



ADDENDUM NO. 01

To: Prospective Bidders & Plan Holders

From: Craig A. Johnson, P.E.
Crist Engineers, Inc.

Date: February 13, 2025

Project: Owner Provided Grit Equipment Installation
City of Sherwood
Sherwood, Arkansas

Bid Date: February 20, 2025

Bid Time: 2:00 PM

Location: Bill Harmon Recreation Center
51 Shelby Road
Sherwood, AR 72120

The BIDDER shall properly acknowledge Addendum No. 01 as required in Article 5 of Document 004100 on the Bid Form as confirmation that the BIDDER has examined the following Addenda and the related changes to the Contract Documents. Lack of proper acknowledgement on the Bid Form may deem a bid non-responsive.

The Contract Documents dated January 8, 2025 are hereby amended as follows:





Prospective Bidders & Plan Holders

Addendum No. 01

Owner Provided Grit Equipment Installation

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IMPORTANT REMINDERS:

The bid opening for this project is 2:00 PM on February 20, 2025.

Please reference Section 002113 - Instructions to Bidders, provided in the contract documents for information required for the bid submission.

SPECIFICATIONS:

1. Specification 400520: Process Pipe and Fittings:
 - a. Add Note 2.2.B
B. "For all abrasive material conveyance, such as grit piping from a grit pump to a grit concentrator, washer, et al. shall be Stainless Steel."
 - b. Delete Note 2.3.I.1

DRAWINGS:

1. Drawings C-04
 - A. Delete ~~D.I.P. Glass Lined~~ and replace with S.S. Sch 40.
 - B. Delete Item 50 ~~Influent Sanitary Sewer~~ and Replace with **8" Grit Screw Classifier – Stainless Steel (460/3/60).**
2. Drawing C-05
 - A. Delete ~~D.I.P. Glass Lined~~ and replace with S.S. Sch 40.
 - B. Delete Item 50 ~~Influent Sanitary Sewer~~ and Replace with **8" Grit Screw Classifier – Stainless Steel (460/3/60).**
3. Drawing C-06
 - A. Delete Item 50 ~~Influent Sanitary Sewer~~ and Replace with **8" Grit Screw Classifier – Stainless Steel (460/3/60).**

END ADDENDUM NO. 01

SECTION 400520

PROCESS PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: The Contractor shall furnish and install all Steel Pipe, Ductile Iron Pipe (DIP), and all appurtenances, complete in place, all in accordance with the requirements of the Contract Documents. Where standards, specifications or methods are cited without dates, the reference shall be construed to apply to the latest revision in effect at the time of contract.

1.2 RELATED SECTIONS

- A. Section 090000 - Painting.
- B. Section 400000 – Basic Materials and Methods.
- C. Section 400404 - Hydrostatic Testing of Process Piping.
- D. Section 400406 – Low-Pressure Air or Vacuum Testing of Process Piping.

1.3 REFERENCES

- A. Ductile Iron Pipe Research Association ,245 Riverchase Parkway, Birmingham, AL.
 - 1. Handbook of Ductile Iron Pipe, latest edition
- B. Uni-Bell PVC Pipe Association, 2655 Villa Creek Drive, Suite 155, Dallas, TX.
 - 1. Handbook of PVC Pipe, latest edition
- C. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
 - 1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM B61 - Specification for Steam of Valve Bronze Castings.
 - 3. ASTM B1000 – Standard Practices for Casting Preparation and Test Procedure of Porcelain Enamel-Lined Pipe, Fittings and Valves for Use in the Municipal Wastewater, Sewage and Water Treatment Industry
 - 4. ASTM D1598 - Specification for Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
 - 5. ASTM D1599 - Specification for Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.
 - 6. ASTM D1784 - Specification for Rigid Poly(Vinyl Chloride)(PVC) Compounds and Chlorinated Poly(Vinyl Chloride)(CPVC) Compounds.
 - 7. ASTM D2152 - Specification for Standard Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion.
 - 8. ASTM D2241 - Specification for Rigid Poly(Vinyl Chloride)(PVC) Pressure Rated Pipe (SDR-Series).
 - 9. ASTM D2412 - Specification for Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
 - 10. ASTM D2487 - Specification for Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

11. ASTM D2488 - Specification for Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).
12. ASTM D3139 - Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
13. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
14. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
15. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
16. ASTM F714 - Specification for Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
17. ASTM F905 Standard Practice for Qualification of Polyethylene Saddle-Fused Joints.
18. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
19. ASTM F1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.
20. ASTM F2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
21. ASTM F1412 Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.
22. ASTM F2206 Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock.
23. ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

D. American Water Works Association

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids.
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds.
8. AWWA C200 - Steel Water Pipe
9. AWWA C222 - Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
10. AWWA C500 - Gate Valves for Water and Sewerage Systems.
11. AWWA C502 - Dry Barrel Fire Hydrants.
12. AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems.
13. AWWA C510 - Standard for Double Check Valve Backflow-Prevention Assembly.
14. AWWA C511 - Standard for Pressure-Reducing Principle Backflow-Prevention Assembly.
15. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
16. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
17. AWWA C651 - Standard for Disinfecting Water Mains.
18. AWWA C900 - Standard for Poly(Vinyl Chloride)(PVC) Pressure Pipe, 4 Inch through 30 Inch, for Water Distribution.

19. AWWA C906 - Standard for Polyethylene (Pe) Pressure Pipe and Fittings, 4 In. Through 65 In, for .
 - E. Plastic Pipe Institute
 1. PPI (TR-4) - Plastics Pipe Institute Handbook of Polyethylene Pipe, Latest Edition.
 - F. American Welding Society
 1. AWS D11.2 Guide for Welding Iron Casting.
 - G. Manufacturers Standardization Society (MSS)
 1. MSS SP-60- Connecting Flange Joint between Tapping Sleeves and Tapping Valves.
 2. MSS SP-111- Gray Iron and Ductile Iron Tapping Sleeves.
- 1.4 SUBMITTALS
- A. Submit under provisions of Section 013300.
 - B. Certificate of Compliance: Submit Certificates of Compliance attesting that materials provided are in compliance with referenced standards.
- 1.5 QUALITY ASSURANCE
- A. Inspection: All pipe shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.
 - B. Plant Access: During the manufacture of the pipe, the Engineer shall be given access to all areas where manufacturing and testing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.
 - C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with requirements as applicable.
 - D. Test Costs: The Manufacturer shall perform said material tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Manufacturer, provided that the Manufacturer's and Contractor's schedule is not delayed for the convenience of the Engineer.
 - E. Third Party Inspection: All pipe material suppliers shall be ISO 9001 or 9002 registered or provide the services of an independent inspection agency. Prior to the start of manufacturing, any manufacturer not meeting the ISO registration requirements shall submit to the Engineer the name of an independent inspection agency for approval. The independent inspection agency shall be responsible for sample monitoring of chemical and mechanical test, sample visual inspection of quality assurance tests performed on in-process pipe and fittings, and a sample visual and dimensional inspection on finished product for this project. A certified inspection report from the independent inspection agency of all witnessed tests shall be supplied to the Engineer within ten (10) days of completion of pipe manufacturing. Chemical samples shall be taken from each ladle of iron and the Manufacturers' chemical control limits shall be maintained for at least the following elements: carbon, sulfur, phosphorus, silicon, magnesium, chromium, manganese, tin, aluminum, cerium, copper, and lead. When chemical values fall outside the Manufacturers' control limits, additional mechanical property test shall be performed to assure minimum mechanical properties are met. All this shall be done at the Owner's discretion.

- F. Field Quality Assurance: Every effort shall be taken to assure the pipe is undamaged before installation. The contractor shall carefully unload pipe from the trucks when stringing alongside the trench. Use only slings or harness made of webbing or other material which will not damage the outside or the inside of the pipe. Do not use fork lifts that may damage the lining of the pipe or fittings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Written pre-approval from the engineer is required for all use of proprietary restrained joint (PRJ) pipe. Pre-approval must be obtained at least 15 days prior to the open of the bid.
- B. All miscellaneous bolts, nuts and washers shall be high strength low alloy steel that meets the requirements of AWWA C111 (including certificate of compliance). All miscellaneous hardware shall be coated with a two (2) coat fluoropolymer coating to no less than 0.7 mils in thickness unless otherwise indicated. Prior to installation, field holiday testing report(s) (in accordance with the latest version of ASTM D5162) may requested to be completed and submitted to the engineer for approval. Where appropriate, stainless-steel bolts and rods may be allowed in lieu of fluoropolymer coating.

2.2 STAINLESS STEEL (SS) PIPE

- A. Piping shall be ASTM A-269 or A-270, 3161 grade stainless steel, interior mill. The piping shall have a sulfur content of .005 to .017%.
1. All stainless-steel steel pipe shall be as indicated on the plans either 304L or 316L where appropriate, dimensionally and wall thickness shall be in accordance with:

Nominal Pipe Size (inches)	Schedule (minimum)
1/2, 3/4	80S
1 through 4	40S
5 through 8	10S
10 through 30	5S
32 through 36	10S
42, 48	30S

- B. For all abrasive material conveyance, such as grit piping from a grit pump to a grit concentrator, washer, et al. shall be Stainless Steel.
- C. Piping shall have no pits, tears, scratches, tool marks, inclusions or other anomalies visible to the naked eye.
- D. All piping and fittings to be welded shall be suitable for automatic TIG welding. All piping shall be matched for proper wall thickness variance such that proper automatic TIG welds result (+/- 10% wall).

- E. Pipe and fittings to be connected by means other than TIG welding shall be provided with either angle type face rings for use with backup flanges or roll grooved ends for use with Victaulic type couplings. The locations of all connection points proposed to be of a method other than TIG welding shall be submitted to and approved by the Engineer.
- F. All piping shall be properly labeled and identified as to ASTM specification, grade, and heat range numbers. Piping not properly identified shall not be used.
- G. Flanges
 - 1. All flanges shall meet the same parameters as the piping (alloy grade, grit finish, sulfur content, etc.).
 - 2. Flange OD and drilling shall be 150# Class.
 - 3. All flange gaskets shall be full-face 1/8-inch thick EPDM unless otherwise indicated.
 - 4. Where connecting stainless steel flanges to stainless steel flanges, use equivalent grade alloy bolt, nuts or other hardware.
 - 5. When connecting stainless steel flanges to ductile iron or carbon steel or other dissimilar metals, all flange bolts, nuts or other hardware shall be coated in fluoropolymer coating to no less than 0.7 mils in thickness unless otherwise approved by the Engineer.
 - 6. When connecting to PVC flanges, use stainless steel hardware approved for use on PVC unless otherwise approved by the Engineer.
- H. Grooved End Couplings
 - 1. Couplings shall be Victaulic or approved equal.
 - 2. Coupling housing shall be cast steel Type 304 stainless steel, flexible type, conforming to ASTM A-296 with appropriate sealing gaskets suitable for used up to 350 degrees F.
 - 3. Coupling shall be supplied with Type 304 stainless steel, hex-head machine bolts and nuts.
- I. Fittings
 - 1. All fittings shall meet the same parameters as the piping (alloy grade, grit finish, sulfur content, etc.).
 - 2. Fittings shall have butt weld connection.
 - 3. Fittings shall dimensionally correspond to the proper wall thickness of piping.
 - 4. Fittings shall conform to the same ASTM Specification, type, and heat range as piping so that they are compatible for automatic TIG welding.
 - 5. Fittings shall have an ovality tolerance such that when matched to piping, dimension difference is not more than 5% of wall.
 - 6. Threaded fittings shall not be allowed.
 - 7. Reducing fittings such as tees or reducing couplings shall have the appropriate wall thickness for each od size.
- J. Expansion Joints for Non-Liquid Conveyance
 - 1. Expansion joints shall be EPDM rubber spool type of a single, open wide arch design.
 - 2. Joint construction shall consist of an elastomer tube and cover, reinforced with a suitable woven fabric and 304 stainless steel rings support.
 - 3. Expansion joints ends shall be flanges drilled to 150# class standards, and be full rubber faced and integral to the body.
 - 4. Split flange backing rings of 304 stainless steel shall be provided.
 - 5. Expansion joints shall be Flexicraft Industries, Ultraspool Model or approved equal.

2.3 DUCTILE IRON PIPE (DIP)

A. Manufacturers:

1. American Cast Iron Pipe Company
2. U.S. Pipe
3. McWane

B. Ductile iron pipe (DIP) shall conform to AWWA C151, subject to the following supplemental requirements. Unless otherwise stated elsewhere, or on the drawings, all buried DIP shall be pressure class 350 4 through 12 inch, pressure class 250 14 through 20 inch, pressure class 200 24 inch and pressure class 150 30 inch or larger unless otherwise indicated on the plans or in the contract documents. Piping used for abrasive materials such as grit or otherwise noted shall be Class 53.

C. Buried DIP, not used for air service, shall be furnished complete with EPDM rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents. Where buried DIP is used for air service, use EPDM gaskets.

1. Where piping is partially exposed or full exposed flanged end connections are necessary, pressure class 250 (min) is required for DIP with ANSI bolt hole patterns.
2. All flanged connections shall be in accordance with AWWA C110 or 153 with bolt hole patterns ANSI A21.10. All flange gaskets shall be full faced with a minimum 1/8" (inch) or 0.125" in thickness and approved EPDM rubber unless otherwise indicated.
 - a. Where DIP is used for air service, use EPDM gaskets, unless otherwise indicated.
3. All bolts shall be in accordance with ANSI B18.2.1 and nuts are specified in ANSI B18.2.2. Bolts and nuts are to be zinc plated finished and consist of low-carbon steel conforming to ASTM A307 with a minimum yield strength of 60,000 psi. High-strength bolts shall not be used when a gray iron flange. All flange bolts shall be coated in fluoropolymer coating to no less than 0.7 mils in thickness unless otherwise approved by the Engineer.
4. Where piping is partially exposed or full exposed pipe is to be used for grooved and shouldered connections, the pipe shall be plain end by plain end to be mechanically restrained or in preparation of grooved and shouldered joints in accordance with AWWA C606.
5. ANSI bolt hole pattern adaptors may be required where connections occur to equipment, special fittings, or other apparatuses. The Contractor shall provide all bolt hole pattern adaptors at no additional cost to the Owner. Where required, all adaptors shall be provided with a full faced gasket with a minimum 0.125" in thickness and made of approved EPDM rubber.
6. Use Tyler Union AWWA C110 or C153, AWWA C104, P401 interior coated, asphaltic exterior coated, PC 350 or equivalent for all special MRJ reducer bends, reducer tees, plugs or for all 2" and 3" diameter fittings or reducers unless otherwise approved by the Engineer. For use in air service, all interior shall be uncoated.

- D. Minimum Pipe Class: Ductile iron pipe shall conform to AWWA C151/A21.51. All pipe shall have a minimum pressure rating as indicated herein or as indicated on the drawings with a 100 psig surge allowance, with a safety factor of 2. No reduction of safety factor for transient pressures shall be allowed. The external loads design criteria shall be a minimum of 3-foot depth of cover at 120 pounds per cubic feet soil weight and live load based on one AASHTO H 20 truck load. The thickness design of ductile iron pipe shall be in accordance with AWWA C150.
- E. The horizontal deflection of ductile iron pipe resulting from external load conditions shall not exceed 3 percent of the pipe diameter.
- F. Unless otherwise indicated on the drawings, the pipe trench shall be:
1. Type 2 laying conditions shall not be allowed.
 2. For Type 5 laying conditions, the Contractor shall gently and in a uniform manner place the pipe in 6" (inches) of angular, interlocking, screened coarse aggregate or locally sourced GP, GM, SW or SP containing no more than 12% fines in accordance with ASTM D2487 and ASTM D2488 that conforms to AASHTO No. 57, 6, 67, 68, 7 or pre-approved equivalent gradation type bedding consolidated to a minimum of 90% standard proctor density to the top of the pipe. Compacted native backfill shall be compacted to 90% of max density standard proctor. When placed under foundations, bedding and backfilling shall be consolidated to 95% of max density standard proctor. Backfilling under foundations or slabs or other areas as identified by the Engineer shall require bedding to be at least 95% max density standard proctor. Bedding and backfilling under streets, driveways, parking lots, sidewalks or other areas as identified by the Engineer shall require at least 95% max density standard proctor. Geotextile (6 oz nonwoven) may be necessary when placed in muck or other unsuitable soil or as directed by the Engineer. Backfill shall not be placed on soil that is muddy, frozen or contain frost. The trench shall be free of standing water prior to placement of bedding and/ or backfill material. All bedding material and backfill shall be within 2 % of optimal moisture. No rocks larger than 4" shall be backfilled into the trench. Unless otherwise approved, no backfilling lift shall exceed 6".
 3. Special Conditions for Type 5 laying conditions: Unless otherwise indicated, or pre-approved by the Engineer, all DIP shall meet the requirements for Type 5 laying conditions for any of the following conditions:
 - a. Pipe that is to be placed under or within 20 ft (as measured horizontally) from the face of any structural foundation or footing.
 - b. Pipe at a depth greater than 6 ft (as measured vertically from the top of the over burden soil on the top of the pipe).
 - c. All cut in pipe and sleeves in any location.
- G. Joints: Use push-on joint or propriety restrained joint and integral bell complying with AWWA C111/A21.11.
- H. Ductile Iron Pipe Coating (exterior)
1. All buried and below-floor DIP shall be furnished and installed with standard asphaltic coating one mil thick in accordance with AWWAC151, AWWA C110 and AWWA C153.
 2. Where identified, all buried exterior DIP shall include a factory applied approved fusion bonded epoxy coating with a minimum of 3 mils in thickness as provided by the DIP manufacturer or as in accordance with AWWA C116/ A21.16. If requested by the Engineer, the Contractor shall perform field holiday testing report (in accordance with the latest version of ASTM G62) prior to installation and submit the report to the Engineer prior to backfill.

3. All ductile iron pipe shall be clearly identified and marked for use with sanitary sewer, non-potable water or process water applications.

I. Ductile Iron Pipe Coating (interior)

1. For all abrasive material conveyance, such as grit piping from a grit pump to a grit concentrator, washer, et al. shall be factory applied porcelain enamel (i.e. glass) lined in accordance with ASTM B1000-15 unless otherwise noted on the plans.
 - a. The glass lining applied to pipe and fittings shall be hard, smooth, continuous vitreous material.
 - b. The glass portion of the lining, the frit(s) used in the formulation, as supplied from the manufacturer, shall have a density of 2.5 to 3.0 grams per cubic centimeter as measured by ASTM D-792.
 - c. The slip shall be applied to the freshly blasted substrate within 8 hours of blasting.
 - d. The slip shall be applied to a minimum wet film thickness (WFT) to provide the desired dry film thickness (DFT).
 - e. The lining shall be of a light, bright color to allow visual detection of defects more easily prior to electronic holiday detection testing.
 - f. Glass linings are not intended to be Holiday free, but to prevent the build-up of grease, scum, and crystalline metal salt deposits.
 - g. The entire finished coating shall be a minimum of 10 mils (0.010 inch) as tested with an acceptable Type I or Type II dry film thickness gage as described in ASTM D7091.
 - h. The finished lining shall be able to withstand a strain of 0.001 inch/inch of the base metal without visible damage to the glass.
 - i. The glass lining shall have a minimum hardness of 5 on the Moh's hardness scale.
 - j. The lining shall be capable of withstanding an instantaneous thermal shock from ambient +350o F to ambient without visible crazing, blistering or spalling.
 - k. The lining shall be resistant to corrosion by an HCl solution adjusted to a PH of 3 at 125 degrees F and a NaOH solution adjusted to a PH of 10 at 125 degrees F.
 - l. Demonstration of this shall be by a weight loss of not more than 3 milligrams per square inch when exposed for 30 minutes.
 - m. There shall be negligible visible loss of surface gloss to the lining after immersing a cut production sample in an 8% by weight sulfuric acid solution at 148 degrees F for a period of 10 minutes.
 - n. Holiday testing shall be performed to a documented procedure. It shall use the low voltage wet sponge testing apparatus as described in ASTM D5162, Test Method A.
 - 1) The testing should insure that for long pipe, testing is performed from both ends of the pipe with the diameter of the dampened sponge exceeding the diameter of the pipe so that the sponge is in full circumferential contact with the lining. Wetting agents should not be used.
 - 2) The sponge should be moved over the surface at a moderate rate approximately 0.3 m/s (1 ft/s) using a two pass (in and out) motion over each area.
 - 3) Care should be exercised near the exposed pipe ends to prevent excess water from tracking and giving a false indication.
 - 4) Limits for holidays (maximum number) are for the following nominal diameters:

- a) 4" through 8": 5 for fittings; 12 for pipe
 - b) 10" through 18": 8 for fittings; 20 for pipe
 - c) 20" or larger: 10 for fittings; 28 for pipe
 - d) Copies of the test results from the Routine Quality Testing shall be available for review.
- 5) The finished glass lined pipe straightness shall comply with the following:
 - a) Fabricated (Flanged and Grooved Ends) 3/8 inch in 20 feet and 0.01875 inches per foot
 - b) Bell X Spigot Pipe: 5/8 inch in 20 feet 0.03125 inches per foot
 - c) Copies of the test results from the Routine Quality Testing shall be available for review.
- o. Welding is not permitted on any porcelain enamel lined pipe.
- p. Any taps shall be completed prior to application of porcelain enamel lining.
- 2. For all process water (i.e. non-potable), all buried, partially, or entirely exposed ductile iron pipe shall be internally lined with cement mortar lining in accordance with AWWA C104/A21.4, unless as shown on the plans.
- 3. For air service, all interior DIP shall be uncoated.
- J. All repairs of handling or other damage shall be made in accordance with the recommendations of the manufacturer.

2.4 FITTINGS, RESTRAINTS, HARNESSSES AND STOPS

- A. All DI fittings coatings:
 - 1. All interior DI fittings shall be furnished and coated with standard factory applied Protecto 401 Ceramic Epoxy (P401) coating meeting the amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment or approved equal.
 - a. A permeability rating of 0.00, Method A of ASTM E-96.
 - b. A rating of 0.0 undercutting, ASTM B-117 Salt Spray (scribed panel).
 - c. A rating of 0.5 mm undercutting, ASTM G-95 Cathodic Disbondment 1.5 volts @ 77 °F.
 - d. No effect or undercutting, ASTM D-714.
 - e. A rating of trace amounts of Acidithiobacillus Bacteria growth, ASTM G-22.
 - f. A rating of no more than 3 mils loss after one million cycles, European Standard EN 598.
- B. All DI fittings shall be furnished and installed with externally coated standard asphaltic one mil thick in accordance with AWWAC151, AWWA C110 and AWWA C153.

- C. Where identified, all exterior DI fittings shall include a factory applied approved fusion bonded epoxy coating with a minimum of 3 mils in thickness as provided by the DIP manufacturer or as in accordance with AWWA C116/ A21.16. If requested by the Engineer, the Contractor shall perform field holiday testing report (in accordance with the latest version of ASTM G62) prior to installation and submit the report to the Engineer prior to backfill. All buried ductile iron fittings and glands shall be externally coated with a fusion bonded epoxy coated meeting the requirements of AWWA C116 (including certificate of compliance). If requested by the Engineer, the Contractor shall perform field holiday testing report (in accordance with the latest version of ASTM G62) prior to installation and submit the report to the Engineer prior to backfill.
- D. All buried fittings and appurtenances shall be encased in eight (8) mil (min) low density polyethylene tube encasement in accordance with AWWA C105.
- E. All buried fittings shall meet the same bedding requirements as described herein or as shown in the details for adjacent piping or approved by the Engineer.
- F. All fully or partially exposed fittings shall be cast of ductile iron conforming to A-536, Grade 65-45-12. Flanged fittings shall conform to ANSI A21.10/AWWA C110 or ANSI A21.53/AWWA C153. Flanged fittings shall be in accordance with AWWA C111 with bolt hole pattern ANSI B16.1 class 125 and coated in accordance with Section 2.2.G. All flange gaskets shall be full faced with a minimum 0.125" in thickness and made of EPDM rubber unless otherwise indicated. All bolts and nuts shall be in accordance with Section 2.2.B.3 unless otherwise approved.
 - 1. All fully or partially exposed fittings shall be provided without exterior bituminous coating and shall be coated with two (2) coats of Tnemec Series N69 High build epoxy at four (4) mils dry film thickness with a finish coat consisting of a single two (2) mils (minimum) dry film thickness Tnemec Series 73 or 1095 Endura-Shield or approved equal in accordance with Section 090000. All fitting colors shall match adjacent DIP coating colors as described herein.
- G. Grooved end fittings shall conform to ANSI A21.10/ AWWA C110 (dimension and thickness) and AWWA C606.
- H. All ductile iron fittings shall be internally lined with P401 unless otherwise shown on the plans.
- I. All restraints, stops and couples shall be coated with a factory applied fusion bonded epoxy coating to no less than 3 mils in thickness. All restraint and stop bolts, washes, rods or any other incidental hardware shall be coated with a factory applied two (2) coat fluoropolymer coating to no less than 0.7 mils in thickness. Prior to installation, field holiday testing report(s) (in accordance with the latest version of ASTM D5162) may be requested to be completed and submitted to the engineer for approval. Where appropriate, stainless-steel bolts and rods may be allowed in lieu of fluoropolymer coating.
- J. Buried Fittings:
 - 1. Use mechanical restrained joint (MRJ) for all fittings unless otherwise shown on the plans.
- K. Where flanged connections are identified, all fully exposed fittings may be Victaulic connection up to 36" diameter unless otherwise shown on the plans or approved by the Engineer. All exposed fittings above 36" shall be flanged. For all special applications of partially exposed fittings shall be mechanically restrained joint (MRJ) by Victaulic.

2.5 GROOVED AND SHOULDERED JOINTS

- A. Victaulic Couplings: Manufactured in two or more segments of cast ductile iron, conforming to A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, FlushSeal® type. Mechanical coupling bolts shall be fluoropolymer coated, heat treated carbon steel track head conforming to physical properties of ASTM A-183, minimum tensile strength 110,000 psi (758450 kPa), Victaulic Style 31, whereas the 3" through 12" nominal size have minimum working pressures of 350 PSI, 14 through 18" nominal size have minimum working pressures of 250 PSI and 20" through 36" nominal size have minimum working pressures of 150 PSI.
- B. For transition between IPS steel and AWWA ductile iron sized pipe use a transition coupling with Housings cast with offsetting, angle-pattern, bolt pads, Victaulic Style 307.
- C. Flange adapters for use with AWWA grooved end pipe and fittings, for mating to ANSI Class 125 flanged components, Victaulic Style 341.
- D. Coupling Gaskets shall be synthetic rubber, Grade "E" EPDM, Grade "E" Vic-Plus™, Grade "EHP", Grade "EHP" Vic-Plus™, Grade "E2", Grade "EW" and Grade P gaskets are UL Classified in accordance with ANSI/ NSF 61 for cold +73°F/+23°C and hot +180°F/+82°C potable water service and ANSI/NSF 372. FlushSeal® configuration, conforming to AWWA pipe outside diameter and coupling housing, manufactured of elastomers as designated in ASTM D-2000. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service by the manufacturer and included in the submittal documentation.
- E. All joints shall be provided with a factory coated with a 1.5 mil series 37H Phenolic Alkyd primer.
 - 1. All joints shall contain a finish coat consisting of a single two (2) mils (minimum) dry film thickness Tnemec Series 73 or 1095 Endura-Shield or approved equal in accordance with Section 090000. All joint colors shall match adjacent DIP and DI fitting coating colors as described herein.
- F. Reference PART 3 for installation.

2.6 CONNECTIONS

- 1. For all 4" through 16" DIP to DIP or PVC to PVC or PVC to DIP connections, use mechanical joint AWWA C153 solid sleeve coupler (long) or MEGA-COUPLING 3800 series or approved equal.
- 2. For all 18" through 24" DIP to DIP or PVC to PVC connections, use mechanical joint AWWA C153 solids sleeve coupler or approved equal.
- 3. For all 30" and 36" PVC to PVC connections, use mechanical joint AWWA C153 solid sleeve coupler.
- 4. For all 30" through 48" DIP to DIP connections use mechanical joint AWWA C153 solid sleeve coupler or MEGA-COUPLING 3800 series or approved equal.
- 5. For all AWWA C110/ C153 DIP fittings to AWWA C906 DR-17 HDPE connections use EBAA Series 15PF00, 2000PV, and 2100 restraint devices pressure rated to match the pipe pressure rating and derated as appropriate for service temperature.
- 6. For all HDPE and PVC connections 4" to 12", use MEGA-COUPLING 3800 series or approved equal.
- 7. For all HDPE and PVC connections larger than 12", use GF central plastics pipe and fabrication (formerly independent pipe products) ductile iron mechanical joint anchor fittings MJ adapters as necessary to complete the connection.

8. For all HDPE connections, use an internal 316 stainless-steel stiffener (minimum 6" length unless otherwise approved by the manufacturer) in accordance with manufacturer's specification. Where all connections to existing pipelines are made, all coupling connections between HDPE and PVC shall be done with like sized sufficient segments of PVC prior to any fittings.
9. Above Grade Connections: For all above grade DIP to DIP, PVC to PVC, DIP to PVC and PVC to DIP (reducing), use Smith Blair Pipe-Lock Joint Restraint Couplings.
 - a. The coupling shall be constructed in accordance with ASTM A 283 Gr. C or Carbon Steel having a minimum yield of 30,000 psi with the glands meeting ASTM A536, with a single tooth ductile iron heat treated wedges.
 - b. The actuating bolts shall be made in accordance with ASTM A 536 with carbon steel break away nuts, coated with fluoropolymer, meeting the torque requirement of 45 to 60 ft-lbs. per nut.
 - c. The coupling shall have a fusion bonded epoxy coating.
- B. All Restraining glands designed to use radially oriented cupped screws that indent the pipe barrel with points are not allowed.
- C. For Steel Pipe or DIP to DI fittings provide EBAA 1100 or 1100 SD MEGALUG by EBAA series mechanical restraint or approved equal.
- D. For PVC pipe to DI fittings, provide 2000 PV or Series 2200 MEGALUG EBAA series mechanical restraint or approved equal.
- E. For all 4" through 54" HDPE pipe to DI fittings, provide 2000 PV or Series 2200 MEGALUG EBAA mechanical restraint or for all 4" through 12" (AWWA C153), 14" through 24" (AWWA C110) use Integrity Fusion Products, Inc. DIPS-MJ Adaptor Molded Butt Fusion or GF central plastics pipe meeting 24" through 48" ASTM-D2513 & ASTM-D3261 requirements with the resin material designation code of PE 4710 fittings meet AWWA C-901/C-906 with MJ Adaptor Accessory Kit necessary to fully restrain the DI fitting to the HDPE pipe. All butt fusion adaptors shall be a minimum of the identified pressure class of the HDPE pipe. All connections shall use a 316 stainless steel stiffener provided by or in accordance with manufacturer's installation instructions.
 1. All connections shall be installed per the manufacturer's requirements and installed in accordance with Sections 2.5 and 3.13 described herein.
- F. For FL x FL valves or fittings, where applicable, use with EBAA MEGAFLANGE 2100 series with adapter or approved equal.
- G. Where appropriate, for buried MJ x MJ valves, use EBAA 1100 or 2000 PV restraint.
- H. Where PVC or HDPE mechanical restrained to DI fittings shall include the EBAA Seal Improvement Mechanical Joint Gasket or approved equal.
- I. PVC pipelines to restrain the identified bell/spigot pipe lengths: Use restraint harnesses EBAA 1900 Series or approved equal for 4" through 12" PVC pipelines or EBAA 2800 series or approved equal for 16" through 54" PVC pipelines. Harnesses rated less than 125 PSI shall not be allowed.
- J. DIP pipelines to restrain the identified bell/spigot pipe lengths: Use restraint harnesses EBAA MEGALUG 1700 or 1100HD Series or approved equal for where harnesses shall be for sizes 3" through 54" meeting the minimum pressure rating of the pipe or fitting, whichever is greater.

1. Where restraining of DIP mechanical joint fittings and/ or restraint harnesses is required or identified on the plans, the Contractor may use propriety restrained joint pipe/ fittings (equivalent restrained length) that is American Cast Iron Pipe Company FLEX-RING by American Cast Iron Pipe Company of Birmingham, AL or TR FLEX by U.S. Pipe of Birmingham, AL or TR Flex by McWane Ductile of Birmingham, AL. Written pre-approval from the engineer is required for all use of all other propriety restrained joint pipe/ fittings. Pre-approval must be obtained at least 15 days prior to the open of the bid. All proprietary restrained joint pipe shall be ductile iron pipe and conform to the requirements described in PART 2.
- K. Restrained joint with a precast or cast in place thrust block shall not be allowed in lieu of restrain harnesses.
- L. All thrust anchors (cast in place) shall use at least a single layer of No. 4 rebar at 8" O.C.E.W or 6x6, W 1.4 X W 1.4 wire-wound mesh for each 6" of height (two layers for 1 ft; three layers for 1.5 ft; four layers for 2 ft; etc.) equally spaced, tied, reinforcement chairs, formed, using a minimum E200 concrete mixture (4000 PSI concrete), in accordance with Section 033000 Structural Concrete for design and placement of reinforced concrete. All deviations from the identified dimensions in the thrust block schedule shall be sealed by a licensed State of Arkansas Professional Engineer.
1. Where identified, for all thrust anchors used with HDPE pipe with nominal DIP size 4" through 24" the Contractor shall use Integrity Fusion Products, Inc. electrofusion flex restraint meet ASTM-D2513 & ASTM-D3261 requirements with the resin material designation code of PE 4710 fittings meet AWWA C-901/C-906. All flex restraints shall be a minimum of SDR 11 or a minimum of the identified pressure class of the HDPE pipe and use the number per the nominal pipe diameter as identified on the plans.
 2. All fittings shall be installed per the manufacturer's requirements and installed in accordance with Sections 2.5 and 3.13 described herein.
- M. Where HDPE and PVC connection occur, use restraint harnesses identified in this Section on PVC connection segments, where possible. Lengths identified are those for a 22.5 degree fitting equivalent unless up or down stream fittings control harness length.
- N. Stops:
1. Use EBAA MEGA-STOP 5000 series or approved equal in all locations identified on the plans.
 2. Where stops are used, the Contractor shall not exceed the rated maximum push load of the stop. The Contractor shall use an approved force gauge to measure the onsite installation force. The force shall be recorded by the Contractor and verified by the resident project representative.
- O. Miscellaneous Equipment Service Connections
1. All service connections shall be solvent welded Schedule 40 or 80 PVC or CPVC in accordance with Section 400531 or welded Schedule 80 or 40 304L stainless steel or 316L stainless steel as described herein, for all sizes 1/2", 3/4", 5/8", 1", 1-1/4", 1-1/2", and 2" as identified on the plans.
 2. All service clamps shall be Mueller BR1B & BR2B or H-13000 & S-13000 Series Service Saddles with I.P thread rated for a minimum of 200 PSI or approved equal for 3/4", 1", 1.5" and 2" below grade service connections.
 3. Where below grade service connections are not intended to be connected immediately, provide brass I.P. plug, square head, with thread anti-size sealant.

4. For schedule 40 or 80 PVC or CPVC, all connections to all below grade service saddles and inlets shall use a brass MIPT x socket PVC or CPVC lined brass transition with manufacturer's approved thread sealant in accordance with Section 400531.
5. For Schedule 40 or 80 304L stainless steel or 316L stainless steel use plain end by threaded MIPT with appropriate thread sealant.
6. All PVC, CPVC or stainless steel service lines shall be bedding in a minimum of 6 (3" above/ 3" below) of ASTM C33 sand.
7. All PVC, CPVC or stainless steel service lines that are not located in a heated space, vault or other area that may prevent it from freezing shall be insulated and heat traced in accordance with Section 404100 and 404200.
8. All above grade service/ miscellaneous equipment service connections shall be Smith-Blair Double Bale Model 313 or 317 service clamp rated for a minimum of 300 PSI or approved equal. All connections to miscellaneous equipment (chemical injection, sample taps, pressure transmitters, pressure gauges, etc.) shall be standard female 1/2", 3/4", 1", 1-1/4", 1-1/2", and 2" NPT threaded connections. All service connections shall be threaded NPT 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" and 2" connections. All gaskets shall be EPDM unless otherwise indicated.
 - a. All bodies shall be Ductile Iron 65-45-12 per ASTM A536
 - b. All straps shall be carbon steel per ASTM A36 or Type 304 Stainless Steel.
 - c. All bale assemblies, where applicable, shall be carbon steel per AWWA C111.
 - d. Spherical washers shall be ductile Iron 65-45-12 per ASTM A536 or 304 Stainless Steel.
 - e. All carbon steel straps, bale assemblies, studs (threads free from epoxy coating) and spherical washers shall be fusion bonded epoxy coated in accordance with AWWA C213. All 304 Stainless steel shall be uncoated.
 - f. All nuts shall be carbon steel ASTM A307 or 304 Stainless Steel.
 - g. All flat washers shall be carbon steel ASTM F844 or 304 Stainless- steel.
 - h. All nuts, flat washers and stud threads shall be factory applied fluoropolymer coated where applicable, otherwise field applied by the Contractor shall be acceptable.
9. For above grade connections, where connections are not intended to be connected immediately, Use 316L stainless steel NPT plug, square head, with thread anti-size sealant.
10. For schedule 40 or 80 PVC or CPVC, all connections to all above grade service clamps and inlets shall use MNPTxMNPT 316L stainless steel nipple with FNPT x socket PVC or CPVC stainless steel transition with manufacturer's approved thread sealant in accordance with Section 400531.
11. For Schedule 40 or 80 304L stainless steel or 316L stainless steel use plain end by threaded MNPT with appropriate anti-seize thread sealant.
12. For all chemical injection points, appropriately sized (an equivalent sized of chemical piping) Saf-T-Flo HC-200 high corrosion resistance, retractable injection quill or approved equal, unless otherwise indicated.
 - a. Pressure Rating (min): 250 PSI
 - b. Valve Material: Alloy C
 - c. Tube Material: Alloy C276
 - d. Insertion Length: As shown on drawing or 1/3 to 1/2 receiving pipe I.D.
 - e. Tip Configuration: 45-degree bevel (bevel pointed parallel with velocity profile of flow)
 - f. Check Valve Option: Alloy/ EPDM
 - g. Thread Connection: Female NPT.

- h. Use thread anti-size sealant on all appropriate NPT connections.
- 13. For all sample taps or connections to pressure transmitters, switches, gauges or other process equipment, use 3/4" Saf-T-Flo EB 109 non-retractable sample probe or approved equal, unless otherwise indicated.
 - a. Pressure Rating (min): 250 PSI
 - b. Valve Material: Stainless steel
 - c. Tube Material: Stainless steel
 - d. Insertion Length: As shown on drawing or 1/3 to 1/2 receiving pipe I.D.
 - e. Tip Configuration: 45-degree bevel (bevel pointed parallel with velocity profile of flow)
 - f. Thread Connection: Female NPT
 - g. Use thread anti-size sealant on all appropriate NPT connections.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Construction of the water line will be inspected by the Engineer and the Owner. Do not cover any work without approval of RPR. Work covered prior to inspection will be uncovered and reworked as required at Contractor's expense.

3.2 SEPARATION FROM EXISTING UTILITIES

- A. Maintain minimum vertical and horizontal separation from adjacent utilities per plans.

3.3 LOCATING TAPE

- A. Shall be used on all pipe.
- B. Install 12" to 18" above the pipe as shown on drawings.
- C. The tape shall be in addition to trace wire specified pipe.

3.4 TRACER WIRE

- A. Tracer wire shall be installed, where appropriate, within 2" to 6" of top of all buried pipe. All direct buried installed pipe and fittings, including all materials and sizes shall use a tracer wire full length of the Project.
- B. Run tracer wire continuous from tracer wire access point to tracer wire access point. Avoid pulling on tracer wire once installed.
- C. Pipe testing shall include trace wire. Testing shall be conducted in the presence of the resident project representative (RPR). Test all tracer wire continuity prior to and after backfilling. The Contractor shall record all voltages, continuities and provide to the Engineer. Contractor shall replace the trace wire along the pipe route for any areas in which the pipe cannot be located from the original trace wire installation.
- D. Wire breaks shall be repaired with repair kit at no additional expense to the Owner. Tracer wire that passed all testing prior to backfilling may be allowed to be spot repaired with an approved repair kit if allowed by the Engineer. Tracer wire that did not pass testing prior to backfilling shall; be excavated and replaced, tested, backfilled, and tested prior to acceptance.

3.5 STRINGING THE PIPE

- A. The contractor shall properly and safely chock the strung pipe so that it cannot roll loose and strike either personnel, livestock, or property.
- B. Do not place anything inside pipe for the purpose of handling.
- C. Protect all pipe from UV light, high temperature and thermal expansion during stringing of the pipe.
- D. Only string a sufficient amount of usable pipe.

3.6 KEEPING THE PIPE CLEAN

- A. Contractor shall keep pipe free from dirt, rocks, and other debris during construction.
- B. Contractor shall install a temporary plastic plug in open ends to prevent mud from washing into pipe.
- C. No pipe shall be left unattended with an open end. Plug the open end with a temporary plastic plug.

3.7 PRESSURE TESTING

- A. Pressure lines shall be hydrostatically tested in accordance with Section 400404.
- B. Engineer and Owner shall observe and document tests.
- C. Use pipe-locating equipment to test continuity of trace wire.

3.8 INSTALLATION OF STEEL PIPE

- A. The Contractor shall provide and install all required piping and accessories in accordance with the contract documents and manufacturer's recommendations. Liquid conveyance pipe installation as specified in this section supplements AWWA M11.
- B. Handling, storage and installation of all pipe shall be done in accordance with the manufacturer's requirements and installation guidelines only and as described in Part 2.
- C. All welding or welds shall be prepared and completed in accordance with Part 2.
- D. All internally applied field coatings shall be completed in accordance with the manufacturer's requirements.
- E. Deflection of any steel pipe shall only be made in accordance with the manufacturer's recommendations and to the maximum allowed as identified in Part 2.
- F. Installing Buried Piping
 - 1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or roll pipe into trenches under any circumstances.
 - 2. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Repair damaged areas in the field in accordance with Part 2. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

3. Grade the bottom of the trench and place a 4-inch minimum layer of select or scarified material under the pipe. Before laying each section the pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
4. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
5. Keep the trench in a dewatered condition during pipe laying.
6. When the pipe laying is not in progress, including the noon hours, close the open ends of the pipe. Do not permit trench water, animals, or foreign objects to enter the pipe.

G. Joints Assembly

1. Lap Field Welded Joints for Liquid Conveyance Pipe
 - a. Clean exposed end of joint surfaces.
 - b. Provide a minimum overlap of 1-inch at any location around the joint circumference.
 - c. Field welders and field weld procedures shall be certified in accordance with AWS D1.
 - d. Provide a full fillet weld per AWWA C206 on the inside or outside of the pipe. Inside welding may be performed after backfilling in accordance with manufacturer's recommendations.
 - e. Testing of field welds shall be in accordance with AWWA C206.
 - f. Field apply lining of interior of the joints with polyurethane in accordance with AWWA C222. Complete the exterior of the joints with heat-shrink sleeve per AWWA C216 and manufacturer's recommendations.
2. Butt Welded Joints for Air Conveyance Pipe
 - a. Reference Section 3.9 contained herein. All carbon steel welding shall be performed in a manner as described below.
3. Flanged Joints
 - a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing; lubricate bolts with graphite or oil.
 - b. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
 - c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.
 - d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or re-tighten the bolts and nuts, and retest the joints.

H. Field Quality Control

1. Perform all hydrostatic or low-pressure air tests in the presence of the Engineer as described herein. Liquid conveyance pipe Leakage allowance shall be per AWWA M11 Chapter 12.

3.9 INSTALLATION OF STAINLESS OR CARBON STEEL PIPE

A. General

1. All materials and installation work shall conform to all applicable codes and regulations. All work shall be done in a competent and workmanlike manner using the best practice and latest techniques of the trade.
2. The contractor shall employ for this work only labor which has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner.
3. All welding operators shall be qualified in accordance with the test required by this specification.
4. Any damage to any existing or installed piping is to be replaced and retested by the contractor at no expense to the owner.
5. Any glass lined carbon steel pipe shall not be handled or lifted using internal hooks, chains or any other method that has the potential to damage the internal lining.
6. Field cutting of glass lined carbon steel pipe shall only occur in accordance with the manufacturer's approved procedures.

B. Storage

1. Material shall be stored in a secure area and labeled as inspected and ready for use.

C. Weld Preparation

1. Welding on glass lined steel pipe is not permitted.
2. All tools and machinery used for preparing or cutting piping shall be kept segregated from other tools and shall not be used for other work. Tools, equipment, and machinery should be protected from air-born contamination when not in use.
3. Piping shall be cut with either a stainless-steel pipe cutter or port-a-band saw with CS, 304 or 316 stainless steel blade.
4. Cutting with a cut-off saw or abrasive saw is not allowed.
5. Pipe ends are then prepped or faced using the appropriate equipment such as Tri-Tool, Berkstram, or owner approved equal.
6. Burrs on the id or od shall be removed with a stainless-steel knife. Files are not allowed.
7. All tools used on the stainless-steel piping must be cleaned daily and free from oils, grease, etc. (i.e., Cutters, facing tools, deburring tools).
8. Measuring and marking pens and pencils are not allowed. Use tungsten scribe or scratch all.
9. Lubricants of any kind are not allowed.
10. Clean with isopropyl alcohol (ipa).
11. Use lint-free cloth, texwipes.
12. Clean both the id and od of the pipe 2 inc. either side of the weld zone.
13. Using high-pressure nitrogen, blow ipa-soaked texwipe through entire length of pipe to remove any particles, grease, dirt, chips, etc.
14. Examine wad. If pipe is still contaminated, contact site quality assurance manager.
15. Tape up both ends of pipe with parafilm.
16. Sanding of id or od of the pipe is not allowed.
17. Obtain approval from owner's inspector.
18. Piping ends, fittings, valves shall be carefully aligned and butted together to create square butt joint. Misalignment or hi-lo shall be minimized to .005 in.

D. Welding

1. Tack welding shall be accomplished so as not to cause any distortion of the complete weld.

2. Any tack that can be distinguished through the completed weldment will be considered an excessive tack and the entire weld rejected.
3. All purging and shielding parameters apply to tack welds.
4. Manual welds are not permitted without prior written consent from the project engineer.
5. The contractor is advised that manual welds are not permitted. Extreme care must be made in the design and execution of the welding program to prevent manual welds.
6. The contractor must purchase all materials suitable for orbital automatic welding. In the event manual welds must be made, the contractor must obtain written consent from the owner.
7. All the same cleaning, purging and acceptance criteria used in automatic welding shall apply.
8. Manual welders shall be tested as outlined in Section IV (acceptance and testing) of this specification.
9. All welds are to be made using only gas tungsten arc welding.
10. Fully automatic programmable orbital welding machine shall be utilized for all weldments. The following suggested welding machines are considered acceptable: Arc Machines, Astroarc, Dimetrics, Creative Pathways, and Systems Technica.
11. Welding machines not listed will not be used without prior written consent from the Engineer.
12. Each welding machine shall be calibrated on site.
13. Welding machines shall use separate dedicated electrical circuits.
14. Electrodes shall be 2% thoriated/tungsten, conforming to AWS-ASTM EW th2 classification. Electrodes are to ground and/or sharpened in accordance with welding machine manufacturer's suggestion.
15. Welding shall consist of butt fusion, one pass, no filler material added.
16. Components containing heat sensitive parts (rubber or plastic) must be disassembled prior to welding.
17. Always weld the joint closest to the purge first.
18. Cooling of welds with a wet cloth is not allowed.
19. Each welder shall identify each weld with a numerical value. This number will also be entered into the welding log.
20. The welding equipment shall be set up by the designated welding supervisor only.
21. Once a weld is completed, the post weld shielding gas shall remain flowing for a minimum of 60 seconds to minimize discoloration to the weld.
22. Sample weld coupons shall be submitted twice a day - one at the beginning of the shift and one at the end of the shift. Weld coupons shall be submitted for each individual welding machine. Additional sample weld coupons shall be submitted for the following reasons:
 - a. Change of pipe size.
 - b. Change of welding machine power supply.
 - c. Change of welding machine head.
 - d. Change of purge source.
 - e. Change of electrical circuit.
 - f. Change of tungsten electrode.
 - g. Immediately after a weld failure.
23. All purge gas used shall be high purity argon from a cryogenic source.
24. Purge containers shall be cryogenic cylinders.
25. Each container shall be certified by the vendor and a certification shall accompany each container. Turn over the original certificate of analysis to owner upon receipt of each container.
26. Maximum impurities by volume:

- a. Oxygen: Less than 2 ppm
 - b. Moisture: Less than 1 ppm
 - c. Total Hydrocarbons: non detectable
 - d. Carbon Dioxide: Less than 0.5 ppm
 - e. Hydrogen: Less than 1 ppm
27. Only portable cryogenic carts shall be used to transport the containers by the contractor at the job site.
 28. Purge manifold will be assembled, using clean components. The manifold shall have separate flow meters for each line being purged. The manifold shall be made in such a way as to utilize a minimum of two purge containers with separate two-stage regulations for each cryogenic container.
 29. Utilize new teflon tubing from the flow meters to the purge attachment.
 30. Purge restrictors shall consist of CS, 304 or 316 stainless steel swagelok caps with 1/8 in. holes drilled through the center. The caps will be affixed to the tubing with nylon ferrules.
 31. Protect exposed open ends of pipe at all times.
 32. Purge flow shall be sufficient enough to prevent oxidation. A minimum flow must be apparent at the end of the pipe being welded.
 33. If at any time a line is found without a purge, that day's installation will be removed-re-cleaned and re-installed at no cost to the owner.
 34. The purge shall continue in one direction. Purging from two directions is not allowed.
 35. A branch line may be capped off during installation to allow purge flow through the main, or in the direction of the work.
 36. An oxygen meter shall be used to assure full blanketing.

E. Welding Logs

1. A "Daily Automatic Welding Log Sheet" shall be maintained for each automatic welding machine. Every weld including test welds, accepted, rejected, and qualification welds, must be logged on a "Daily Automatic Welding Log Sheet." The weld number shall include a designation indicating the welding machine used to make the weld. The following information should be recorded for every weld:
 - a. Weld number shall comply with the following procedure.
 - b. Welds shall have prefix - "W"
 - c. Welding machines shall have a prefix letter - "A", "B", "C"
 - d. Weld numbers will follow a sequential order
 - e. Sample weld coupons shall have a prefix "C" machine identification, following by a number (e.g., Wb-42 - weld #42 from "b" welding machine. B-22 - sample weld coupon #22, machine "b")
 - f. Date, time of day
 - g. Drawing number locating weld
 - h. Welding machine serial number
 - i. Purge gas cylinder id
 - j. Weld head serial number
 - k. Weld schedule (program) number
 - l. Pipe size and wall thickness
 - m. Welder's signature
 - n. Inspector's signature
 - o. Inspector's signature
 - p. Inspector's acceptance/rejection
 - q. Pipe mill heat number
 - r. Joint description

2. Some of these items may be included in the log sheet header as appropriate and previously agreed to by owner. Other items must be made for each weld.
3. Some rejected, test, and qualification welds shall be number with an electric engraving tool and retained for evaluation. All welds removed from the system for any reason shall be similarly numbered and retained. All welds not included in the system shall be placed in the weld documentation file for final disposition.
4. Every weld number must be unique with no duplicate weld numbers permitted for any reason.
5. Every weld must be appropriately marked on the piping with an electric engraving tool.
6. No rejected, test, or qualification welds shall be chemically or mechanically cleaned or treated in any way.
7. Documentation regarding all equipment used shall be provided for inclusion in the weld documentation file. Documentation should include, but not be limited to, manufacturer's names, model numbers, serial numbers, and all other relevant identification numbers.
8. As-built isometric drawings shall be submitted to the owner. The "as-built drawings" shall identify each weld and be submitted on a daily basis attached to the welding log.

F. Weld Acceptance Test

1. The owner, or his designated representative(s), will have the authority to approve or disapprove materials, equipment or workmanship done by the contractor. He shall have full technical jurisdiction over the contractor in matters relating to quality and control of the cleaning, fabrication, installation, and test of the systems. All problems, requests, questions, etc. Relating to this specification, methods, procedures, field changes, and revisions shall be subject to his approval. The pressure and purity testing shall be conducted, witnessed, and/or verified by him.
2. All cleaning procedures will be reviewed on a regular basis by the owner's representative.
3. Purging procedures will be reviewed on a daily basis.
4. Workmanship shall be guaranteed by the contractor to be free from defect and in compliance with all requirements set forth in this specification.
5. All personnel are subject to certification by the owner's representative. Their installation practices will be reviewed on a daily basis.
6. Daily reviews by the owner's representative shall not relieve the contractor of responsibility for overall system performance and project completion schedule.
7. On-site qualification: each welder shall demonstrate his ability to make an ultra high purity weld. Only personnel qualified shall be allowed to work on these systems.
8. Manual welding TIG: all manual welders to test the level of qualification as outlined by same Section IX code. Joints shall be open groove with 1/8 in. gap. Pipe material shall be 316 .065 in. wall stainless steel tubing. All coupons will be performed while using an argon purge. Welds will also be evaluated for oxidation and under or over penetration. Filler metal shall be 316 stainless steel.
9. Automated welding TIG: all automatic TIG welding machine operators are subject to testing. Each machine shall have all the prescribed settings returned to a zero position. All weld programs are removed from the operator. At the end of one hour, the operator must submit an acceptable program and coupon.
10. All welds shall meet the acceptance of criteria established during the qualifications of the welding program used to make the weld.
11. Any change in the acceptance of criteria established during the qualifications of the welding program used to make the weld.
12. All welds made shall have full penetration over the complete internal weld periphery.

13. Slag or other inclusions are not permitted.
14. The weld program shall ensure that the weld completion has a suitable "down slop" to taper off the welding current at the end of the weld to eliminate any pin hole or "suck back" at the end of the weld.
15. Inside weld ID shall be smooth with a minimum internal weld bead. While weld ID matching is deal, minute convexity (raised bead) is preferred to concavity (recessed bead). Any weld displaying under or over penetration shall be removed at no cost to the owner (+/- .010 inc. constitutes under or over penetration on .065 in. wall tube welds).
16. Cracks, crevices, pits, or pin holes are not permitted.
17. Evidence of carbide precipitation is not permitted.
18. Evidence of porosity in the weld is not permitted.
19. Any evidence of improper alignment of the weld shall cause the weld to be rejected.
20. Evidence of weld discoloration caused by improper gas back-up procedures or pressures is not permitted. A yellow or straw, blue or black color is unacceptable, and there must be no indication of bubbling or "sugaring" of the weld area.
21. Rewelds are not acceptable.
22. As a general rule, the width of the weld puddle should be approximately twice the thickness of the tubing wall. Weld bead width should be uniform thickness or the tubing wall. The weld bead should be approximately 1/8 in. wide.
23. All welds are to be 100% inspected externally.
24. All rejected welds shall be replaced at no cost to the owner and re-inspected internally.
25. Materials will be tested on a random basis for ovality and wall tolerance.
26. Project material shall be replaced at no cost to the owner. Purchasing new acceptable material shall not relieve the contractor of the responsibility of project completion schedule or the overall system performance.

G. Hydrostatic or Low-Air Pressure Testing

1. All welded stainless-steel pipe shall be tested in accordance with Sections 400404 or 400406.

3.10 INSTALLATION OF DIP

- A. Handling, storage and installation of all pipe shall be done in accordance with the manufacturer's requirements and installation guidelines only. When assembling push on joints, use sufficient amount of manufacturer's approved pipe lubricant to prevent gasket displacement.
- B. Any glass lined DIP shall not be handled or lifted using internal hooks, chains or any other method that has the potential to damage the internal lining.
- C. Field cutting of glass lined DIP shall only occur in accordance with the manufacturer's approved procedures.
- D. Clean the socket and bell of the pipe or fitting. Make sure all recesses are cleaned of dirt. Use clean rags for this purpose.
- E. Press the gasket or special gasket into the socket using the technique recommended by the manufacturer.
- F. Apply the lubricant to both the spigot end and to the gasket. Use a clean application brush.
- G. With the pipe straightly aligned, bring the spigot end into the bell.
- H. Push the pipe spigot into the socket until it is home.

- I. Deflection of any DIP shall only be made in accordance with the manufacturer's recommendations and to the maximum allowed as identified in Part 2.
- J. Install all mechanical restrained joints (MRJ) and bell/ spigot harness in accordance with manufacturer's requirements and in a manner that does not create stress within the pipe. If the joint is incorrectly made disassemble it and correct the problem. Do not attempt to pressure test a joint that is improperly put together.
- K. All DIP shall use polyethylene protective material, either in tubing form or in the form of flat sheet or rolls shall be placed around all ductile iron pipe and fittings.
- L. Fittings and appurtenances shall be completely encased in polyethylene material. It is not the intent that the material form an enclosure that is absolutely air and water tight, but to prevent pipe to soil contact.
- M. Polyethylene material shall be applied to ductile iron pipe, fittings, and appurtenances by one of the following methods:
 - 1. Method A - Cut polyethylene tubing material to a length approximately 2 feet longer than the length of pipe section. Slip the tube around the pipe centering it to provide a one-foot overlap on each adjacent pipe section and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe section into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene from the new pipe section of the at the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make it snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.
 - 2. Method B - Cut polyethylene tube to a length approximately 1 foot shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide 6 inches of bare pipe at each end. Make polyethylene snug, but not tight and secure the ends. Before making up a joint, slip a 3-foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the 3-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least 1 foot; make snug and secure each end.
- N. Ductile iron pipe shaped appurtenances such as bends, reducers, offsets, and other pipe shaped appurtenances shall be covered with polyethylene in the same manner as pipe.
- O. Odd, shaped appurtenances such as valves, tees, crosses and other odd shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Slack width and overlaps at joints shall be handled as described above. Tape polyethylene securely in place at valve stem and other penetrations.
- P. Openings in tubing material for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making an X-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.

- Q. At junctions between wrapped and unwrapped pipe - Where polyethylene wrapped pipe joins a pipe which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least 2 feet and secure the end.
- R. The polyethylene material shall be secured around the pipe and appurtenances by at least three circumferential wraps of tape.
- S. All tongs, cables or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.
- T. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open and wrapped around the pipe or appurtenance and secured in place.
- U. Polyethylene material shall be stored on the project site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed 48 hours.
- V. Backfill material shall be the same as specified and shown on the Drawings for pipe or appurtenances without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.
- W. Field Repairs
1. Connection to the existing water distribution system shall be made in the manner as detailed on the Drawings. Contractor shall provide all necessary temporary caps, plugs, and restraints in order to pressure test and disinfect the proposed water lines.
 2. in the event that testing reveals a leak either at the joint or anywhere in between field repairs shall utilize mechanical joint solid sleeves similar or equal to American Table 5 18 or 5 19 conforming to AWWA C110. Leaks originating with improperly installed or defective gaskets shall not be repaired with bell joint leaks clamps or other similar device. Leaks originating from a perforation in the pipe wall shall not be repaired with full circle clamps or similar. Instead, the source of the leak shall be cut out and suitable length of new pipe inserted in place of the cut-out section and then coupled together with the solid sleeves.
- X. Grooved And Shouldered Joints Installation
1. Victaulic's factory trained representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and product installation.
 2. Victaulic's factory trained representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.
 3. Pipe ends shall be clean and free from indentations and projections in the area from pipe end to groove.
 4. Install in accordance with manufacturer's latest recommendations. Follow the instructions listed in the latest Victaulic I-300 assembly manual.

3.11 INSTALLATION OF PVC PIPE

- A. Handling, storage and installation of all pipe shall be done in accordance with the manufacturer's requirements and installation guidelines only. Thoroughly protect PVC from high temperature and sunlight prior to installation. When assembling push on joints, use sufficient amount of manufacturer's approved pipe lubricant to prevent gasket displacement. The spigot end of the pipe shall never be inserted past the maximum insertion lines provided by the manufacturer. All pipe insertions shall be visually recorded by the contractor and verified by the resident project representative.
- B. Clean the socket and bell of the pipe or fitting. Make sure all recesses are cleaned of dirt. Use clean rags for this purpose.
- C. Press the gasket or special gasket into the socket using the technique recommended by the manufacturer. Make sure the metal carrying the retainer end of the gasket is seated completely and uniformly. Take care that no gasket loops or bulges protrude into the path of the pipe when it enters.
- D. Apply the lubricant to both the spigot end and to the gasket. Use a clean application brush.
- E. With the pipe straightly aligned, bring the spigot end into the bell.
- F. Push the pipe spigot into the socket until it is home. The assembly stripe should be visible just outside the bell. Every restrained joint should be checked with a feeler gauge to detect incorrect gasket placement.
- G. Deflection of any AWWA C900 pipe or push on joint is not allowed. Deflection at couples and fittings shall only be allowed to a maximum of 1/2 the maximum recommended by the manufacturer. All coupling deflections and pipe to fitting angles (including those without intentional deflections) shall be measured using an onsite laser and recorded by the contractor and verified by the resident project representative.
- H. Install all mechanical restrained joints (MRJ) and bell/ spigot harness in accordance with manufacturer's requirements and in a manner that does not create stress within the pipe. If the joint is incorrectly made disassemble it and correct the problem. Do not attempt to pressure test a joint that is improperly put together.
- I. All taps and tapping sleeves shall be conducted in a manner that does not cause stress within the pipe. Exercise caution when performing taps on all PVC pipelines.
- J. Where all connections to existing lines are made, all coupling connections between HDPE and PVC shall be done with like sized sufficient segments of PVC prior to any fittings.
- K. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of installation and final use.
- L. Typically, the bell of the pipe shall be facing in the direction in which the pipe is laid. BELL UP.

3.12 INSTALLATION OF HDPE PIPE/ FITTING/ ADAPTOR JOINING

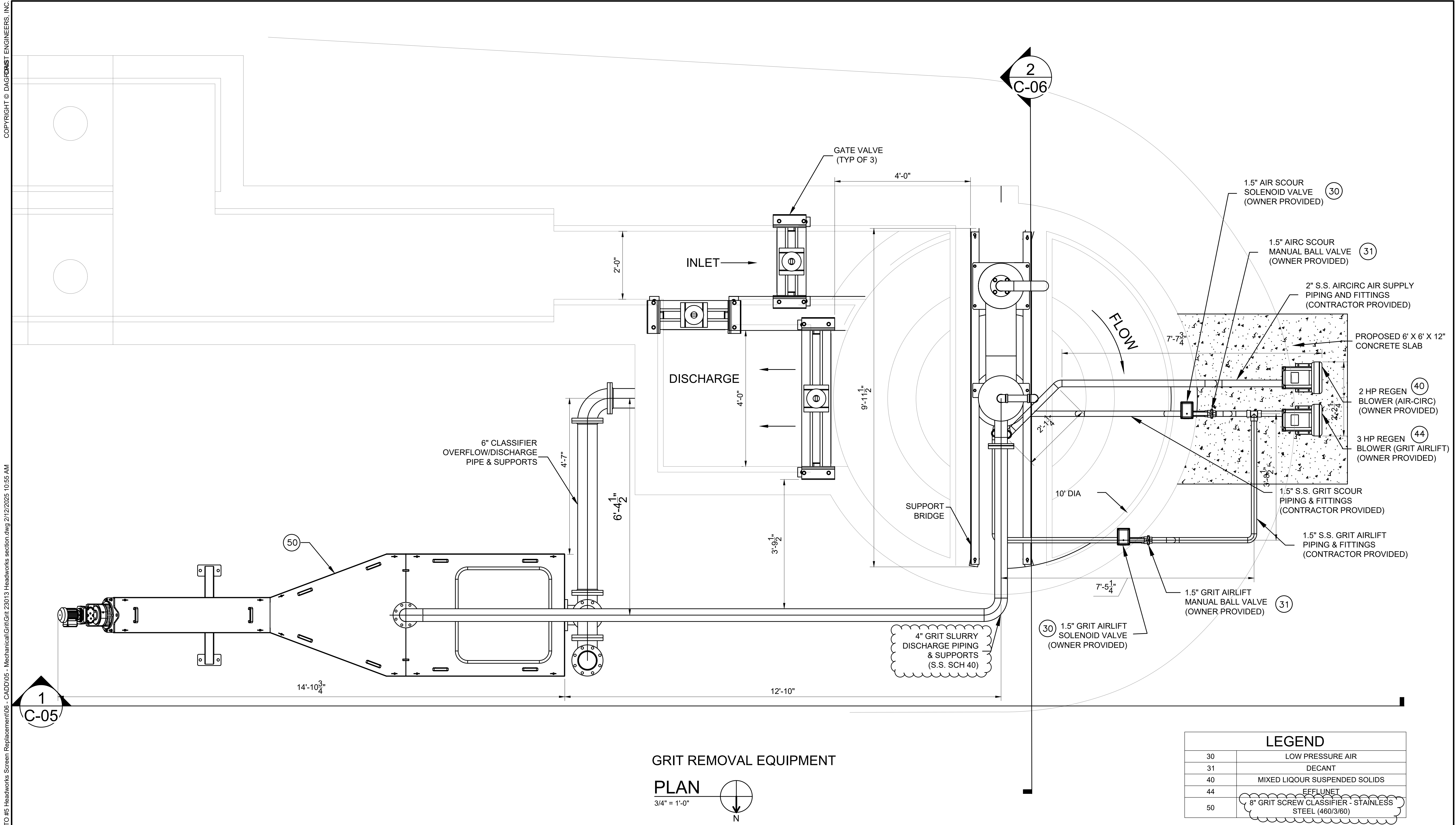
- A. Handling, storage and installation of all pipe shall be done in accordance with the manufacturer's requirements and installation guidelines only. Thoroughly protect HDPE from high temperature and sunlight prior to installation. Correct field length adaptations shall be made to correct for minimum and maximum water temperatures vs the temperature at the time of installation.

- B. Sections of polyethylene pipe shall be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 psi. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a McElroy Data Logger. Temperature, fusion pressure, and a graphic representation of the fusion cycle shall be part of the quality control records.

3.13 INSTALLATION OF MECHANICAL JOINT FITTINGS

- A. Pipe joints shall be assembled in accordance with procedures recommended by the pipe manufacturer, using proper gaskets, lubricants, tools, and jointing techniques. All surfaces of the joint including the socket and bell of the pipe or fitting shall be cleaned before the pipe is laid and the joint started. Use clean rags for this purpose.
- B. Joints shall be made tight by advancing the nuts with a wrench 180 degrees apart until a tight joint is made per manufacturer.
- C. Fittings including glands and bolts shall be encased in polyethylene material.

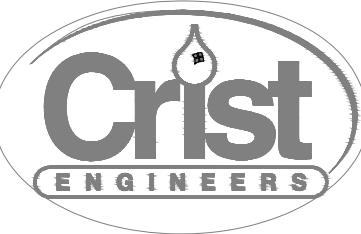
END OF SECTION



REV. NO.	DATE	DRWN	CHKD	REMARKS

THIS LINE MEASURES 1" WHEN PLOTTED FULL SIZE

DESIGNED:	MU
DRAFTED:	WTC
CHECKED:	CAJ
DATE:	JAN 2025

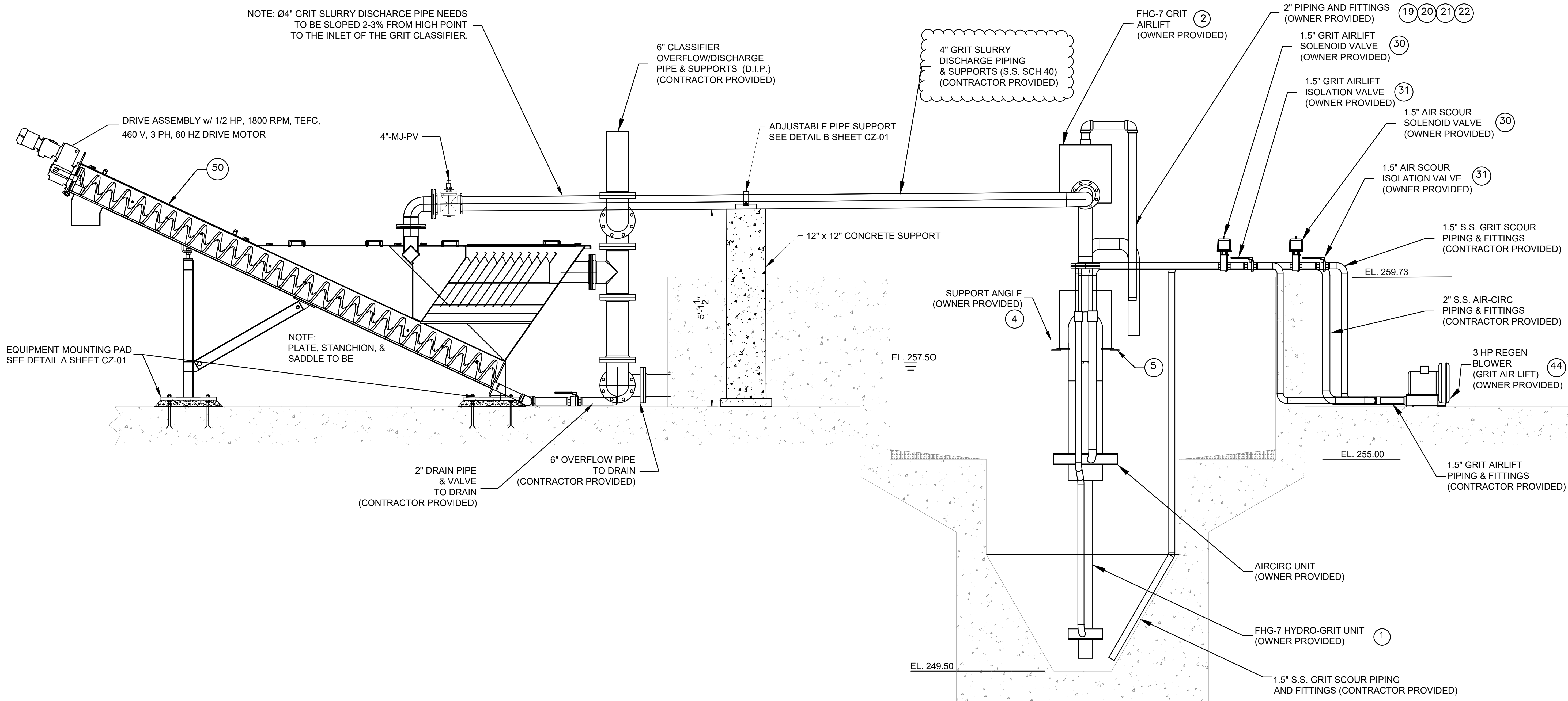


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SHERWOOD, ARKANSAS
WASTEWATER TREATMENT PLANT IMPROVEMENTS
GRIT EQUIPMENT AND CLASSIFIER REPLACEMENT

BID SET
CITY OF SHERWOOD
PROPOSED HEADWORKS PLAN

JOB NO.	23013
SHEET NO.	C-04



GRIT REMOVAL EQUIPMENT
SECTION

3/4" = 1'-0"

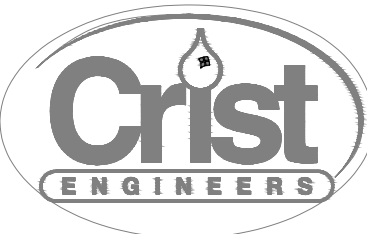
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LEGEND	
1	FHG-7 HYDRO-GRIT W /AIRLIFT
2	FHG-7 GRIT AIRLIFT - AIR/LIQUID SEPARATOR
4	AIR LIFT SUPPORT ANGLE - RH
5	AIR LIFT SUPPORT ANGLE - LH
19	2" DIA, SCH 40 PIPE x 4" LG, SST - THREADED BOTH ENDS - MNPT
20	2" DIA, SCH 40 PIPE x 9" LG, SST - THREADED BOTH ENDS - MNPT
21	2" DIA, SCH 40 PIPE x 84" LG, SST - THREADED ONE END - MNPT
22	2" SCH 40, 90° ELBOW, SST - THREADED
30	LOW PRESSURE AIR
31	DECANT
44	EFFLUNET
50	8" GRIT SCREW CLASSIFIER - STAINLESS STEEL (460/3/60)

REV. NO.	DATE	DRWN	CHKD	REMARKS

THIS LINE MEASURES 1"
WHEN PLOTTED FULL SIZE

DESIGNED:	MU
DRAFTED:	WTC
CHECKED:	CAJ
DATE:	JAN 2025



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SHERWOOD, ARKANSAS
WASTEWATER TREATMENT PLANT IMPROVEMENTS
GRIT EQUIPMENT AND CLASSIFIER REPLACEMENT

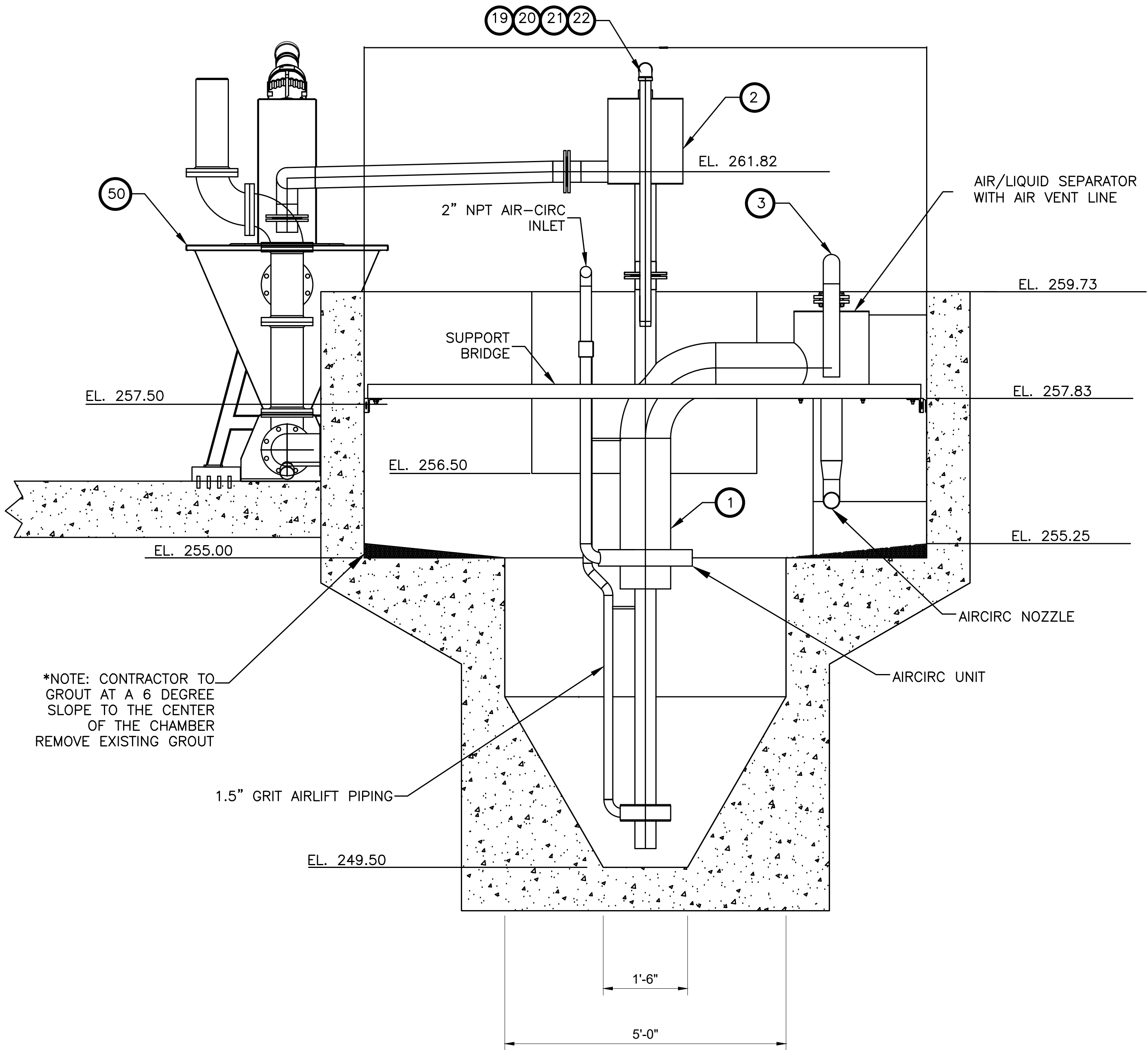
BID SET
CITY OF SHERWOOD
PROPOSED HEADWORKS SECTION I

JOB NO.

23013

SHEET NO.

C-05



GRIT REMOVAL EQUIPMENT
FRONT SECTION VIEW

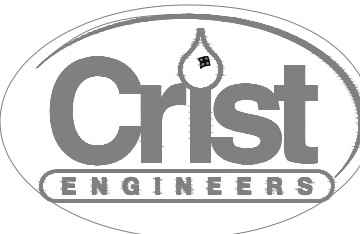
3/4" = 1'-0"

2
-

LEGEND	
1	FHG-7 HYDRO-GRIT W /AIRLIFT
2	FHG-7 GRIT AIRLIFT - AIR/LIQUID SEPARATOR
3	3" VENT LINE
19	2" DIA, SCH 40 PIPE x 4" LG, SST - THREADED BOTH ENDS - MNPT
20	2" DIA, SCH 40 PIPE x 9" LG, SST - THREADED BOTH ENDS - MNPT
21	2" DIA, SCH 40 PIPE x 84" LG, SST - THREADED ONE END - MNPT
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SHERWOOD, ARKANSAS

WASTEWATER TREATMENT PLANT IMPROVEMENTS
GRIT EQUIPMENT AND CLASSIFIER REPLACEMENT

BID SET
CITY OF SHERWOOD
PROPOSED HEADWORKS SECTION II

JOB NO.	23013
SHEET NO.	C-06