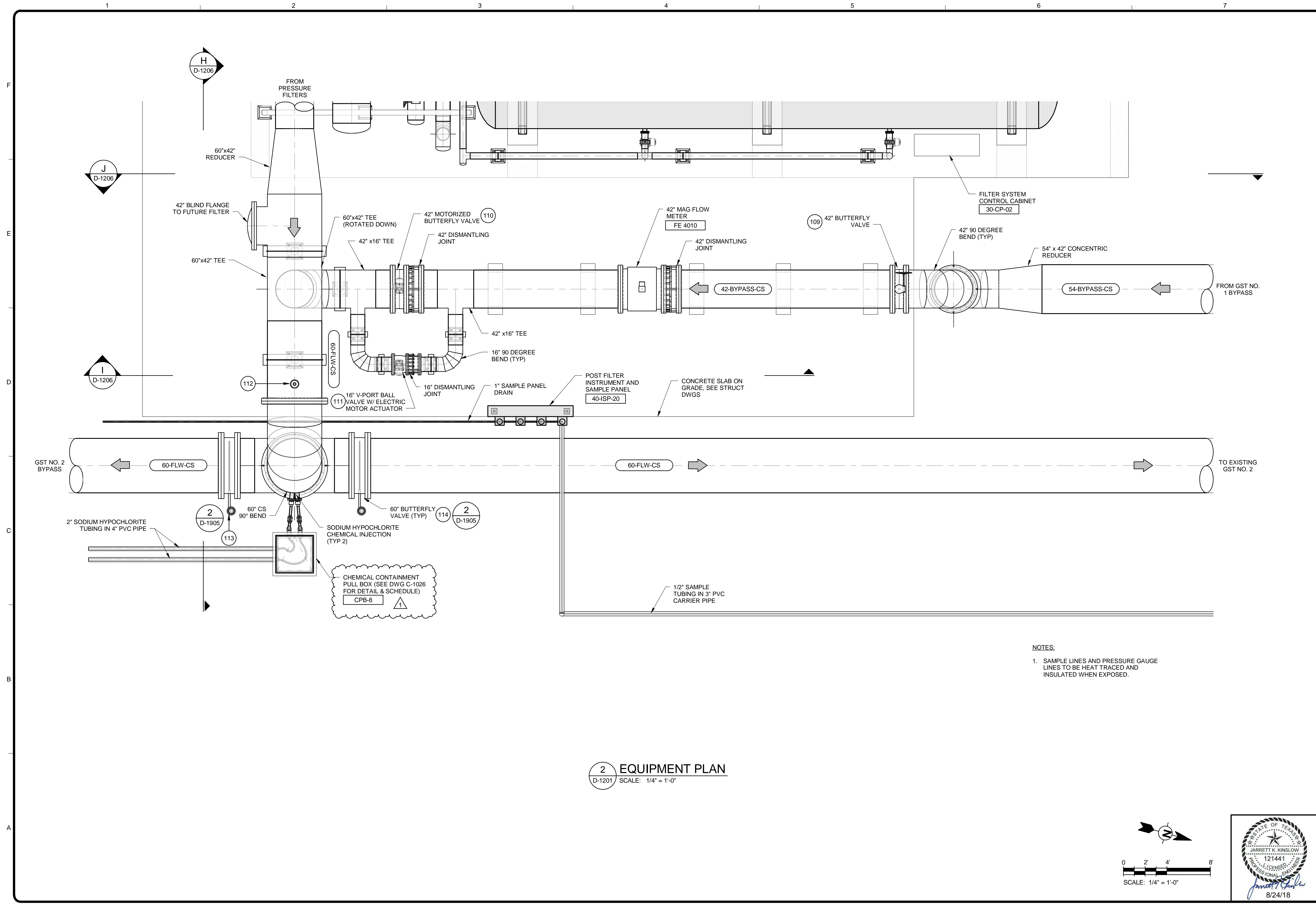
D-1113

- NOTES:**
- SEE DWG D-1110 FOR FULL VALVE & ACCESSORY TABLE.
 - CONCRETE ENCASE ALL PIPING BELOW SLAB PER DETAIL 4 / D-1901.
 - FRP TANK MANUFACTURER TO PROVIDE STAND-OFF SUPPORT BRACKETS PRE-MOLDED TO THE TANK FOR VERTICAL PIPING MOUNTED TO TANK.



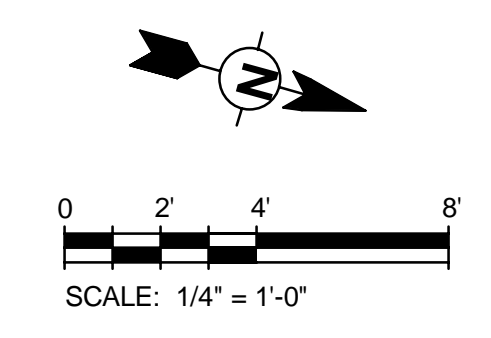
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2 EQUIPMENT PLAN
D-1201 SCALE: 1/4" = 1'-0"

- NOTES:
- 1. SAMPLE LINES AND PRESSURE GAUGE LINES TO BE HEAT TRACED AND INSULATED WHEN EXPOSED.



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SAN ANTONIO WATER SYSTEM

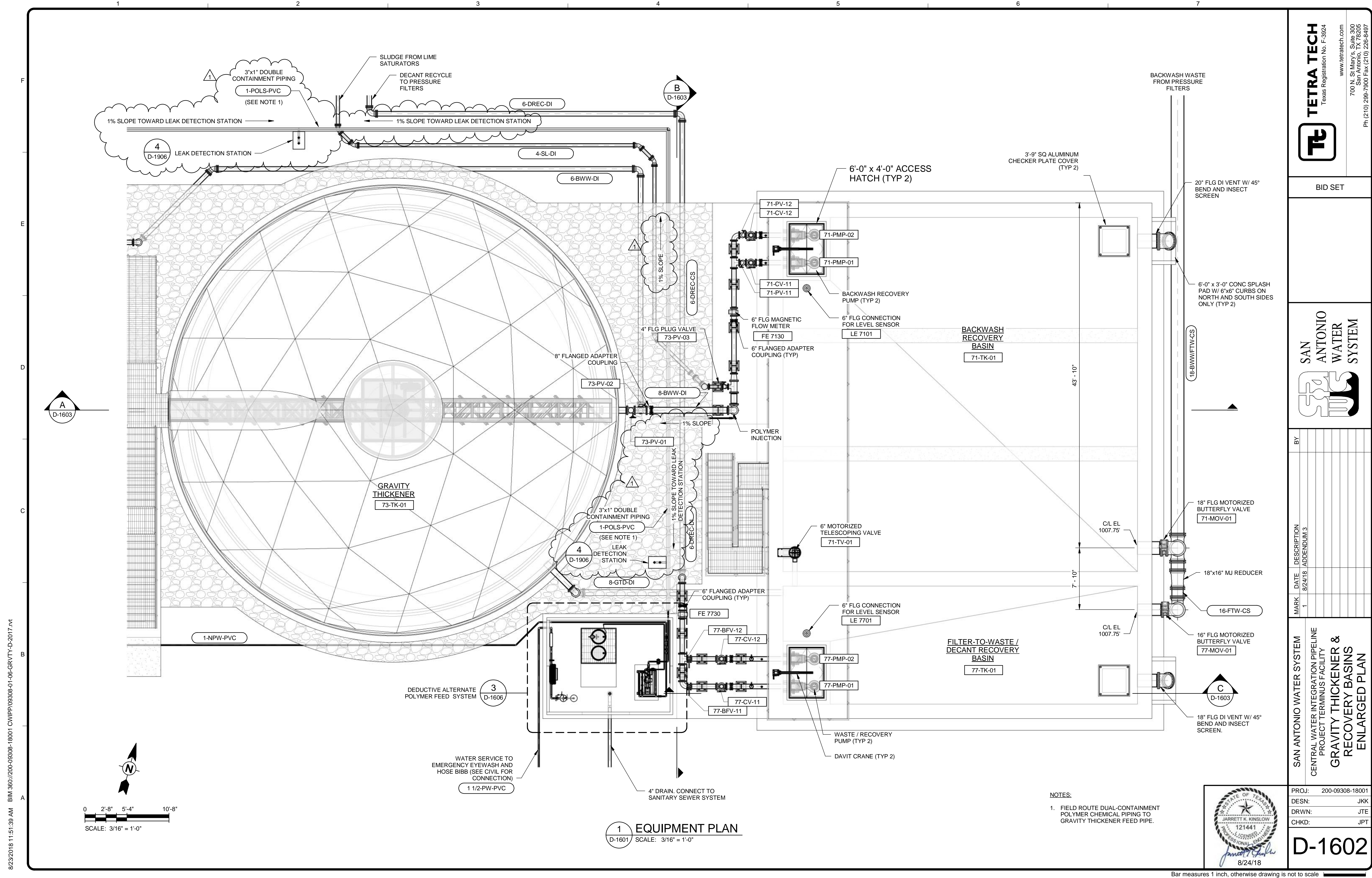
MARK	DATE	DESCRIPTION	BY
1	08/24/18	PER APPENDIX #3	AST

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
PRESSURE FILTERS & EFFLUENT HEADER & BYPASS ENLARGED PLAN

PROJ: 200-09308-18001
DES: AST
DRWN: JTE
CHKD: JKK

D-1205

Bar measures 1 inch, otherwise drawing is not to scale



1 EQUIPMENT PLAN
D-1601 SCALE: 3/16" = 1'-0"

NOTES:
1. FIELD ROUTE DUAL-CONTAINMENT POLYMER CHEMICAL PIPING TO GRAVITY THICKENER FEED PIPE.



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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY
1	8/24/18	ADDENDUM 3	

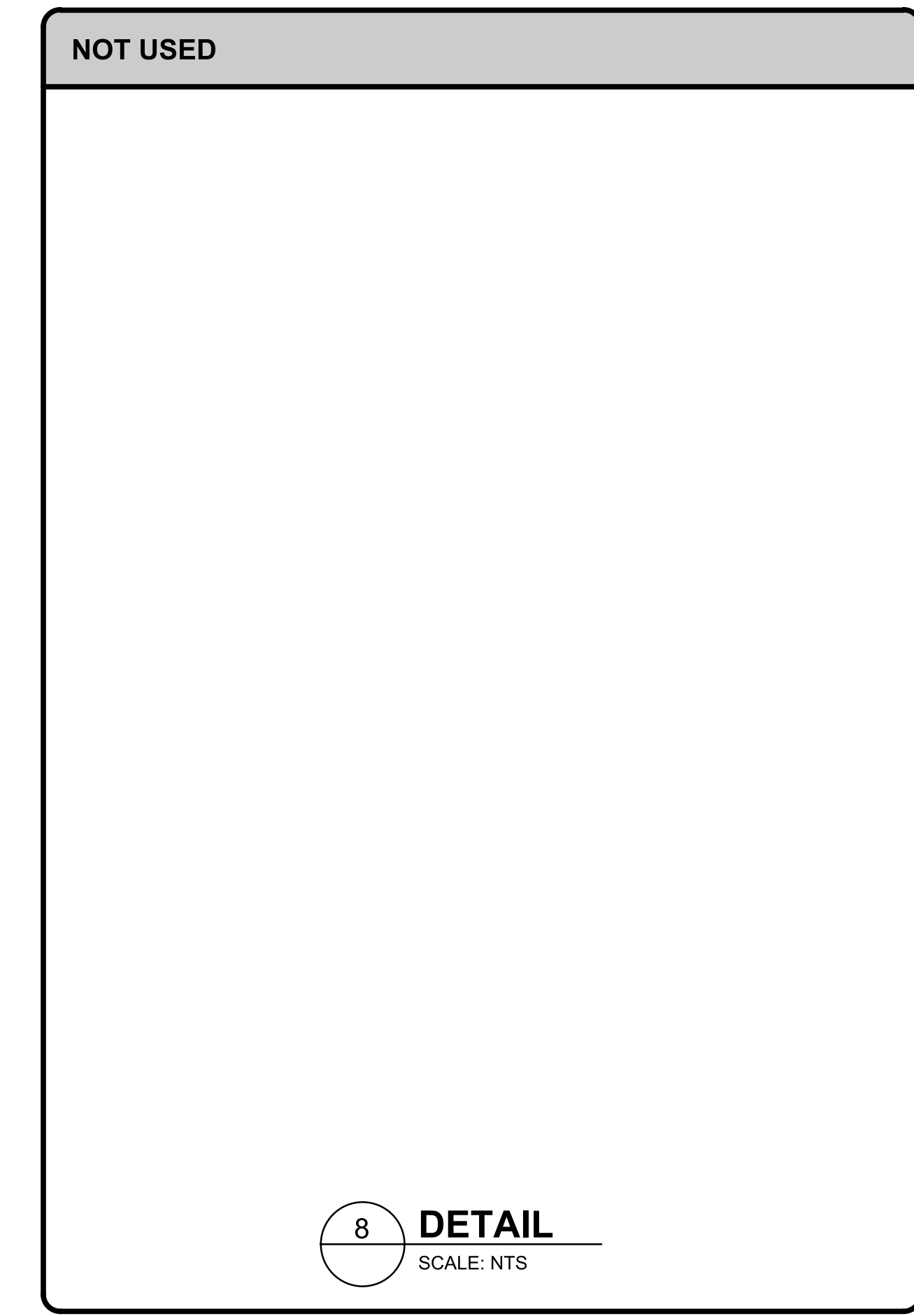
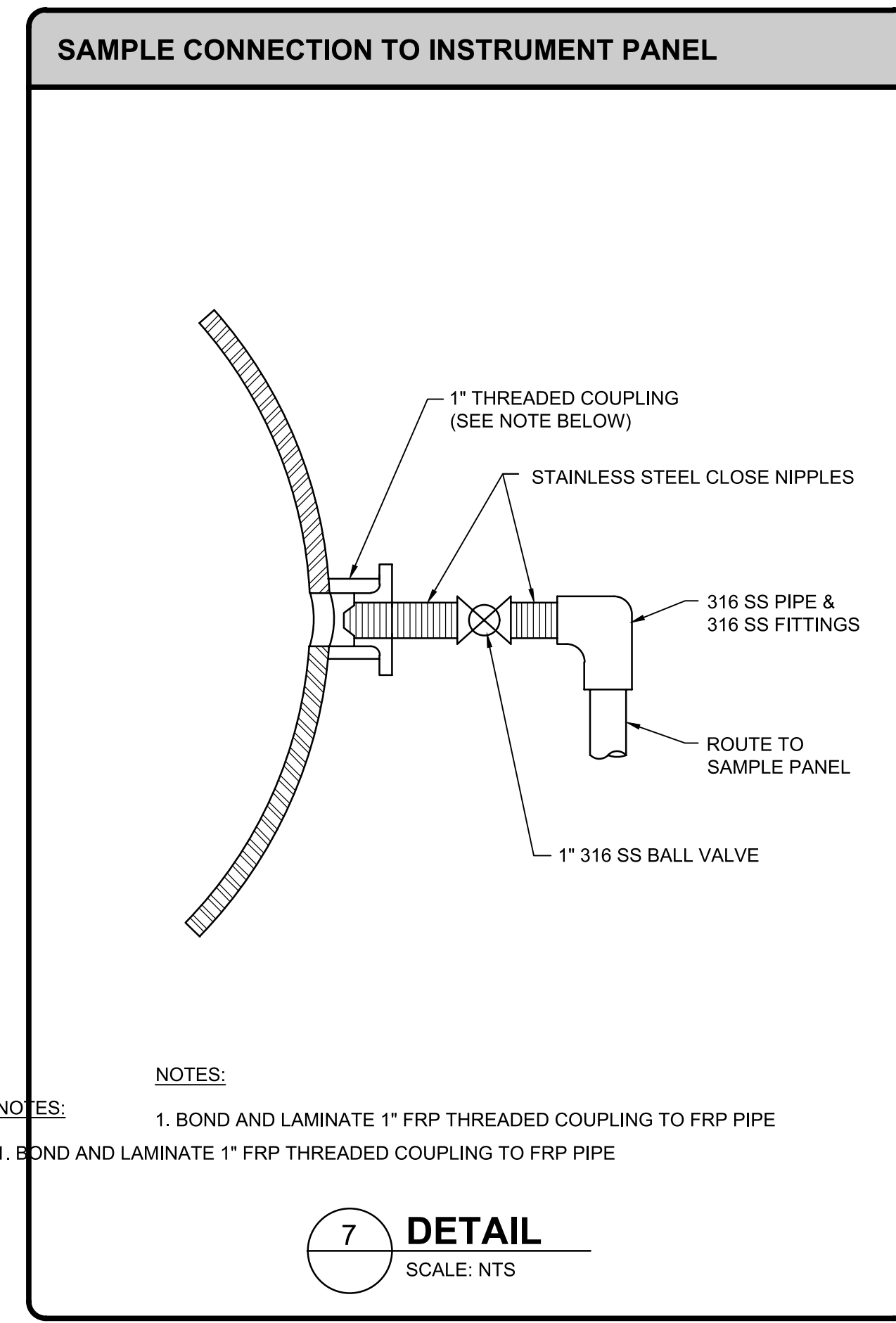
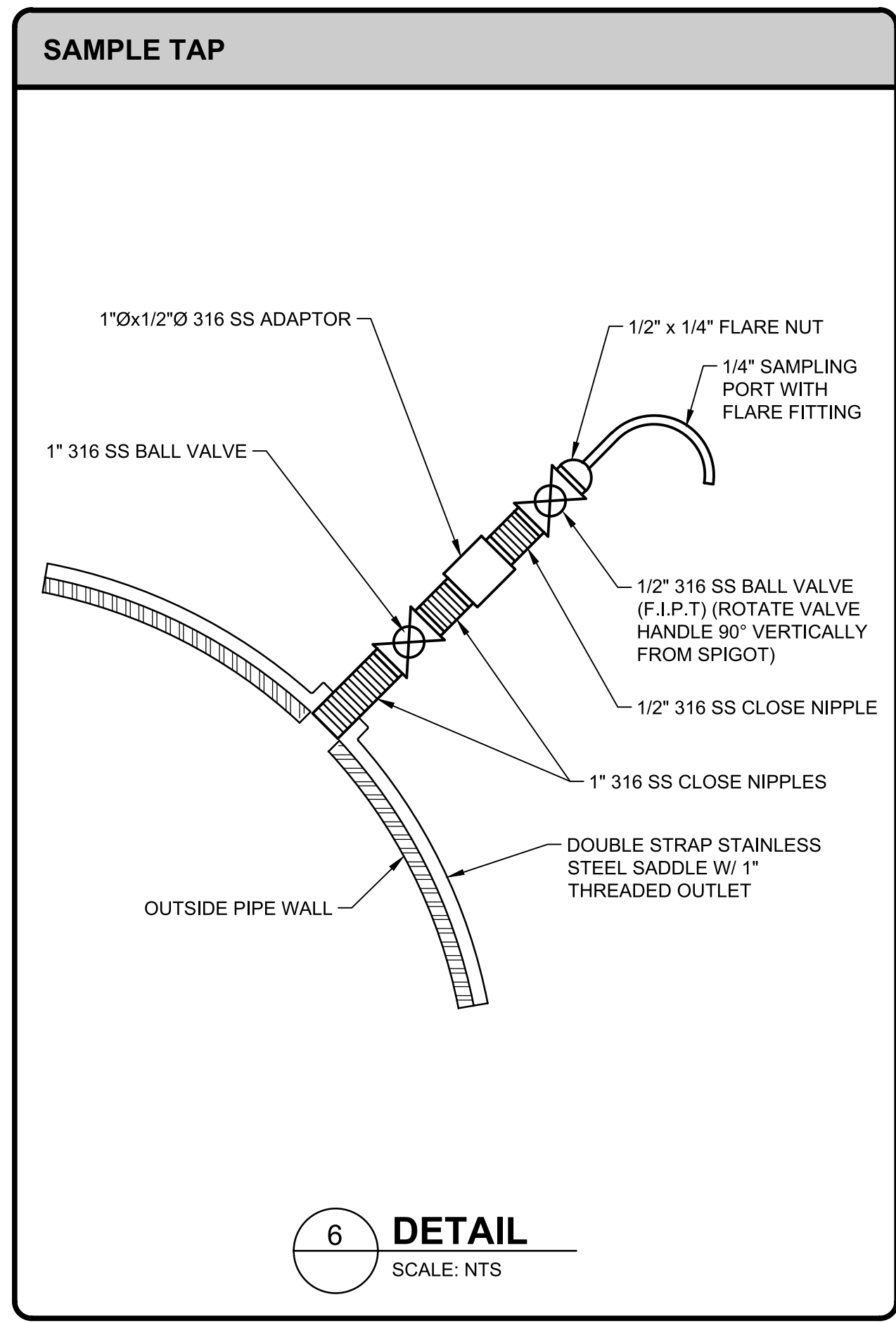
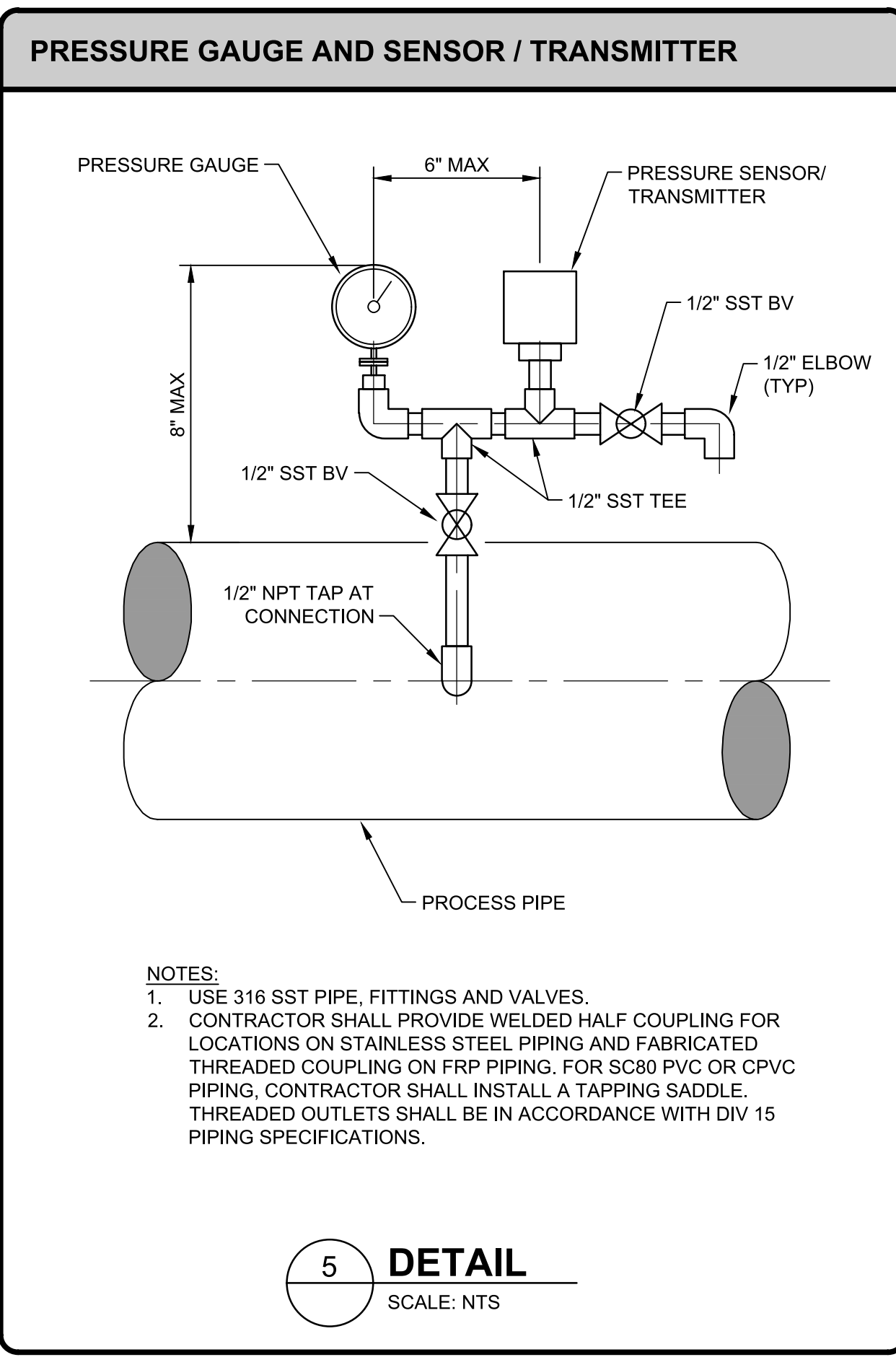
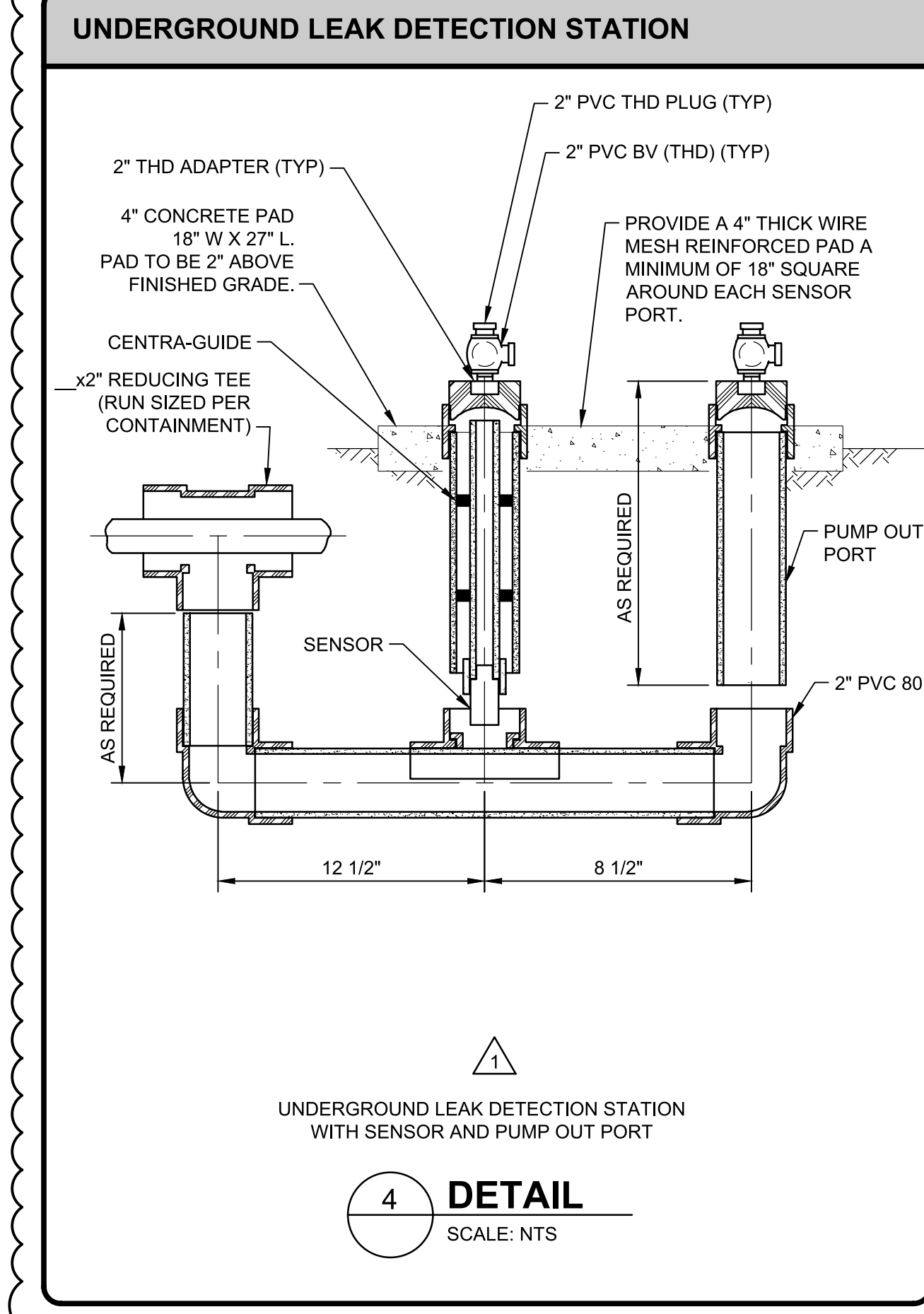
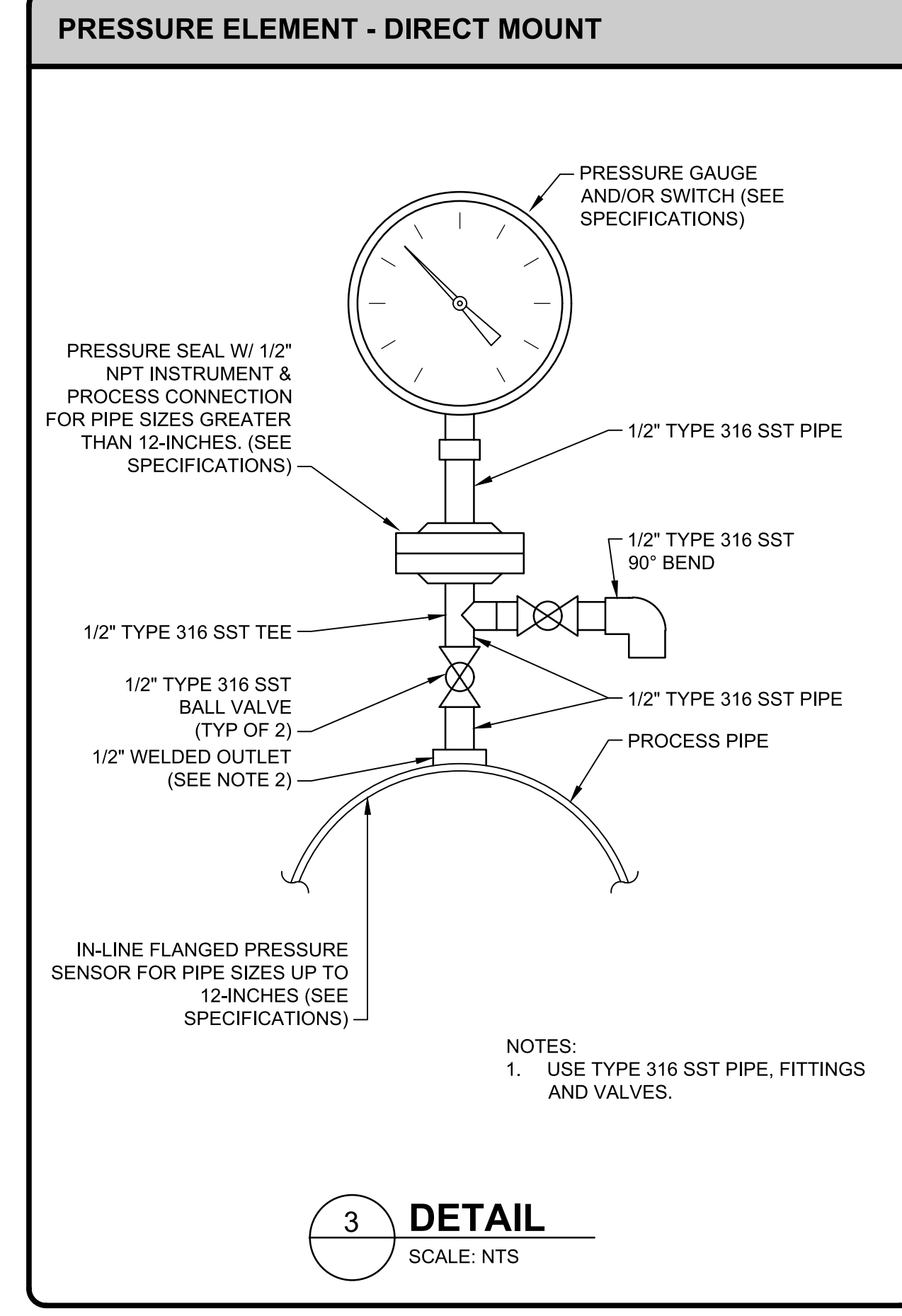
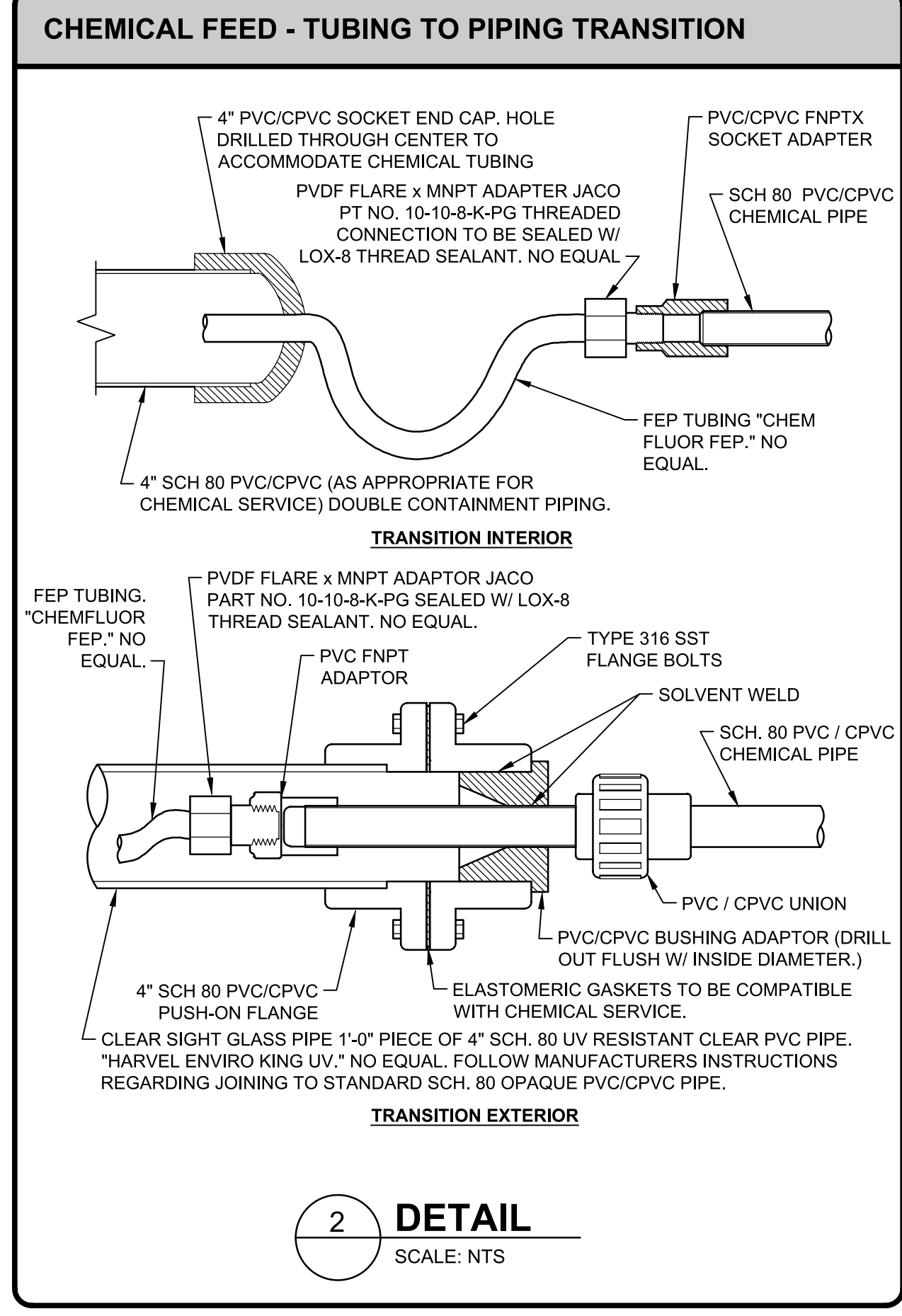
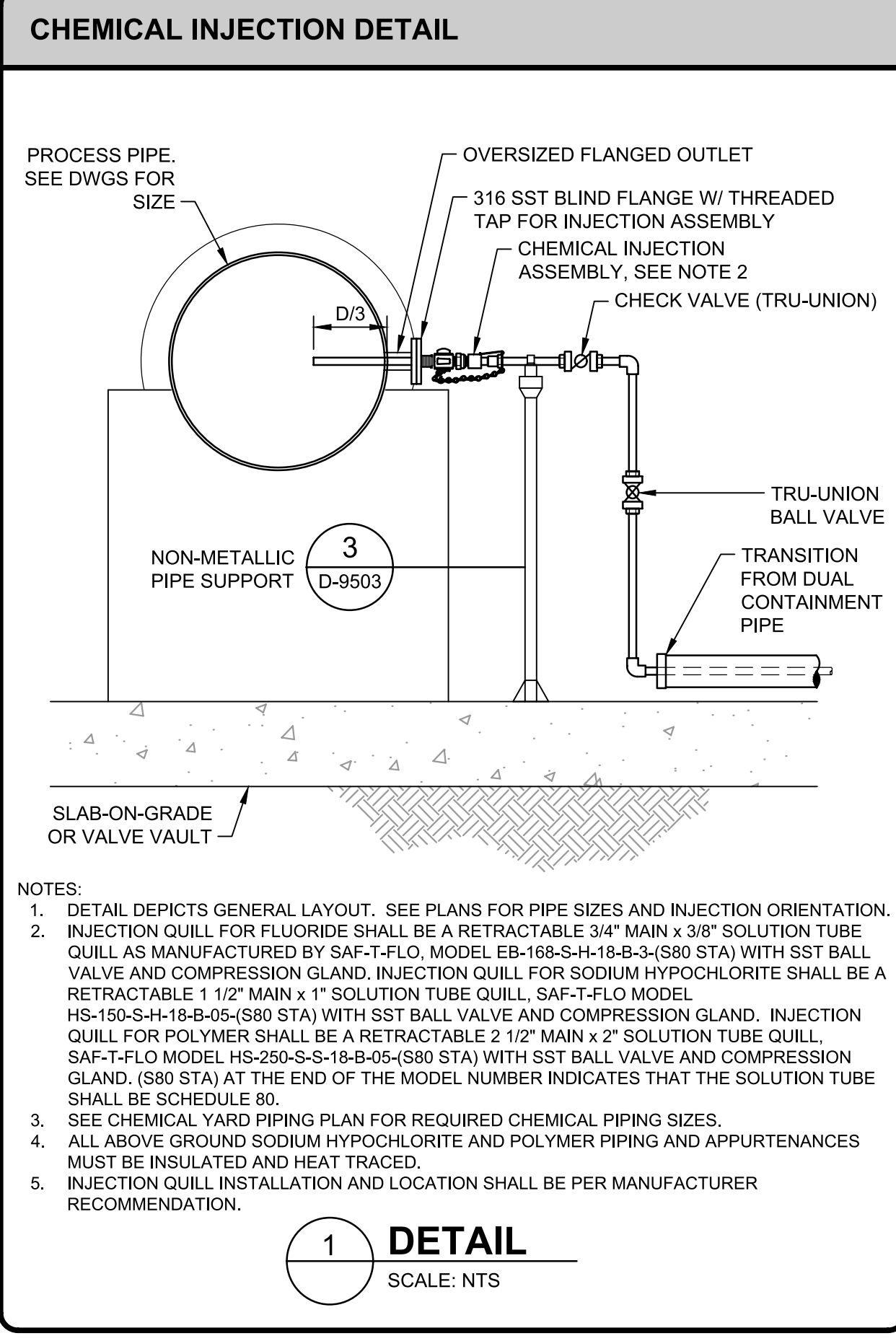
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
GRAVITY THICKENER & RECOVERY BASINS ENLARGED PLAN

PROJ:	200-09308-18001
DESN:	JKK
DRWN:	JTE
CHKD:	JPT

D-1602

8/23/2018 11:51:39 AM BIM_360/200-09308-18001 C:\P\09308-01-06-GRV-TY-D-2017.rvt

8/23/2018 2:16:48 PM - C:\PROJECTS\ORLANDO\IF080308\200-093038-18001-8\CAD\SHSHEET\TREATMENT_FACILITY\D-1906X STANDARD PROCESS DETAILS.DWG - REYNOLDS, MARY



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SAN ANTONIO WATER SYSTEM

BY: LH

DATE: 8/24/2018

DESCRIPTION: ADDENDUM 3

MARK: 1

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY

STANDARD
PROCESS DETAILS

PROJ: 200-09308-18001
DESN: JKK
DRWN: JTE
CHKD: JPT

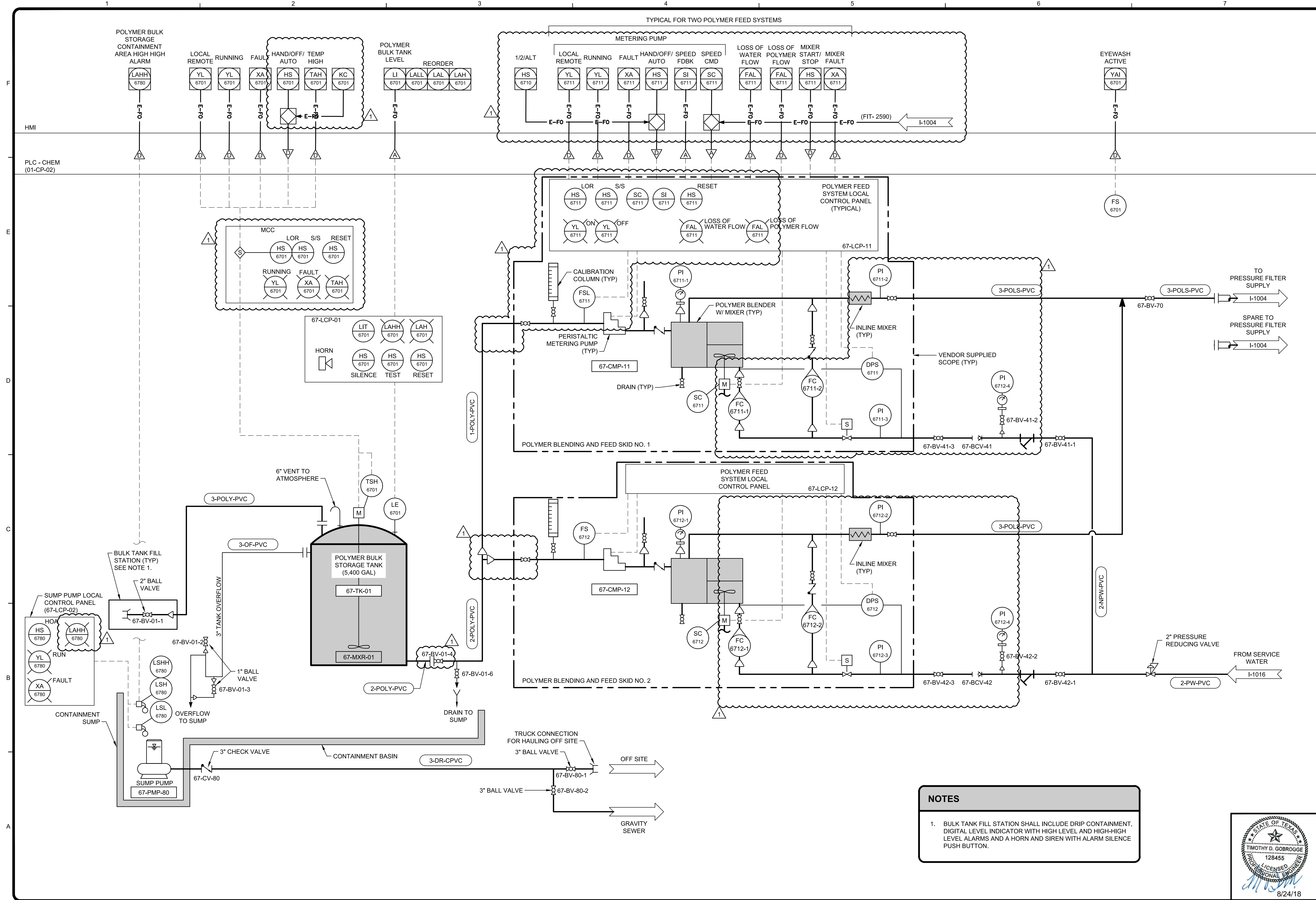
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PROJ: 200-09308-18001
DESN: JKK
DRWN: JTE
CHKD: JPT

8/24/18

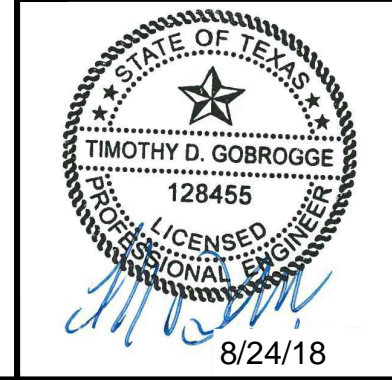
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NOTES

1. BULK TANK FILL STATION SHALL INCLUDE DRIP CONTAINMENT, DIGITAL LEVEL INDICATOR WITH HIGH LEVEL AND HIGH-HIGH LEVEL ALARMS AND A HORN AND SIREN WITH ALARM SILENCE PUSH BUTTON.



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BID SET

SAN ANTONIO WATER SYSTEM

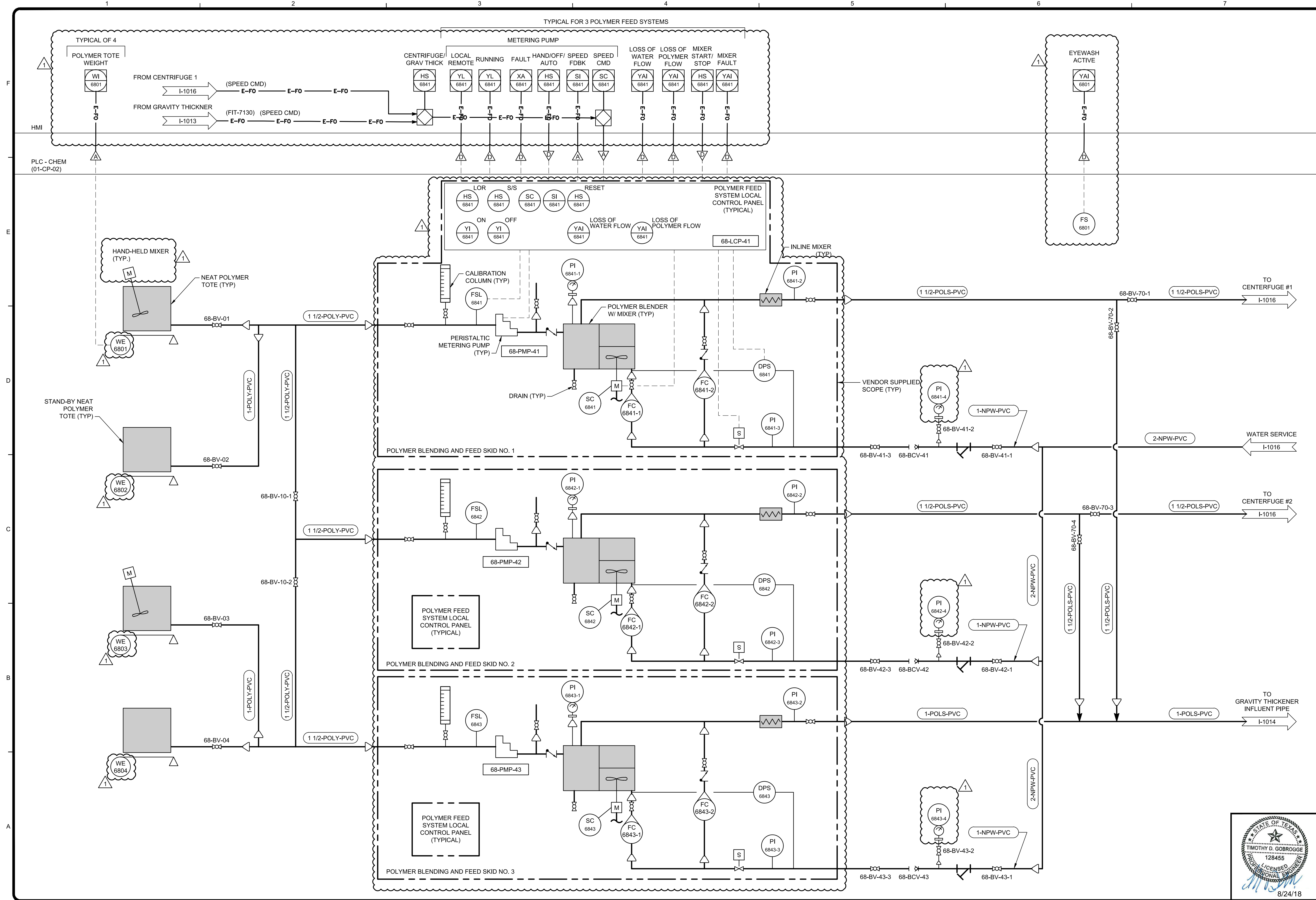
MARK	DATE	DESCRIPTION
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SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
FILTER AID POLYMER SYSTEM P&ID

PROJ:	200-09308-18001
DESN:	BRW
DRWN:	JTE
CHKD:	TG

I-1012

8/23/2018 3:01:41 PM - O:\PROJECTS\ORLANDO\IER0308\200-09308-18001-8\CAD\SHEET\ESTREATMENT_FACILITY\I-1017 DEWATERING POLYMER & SETTLING AID P&ID.DWG - REYNOLDS, MARY



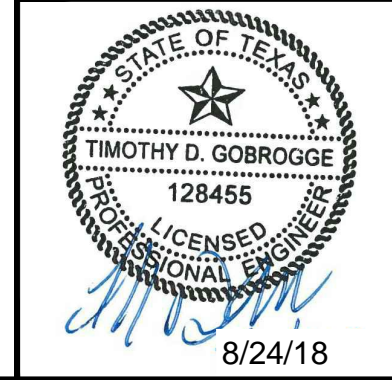
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BID SET

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
DEWATERING POLYMER &
SETTLING AID
P&ID

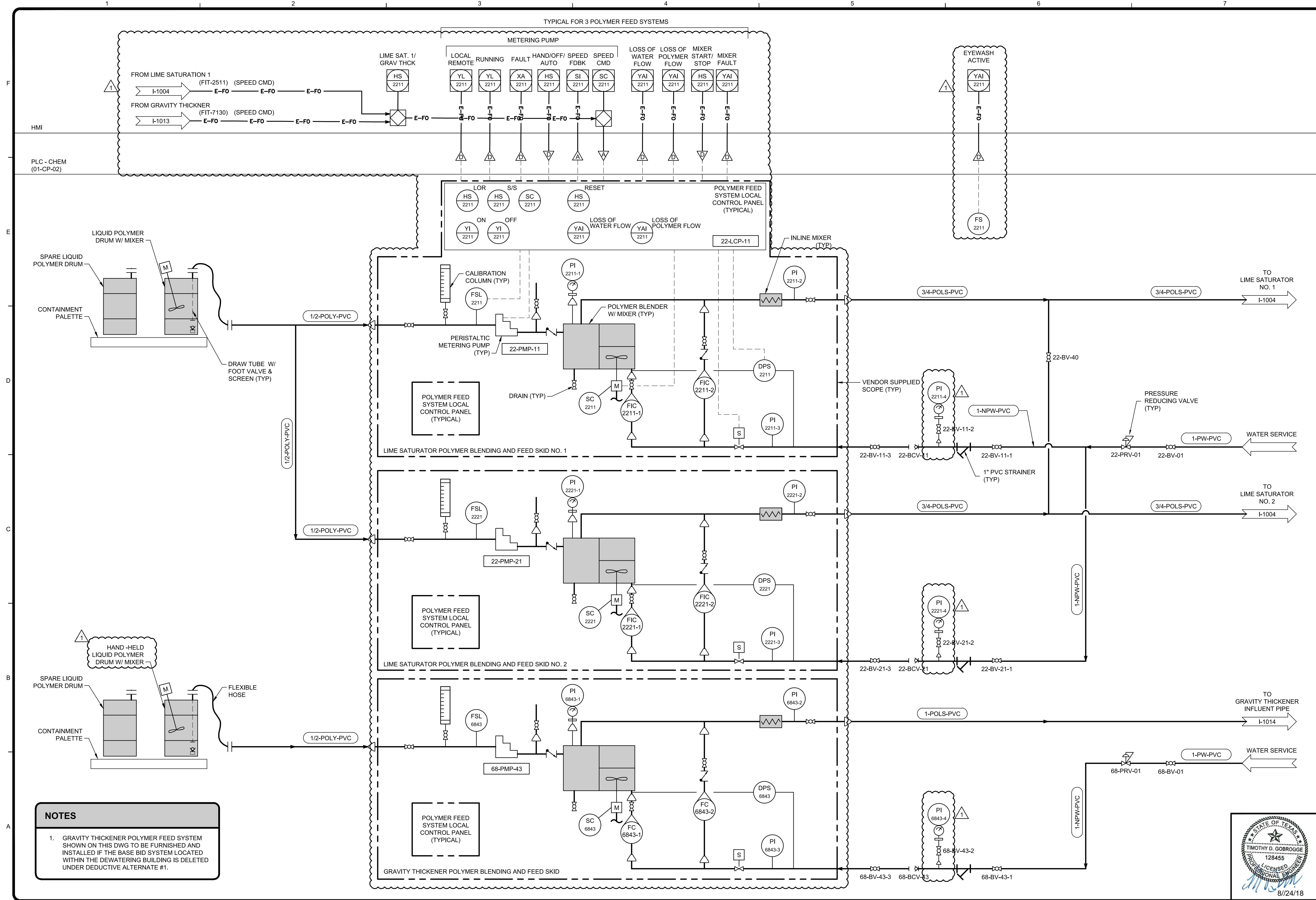


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DESN:	BRW
DRWN:	JTE
CHKD:	TG

I-1017

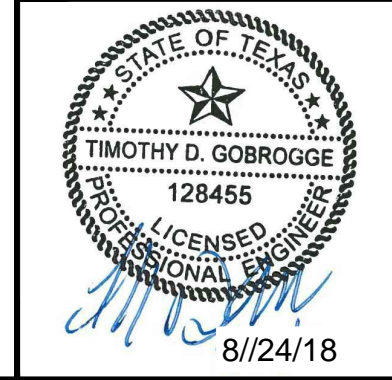
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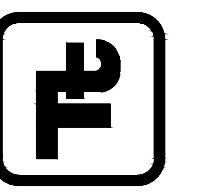
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NOTES

1. GRAVITY THICKENER POLYMER FEED SYSTEM SHOWN ON THIS DWG TO BE FURNISHED AND INSTALLED IF THE BASE BID SYSTEM LOCATED WITHIN THE DEWATERING BUILDING IS DELETED UNDER DEDUCTIVE ALTERNATE #1.



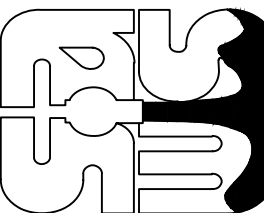


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San Antonio, TX 78205
Ph (210) 298-7900 Fax (210) 226-8497

BID SET

SAN ANTONIO WATER SYSTEM



MARK	DATE	DESCRIPTION
1	08/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
MISCELLANEOUS POLYMER FEED SYSTEMS P&ID

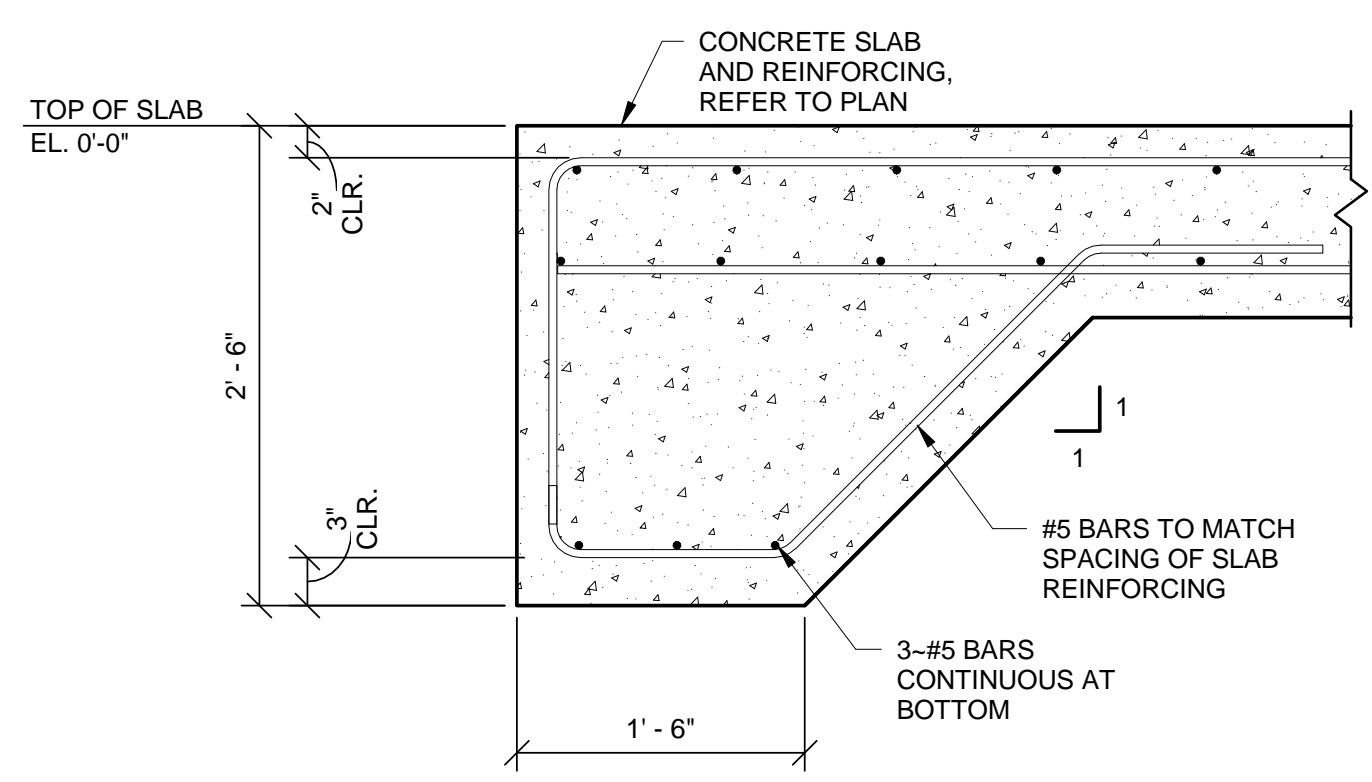
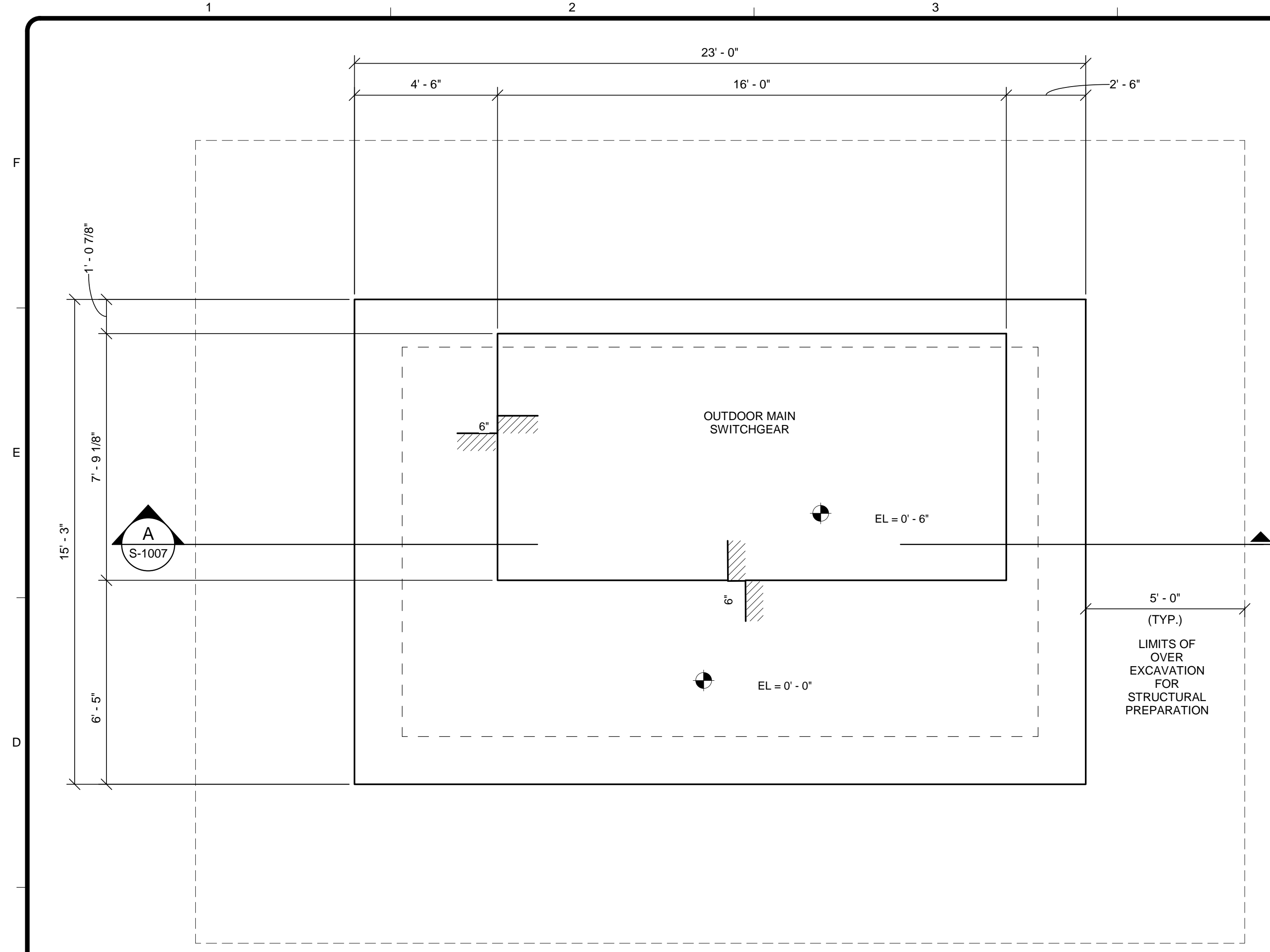
PROJ: 200-09308-18001

DESN: BRW

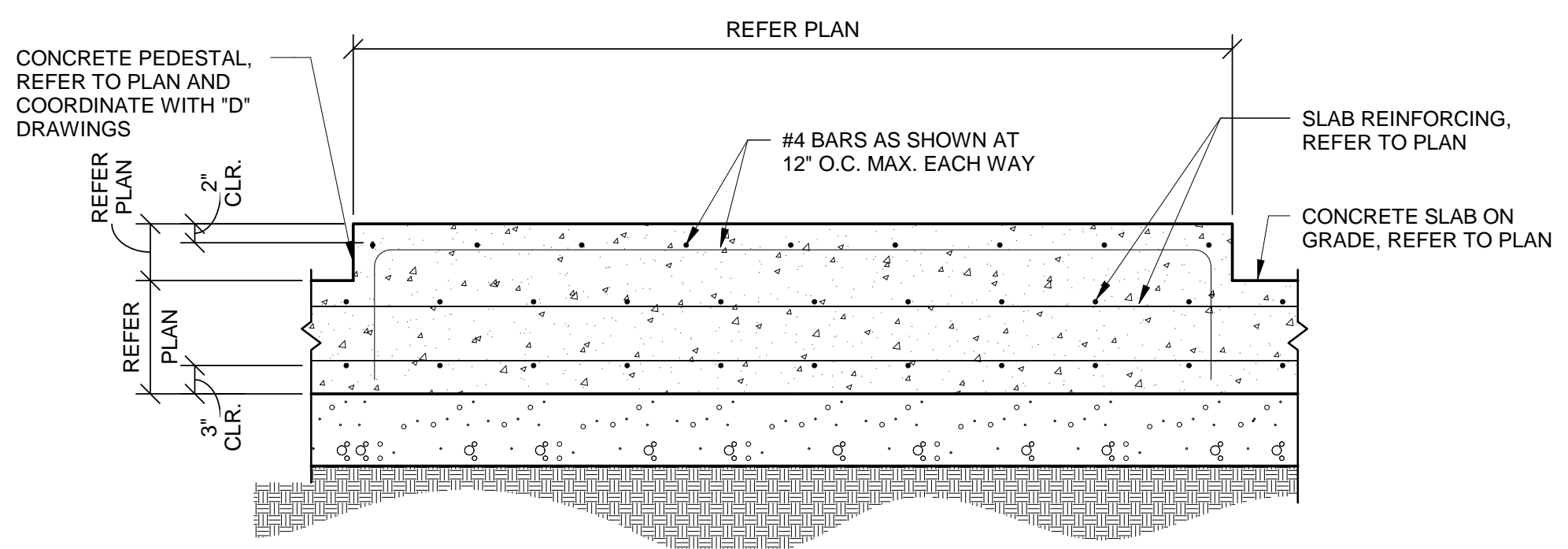
DRWN: JTE

CHKD: TD

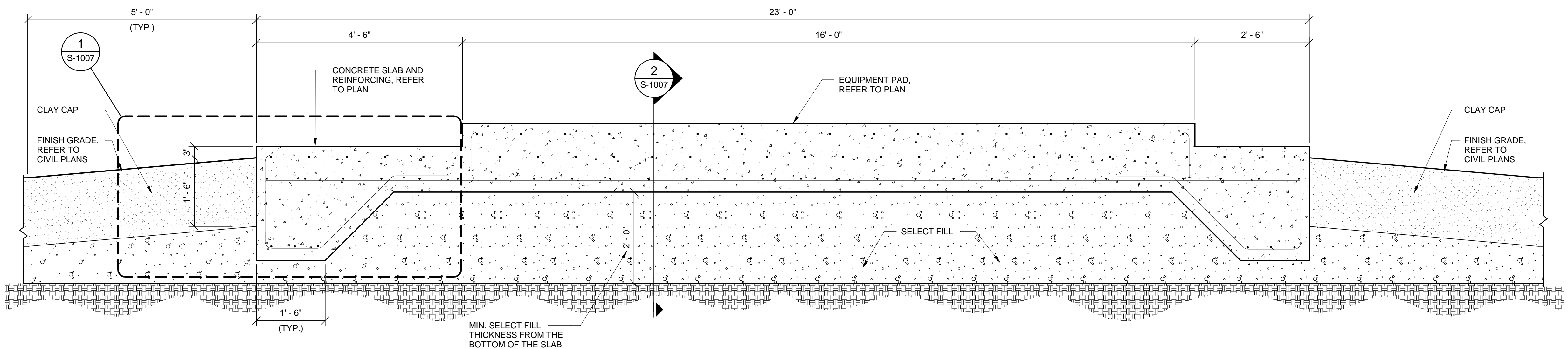
I-1019



1 EDGE DETAIL
S-1007 SCALE: 1" = 1'-0"



2 DETAIL
S-1007 SCALE: 3/4" = 1'-0"



A SECTION
S-1007 SCALE: 3/4" = 1'-0"

FOUNDATION NOTES:

1. REFER TO GENERAL STRUCTURAL NOTES SHEETS FOR INFORMATION NOT GIVEN.
2. REFER TO "D" DRAWINGS FOR EQUIPMENT AND PIPES LAYOUT AND SIZING.
3. COORDINATE OPENINGS, CONDUITS, RAILINGS, ETC. WITH ALL DISCIPLINES.
4. REFERENCE TYPICAL DETAIL SHEETS FOR ADDED REINFORCING AROUND OPENINGS ETC.
5. REFERENCE SECTIONS FOR WALL REINFORCING

FOUNDATION LEGEND:

- S-4 12" CONCRETE SLAB ON GRADE WITH #5 BARS AT 10" O.C. EACH WAY, TOP AND BOTTOM. PROVIDE STANDARD 90 DEGREE BEND AT ENDS
- SLOPE INDICATES SLOPE IN SLAB. COORDINATE WITH OTHER DISCIPLINE'S DRAWINGS
- #5 INDICATES STEP IN TOP OF SLAB ELEVATION.
- EL. 0'-0" INDICATES TOP OF SLAB DATUM ELEVATION. TOP OF SLAB = ELEV. 1005.00', REF CIVIL

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BID SET

STRUCTURAL ENGINEERING ASSOCIATES, INC.
CONCRETE FOUNDATION SPECIALISTS

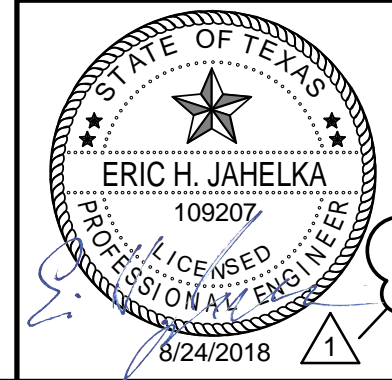
TYPE FIRM REG. NO. F-199
DATE OF REG. 01/10/01 WWW.SEATX.COM
(210) 735-6202

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	8/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
SWITCHGEAR FOUNDATION
PLAN AND SECTIONS

PROJ:	200-09308-18001
DESN:	EHJ
DRWN:	AGS
CHKD:	SD



S-1007

Bar measures 1 inch, otherwise drawing is not to scale

1 2 3 4 5 6 7

F

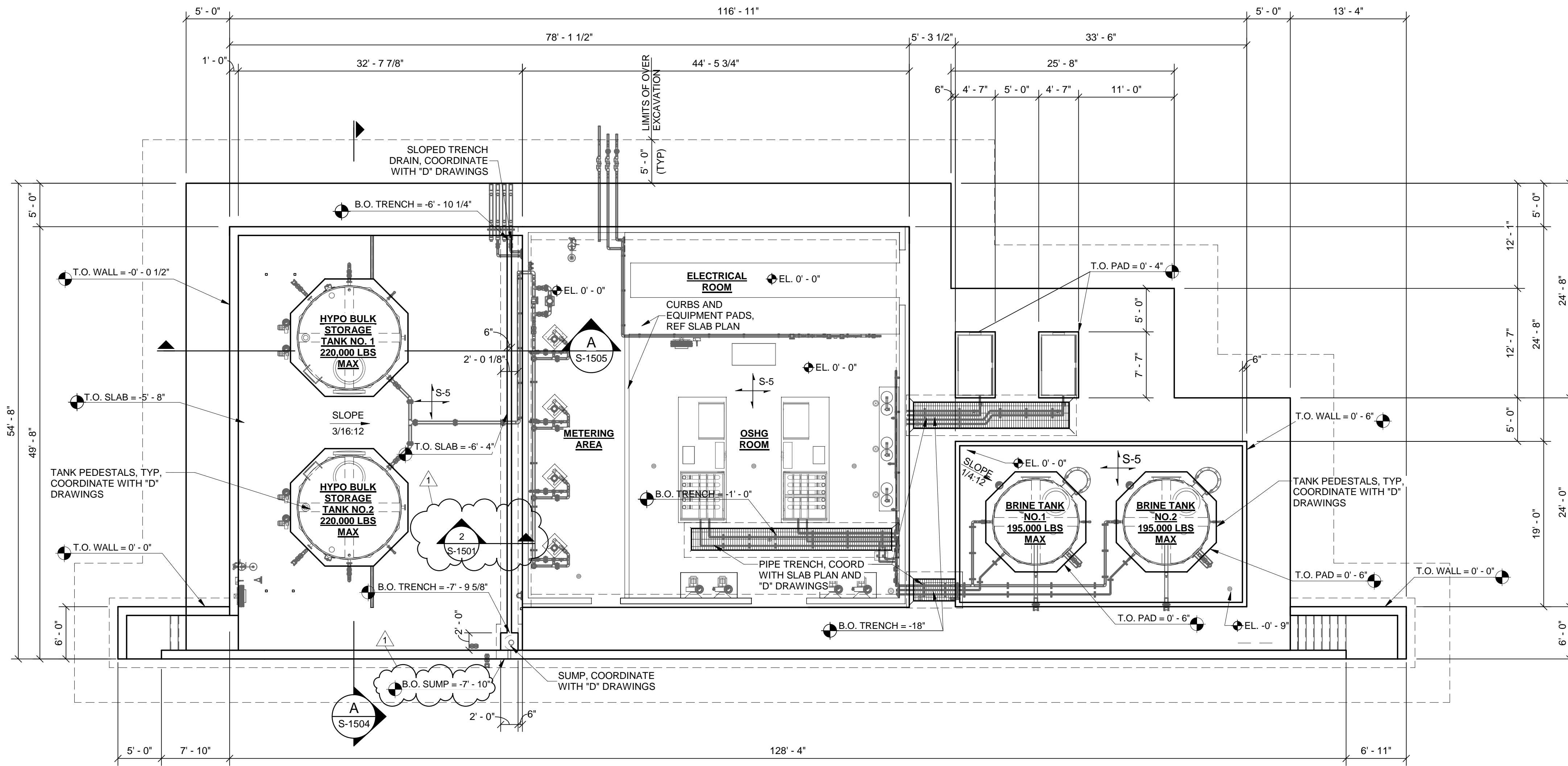
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D

C

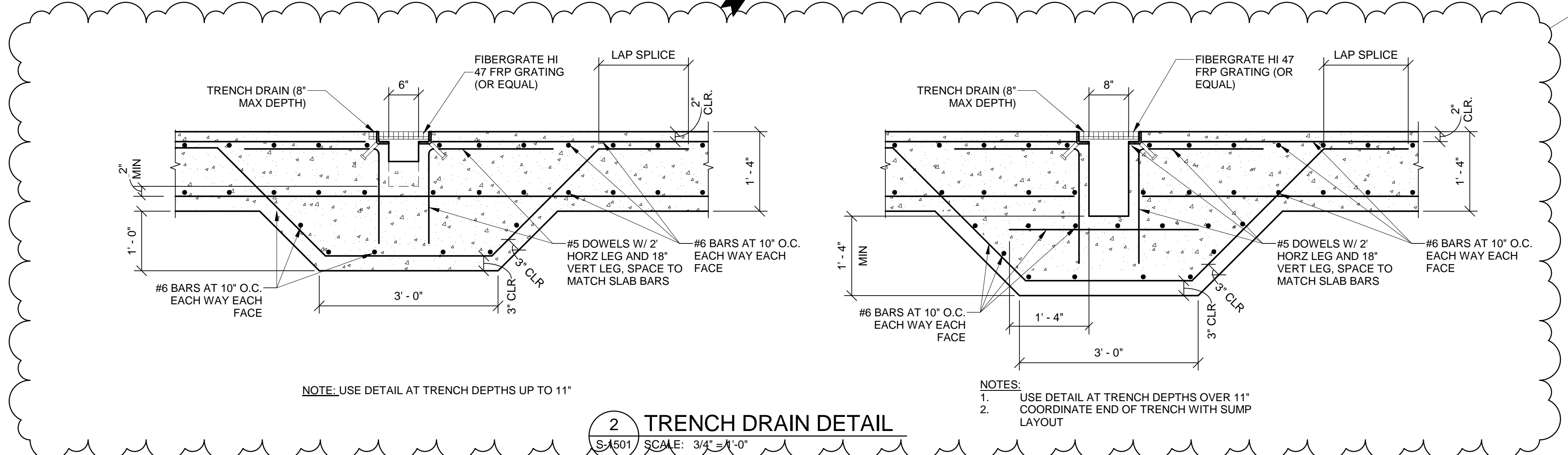
B

A



OSG FACILITY FOUNDATION PLAN

SCALE: 1/8" = 1'-0"



FOUNDATION NOTES:

- REFER TO GENERAL STRUCTURAL NOTES SHEETS FOR INFORMATION NOT GIVEN.
- REFER TO "D" DRAWINGS FOR EQUIPMENT AND PIPES LAYOUT AND SIZING
- COORDINATE OPENINGS, CONDUITS, RAILINGS, ETC. WITH ALL DISCIPLINES.
- REFERENCE TYPICAL DETAIL SHEETS FOR ADDED REINFORCING AROUND OPENINGS ETC.
- REFERENCE ARCHITECTURAL FOR WALL ELEVATIONS OPENINGS.
- COORDINATE HEIGHT OF CONCRETE PEDESTAL WITH EQUIPMENT MANUFACTURERS.
- PROVIDE 6 MIL POLYETHYLENE VAPOR BARRIER UNDER ALL SLAB AREAS RECEIVING FLOOR TREATMENTS
- REFERENCE SHEET S-1502 FOR ADDITIONAL SLAB/FOUNDATION SLOPING INFORMATION

FOUNDATION LEGEND:

- S-1 6" CONCRETE SLAB ON GRADE WITH #5 MID LAYER BARS AT 10" O.C. EACH WAY.
- S-5 16" CONCRETE SLAB ON GRADE WITH #6 BARS AT 10" O.C. EACH WAY, TOP AND BOTTOM.
- SLOPE INDICATES SLOPE IN SLAB. COORDINATE WITH OTHER DISCIPLINE'S DRAWINGS
- EL. 0'-0" INDICATES T.O. SLAB DATUM ELEVATION. T.O. SLAB = 995.00', REF CIVIL

8/23/2018 12:13:32 PM BIM 360://200-09308-18001 C:\P\09308-01-05-HYPO-S-2017.rvt

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CONSULTING ENGINEERS
TYPE FIRM REG. NO. F-199
PROJECT REG. NO. 18242
(210) 756-6202 WWW.SEA-TX.COM

SAN ANTONIO WATER SYSTEM

BY

MARK DATE DESCRIPTION
1 8/24/18 PER APPENDIX #3

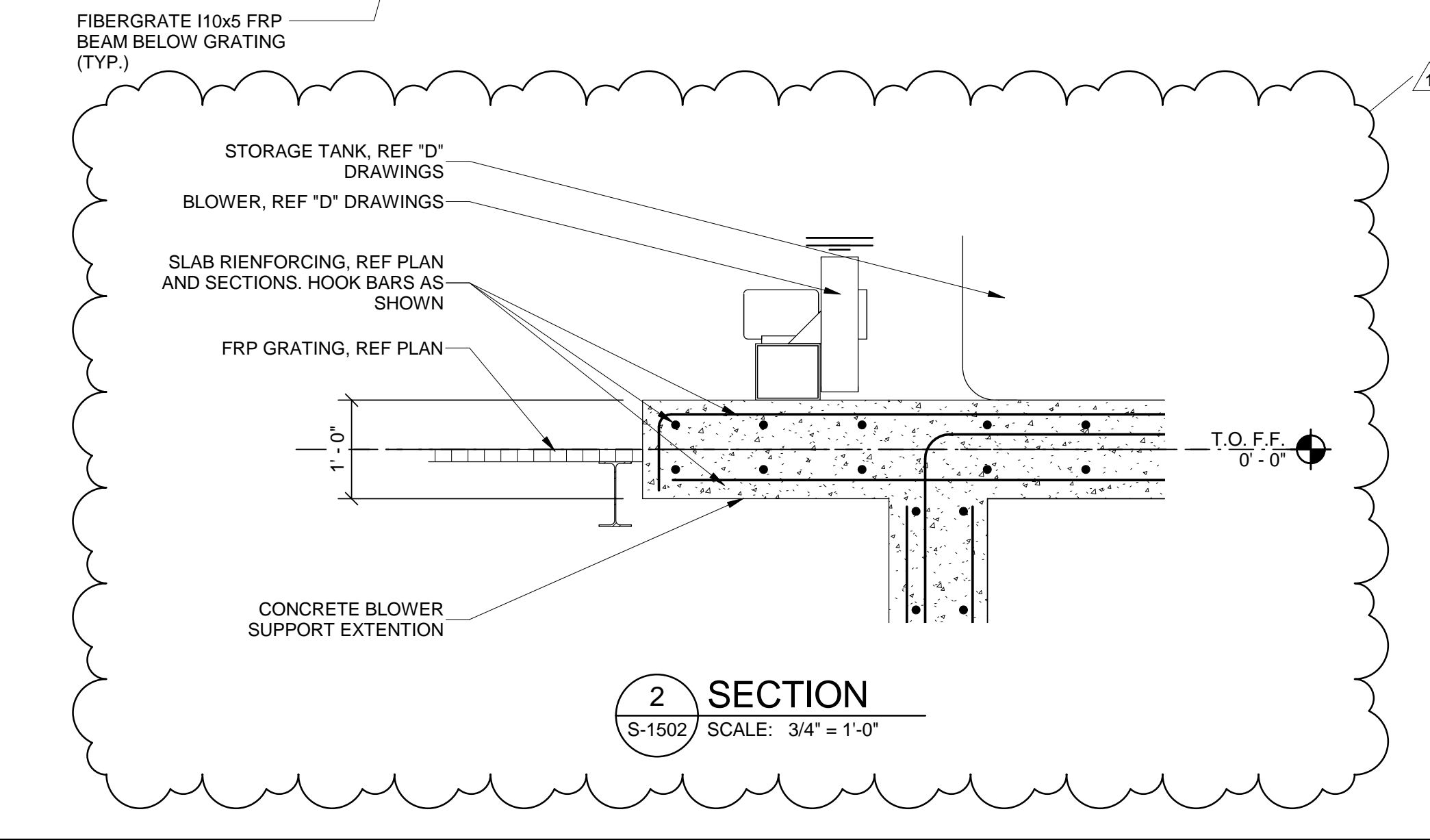
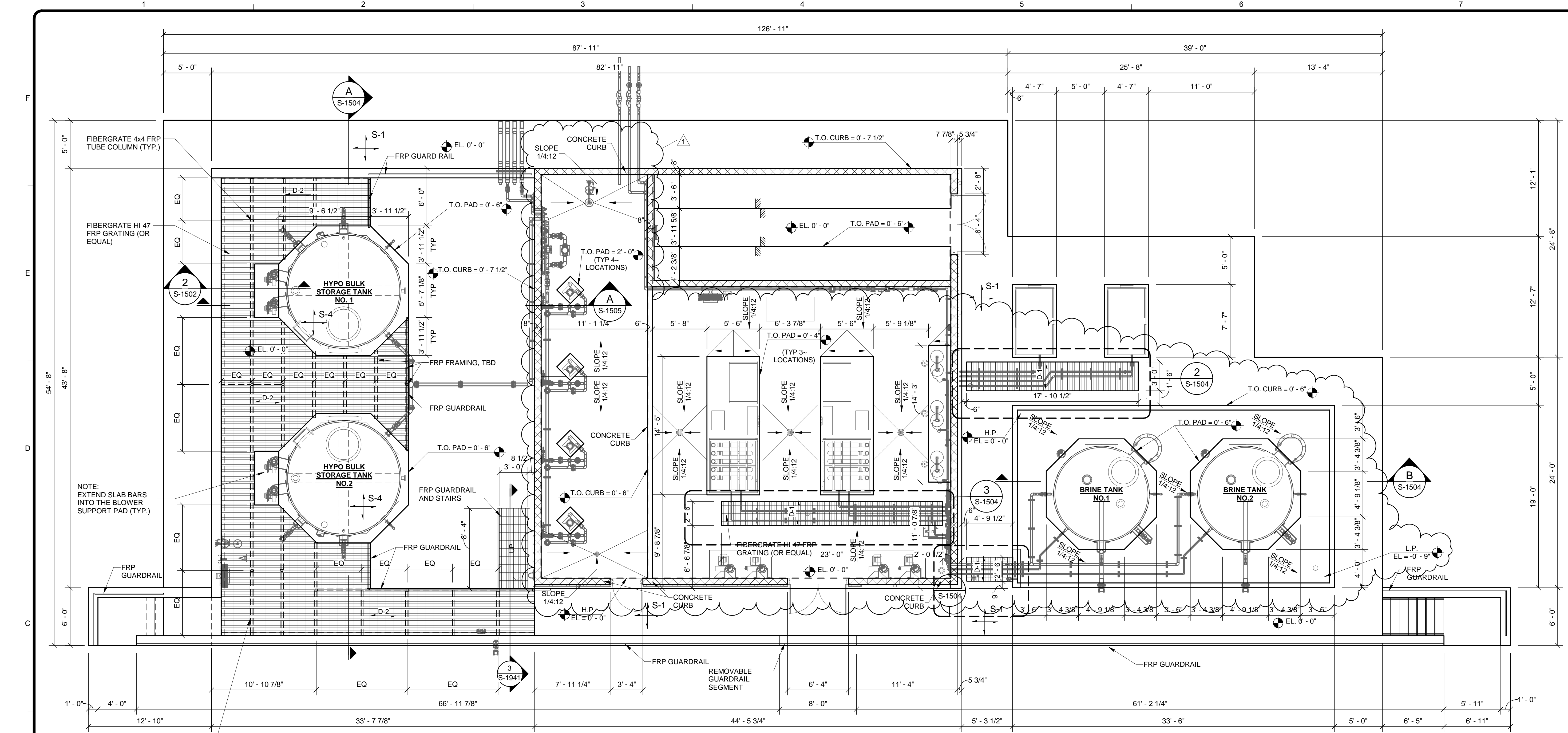
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE PROJECT TERMINUS FACILITY
OSG FACILITY FOUNDATION PLAN

PROJ: 200-09308-18001
DES: SD
DRW: AGS
CHKD: EHU



S-1501

Bar measures 1 inch, otherwise drawing is not to scale



OSG FACILITY SLAB PLAN
SCALE: 3/16" = 1'-0"

- SLAB NOTES:**
- REFER TO GENERAL STRUCTURAL NOTES SHEETS FOR INFORMATION NOT GIVEN.
 - REFER TO "D" DRAWINGS FOR EQUIPMENT AND PIPES LAYOUT AND SIZING
 - COORDINATE OPENINGS, CONDUITS, RAILINGS, ETC. WITH ALL DISCIPLINES.
 - REFERENCE TYPICAL DETAIL SHEETS FOR ADDED REINFORCING AROUND OPENINGS ETC.
 - REFERENCE ARCHITECTURAL DRAWINGS FOR WALL OPENINGS.
 - COORDINATE HEIGHT OF CONCRETE PEDESTAL WITH EQUIPMENT MANUFACTURER'S.
 - REF SHEET S-1921 FOR ALL CMU DETAILS.

- SLAB LEGEND:**
- S-1 6" CONCRETE SLAB ON GRADE WITH #5 MID LAYER BARS AT 10" O.C. EACH WAY.
 - S-4 12" CONCRETE SLAB REINFORCING WITH #5 BARS AT 8" O.C. EACH WAY, TOP AND BOTTOM.
 - S-5 16" CONCRETE SLAB ON GRADE WITH #6 BARS AT 10" O.C. EACH WAY, TOP AND BOTTOM.
 - SLOPE INDICATES SLOPE IN SLAB. COORDINATE WITH OTHER DISCIPLINE'S DRAWINGS
 - EL. 0'-0" INDICATES T.O. SLAB DATUM ELEVATION. T.O. SLAB = 995.00', REF CIVIL
 - INDICATES 8" CMU WALL WITH #5 BAR AT 16" O.C. VERTICAL IN FULLY GROUTED CELL AND 9 GAUGE WIRE LADDER AT 16" O.C. HORIZONTAL
 - D-1 INDICATES SPAN DIRECTION OF 1 1/2" FRP DECKING
 - D-2 INDICATES SPAN DIRECTION OF 2 1/2" FRP DECKING

8/23/2018 12:06:02 PM BIM 360://200-09308-18001 C:\P\09308-01-05-HYPO-S-2017.rvt

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San Antonio, TX 78205
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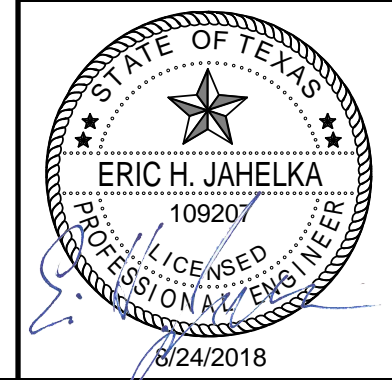
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STRUCTURAL ENGINEERING
ASSOCIATES INC.
TYPE FIRM REG. NO. F-199
755-6202 WWW.SERTX.COM
(210) 755-6202

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	8/24/18	PER APPENDIX #3

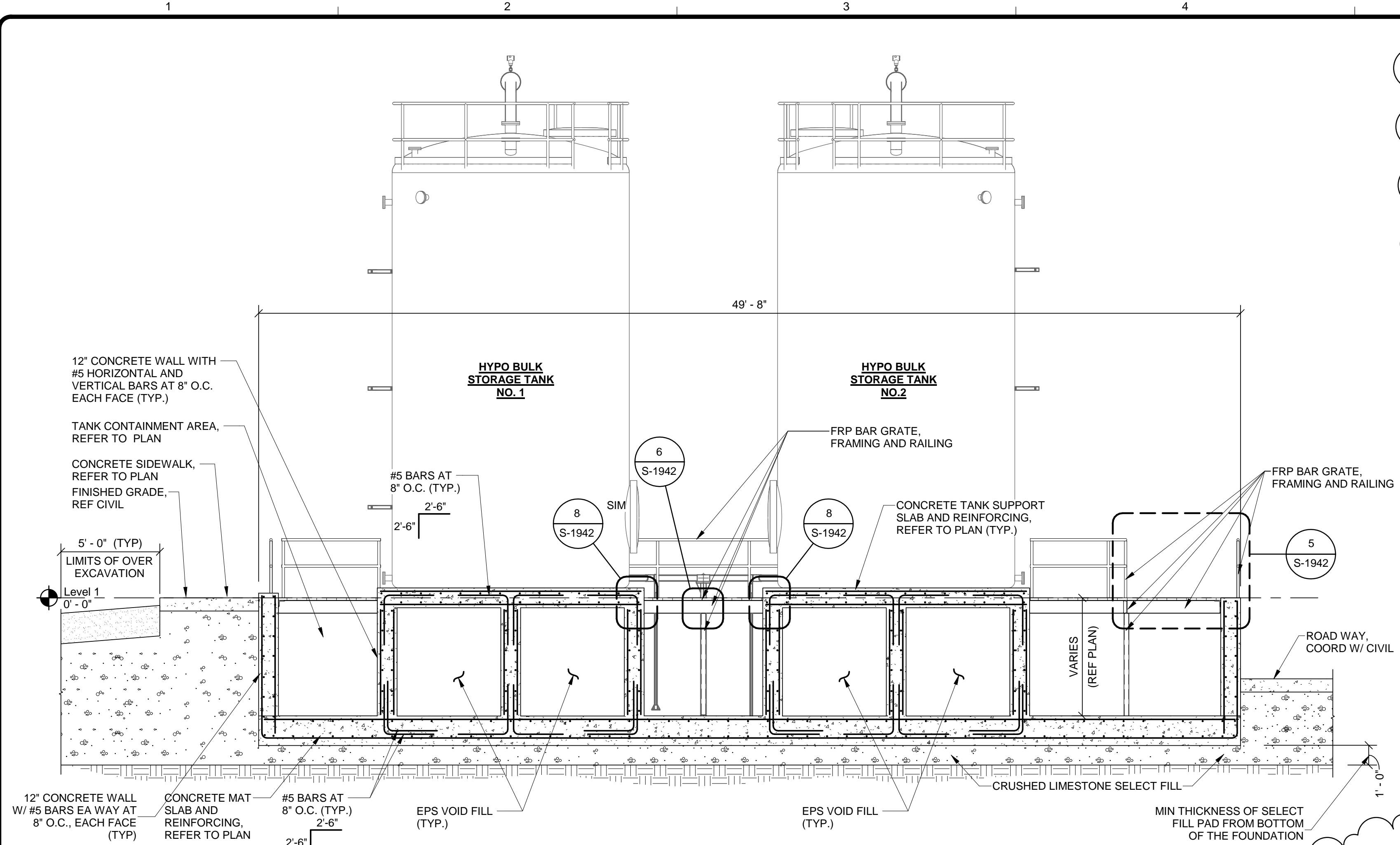
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
OSG FACILITY SLAB PLAN



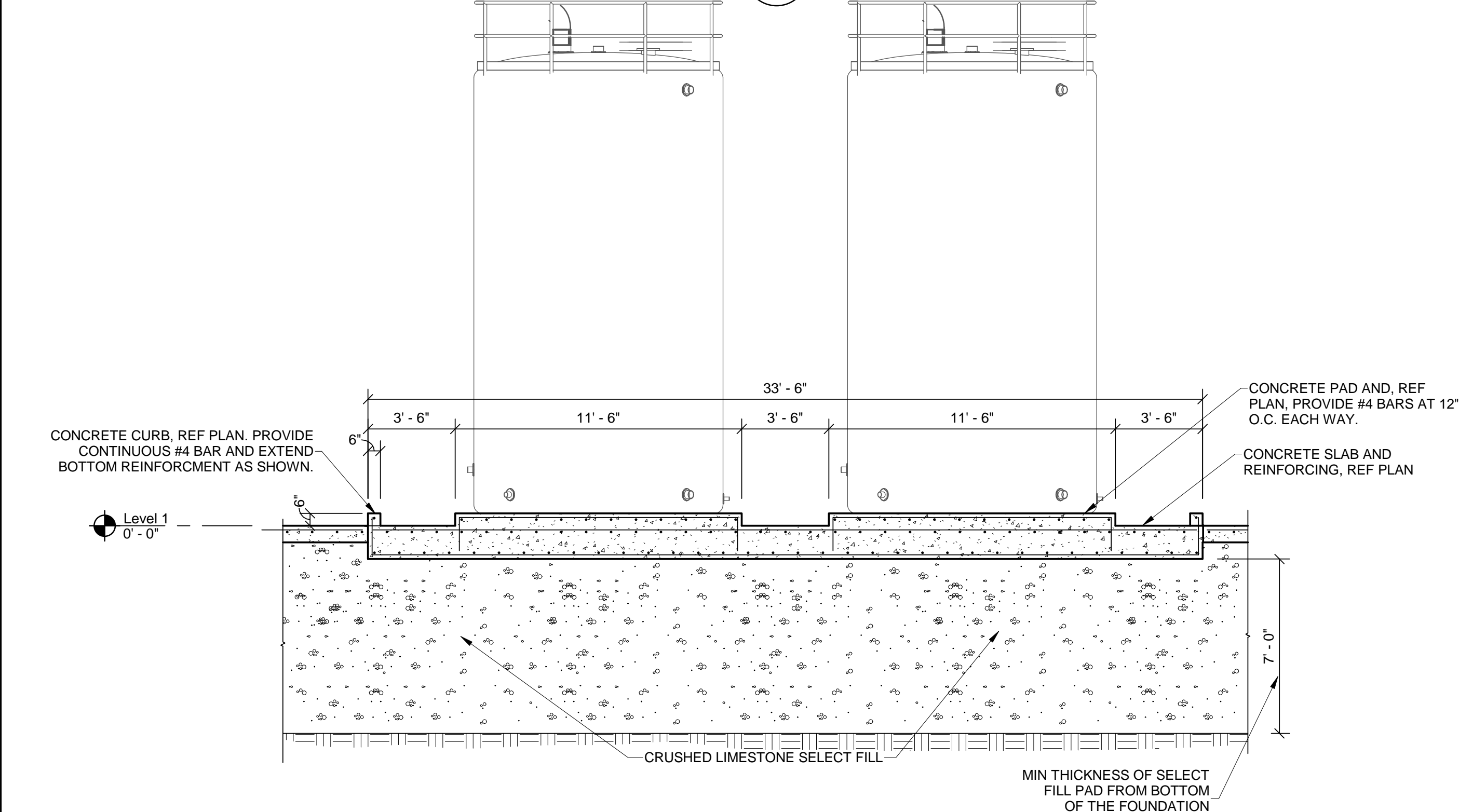
PROJ:	200-09308-18001
DESN:	EHJ
DRWN:	AGS
CHKD:	JO

S-1502

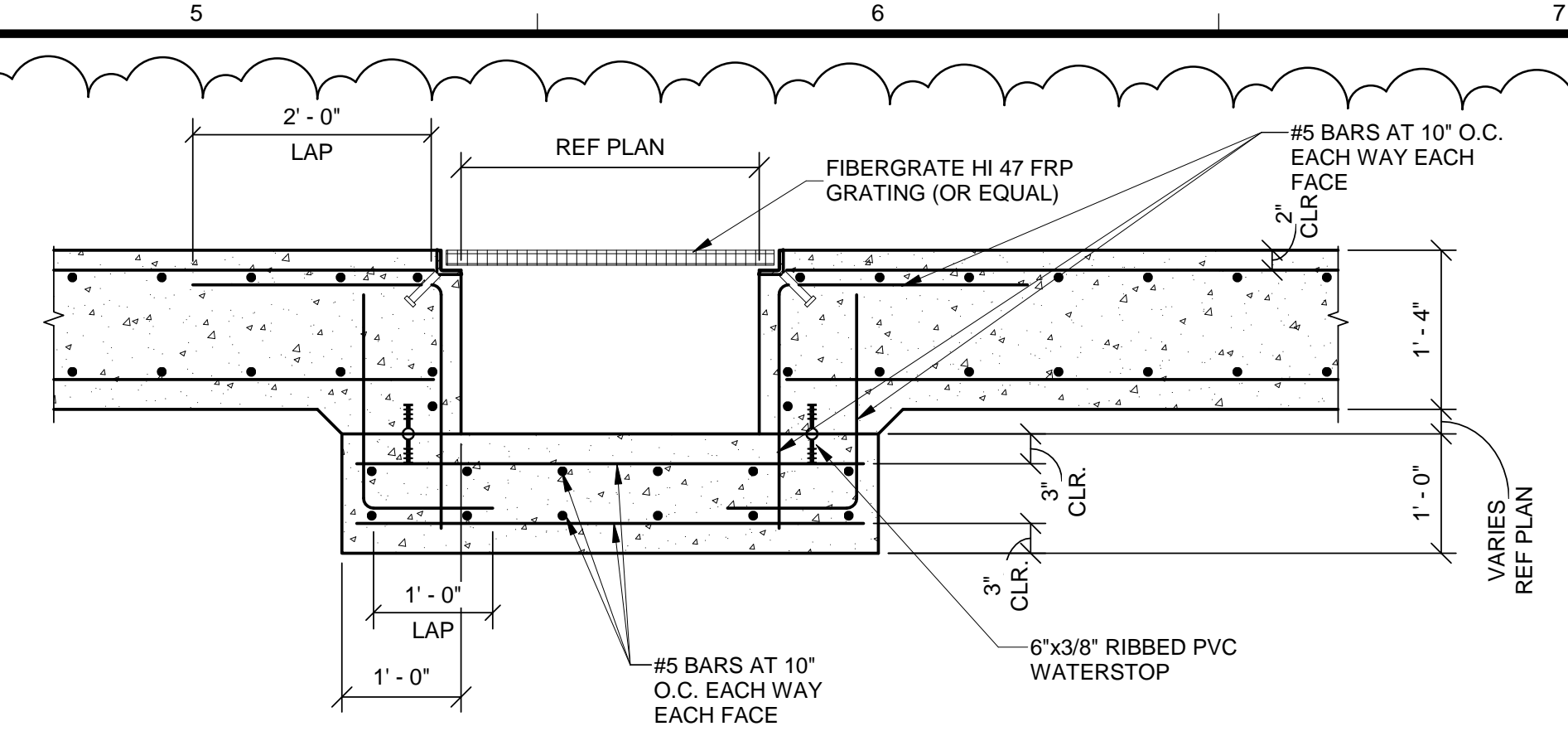
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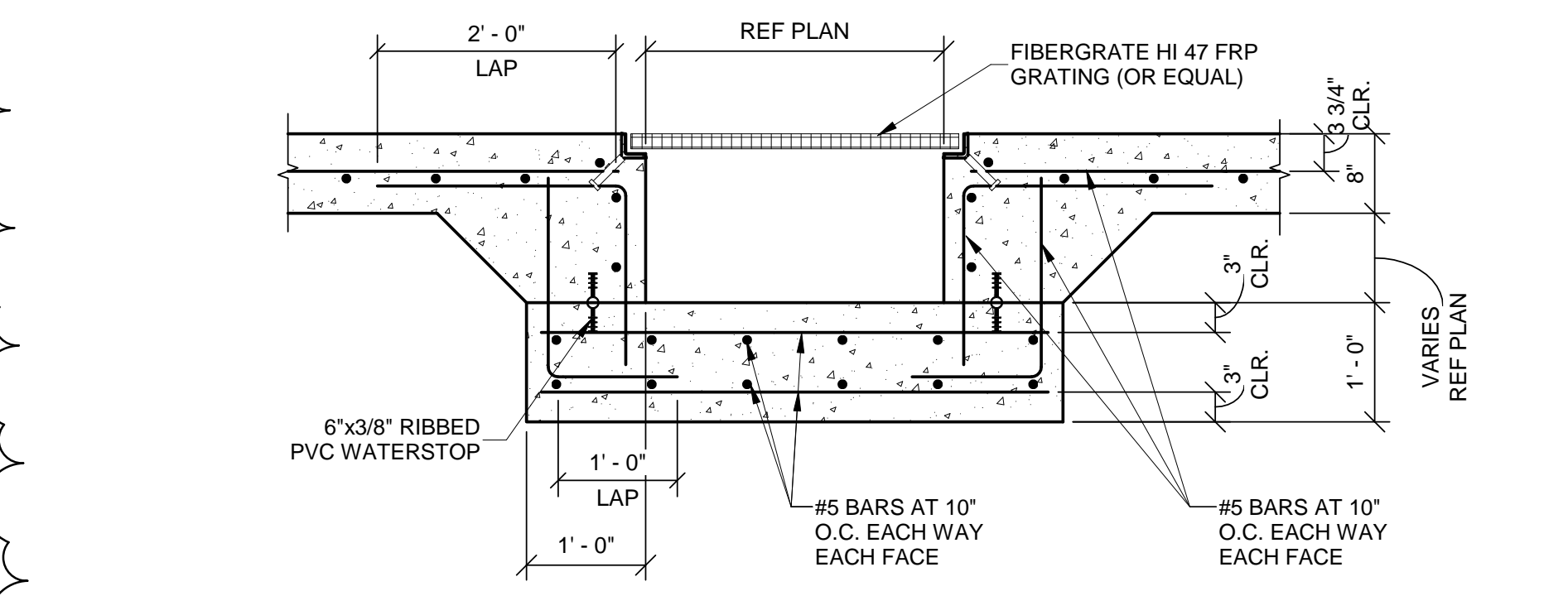
A SECTION
S-1501 SCALE: 1/4" = 1'-0"



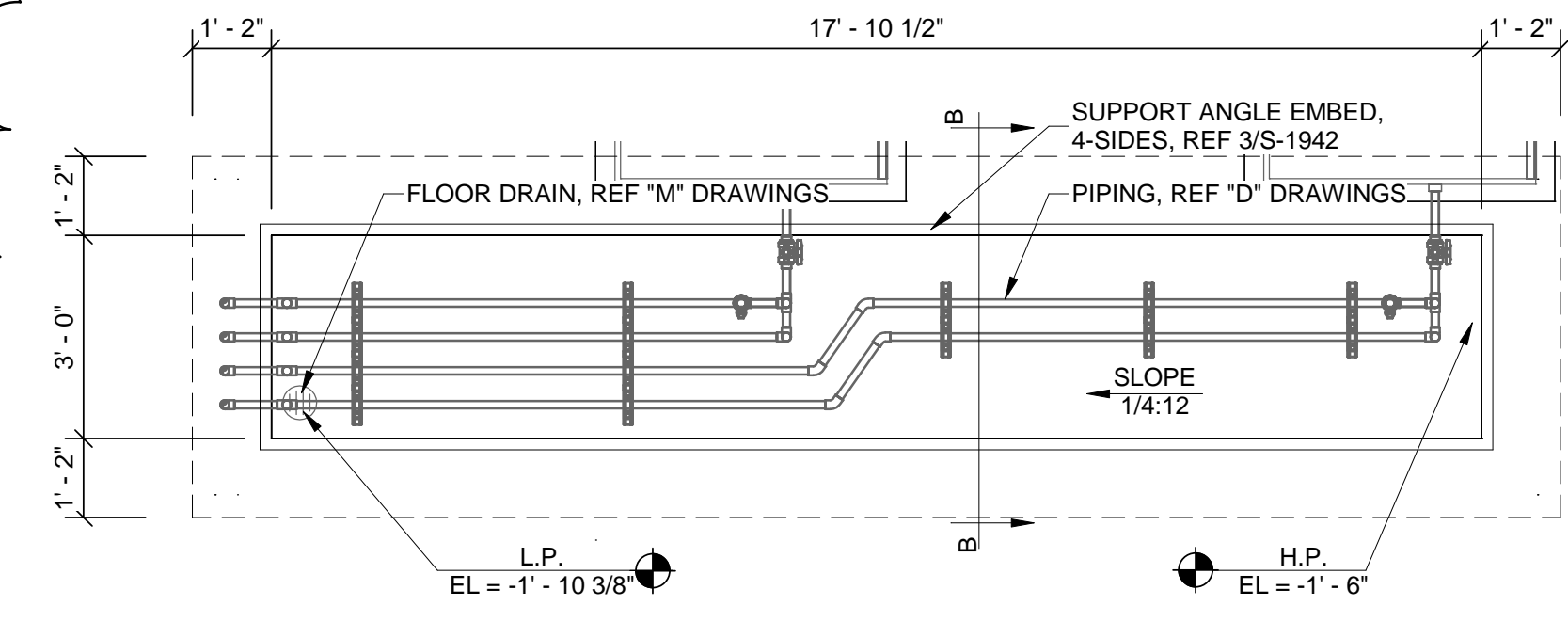
B SECTION
S-1502 SCALE: 1/4" = 1'-0"



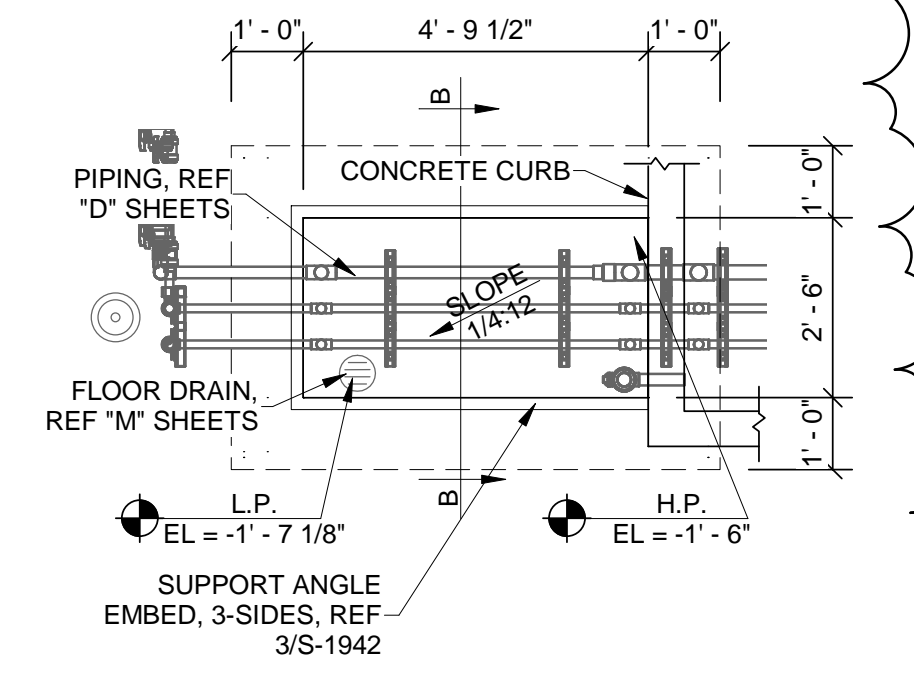
SECTION A-A
SCALE: 3/4" = 1'-0"



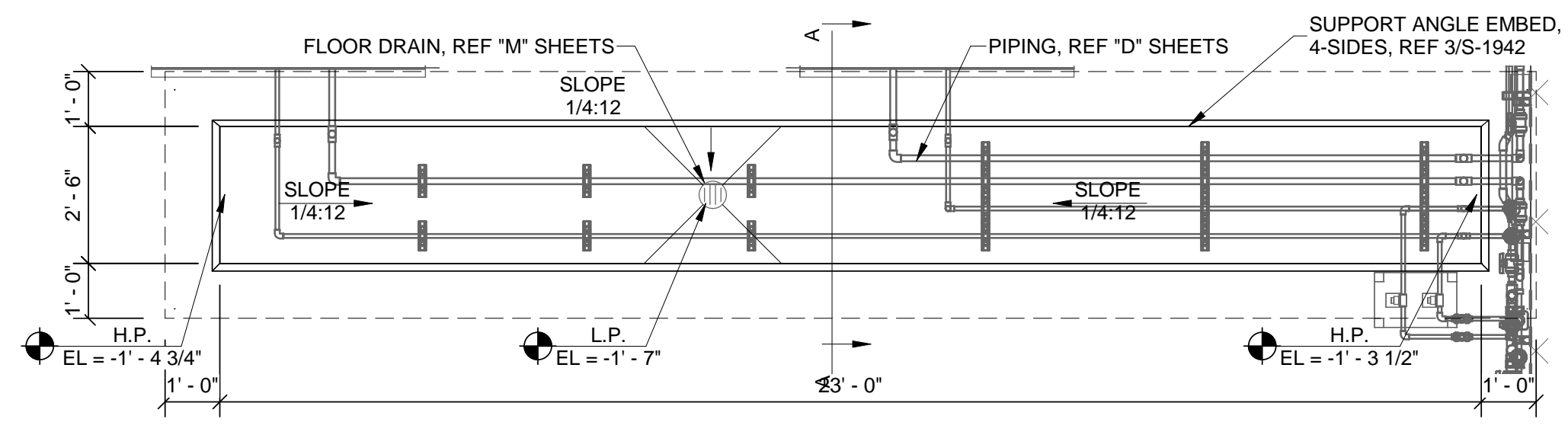
SECTION B-B
SCALE: 3/4" = 1'-0"



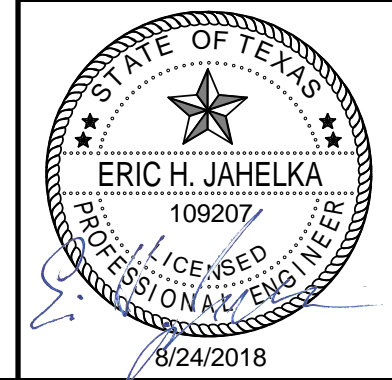
2 PARTIAL PLAN - PIPE TRENCH
S-1502 SCALE: 3/8" = 1'-0"



1 PARTIAL PLAN - PIPE TRENCH
S-1502 SCALE: 3/8" = 1'-0"



3 PARTIAL PLAN - PIPE TRENCH
S-1502 SCALE: 3/8" = 1'-0"



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755-6202 WWW.SERTAX.COM
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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	8/24/18	PER APPENDIX #3

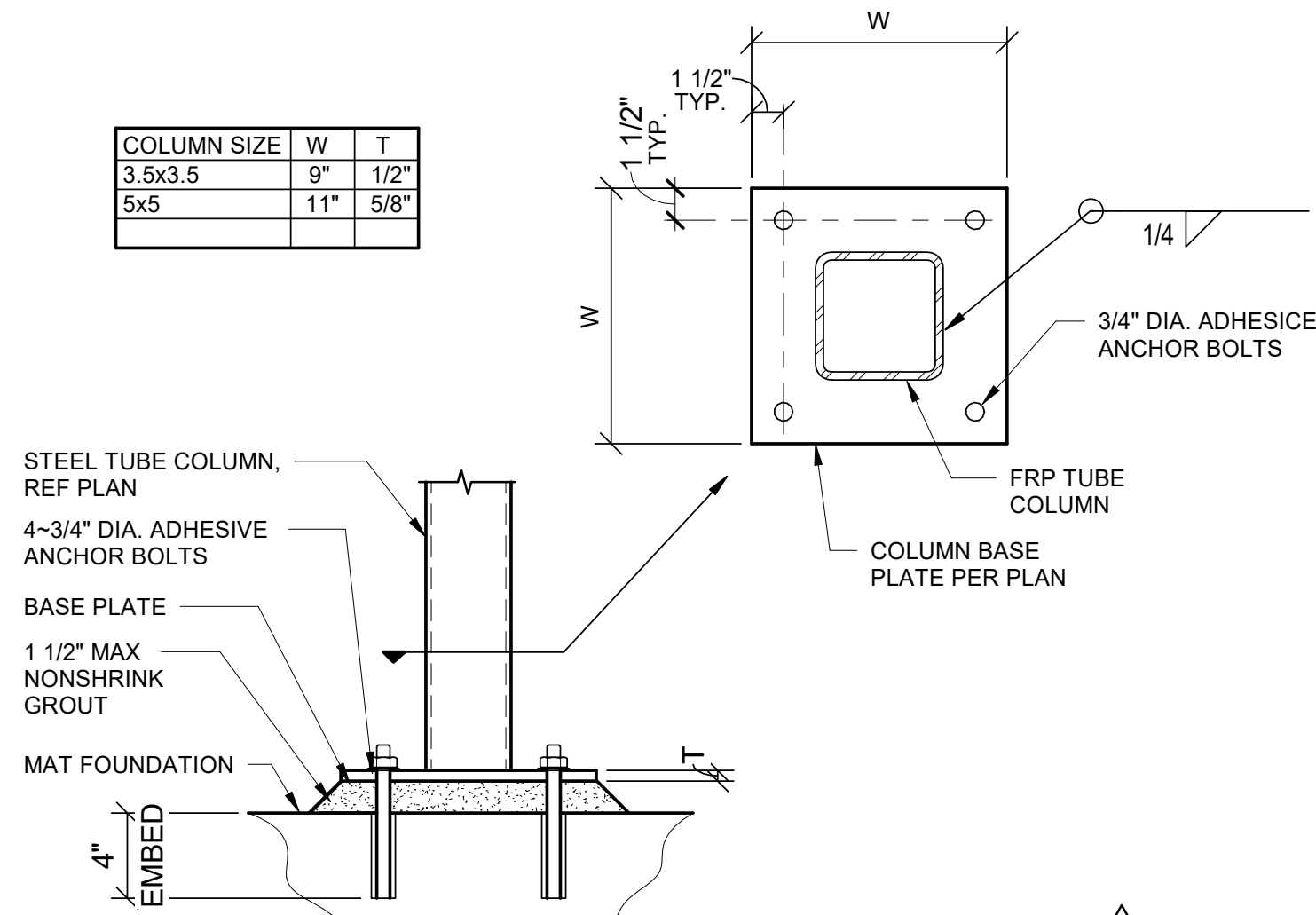
SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
OSG FACILITY SECTIONS

PROJ:	200-09308-18001
DESN:	SD
DRWN:	AGS
CHKD:	EHJ

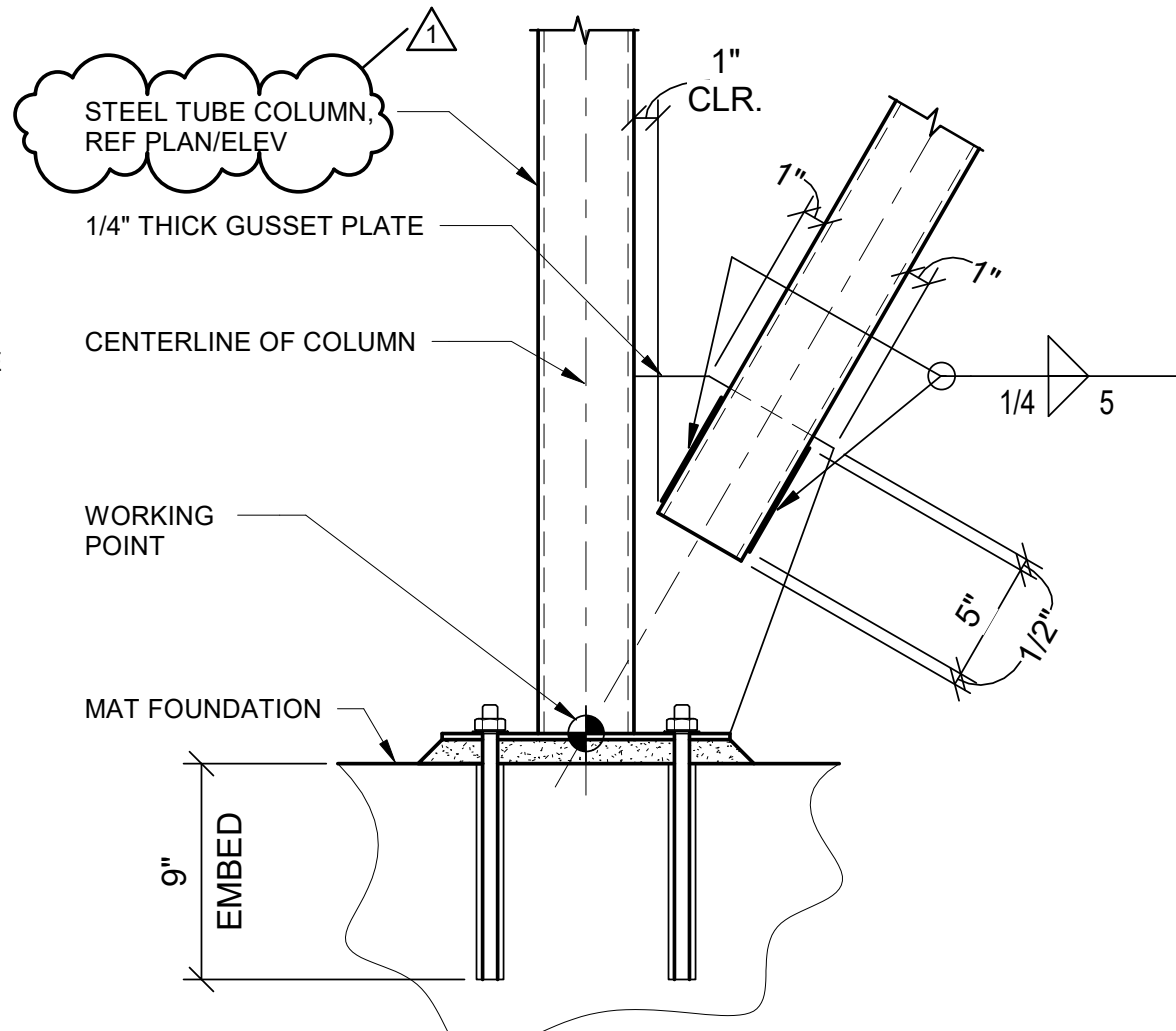
S-1504

Bar measures 1 inch, otherwise drawing is not to scale

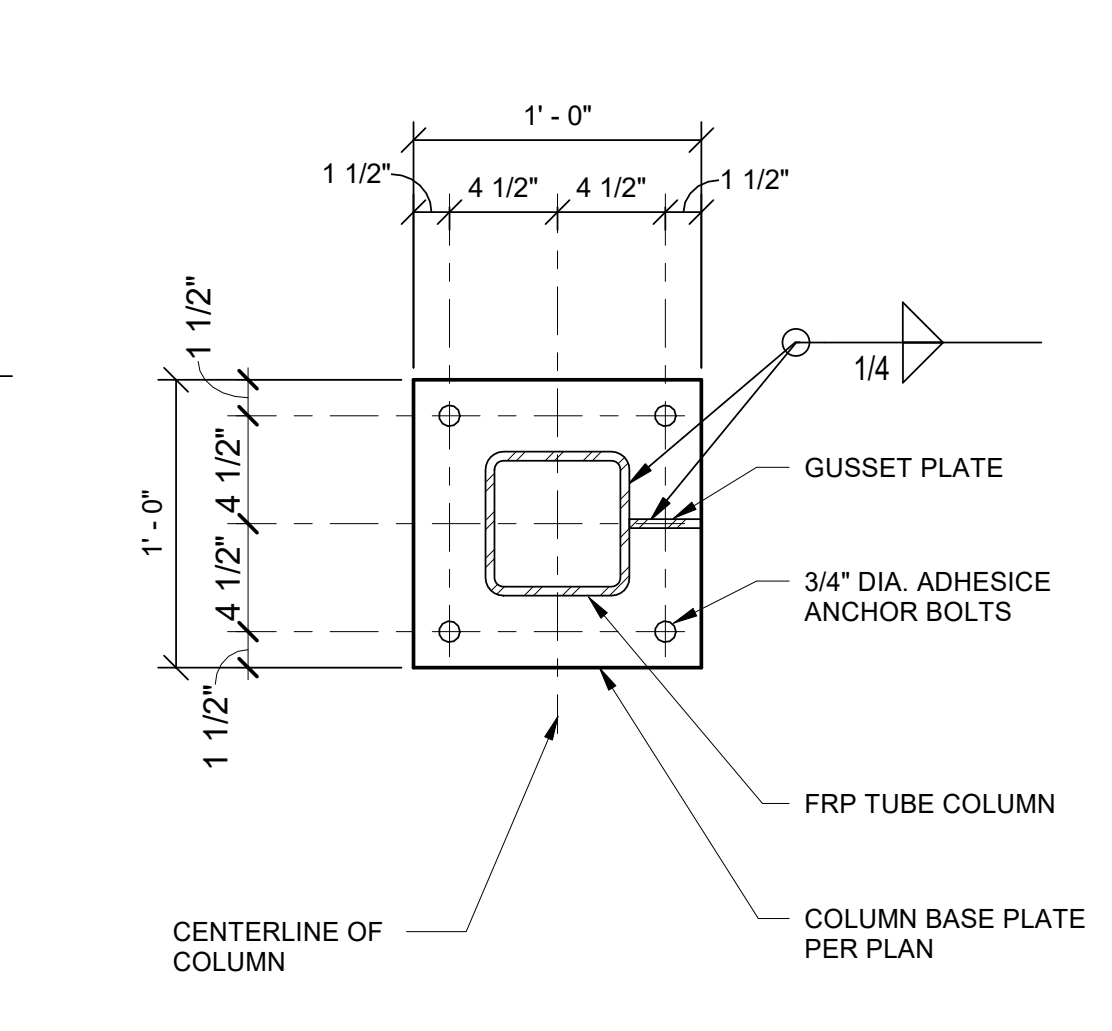
COLUMN SIZE	W	T
3.5x3.5	9"	1 1/2"
5x5	11"	5/8"



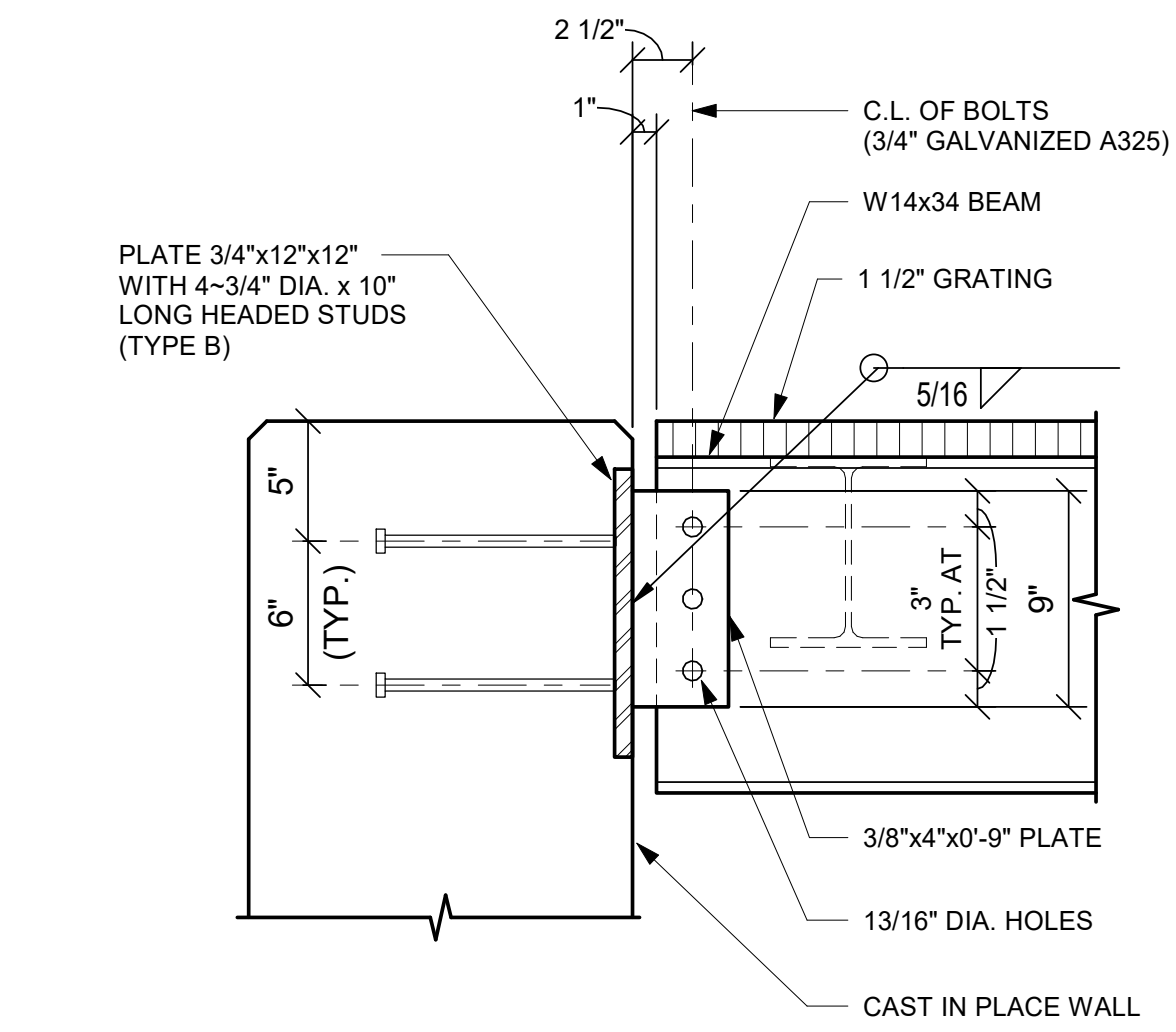
1 TYPICAL NON-BRACE FRAME COLUMN BASE CONNECTION
SCALE: 1 1/2" = 1'-0"



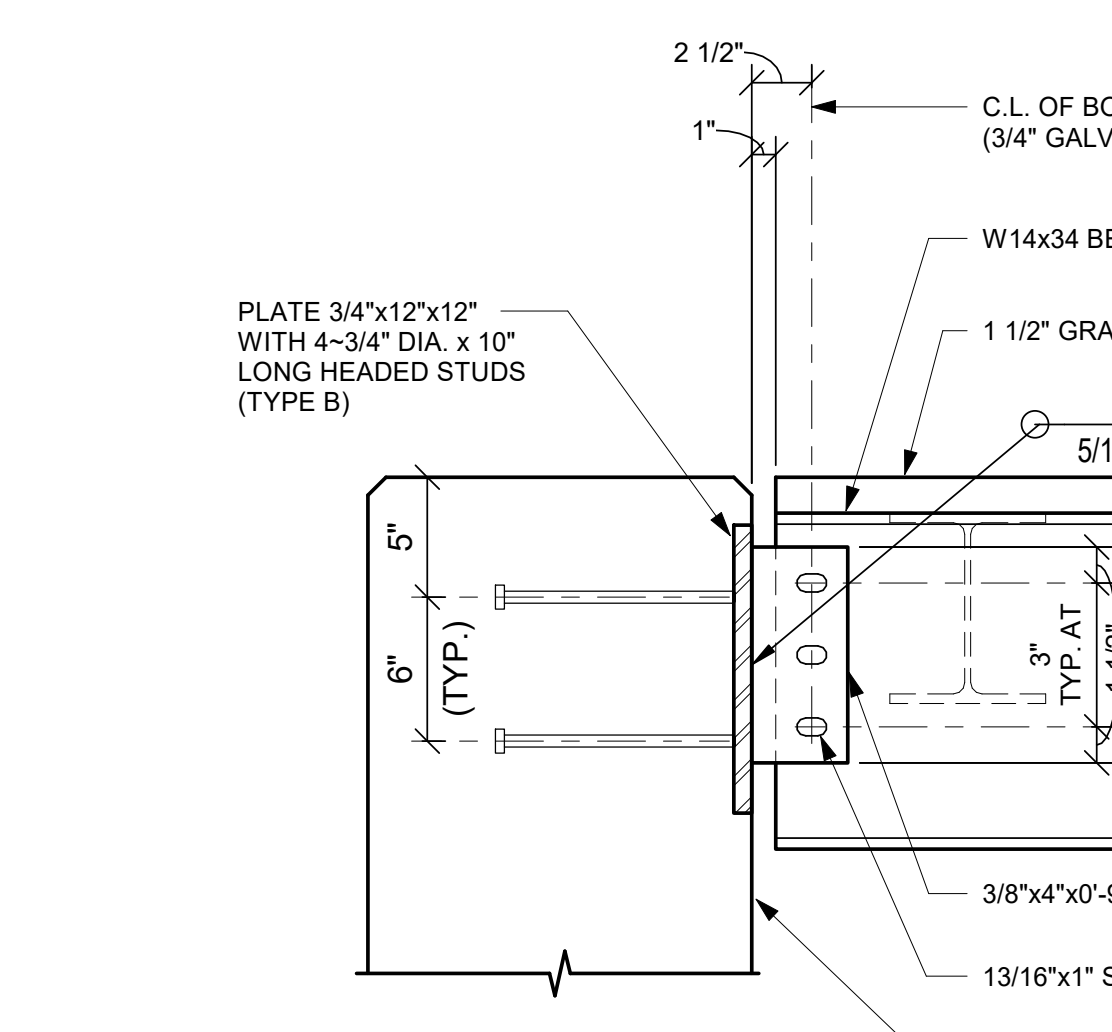
2 BASE CONNECTION TO BASEPLATE AT STAIRS
SCALE: 1 1/2" = 1'-0"



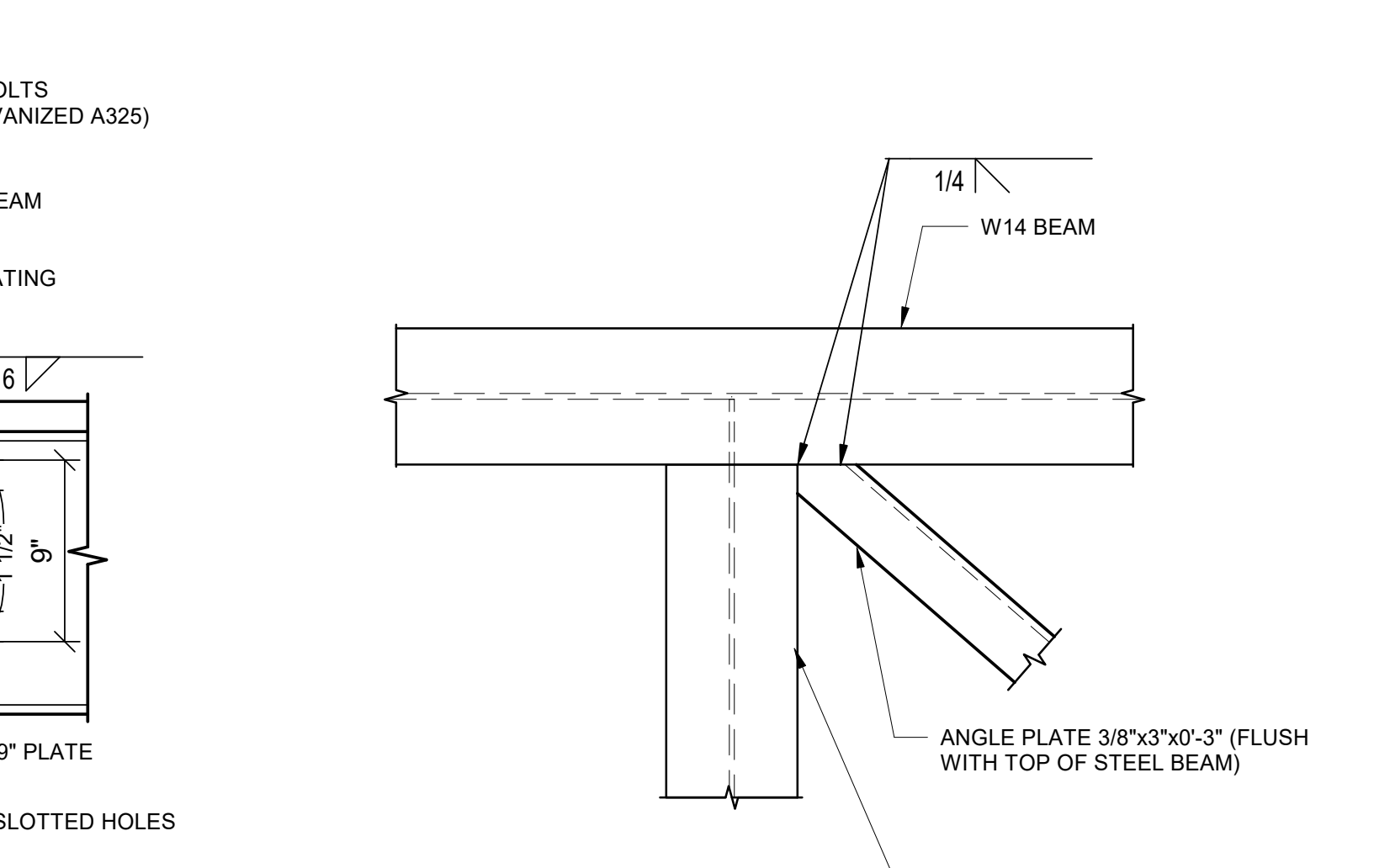
3 BRACE FRAME BASEPLATE AT STAIR PLATFORM
SCALE: 1 1/2" = 1'-0"



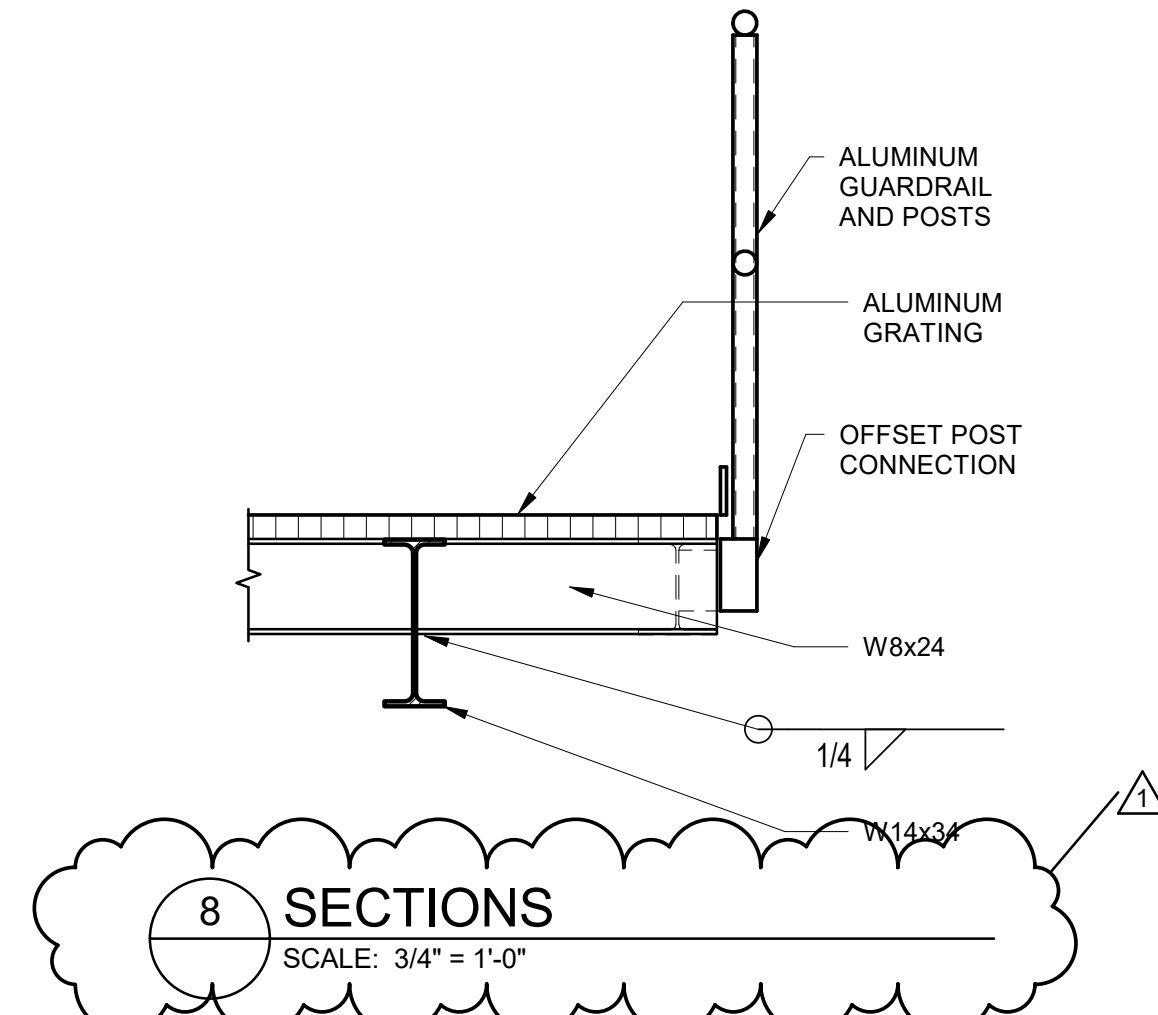
6 SECTIONS
SCALE: 1 1/2" = 1'-0"



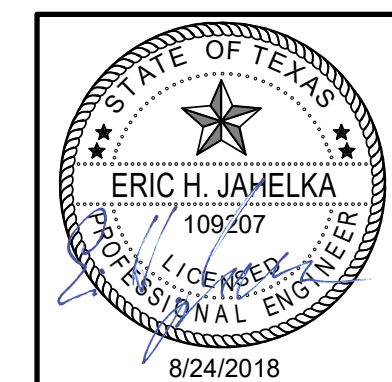
7 SECTIONS
SCALE: 1 1/2" = 1'-0"



9 SECTIONS
SCALE: 1 1/2" = 1'-0"



8 SECTIONS
SCALE: 3/4" = 1'-0"



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S&A STRUCTURAL ENGINEERING ASSOCIATES INC.
CONSULTING ENGINEERS
TYPE FIRM REG. NO. F-199
4100 N. LOOP W. SUITE 1200
DALLAS, TEXAS 75242
(210) 755-6202 WWW.S&A.COM

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	8/24/18	PER ADDENDUM #3

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
STANDARD STEEL DETAILS

PROJ:	200-09308-18001
DESN:	EHJ
DRWN:	AGS
CHKD:	EHJ

S-1932

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Bar measures 1 inch, otherwise drawing is not to scale