

**NOTICE TO CONTRACTORS**  
**INVITATION FOR BIDS**

Sealed Bids will be received by the City of Columbiana in the Council Chambers located at 107 Mildred Street, Columbiana, AL 35551 until September 5, 2017, at 2:00 P.M., local time, for furnishing all labor, materials, and equipment and doing the work of constructing, according to Plans, Specifications and Contract Documents on file in the office of the Owner, the improvements hereinafter described. No bids will be received after the time set forth hereinabove, and the Bids will be publicly opened and read.

The work of constructing the City of Columbiana Air Line Repairs will be let under one Contract. The principal items of work are detailed herein below.

Principal Work:

1. 1 LS Air Line Gasket Replacement and 1-6" Butterfly Valve

Plans, Specifications and Contract Documents are open to public inspection at the office of Owner, The City of Columbiana or may be obtained from the office of the Engineers, Utility Engineering Consultants, LLC, 2000 Crestwood Blvd., Suite 100, Irondale, Alabama 35210.

The Contractor is hereby advised that TIME IS OF THE ESSENCE on this project and that the contract time of 14 consecutive calendar days and noted restrictions shall be strictly observed. LIQUIDATED DAMAGES WILL BE ASSESSED IF THE CONTRACT TIME IS EXCEEDED. The Contractor may apply for an extension of time in accordance with the provisions of the contract; however, such an extension must be approved prior to the contract completion date to avoid the imposition of liquidated damages.

By: Stancil Handley, Mayor

**UTILITY ENGINEERING CONSULTANTS, LLC**  
2000 Crestwood Blvd , Suite 100  
Irondale, Alabama 35210  
(205) 951-3838

**SECTION 00410**

**BID FORM**

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**BID FORM**

**ARTICLE 1 - BID RECIPIENT**

1.01 This Bid is submitted to:

\_\_\_\_\_

The City of Columbiana

\_\_\_\_\_

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

**ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS**

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

**ARTICLE 3 - BIDDER'S REPRESENTATIONS**

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

E. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

F. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

G. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

J. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

#### **ARTICLE 4 - FURTHER REPRESENTATIONS**

4.01 Bidder further represents that:

A. this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

#### **ARTICLE 5 - BASIS OF BID**

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

**PROPOSAL FORM  
THE CITY OF COLUMBIANA AIR LINE REPAIRS  
CONTRACT NO. CO 17 065  
SEPTEMBER 2017**

Contractor's Name \_\_\_\_\_

License # \_\_\_\_\_

Item No.	Description	Estimated Quantity	Bid Unit Price	Bid Price
1.	Air Line Gasket Replacement and 1-6" Butterfly Valve as per Drawings Furnish and Install Complete  Per LS	1 LS		
<b>Written Form:</b>			<b>TOTAL BID</b>	

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

#### **ARTICLE 6 - TIME OF COMPLETION**

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

#### **ARTICLE 7 - ATTACHMENTS TO THIS BID**

- 7.01 The following documents are attached to and made a condition of this Bid:
  - A. Required Bid security in the form of Bid Bond or check
  - B. List of Proposed Subcontractors
  - C. List of Proposed Suppliers
  - D. List of Project References
  - E. Required Bidder Qualification Statement with Supporting Data
  - F. Affidavit of Non-Collusion
  - G. Bid Bond

#### **ARTICLE 8 - DEFINED TERMS**

- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

**BID SUBMITTAL**

8.01 This Bid submitted by:

If Bidder is:

An Individual

Name (typed or printed): \_\_\_\_\_

By: \_\_\_\_\_ (SEAL)  
*(Individual's signature)*

Doing business as: \_\_\_\_\_

A Partnership

Partnership Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature of general partner — attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

A Corporation

Corporation Name: \_\_\_\_\_ (SEAL)

State of Incorporation: \_\_\_\_\_

Type (General Business, Professional, Service, Limited Liability): \_\_\_\_\_

By: \_\_\_\_\_  
*(Signature — attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_  
(CORPORATE SEAL)

Attest \_\_\_\_\_

Date of Authorization to do business in *Alabama* is \_\_\_\_/\_\_\_\_/\_\_\_\_.

A Joint Venture

Name of Joint Venture: \_\_\_\_\_

First Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature of first joint venturer partner — attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title \_\_\_\_\_

Second Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_

*(Signature of second joint venturer partner — attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidder's

Business Address \_\_\_\_\_

Phone No. \_\_\_\_\_

Fax No. \_\_\_\_\_

SUBMITTED on \_\_\_\_\_, 20\_\_\_\_

State Contractor License No. \_\_\_\_\_



## SECTION 15051

### DUCTILE IRON PIPE

#### PART 1 - GENERAL

#### 1.1 THE REQUIREMENT

- A. **General:** The CONTRACTOR shall furnish and install Ductile Iron Pipe 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.
- B. **Manufacturer:**
1. The term "MANUFACTURER" shall mean the party that manufactures, fabricates, or produces materials or products.  
All 30-inch through 64-inch ductile iron pipe shall be the product of one manufacturer experienced in manufacturing pipe of the size, class, and quantity specified herein. The pipe manufacturer shall have manufactured 30-inch through 64-inch ductile iron pipe for a minimum of five (5) years. Prior to bid (or manufacture) the pipe manufacturer upon request shall submit to the OWNER or OWNER's ENGINEER a reference list for at least five (5) projects of comparable magnitude. This list shall include the following information: Location of Project; Quantity, Size, and Class; Owner, Address, Contact Name, and Phone.

#### 1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards:
1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
  2. ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Pipe Systems
  3. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
  4. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  5. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  6. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe
  7. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water
  8. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
  9. ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and their Appurtenances
  10. ANSI/AWWA C606 Grooved and Shouldered Joints
  11. ANSI/AWS D11.2 Guide for Welding Iron Casting

Note: Hereafter in this specification the specific referenced ANSI/AWWA standards are referred to either by their full description as in the first column of the above standards list, or only by their abbreviated AWWA "C" designation (e.g. AWWA C151 is meant to refer to ANSI/AWWA C151/A21.51, etc.).

#### 1.3 CONTRACTOR SUBMITTALS

- A. Shop Drawings/Lay Schedules: The CONTRACTOR upon request shall submit catalog cuts of pipe and fittings in accordance with the requirements of this Section.
1. Certified dimensional drawings of all valves, fittings, and appurtenances.
  2. Certified dimensional drawings of joints, showing the manufacturer's allowable deflections.

3. Copies of the manufacturer's approved installation instructions for the types of joints being used.
  4. For pipe 42 inches in diameter and larger, lay schedules that indicate the type of pipe, fitting, or special, and the location and the direction of each of these components in the completed line shall be provided. In addition, the lay schedule shall include: the pipe stationing at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or concrete encasement.
- B. **Certifications:** Upon request the CONTRACTOR shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section, as specified in the referenced standards and as specified in Section 1.4 – Quality Assurance.
- C. **Sample Costs:** All expenses incurred in making samples for certification of specified tests shall be borne by the MANUFACTURER.

#### 1.4 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. **ISO/Third Party Inspection:**
1. All pipe material suppliers shall be ISO 9001:2000 registered or provide the services of an Independent Inspection Agency. ISO 9001:2000 registration shall have been certified by a qualified ISO registrar. Prior to the start of manufacturing any manufacturer not meeting the ISO registration requirements shall submit to the OWNER or OWNER's ENGINEER, for approval, a list of qualifications for a minimum of three (3) Independent inspection agencies. These qualifications shall include but are not limited to the following:
    - a. List of project references for projects of similar type and size
    - b. Resumes for inspection and testing personnel
    - c. Capacities for chemical and mechanical testing of material specimens
    - d. Frequencies for all instrument and testing equipment certifications
  2. The independent testing agency will be responsible for observing, verifying, and documenting all quality assurance testing for the production of pipe material produced for this project. Independent inspection agency shall ensure that all pipe sections produced for this project have traceability such that each individual pipe section can be referenced to the following chemical, mechanical, and performance tests:
    - a. Chemistry
      - 1) Ladle Number
      - 2) Ladle Chemistry

- b. Mold Number
  - 1) Mold Production History
- c. Bracketed Mechanical Testing
  - 1) Tensile Yield
  - 2) Elongation
  - 3) Charpy Test
- d. Hydrostatic Proof Test
  - 1) Chart Recorder Graph
  - 2) Proof Test Pressure
- e. Annealing
  - 1) Annealing Furnace Number
  - 2) Horizontal Continuous Annealing Ovens, Record Pipe Flow Through Speeds
  - 3) Horizontal Annealing Ovens, Record Pipe Rotation Speeds
  - 4) Vertical Stationary Annealing Ovens, Record Position of Pipe in Oven
  - 5) Chart Recorder Graph of Time and Temperatures During Annealing Process
- f. Pipe Weight
- g. Lining/Coating/Finishing
  - 1) Cement Analysis,
  - 2) Sand Cement Ratio
  - 3) Curing Temperature and Humidity Records
- h. Prior to the start of pipe manufacture the independent testing agency shall review all calibration certifications for all measuring instruments (e.g., weight scales, tape measures, dial gage indicators, tensile tester load cells, etc.) used to ensure the quality of the pipe and if necessary perform certification tests in accordance with the National Institute of Standards and Technology. The independent testing agency shall verify that written procedures and job training records are available for operations personnel for each production operation, including but not limited to raw material processing, melting, pipe casting, annealing, testing and inspection, lining, coating, etc. At all times the independent inspection agency shall verify compliance with these written procedures and these specifications.
- i. During pipe manufacture the independent inspection agency shall provide adequate qualified personnel to facilitate a thorough and complete observation of the pipe's production from raw materials through final shipment. The independent inspection agency shall observe, review, document all tests required by AWWA/ANSI C151/A21.51 and these specification performed by the manufacturer. The independent inspection agency shall also be responsible for performing verification tests on materials and samples to support the results of manufacturer performed testing. The table below indicates the required tests to be performed by the manufacturer and frequency of observations and re-testing for the independent testing agency.

**Table No. 1**

Operation Area	Required Tests	Frequency
Raw Materials	Analysis of chemical content of metallics, coke, fluxes, silicon.	Review daily
Cupola	Analysis of chemical content of molten stream.	Observed tests: every 30 minutes. Verification tests: retest one (1) each day
	Analysis of chemical content after inoculation.	Observed tests: every ladle Verification tests: retest one (1) sample out of every five (5).
Post Annealing	Visual inspection.	Observed tests: every pipe.
	Dimensional verification.	Observed tests: every pipe. Verification tests: retest one (1) pipe out of every ten (10)
	Mechanical properties verification (tensile, impact, hardness)	Observed tests: each test Verification tests: retest one (1) sample

Operation Area	Required Tests	Frequency
		out of every ten (10).
	Microstructure	Observed tests: each test
Hydrotesting	Hydrostatic proof test	Observed tests: each pipe
Lining	Visual inspection Lining thickness testing	Observed tests: each pipe
Final Inspection	Visual inspection	Verification Tests: each pipe shall be visually inspected and stamped with the inspector stamp.

- j. The independent inspection agency shall verify that all test results of the manufacturer and those re-tests performed by the independent testing agency are referenced to each individual pipe section for traceability in the future. This information shall be in a suitable format that, at the request of the owner or owner's engineer, may be downloaded into a spreadsheet format.

F. **Factory Hydrostatic Test:** All pipe shall be subject to a factory hydrostatic test of at least 500 psi for a period of not less than 10 seconds, for 30-inches and larger the pressure will then be elevated to a peak pressure that induces a stress in the pipe wall equivalent to 75% of the minimum specified yield strength of ductile iron (42,000 psi) as calculated by the following formula:

$$p = \frac{2f_s t}{D}$$

- Where: p = peak hydrostatic pressure  
 $f_s$  = 31,500 psi, stress in pipe wall during hydrostatic test, which shall be 0.75 times the minimum yield strength of the ductile iron in tension (42,000 psi)  
t = nominal wall thickness, in.  
D = outside diameter, in.

**Table No. 2**

Factory Hydrostatic Test Pressures for Ductile Iron Pipe (30 in and Larger)										
Pressure Class	150		200		250		300		350	
Pipe Size/ Outside Diameter	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)
30" / 32.00	0.34	669	0.38	748	0.42	827	0.45	886	0.49	965
36" / 38.30	0.38	625	0.42	691	0.47	773	0.51	839	0.56	921
42" / 44.50	0.41	580	0.47	665	0.52	736	0.57	807	0.63	892
48" / 50.80	0.46	570	0.52	645	0.58	719	0.64	794	0.70	868
54" / 57.60	0.51	558	0.58	635	0.65	711	0.72	788	0.79	865
60" / 61.60	0.54	552	0.61	624	0.68	695	0.76	777	0.83	849
64" / 65.70	0.56	537	0.64	614	0.72	691	0.80	767	0.87	835

- G. **Affidavits:** Upon request the CONTRACTOR shall submit affidavits of compliance from the MANUFACTURER for the following:
1. Ductile iron pipe in accordance with the requirements of AWWA C151 and these specifications.

2. Cement mortar lining of ductile iron pipe, specials and fittings in accordance with the requirements of AWWA C104 and these specifications.
3. Polyethylene encasement for ductile iron piping in accordance with AWWA C105 (if specified).
4. Rubber gasket joints for ductile iron pressure pipe and fittings in accordance with the requirements of AWWA C111 and these specifications.
5. Charpy impact testing of ductile iron used in the manufacture of pipe shall be performed in accordance with AWWA C151.

The minimum corrected absorbed energy (ft.-lb.) shall be as follows:

$$7 \text{ ft.-lb. at } 70^{\circ} \text{ F } \pm 10^{\circ} \text{ F}$$

6. Low-temperature impact tests shall be made from at least 10% of the test pipe to assure compliance. The minimum corrected absorbed energy (ft.-lb.) shall be as follows:

$$3 \text{ ft.-lb at } -40^{\circ}\text{F}(^{\circ}\text{C})$$

7. The affidavits of compliance shall be certified by a registered professional engineer.

#### H. Domestic Manufactures

1. Ductile iron pipe shall be designed and manufactured in accordance with ANSI/AWWA C 150/A21.50 and ANSI/AWWA C 151/A21.51, latest revisions. All pipe must be new and shall be manufactured in the United States of America (USA); all ductile iron pipe shall be cast, cleaned, lined, coated, tested, and certified at a single manufacturing facility located in the USA - with all manufacturing units contiguous to one another. Approved USA manufacturers are American, U.S. Pipe, Tyler or equivalent.
2. All pressure pipe for water service shall be SMaRT certified by the institute for Market Transformation to Sustainability.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. **Standards:** Ductile iron pipe shall conform to AWWA C151, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents. The ductile iron pipe, specials, and fittings shall be manufactured or supplied by American Ductile Iron Pipe (a division of American Cast Iron Pipe Company, Birmingham, Alabama) or pre-approved equal.
- B. **Markings:** Upon request the CONTRACTOR shall require the MANUFACTURER to legibly mark specials in accordance with the laying schedule and marking diagram.
- C. **Laying Lengths:** Pipe laying lengths shall be provided in 20 feet nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths provided as required by the Drawings.

#### **2.2 PIPE DESIGN**

- A. **Design Parameters:** All ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and AWWA C151, respectively, for the following minimum operating conditions:
  1. The minimum internal design pressure shall be 150 psi with a 100-psi surge allowance, with a safety factor of 2, for a total internal design pressure of 500 psi. No reduction of safety factor for transient pressures shall be allowed.

2. The external loads design criteria shall be a minimum of 4 feet depth of cover at 120 lbs. 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.
3. The horizontal deflection of cement mortar lined ductile iron pipe resulting from external load conditions shall not exceed three percent of the pipe diameter.
4. The pipe trench, per AWWA C150, for design purposes shall be:
  - a. Laying condition Type 4 – Pipe bedded in sand, gravel or crushed stone to depth of 1/8 pipe diameter, 4” minimum. Backfill compacted to top of pipe. (Approximately 80% Standard Proctor, AASHTO T-99.)
5. For purposes of restrained joint calculations per the Ductile Iron Pipe Research Association (DIPRA) method, the soil classification\* for both the native trench soil and also the backfill soil to surround the pipe shall be defined with one or more of the following options:

<u>Option A</u>	<u>Option B</u>	<u>Option C</u>	<u>Option D</u>	<u>Option E</u>	<u>Option F</u>	<u>Option G</u>
Clay 1	Silt 1	Clay 2	Silt 2	Coh-gran	Sand Silt	Good Sand

\* As described in DIPRA’s “Thrust Restraint Design for Ductile Iron Pipe,” latest edition.

- B. **Minimum Pipe Class:** Ductile iron pipe shall conform to AWWA C151. All pipe shall have a minimum pressure rating as indicated below, or higher ratings as indicated in the contract documents:

**Table No. 3**

Pipe Sizes (inch)	Pressure Class (psi)
4-12	350
14-20	250
24	200
30-64	150

## 2.3 JOINT DESIGN

- A. **General:** Ductile Iron Pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, flanged joints, and grooved joints as required.
- B. **Push-on Joints:** Push-on joints shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.) Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or pre-approved equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less. Standard allowable joint deflection for 4” – 30” Fastite pipe shall be five degrees, for 36” Fastite pipe shall be four degrees, and for 42” – 64” Fastite pipe shall be three degrees. Allowable deflection of American’s Fastite joint “Special Deflection Bells” for 36” – 42” shall be five degrees and for 48” – 64” shall be four degrees.
- C. **Restrained Joints:** Restrained joints shall be “Flex-Ring” or “Lok-Ring” restrained joints as manufactured by American Ductile Iron Pipe or pre-approved equal. Field-adaptable restraint shall be provided through the use of “Fast-Grip” or “Field Flex-Ring” as manufactured by American Ductile Iron Pipe, or other pre-approved and bolt-less, push-on restrained devices. When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR.) Restrained joints and restrained joint pipe shall be rated for the minimum pressure shown in **Table No. 4** or the specified pressure rating of the pipe, whichever is less. The

MANUFACTURER shall furnish test results showing that restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Torque-activated restrained joint devices that rely on threaded bolts or set-screws for joint restraint shall not be used.

**Table No. 4**

<b>RESTRAINED JOINT PRESSURE RATINGS, (psi) &amp; ALLOWABLE JOINT DEFLECTIONS</b> (Limited to the pressure rating of the pipe)				
JOINT SIZE	FASTGRIP	FIELD FLEXRING	FLEXRING	LOKRING
4"	350 / 5°		350 / 5°	
6"	350 / 5°		350 / 5°	
8"	350 / 5°		350 / 5°	
10"	350 / 5°		350 / 5°	
12"	350 / 5°		350 / 5°	
14"	250 / 4°	350 / 4°	350 / 4°	
16"	250 / 3°	350 / 3.75°	350 / 3.75°	
18"	250 / 3°	350 / 3.75°	350 / 3.75°	
20"	250 / 3°	350 / 3.5°	350 / 3.5°	
24"	250 / 3°	350 / 3°	350 / 3°	
30"	150/2.5°	250 / 2.5°	250 / 2.5°	
36"		250 / 2°	250 / 2°	
42"				250 / 0.5°
48"				250 / 0.5°
54"				250 / 0.5°
60"				250 / 0.5°
64"				250 / 0.5°

- D. Flanged Joints – Pipe: Candidate pipe for 4”- 54” flanged pipe thread-fabrication shall be Special Thickness Class 53 and for 60” – 64” flanged thread-fabrication shall be Pressure Class 350 ductile iron pipes, all in accordance with AWWA C115. Threaded companion flanges for ductile iron pipe shall be ductile iron in accordance with AWWA C115, not ANSI B16.1. Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSE B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. The threaded flanges shall be individually fitted and machine tightened on the pipe ends. Bolts, gaskets and installation shall be in accordance with AWWA C115, Appendix A requirements, and flanged gaskets shall be Toruseal gaskets as manufactured by American Ductile Iron Pipe, with a special seal design. Toruseal gaskets must be used for all 54” – 64” flanged piping, for all glasslined piping, and for all buried flanged joints. Gaskets shall be full face Toruseal design for all service installations. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ANSI B16.21. Flange facing shall be smooth or with shallow serrations per AWWA C115.

- 1 To insure accountability, all flanged pipe shall be fabricated at the factory by the pipe manufacturer.

- E. **Flanged Joints – Fittings:** Flange fittings shall be ductile iron in accordance with AWWA C110 or AWWA C153, not ANSI B16.1. Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. Bolts, gaskets and installation shall be in accordance with AWWA C110 or AWWA C115, Appendix A requirements, and flanged gaskets shall be Toruseal gaskets as manufactured by American Ductile Iron Pipe, with a special seal design. Toruseal gaskets must be used for all 54” – 64” flanged piping, for all glasslined piping, and for all buried flanged joints. Gaskets shall be full face Toruseal design for all service installations. Gaskets for flanged ductile iron pipe must *not* have the larger inside diameters provided by the requirements of ANSI B16.21. Flange facing shall be smooth or with shallow serrations per AWWA C110 or AWWA C153.
- F. **Welded-on Thrust Collars:** Welded-on thrust collars, for wall pipe and pipe thrust restraint, shall be welded steel collars designed for the thrust generated by 250 psi working pressure with a safety factor of at least two (2.0) against failure. Welded-on thrust collars shall be as manufactured by American Ductile Iron Pipe or pre-approved equal. The manufacturer shall qualify all welding procedures and welders per the requirements of a documented quality assurance system based on ANSI/AWS D11.2.
- G. **Mechanical Joints:** Mechanical joints shall conform to AWWA C111. Bolts shall be high strength low alloy steel per AWWA C111. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR) per this standard.
- H. **Grooved Joints:** Unless specifically otherwise called for on the contract drawings, grooved joints shall be an approved substitute for flanged joints. Grooved pipe and groove joints shall be in accordance with AWWA C606. Rigid radius groove dimensions shall be utilized. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the ENGINEER and as specifically shown on the contract drawings. Gasket material shall be Grade “M” halogenated butyl. Bolts shall be heat treated plated carbon steel, track head, conforming to the mechanical properties of ASTM A-183, minimum tensile strength 110,000 psi. Grooved ductile iron pipe shall be Special Thickness Class 53 for 4” – 16”, Class 54 for 18”, Class 55 for 20”, and Class 56 for 24” – 36”.

*Commentary – The following table of available push-on and mechanical joint gaskets and services is to be used for selecting various gasket compounds for push-on and mechanical joints. The maximum service temperatures are based on lowest temperature rated mechanical joint applications, but shall also be suitable for push-on joint applications. The manufacturer should be consulted for higher temperature rating requirements that will generally be met by superior performance of push-on joint design.*

Common Name Or Trade Name	Chemical Name	Temperature Capability	Common Uses
Plain Rubber	Styrene Butadiene (SBR)	120°F	Fresh Water, Salt Water, Sanitary Sewage
Neoprene	Polychloroprene (CR)	200°F	Fresh Water, Sewage, Outdoor Exposure
Fluoroelastomer Fluorel Viton	FKM	225°F	Aromatic Hydrocarbons, Gasoline, Refined Petroleum Products, most Chemicals and Solvents, High Temperature, Air
Buna-N Nitrile	Acrylonitrile Butadiene	120°F	Non-Aromatic Hydrocarbons, Petroleum Oil, Hydraulic Fluids, Fuel Oil, Fats, Oil, Grease, Digester Gas



Common Name Or Trade Name	Chemical Name	Temperature Capability	Common Uses
EPDM	Ethylene Propylene Diene Monomer	225°F	Water, Sewage, Ketones, Dilute Acids and Alkalies, Vegetable Oil, Alcohols, Outdoor Exposures, Air

## 2.4 FITTINGS

- A. **General:** Fittings shall be ductile iron in accordance with AWWA C110, AWWA C153, or AWWA C606, latest revisions.
- B. **Cement Lining:** Fittings shall be internally lined with cement mortar in accordance with AWWA C104. The lining thicknesses shall be equal to or greater than those for comparable size pipe.
- C. **Buried Service Fittings:** Fittings, sizes 4" – 24", with push-on, restrained push-on, or mechanical joints shall be rated for 350 psi working pressure. Fittings, sizes 30" – 64", with push-on, restrained push-on, or mechanical joints shall be rated for 250 psi working pressure.
- D. **Aboveground Service Fittings:** Fittings, sizes 4" – 64", with flanged joints shall be rated for 250 psi working pressure. Fittings, sizes 4" – 36", with grooved joints shall be rated for 250 psi working pressure. Grooved couplings shall be rated for 250 psi working pressure for 4" – 18" and 150 psi working pressure for 20" – 36".

## 2.5 WELDED-ON OUTLETS

- A. **Outlet Size and Parent Pipe Size:** Welded-on outlets shall be limited to branch outlets having a nominal diameter not greater than 70% of the nominal diameter of the main line pipe or 36-inch whichever is smaller (see Table No. 1), with all fabrications subject to further requirements of the following specification with regard to design and manufacture. The MANUFACTURER shall have the capability to furnish welded-on outlets as a radial (tee) outlet, tangential outlet, or lateral outlet fabricated at a specific angle to the main line pipe (in 15° increments between 45° and 90° from the axis of the main line pipe), as indicated on the drawings. Welded-on outlets shall be fabricated by the pipe manufacture at the same facility where the pipe is produced. The pipe manufacturer shall have a minimum of 5 years experience in the fabrication and testing of outlets of similar size and configuration.

**Table No. 5**

Main Line Nominal Diameter Versus Maximum Nominal Branch Outlet Diameter			
Main Line Nominal Dia.	Branch Outlet Nominal Dia.	Main Line Nominal Dia.	Branch Outlet Nominal Dia.
10"	6"	30"	20"
12"	8"	36"	24"
14"	8"	42"	30"
16"	10"	48"	30"
18"	12"	54"	*30"
20"	14"	60"	*30"
24"	16"	64"	*30"

- B. **Outlet Joint Types:** The joints on welded-on branch outlets shall meet, where applicable, the requirements of AWWA C111 and/or AWWA C115.

**C. Design:**

- 1 The pipe wall thickness and weld reinforcement design for welded-on outlet fabrications shall be based on a method similar to that which is described in Section 13 of AWWA Manual M11 for similar welded outlets on steel pipe (which in turn refers to Section VIII of the ASME Unfired Pressure Vessel Code for design method details). Reinforcing welds shall be placed using Ni-Rod FC 55<sup>0</sup> cored wire, Stoodly Castweld Ni 55-0 cored wire, or Ni-Rod 55<sup>0</sup> electrodes manufactured by INCO Alloys (or an electrode with equivalent performance properties). Carbon steel electrodes are not acceptable. Upon request, the MANUFACTURER shall provide test results indicating typical mechanical properties of the utilized weld material (an all-weld sample), as well as typical mechanical properties from transverse tensile and impact specimens machined from butt-weld joined ductile iron pipe coupons to show the suitability or equivalence of the electrodes used.
- 2 Parent pipe and branch outlet candidate pipe shall be centrifugally cast ductile iron pipe designed in accordance with AWWA C150 and manufactured in accordance with AWWA C151. Minimum classes for parent and outlet pipe shall be: for sizes 4-inch through 54-inch, Special Thickness Class 53; for sizes 60-inch through 64-inch, Pressure Class 350.
- 3 All welded-on outlets 6-inch through 30-inch shall be rated for a working pressure of 250 psi. Welded-on outlets 36-inch and larger shall be rated for 200 psi. Welded-on outlets of all diameters and configurations must have a minimum safety factor of 2.5 based on proof of design hydrostatic test results. The MANUFACTURER shall, at the request of the OWNER or OWNER's ENGINEER, provide representative proof test data confirming the design, hydrostatic test results, and safety factors.
- 4 Prior to the application of any coating or lining in the outlet area all weldments for branch outlets to be supplied on this project shall be subjected to an air pressure test of at least 15 psi. Air leakage is not acceptable. Any leakage shall be detected by applying an appropriate foaming solution to the entire exterior surface of the weldment and adjoining pipe edges or by immersing the entire area in a vessel of water and visually inspecting the weld surface for the presence of air bubbles. Any weldment that shows any signs of leakage shall be repaired and re-tested in accordance with the manufacturers' written procedures.

**D. Quality Assurance**

- 1 The manufacturer shall have a fully documented welding quality assurance system and maintain resident quality assurance records based on ANSI/AWS D11.2, the *Guide for Welding Iron Castings*. The manufacturer shall maintain appropriate welding procedure specification (WPS), procedure qualification (PQR), and welder performance qualification test (WPQR) records as well as appropriate air test logs documenting air leakage tests on all welded on outlet pipes furnished to the project. The manufacturer shall have ISO 9001:2000 registration.
- 2 Prior to the start of manufacturing any proposed manufacturer not meeting ISO 9001:2000 registration requirements shall submit to the OWNER or OWNER's ENGINEER the name of an Independent Inspection Agency and the agency's qualifications. Submitted qualifications shall include but are not limited to the following:
  - a. List of project references for projects of similar type and size
  - b. Resumes for inspection and testing personnel
  - c. Capacities for chemical and mechanical testing of material specimens
  - d. Frequencies for all instrument and testing equipment certifications
- 3 The independent inspection agency shall be responsible for all of the following:
  - a. Verify compliance to written welding procedures, specification (WPS), and procedure qualification (PQR).
  - b. Verify qualification of all welders (WPQR) per ANSI/AWS D11.2 criteria
  - c. Document use of Ni-Rod FC 55<sup>®</sup> cored wire or Ni-Rod 55<sup>®</sup> electrodes manufactured by INCO Alloys, Stoodly Cast-Weld 55-0 cored wire, or an electrode with equivalent performance properties. The independent testing agency shall provide test results indicating typical mechanical properties of the utilized weld material (an all-weld sample), as well as typical

mechanical properties from transverse tensile and impact specimens machined from butt-weld joined ductile iron pipe coupons to show the suitability or equivalence of the electrodes used.

- d. Witness and document all air testing of outlet welds

## **2.6 EXTERIOR LINING - SEWER**

- A. Buried Ductile Iron Pipe: The exterior of ductile iron pipe, special, and fittings shall be coated with a 1 mil asphaltic coating in accordance with AWWA C151, Section 51-9. When specified, loose polyethylene encasement shall be supplied in accordance with AWWA C105.
- B. Aboveground Ductile Iron Pipe: The exterior of ductile iron pipe, specials, and fittings shall be coated with one of the following coatings or primers:

Above Grade - Exterior (Mild Exposure)

Tnemec Series N140-1211 Pota-Pox Plus Primer at 6.0 – 8.0 mils DFT.

Above Grade - Interior/Exterior Immersion/Non-immersion (Mild to Aggressive Exposure). Tnemec Series N140—1211 Pota-Pox Plus Primer applied at 6.0- 8.0 mils DFT

## **2.7 PIPE AND FITTINGS JOINTS**

### **A. JOINTS:**

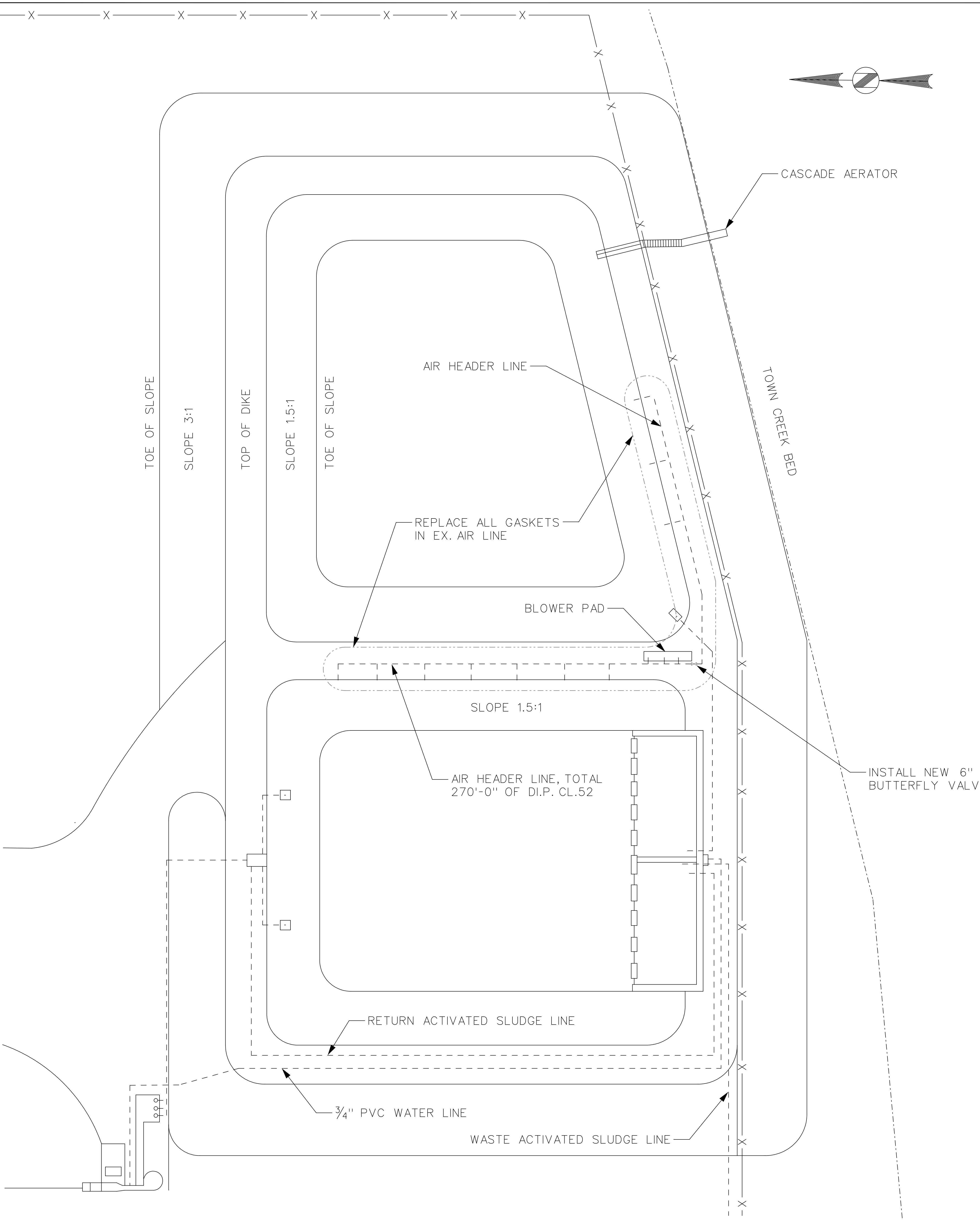
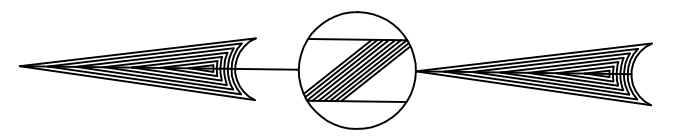
- 1 Ductile iron pipe and fittings to have rubber gasket joints in accordance with the latest revision of ANSI/AWWA C111/A21.11. Buried piping and fittings shall be either push-on joint (pipe), push-on restrained joint, or mechanical joint (fittings-only, where specified; see \*\* below).
- 2 Piping and fittings above ground shall be flanged.
- 3 Where buried restrained pipe joints are required to resist thrust due to internal pressure, restrained gasket [AMERICAN Amarillo Fast-Grip or equal, colored (yellow, orange, etc.) restrained joint gasket] - or fabricated, push-on restrained joints (AMERICAN Flex-Ring or AMERICAN Lok-Ring joints - or equal) shall be utilized at the specified locations.
- 4 Where buried restrained fitting joints are required to resist thrust due to internal pressure, restrained mechanical joints (MJ) [in limited situations; see \*\* below] utilizing torque-activated MJ restraints (MegaLugs, One-Loks, or equal), restrained gasket [AMERICAN Amarillo Fast-Grip or equal, colored (yellow, orange, etc.) restrained joint gasket] - or fabricated, push-on restrained joints (AMERICAN Flex-Ring or AMERICAN Lok-Ring joints - or equal) shall be utilized at the specified locations.
- 5 Restrained joints shall be rated for a working pressure of 350 psi minimum (4@-18@) and 250 psi minimum (20@-64@).

\*\* Restrained joints (for items other than fittings less than or equal to 14@ and MJ sleeves and MJ valves) using set screws such as retainer glands, Mega-Lugs, or other torque-activated means of restraint shall be permitted only following specific approval by the owner / engineer.

## **2.8 AMARILLO FAST-GRIP GASKETS FOR DUCTILE IRON PIPE**

- A. Four-inch through 30-inch restrained joints shall be AMERICAN Amarillo Fast-Grip gasket and joint restraining system.
- B. Pressure ratings shall be 350 psi for 4-inch through 18-inch; 250 psi for 20-inch through 24-inch; and 150 psi for 30-inch, but in no case shall the joint be considered rated at a higher pressure than the pipe of which it is a part.
- C. Joint deflection shall be 5 degrees for 4-inch through 12-inch; 4 degrees for 14-inch; 3 degrees for 16-inch through 24-inch; and 2.5 degrees for 30-inch.

- D. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.
- E. Gaskets shall be yellow in color, and the yellow color shall be consistent throughout the entire cross section of the gasket. The yellow color shall not be attained by surface coating; it shall be inherent within the rubber.
- F. Restraining gaskets shall be manufactured in the United States.



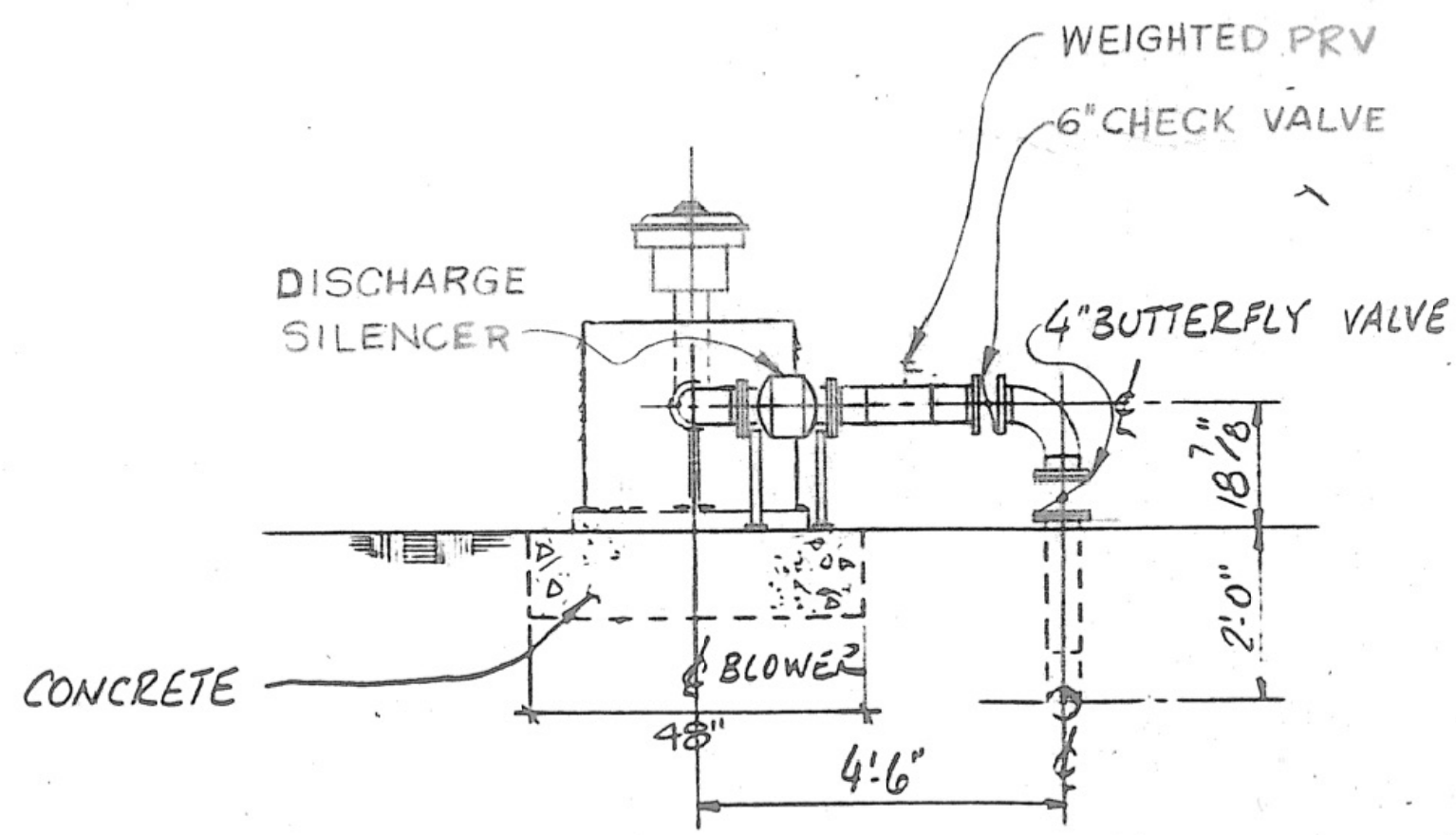
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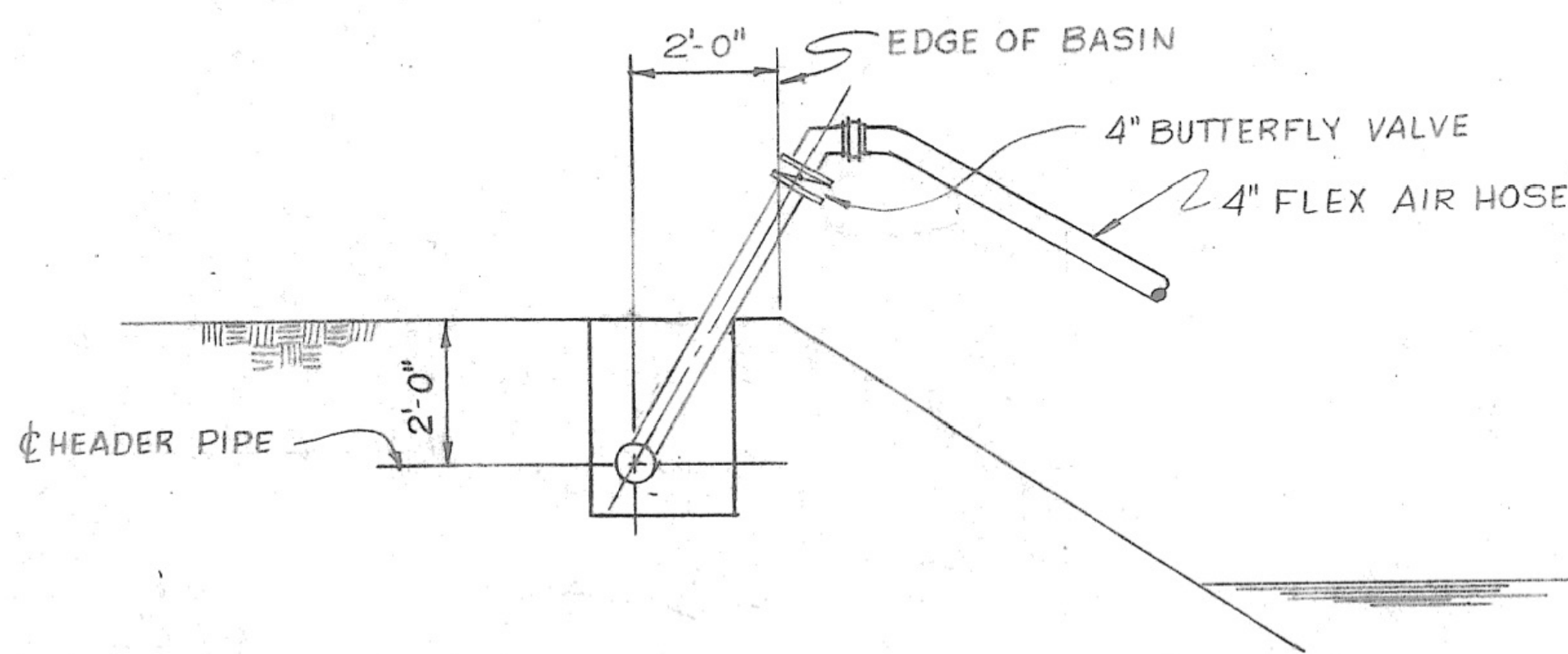
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Irondale, Alabama 35210

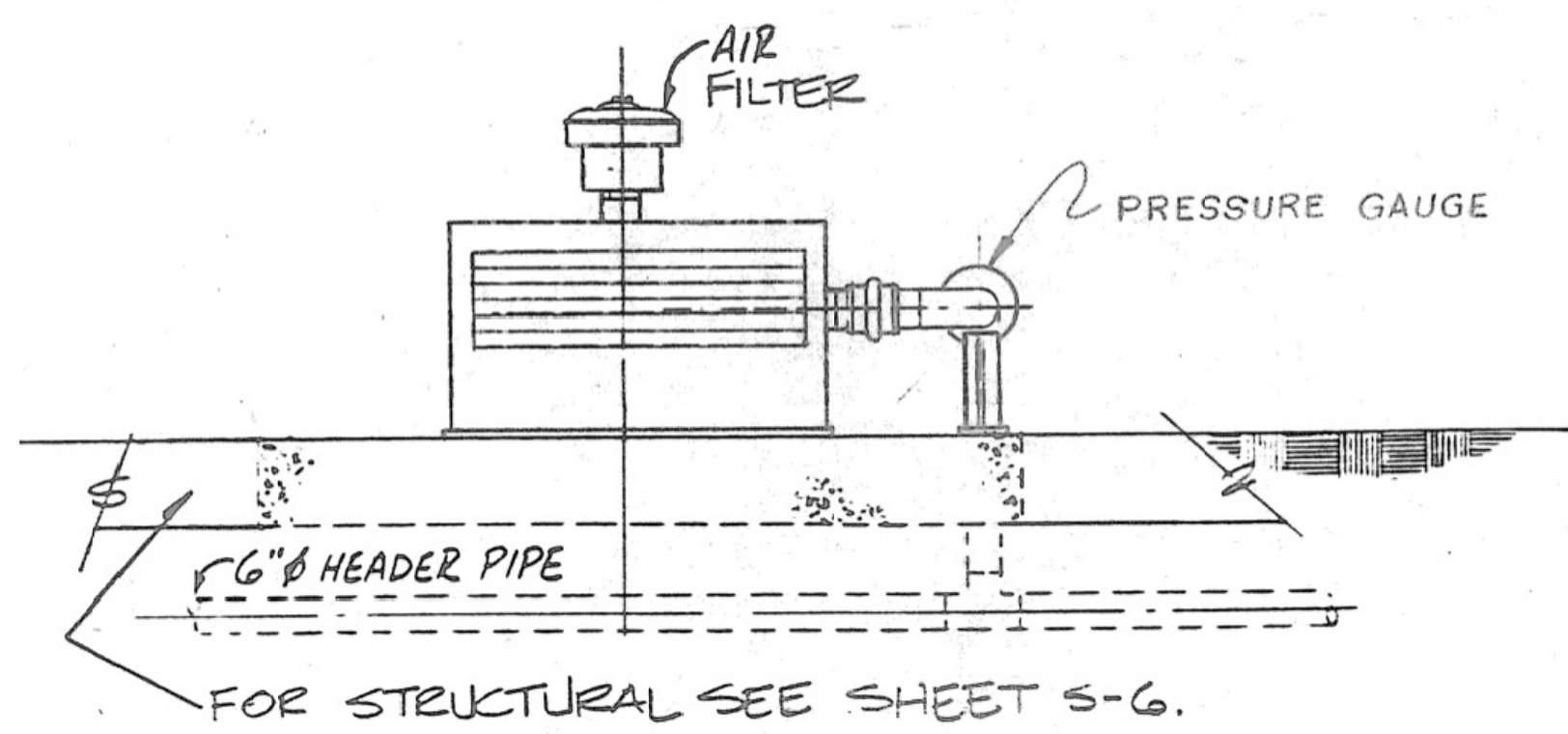
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DETAIL 2  
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DETAIL 3  
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