

CONTRACT: 278-78  
PROJECT: Mason Farm WWTP Fermenter Mixing Improvements  
DATE: October 13, 2021

DOCUMENT 00 91 13

ADDENDA

ADDENDUM NUMBER 2

DATE: October 13, 2021

PROJECT: MASON FARM WWTP FERMENTER MIXING IMPROVEMENTS

OWASA CIP NUMBER: 278-78

OWNER: ORANGE WATER AND SEWER AUTHORITY

ENGINEER: BROWN AND CALDWELL

TO: Project Planholders

This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated July 2021 and September 2021, Addendum Number 1 issued October 8, 2021, with amendments and additions noted herein below.

Acknowledge receipt of this Addendum in the space provided in the Bid form. Failure to do so may disqualify the Bidder.

This Addendum consists of 3 pages:



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**CHANGES TO THE SPECIFICATIONS:**

SECTION 40 05 63.08

1. Insert Section 40 05 63.08 SST Flanged Ball Valves, included as Attachment 1, between Section 40 05 63.05 and Section 40 06 20.13.

SECTION 40 05 23

1. Insert Section 40 05 23 Stainless Steel Pipes, included as Attachment 3, between Section 43 05 19 and Section 40 05 45.

SECTION 40 05 63.08

1. Insert Section 40 05 24 Steel Pipe, included as Attachment 4, between Section 40 05 23 and Section 40 05 45.

**CHANGES TO THE DRAWINGS:**

SHEET 000-M-04

1. Replace Sheet 000-M-04 with Attachment 2.

**CLARIFICATIONS FOLLOWING QUESTIONS FROM BIDDERS:**

Question:	Answer:
<p>DWGs 000-M-04, DTL “Piping vent and drain” detail (we assume that it is this detail being reference by Keynote #3 on DWG 850-M-14). This detail calls for valves to be plug, whereas the P&amp;ID drawings show a ball valve symbol. Note #2 on this detail specifies an MNPT connection to the valve, whereas the plug valve spec (40 05 62.12) includes only flanged connections. Are we permitted to use a threaded companion flange to facilitate a threaded connection? Please confirm this is the correct detail for the 12” FPS suction and discharge lines and please confirm valve type.</p>	<p>On 850-M-14, Keynote #3 refers to “Pipe support location to remove stress on pump connection.” For drain connections (Keynote #8), Detail A on Sheet 000-M-04 should be used. For flushing connections (Keynote #9), the ‘Inline Pipe Flushing’ or ‘Process Pipe Elbow Flushing Connection’ details should be used. For vent and drain connections for the automatic air release valve (Keynote 2 on sheet 850-M-14), the ‘Piping vent and drain’ detail should be used, and a ball valve would be acceptable. See Attachment 2 for updates to this detail.</p>
<p>Spec 40 05 63.03 (SSTL ball valves) includes only threaded connections up to 3”, however SHT 850-M-14 calls for a 4” SSTL ball valve, P&amp;ID SHT P-01 does not show this valve at all and spec 40 05 02.11, COND specifies</p>	<p>Specification Section 40 05 63.08, included as an attachment, specifies flanged stainless steel ball valves between 2” and 24”. This specification should be used for the 4” SST</p>

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that valves 3" thru 48" are to be high-performance butterfly valves (40 05 64.03) which we were unable to find. Please confirm valve information for the 4" portion of the COND line.	ball valve shown on Section 3 of Sheet 850-M-14.
It appears that there may be a couple of spec sections missing: 40 05 23 & 24 (relating to stainless and galv steel). Have I missed them? Please publish missing specification section as soon as possible	Specification Sections 40 05 23 and 40 05 24 are included as Attachments 3 and 4 of this Addendum.

**ATTACHMENTS:**

1. Section 43 05 63.08 SST Flanged Ball Valves
2. Sheet 000-M-04 Mechanical Details
3. Section 43 05 23 Stainless Steel Pipe
4. Section 43 05 24 Steel Pipe

-END OF DOCUMENT-



## **Attachment 1. Section 43 05 63.08 – SST Flanged Ball Valves**

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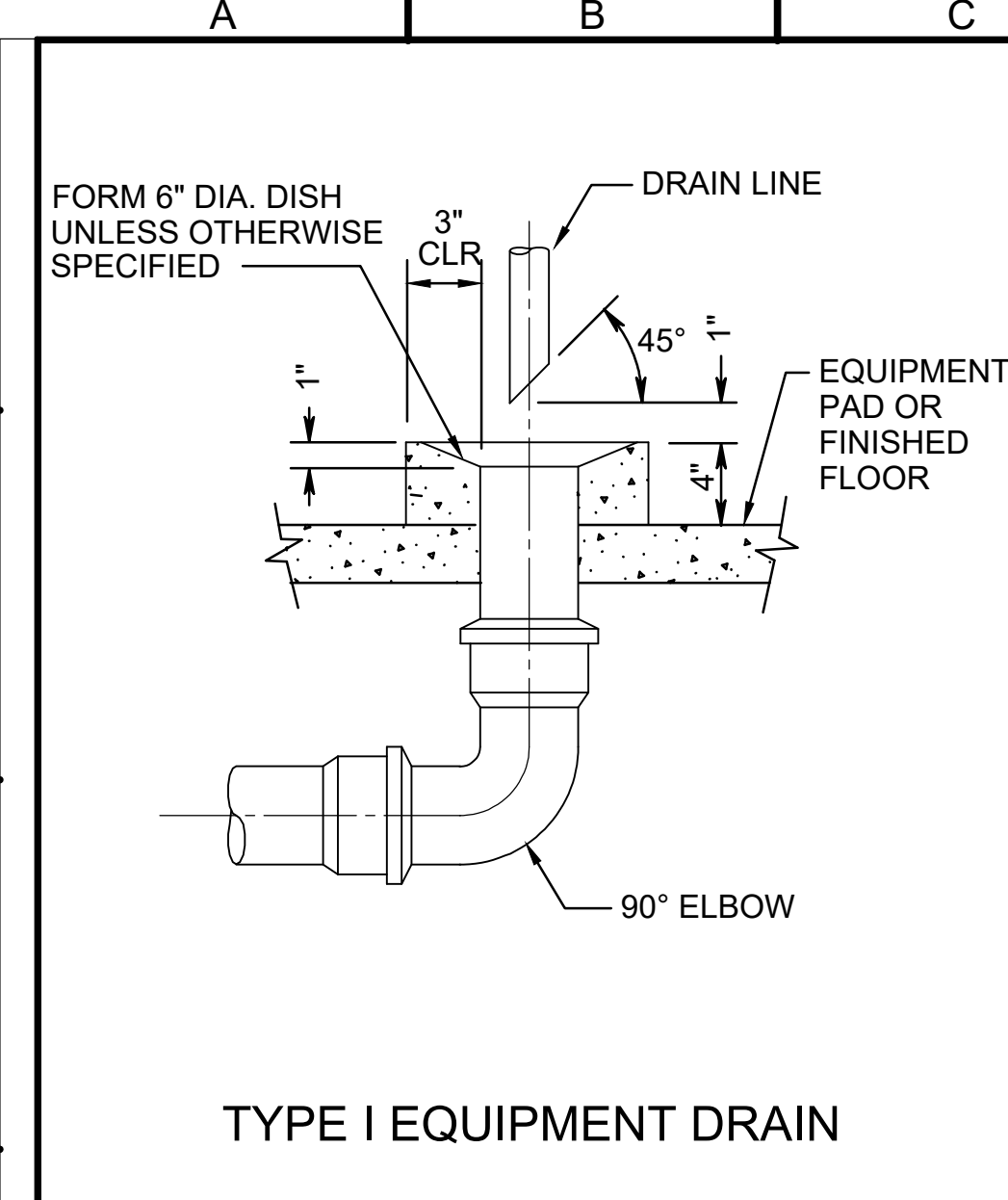
40 05 63.08

**BALL VALVE, STAINLESS STEEL FLANGED**

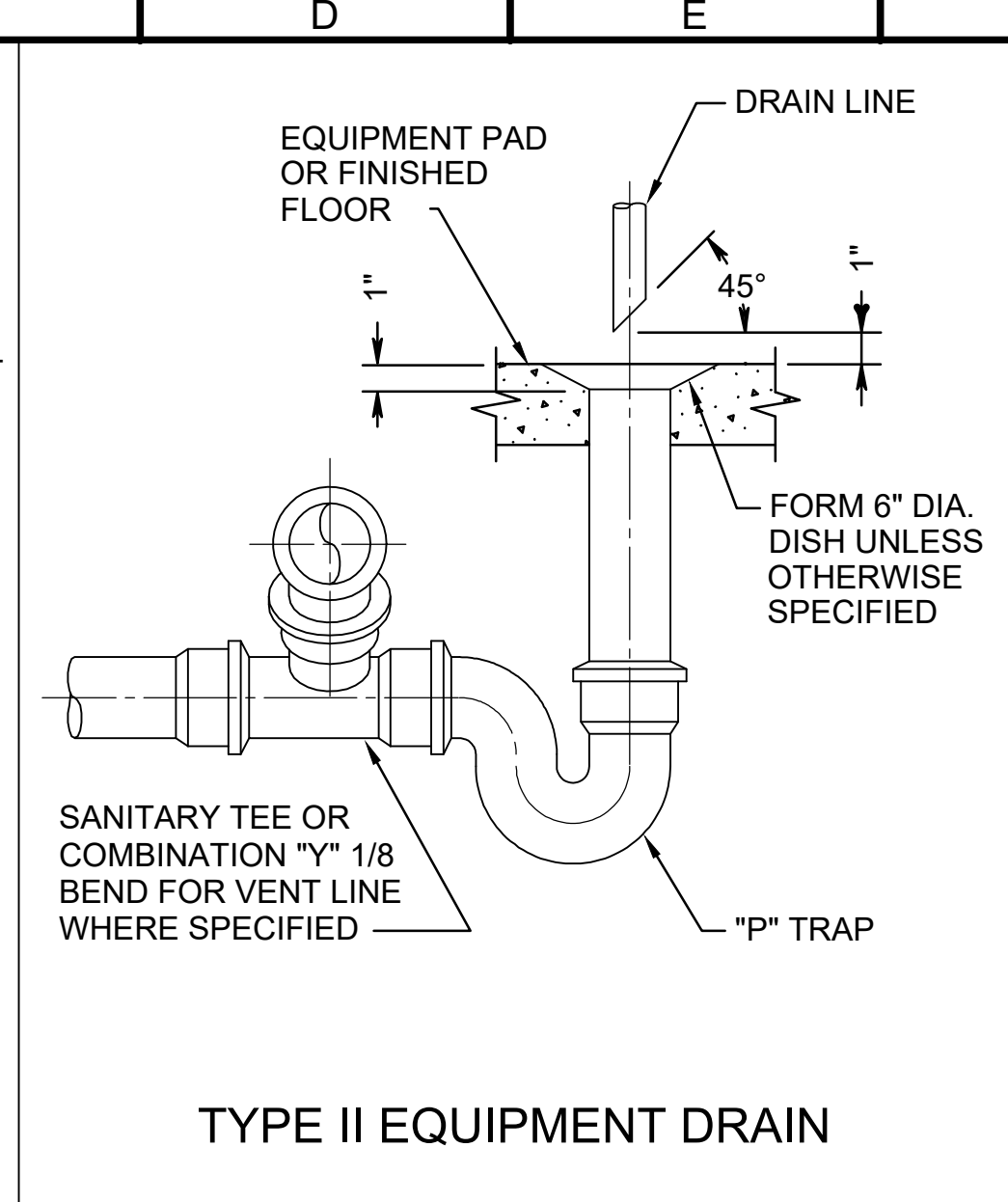
<b>GENERAL</b>
<ol style="list-style-type: none"><li>1. Line Size: 2 through 24 inches</li><li>2. Rated Limits: Pressure 170 psi; Temperature 120 °F</li></ol>
<b>VALVE MATERIALS</b>
<ol style="list-style-type: none"><li>1. Body: Stainless Steel (304 or 316)</li><li>2. Ball: Stainless Steel (304 or 316)</li><li>3. Seats: PTFE</li><li>4. Packing: RPTFE</li><li>5. Stem: Stainless Steel (304 or 316); blowout-proof stem</li></ol>
<b>VALVE CONFIGURATION</b>
<ol style="list-style-type: none"><li>1. Valve End/Connections: Flange, ANSI 16.1 Class 150</li><li>2. Pattern: Full Port, Split Body</li><li>3. Ball Mount: provide trunnion-mounted ball on all valves sizes 8 inches and greater, provide floating ball on all valves sizes 6 inches and smaller</li><li>4. Manual Operator: Lever/Handwheel; provide lever operators for valves 4 inches and less, provide geared operators for valves 6 inches and greater</li></ol>
<b>SUBMITTALS</b>
<ol style="list-style-type: none"><li>1. Action Submittals:<ol style="list-style-type: none"><li>a. See Section 40 05 60 for requirements.</li></ol></li><li>2. Information Submittals:<ol style="list-style-type: none"><li>a. See Section 40 05 60 for requirements.</li></ol></li><li>3. Closeout Submittals:<ol style="list-style-type: none"><li>a. See Section 40 05 60 for requirements.</li></ol></li></ol>
<b>CANDIDATE MANUFACTURERS</b>
<ol style="list-style-type: none"><li>1. Kitz 150UTDZM</li><li>2. Velan SB-150</li><li>3. Elite E9200</li></ol>

## **Attachment 2. Sheet 000-M-04 Mechanical Details**

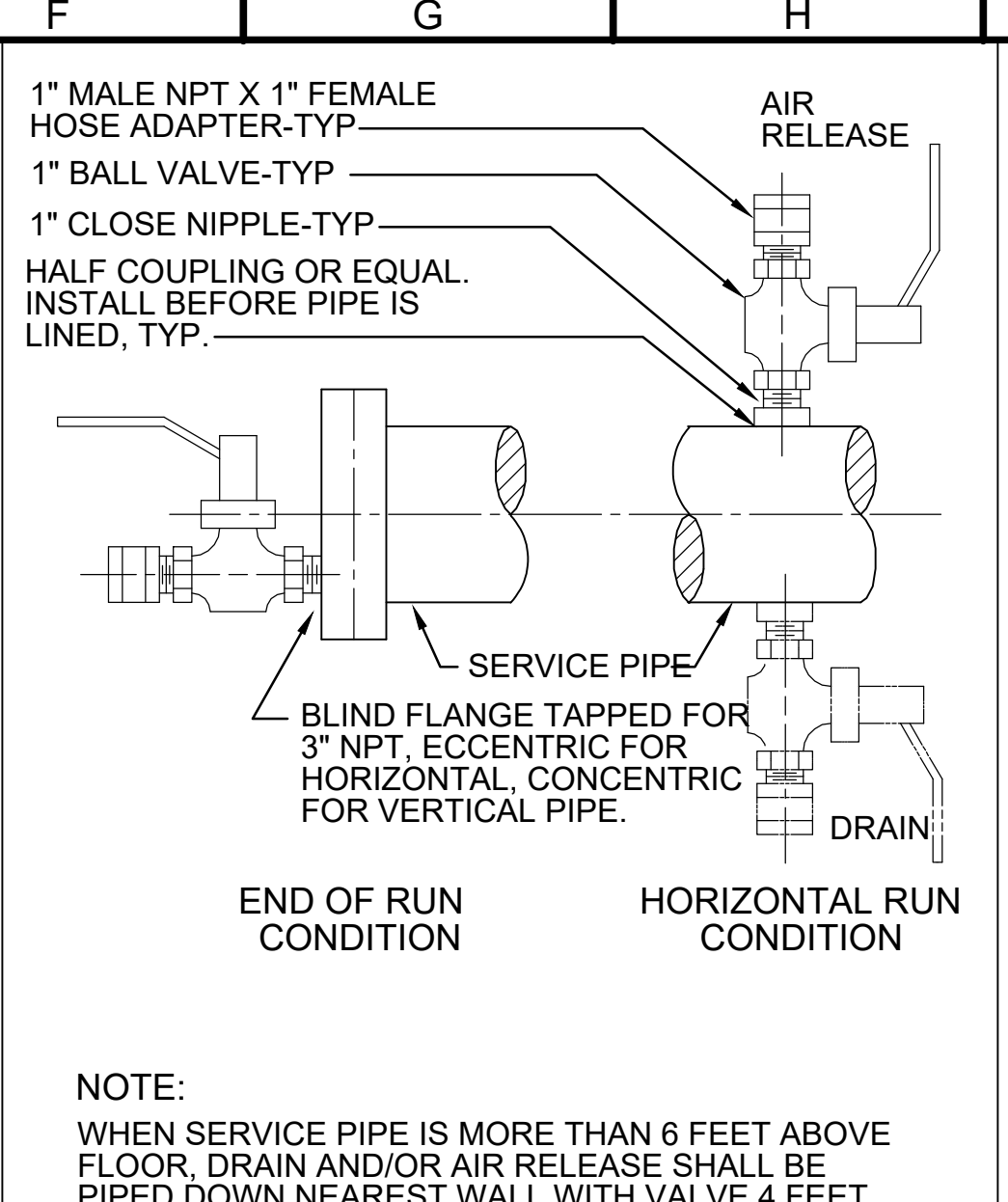
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TYPE I EQUIPMENT DRAIN

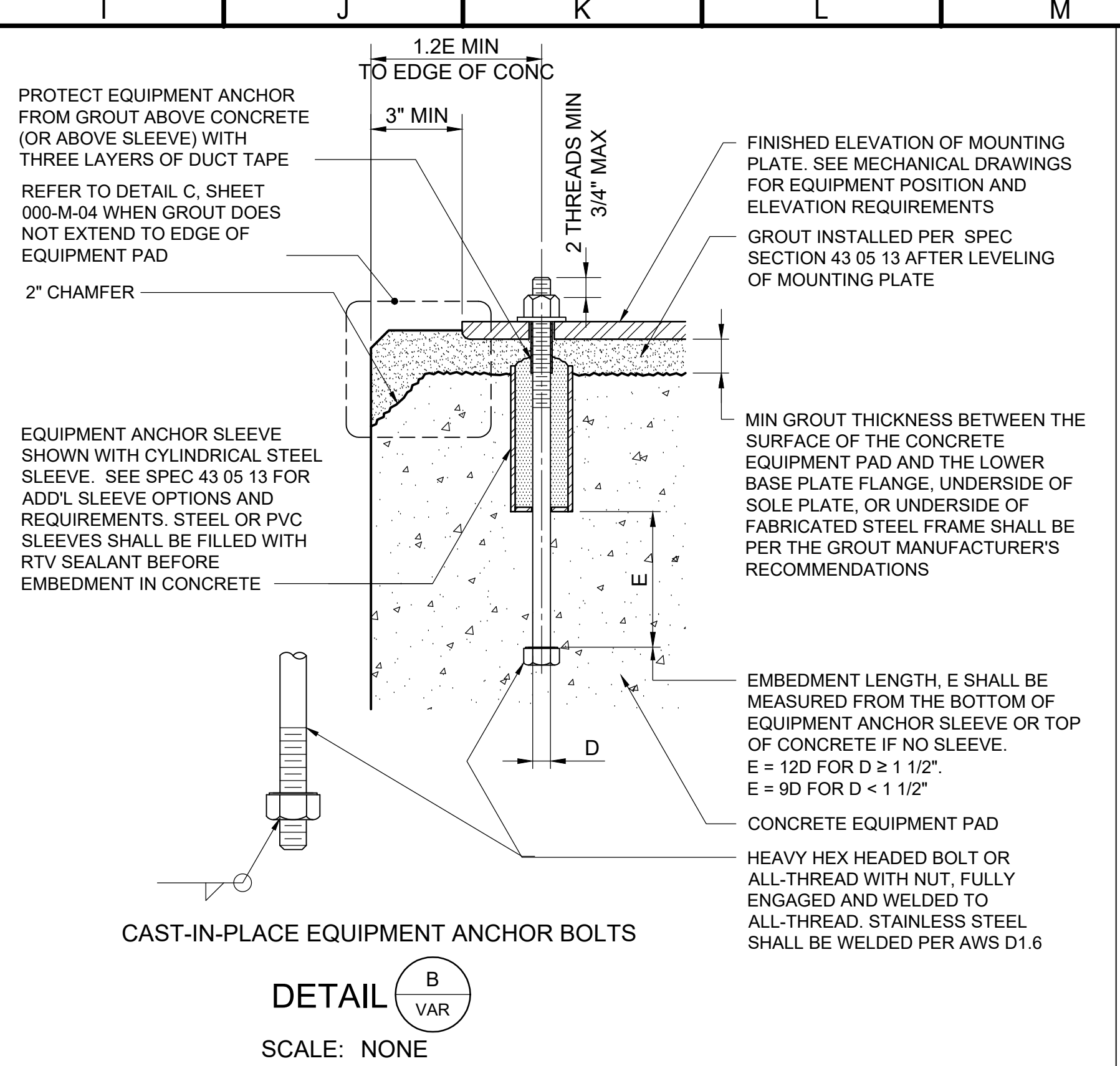


TYPE II EQUIPMENT DRAIN

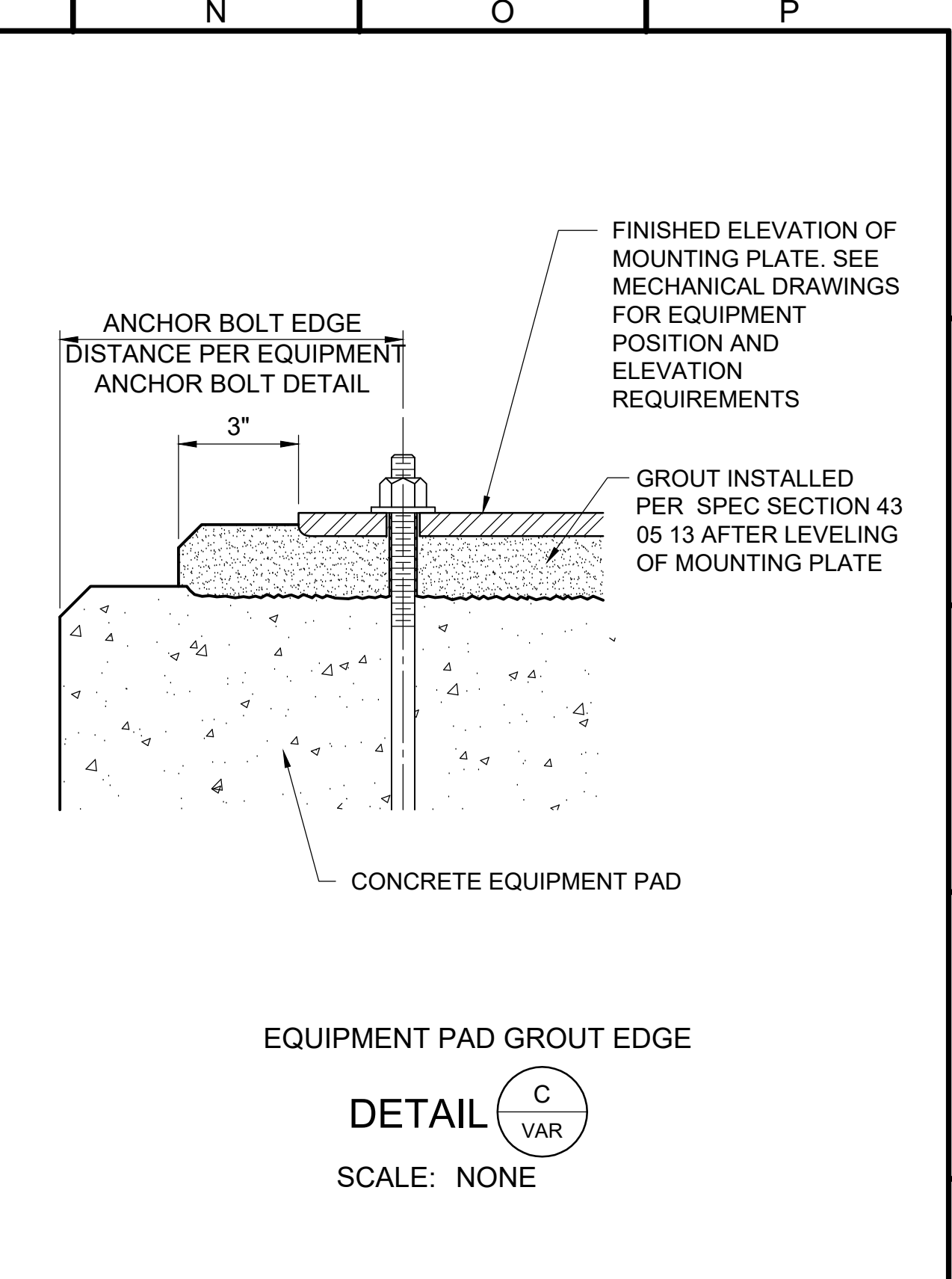


NOTE:  
WHEN SERVICE PIPE IS MORE THAN 6 FEET ABOVE FLOOR, DRAIN AND/OR AIR RELEASE SHALL BE PIPED DOWN NEAREST WALL WITH VALVE 4 FEET ABOVE FLOOR.

FLUSHING COCK  
DETAIL A  
SCALE: NONE  
(FOR AIR RELEASE OR DRAIN AS REQUIRED)



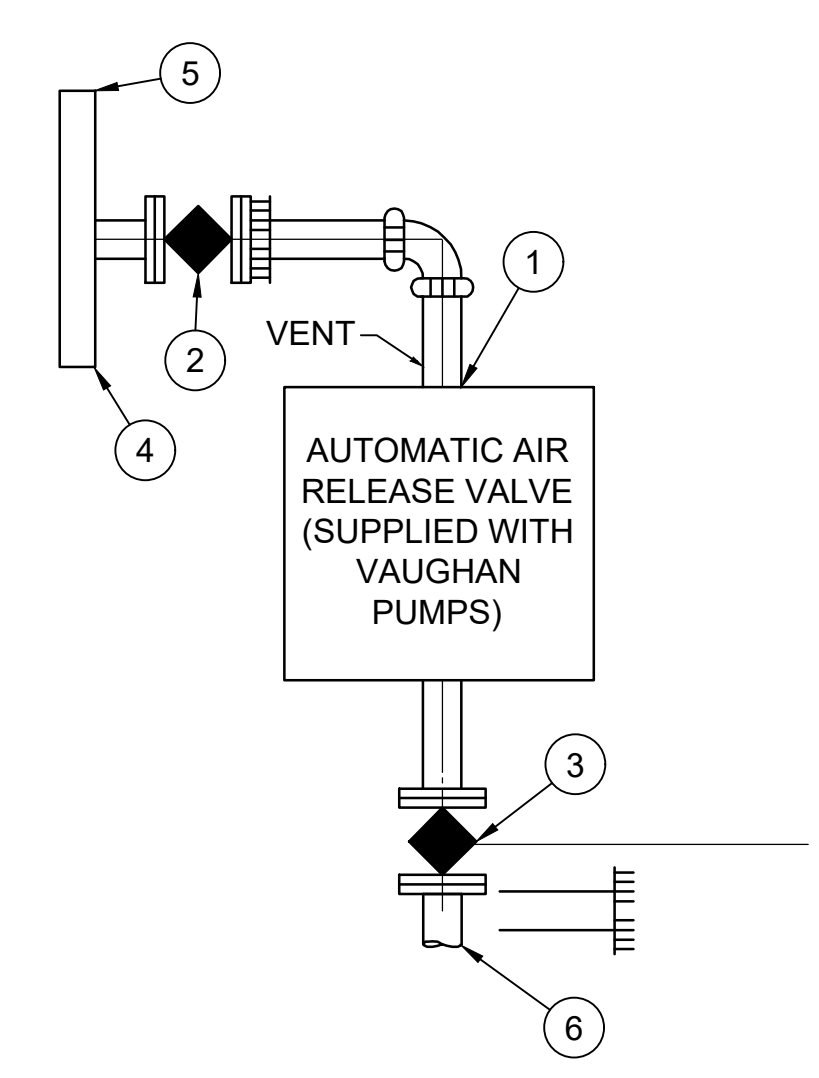
CAST-IN-PLACE EQUIPMENT ANCHOR BOLTS  
DETAIL B  
SCALE: NONE



EQUIPMENT PAD GROUT EDGE  
DETAIL C  
SCALE: NONE

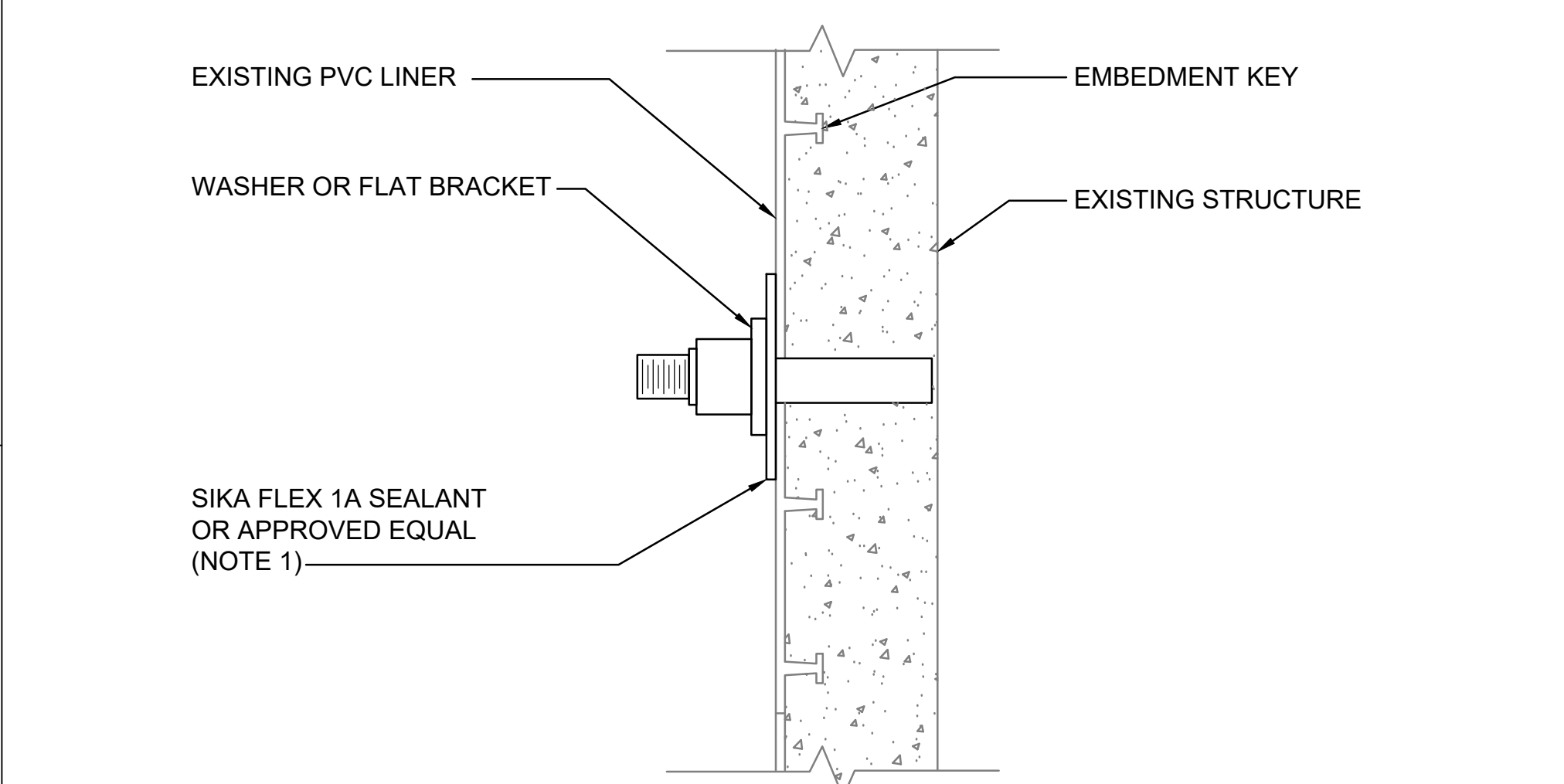
- NOTES**
1. THE CONTRACTOR SHALL DO ALL WORK REQUIRED BY AND IN ACCORDANCE WITH STATE AND LOCAL PLUMBING CODES.
  2. UNLESS OTHERWISE SPECIFIED AND EXCEPT IN PEDESTRIAN AREAS SUCH AS OFFICES, LABORATORY AREAS, WASHROOMS, JANITOR ROOMS, ETC., ALL FLOOR DRAINS AND CLEANOUTS SHALL BE PROVIDED WITH GALV DIKROME DUCTILE GRATES.
  3. HORIZONTAL DRAINAGE SHALL HAVE A SLOPE OF 1/4-INCH PER FOOT.
  4. CLEANOUTS FOR HORIZONTAL DRAINAGE PIPES SHALL BE PROVIDED IN ACCORDANCE WITH THE PLUMBING CODE.
  5. NOT ALL CLEANOUTS AND DRAINS ARE USED IN THESE CONTRACT DRAWINGS.

ABBREVIATIONS	
CO	CLEANOUT
D	DRAIN
ED	EQUIPMENT DRAIN
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
RD	ROOF DRAIN
SCD	SCUPPER DRAIN
SD	SANITARY DRAIN
SSK	SERVICE SINK
T	TRAP
TP	TRAP PRIMER
V	VENT
VTR	VENT THROUGH ROOF
WCO	WALL CLEANOUT
YCO	YARD CLEANOUT



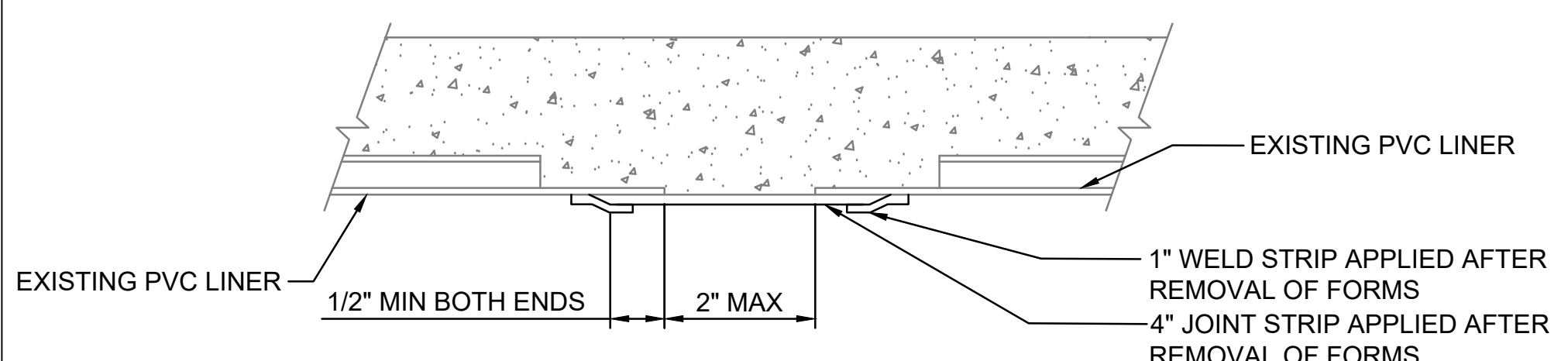
- 1 1" VENT CONNECTION.
- 2 BALL VALVE.
- 3 UNLESS OTHERWISE INDICATED ON DRAWINGS, PROVIDE A PLUG VALVE.
- 4 ROUTE TO EXISTING DRAIN PIPE IN PUMP ROOM.
- 5 ROUTE VENT PIPING TO EXISTING 3-INCH STANDPIPE VENT ON THE FIRST FLOOR. ENSURE THAT THERE ARE NO LOCALIZED LOW OR HIGH POINTS.
- 6 2" TAP CONNECTION OFF PIPELINE HIGHPOINT.

PIPING VENT AND DRAIN  
SCALE: NONE

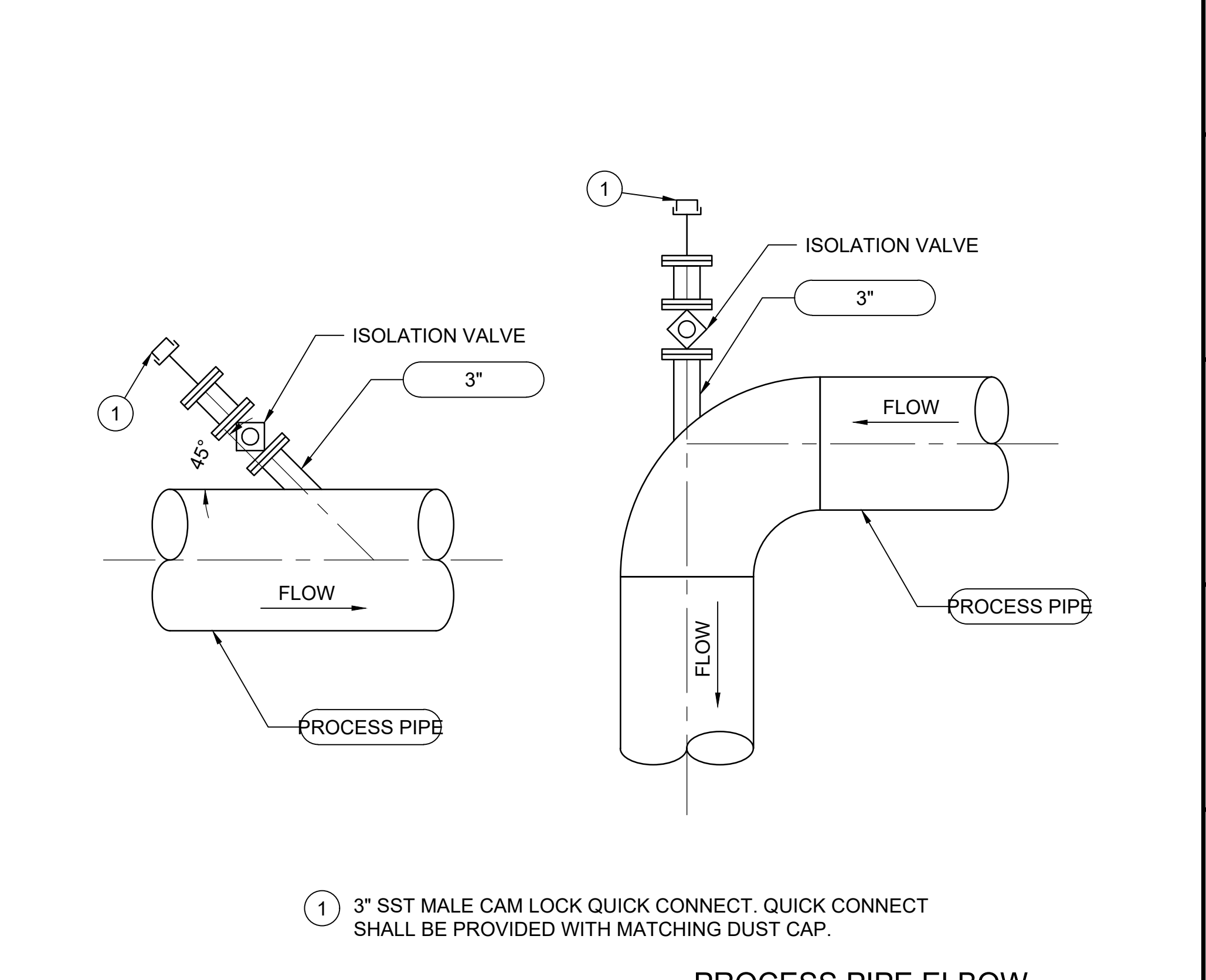


NOTE:  
1. APPLY GENEROUS AMOUNT OF SEALANT TO BASE OF ANCHOR. INSTALL WASHER/BACKET AND NUT WHILE SEALANT IS WET. UNIFORMLY WORK EXCESS AROUND NUT AND WAHSER.

PENETRATING EXISTING PVC LINER



REINSTALLING SECTION OF PVC LINER - TYING INTO EXISTING PVC LINER



INLINE PIPE FLUSHING  
SCALE: NONE

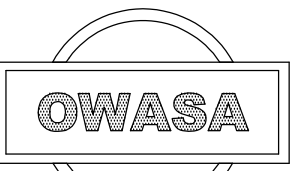
PROCESS PIPE ELBOW FLUSHING CONNECTION  
SCALE: NONE

**Brown and Caldwell**  
Environmental Engineering and Consulting  
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Raleigh, North Carolina 27607  
(919) 233-9178  
License No. F-0785

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2"-SCALE ACCORDINGLY)  
FILE 155193-000-M-04.dwg  
DRAWN M. DEAL  
DESIGNED T. NANGLE  
CHECKED P. SCHULER  
CHECKED B. BUCKLEY



REVISIONS				
ZONE	REV.	DESCRIPTION	BY	DATE



ORANGE WATER AND SEWER AUTHORITY  
MASON FARM WWTP  
FERMENTER MIXING IMPROVEMENTS

MECHANICAL  
MISCELLANEOUS DETAILS

SCALE AS NOTED  
DRAWING NUMBER 000-M-04  
SHEET NUMBER 17 OF 30

## **Attachment 3. Section 43 05 23 – Stainless Steel Pipe**



SECTION 40 05 23  
STAINLESS STEEL PROCESS PIPE AND TUBING

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section specifies stainless steel pipe and fittings.

**1.02 RELATED SECTIONS**

- A. Section 40 05 01 – Piping Systems
- B. Section 40 05 02 – Piping System Schedules

**1.03 QUALITY ASSURANCE**

- A. References:
  - 1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
  - 2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI B31.3	Process Piping
ASME Section IX	Boiler and Pressure Vessel Code; Welding and Brazing Requirements
ASTM A480	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
AWWA M11	Steel Pipe-A Guide for Design and Installation
AWWA C227	Bolted, Split-Sleeve Restrained and Non-Restrained Couplings for Plain-End Pipe
AWWA C606	Grooved and Shouldered Joints
CSA W48.3	Low Alloy Steel Covered Electrodes for Shielded Metal Arc Welding

**1.04 SUBMITTALS**

- A. Action Submittals:
  - 1. Procedures: Section 01 33 00.

2. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The CITY shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
3. Piping layout drawings as specified in Section 40 05 01.
4. Manufacturers' product data, catalog cuts, typical installation details, and dimensions. Indicate on the submittal each piping system where the product will be used.
5. Pipe wall thickness calculations for pipe fabricated per AWWA C220. Demonstrate the maximum permissible internal design pressure in the pipe based on the wall/shell thickness specified in the Piping System Schedule for the associated Process Service and pipe size and the support and/or bedding conditions specified on the Drawings. Steel pipe design calculations conform to AWWA M11.
6. Pipe wall thickness and reinforcement calculations for fittings fabricated per AWWA C226. Demonstrate that the maximum permissible internal design pressure for fabricated fittings matches or exceeds the maximum permissible internal design pressure in the connecting pipe for the support and/or bedding conditions specified on the Drawings. Fabricated steel pipe fitting design calculations conform to AWWA M11.
7. Calculations for any pipe and fittings that are not fabricated per one of the components standards listed in the specified ASME B31 code.
8. Submit calculations for engineered flange face rings in accordance with Appendix D of ASME Section VIII Division 1.

B. Informational Submittals:

1. Procedures: Section 01 33 00.
2. Manufacturers' certificates of compliance with specified industry standards.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Procedures: Section 01 6600 for Shipment and Storage.
- B. Deliver pipe and fittings with end protectors in place. Do not remove protectors until materials are about to be installed.
- C. Prevent carbon steel contamination of stainless steel pipe and fittings during storage, handling, fabrication, and installation.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. All pipe system materials to be new, free from defects and conforming to the requirements and standards specified in Piping System Schedules (Section 40 05 02.00 through Section 40 05 02.99) and this Section.
- B. Pipe.
1. Use pickled and annealed sheet or plate for manufacture of fabricated stainless steel pipe.
  2. Finish.
    - a. 8-gage through 16-gage material: No. 1 or 2B per ASTM A480.
    - b. 3/16-inch and heavier plate material: No. 1 mill finish per ASTM A480, "Hot-Rolled or Cold-Rolled, and Annealed or Heat Treated, and Blast Cleaned or Pickled."
- C. Shop-fabricated stainless steel pipe and fittings.
1. Furnished by a single manufacturer who is experienced and qualified in the manufacture and fabrication of the items to be provided.
  2. Manufacture using Weld Procedure Specifications (WPS) that have been qualified under ASME Section IX. Document qualifications in Procedure Qualification Reports (PQR). Use only certified welders who have successfully completed performance qualification tests per ASME Section IX for manufacture of stainless steel pipe.
- D. Flanges.
1. Plate steel backing ring flanges, AWWA C207 Class D minimum thickness.
  2. Ductile iron backing ring flanges with the following flange thicknesses.

Flange Size, in	Flange Thickness, minimum, in.
3	1/2
4	9/16
6 thru 10	5/8
12 thru 16	3/4
18 thru 22	7/8
24 thru 30	1
36	1-1/8
42	1-1/4
46 to 54	1-3/8
60	1-1/2

3. Stub ends.
    - a. Wall thickness equal to or greater than pipe or fitting to which it is welded.
    - b. Lap face/gasket mating surfaces clean, free of debris, with welds ground flush and surface roughness between 3.18 and 12.7 microns RMS.
- E. Fittings.

1. Double ferrule compression fittings capable of holding the full bursting pressure of connected tubing.
  2. Candidate manufacturers for double ferrule compression fittings.
    - a. Swagelok.
    - b. Gyrolok.
    - c. Approved Equal.
  3. Provide straight tapered reducers. Flanged & flued reducers and bushing type adapters are not permitted.
  4. Pressure rating and thickness of elbows, tees, crosses, and wyes equal to or greater than connecting pipe.
- F. Grooved couplings and fittings.
1. Flexible and rigid coupling with pipe grooves compliant with AWWA C606.
  2. When pipe wall thickness does not meet the minimum requirements of AWWA C606 for rolled or cut groove joints, provide shoulder ends per the requirements of AWWA C606.
  3. Candidate manufacturers.
    - a. Victaulic
    - b. Gruvlok
    - c. Approved equal.
- G. Bolted split sleeve couplings.
1. AWWA C227 compliant sleeve with single or double arch cross section of the same material as pipe. Body thickness equal to or greater than that of connecting pipe wall thickness.
  2. Candidate manufacturers.
    - a. Victaulic, Style 231S through 234S.
    - b. Approved equal.

## **2.02 SHOP FABRICATION**

- A. Metal forming processes.
1. Use pinch rolls with a hard chrome finish to form cylinders. Thoroughly clean the rolls using Avesta BlueOne™ 130 Pickling Paste or approved equal, prior to roll forming the pipe. Alternatively, provide a protective barrier between the stainless steel plate/sheet and the plate rolls during the forming process.
  2. Provide a protective barrier between pipe welding rollers and the stainless steel pipe cylinder. Alternately, new rollers or rollers that have been turned down on a lathe to provide a new and clean working face may be used.
- B. All saws, drills, files, wire brushes, grinding wheels, etc. will be free of carbon contamination and designated for stainless steel use only.
- C. Provide nonferrous, stainless steel, or rubber-lined pipe storage and fabrication racks.
- D. Use nylon slings or straps for handling stainless steel piping.

- E. Preparation of surfaces to be welded.
  - 1. Surfaces of joints to be welded are to be free from mill scale, slag, grease, oil, paint, rust, and other foreign material.
  - 2. Use only stainless wire wheels and grinding wheels that have not come into contact with carbon steel.
  - 3. Flame cutting or any use of oxy-acetylene gas cutting tools is prohibited. Use plasma arc torch with a nitrogen or argon-hydrogen carrier gas, laser or waterjet processes for cutting and plate beveling.
  - 4. Air arc and gas backgouging are prohibited. Use grinding and plasma gouging methods to achieve full penetration welds.
  
- F. Welding.
  - 1. Welding and production processes are to conform to ASME B31.3.
  - 2. Use of Solar Flux is prohibited.
  - 3. Use of FCAW welding is prohibited.
  - 4. Pipe and fittings with wall thickness up to 11-gage (1/8-inch): weld using the GTAW process.
  - 5. Pipe and fittings with wall thicknesses greater than 1/4-inch may be welded using an automated SAW process.
  - 6. Pipe and fittings with wall thickness greater than 11-gage (1/8-inch): Bevel and complete root pass using the GTAW process, followed by subsequent passes with the GTAW, GMAW, or Metallic Arc SMAW process.
  - 7. Filler material:
    - a. Add only ELC wire grades to provide a cross section at the weld equal to or greater than the parent metal.
    - b. SMAW electrodes to conform to CSA W48.3.
  - 8. Make weld deposit smooth and evenly distributed and with a crown of no more than 1/16-inch on the I.D. and 3/32-inch on the O.D. of the piping. Concavity, undercut, cracks, or crevices are not permitted.
  - 9. Full penetration butt welds: provide inert gas shielding to the interior and exterior of the joint.
  - 10. Lap joints: provide full thickness seal welds on both joints.
  
- G. Remove excessive weld deposits, slag, spatter, and projections by grinding. Grind welds smooth on gasket surfaces. Tack welds, clips, and other attachments.
  - 1. Repair nicks, gouges, notches, and depressions in the base metal in the area before the joint weld is made.
  - 2. Remove tack welds, clips, and other attachments and repair defects, except where the tack welds occur within the weld area and these tack welds do not exceed the size of the completed weld. Remove cracked tack welds.
  - 3. Grind those areas to be repaired down to clean metal and then repair by building up with weld metal. Grind the repaired areas smooth to form a plane surface with the base metal.

- H. Defects and repairs.
  - 1. Remove welds with cracks, slag inclusions, porosity, undercutting, incomplete penetration, or which are otherwise deficient in quality or made contrary to any provisions of these specifications, by chipping or grinding throughout their depth to clean base metal.
  - 2. Do not perform calking or peening of welds to correct defects.
  - 3. Enlarge welds found deficient in dimension but not in quality by additional welding after thoroughly cleaning the surface of previously deposited metal and the adjoining plate.
  - 4. Remove weld deposits, slag, weld spatter, and projections into the interior of the pipe by grinding.
- I. Finish.
  - 1. Treat all welded joints with Avesta BlueOne™ 130 Pickling Paste or approved equal and rinse with clean water.
  - 2. If rusting of embedded iron occurs, pickle the affected surface with Avesta BlueOne™ 130 Pickling Paste or approved equal.
  - 3. Rinse clean using Avesta FinishOne Passivator 630 or approved equal.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Field Installation Weather conditions.
  - 1. Perform welding only when the surfaces are clean and completely free of any moisture or mineral deposits. Protect pipe and fittings from salt water spray or deposition or clean and protect pipe and fitting joints prior to welding.
  - 2. Do not weld the pipe during periods of high winds or rain unless the areas being welded are properly shielded.
- B. Field welding.
  - 1. Use couplings and prefabrication of pipe systems at the factory to minimize field welding to the greatest extent possible. Pipe butt welds may be performed at the job site, providing the butt welds are performed only with an inert gas shielded process and that the welding requirements of this Section are rigidly adhered to.
  - 2. On the interior and exterior of the pipe, remove all residue, oxide, and heat stain from any type of field weld and the affected areas adjacent by the use of stainless steel wire brushes, followed by cleaning with an agent such as Avesta BlueOne™ 130 or approved equal, followed by complete removal of the agent.
- C. Use wooden scaffolding and/or ladders if possible to gain access to work areas. If metal scaffolding and/or ladders must be used, tape or otherwise shield the contact points between scaffolding/ladders and the stainless steel.
- D. After installation, wash and rinse all foreign matter from the piping surface. Adhere to the passivation manufacturer's recommendations and local regulations for safety and disposal of any waste chemicals.

### **3.02 REPAIR/RESTORATION**

- A. Per Section 40 05 01 and as specified herein.
- B. Paint all steel or iron flanges, couplings, and appurtenances in accordance with Section 09 90 00. Painting of the stainless steel pipe is not required.
- C. Restore areas damaged or discolored by field welding or handling, iron contamination or soiled to a uniform surface finish and consistently clean surface with methods specified for shop fabrication.
- D. Identifying spool piece marks shall be removed with paint thinner or solvents and the entire stainless steel surface shall be washed with detergent and hot water and rinsed clean.

### **3.03 COMPONENT TEST PHASE**

- A. Per Section 40 05 01.

**END OF SECTION**

## **Attachment 4. Section 43 05 24 – Steel Pipe**

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## SECTION 40 05 24

### STEEL PIPE

#### PART 1 GENERAL

##### 1.01 SUMMARY

A. This Section specifies steel pipe and fittings.

##### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 66 00 – Product Requirements

C. Section 40 05 01 – Piping Systems

D. Section 40 05 02 – Piping System Schedules

##### 1.03 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASME B16.3	Malleable Iron Threaded Fittings, Class 150 and 300
ASME B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	Forged Steel Fittings, Socket-Welding and Threaded
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASTM A36/A36M	Standard Specification for Carbon Structural Steel
ASTM A47	Ferritic Malleable Iron Castings
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A105/A105M	Forgings, Carbon Steel, for Piping Components
ASTM A106	Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A283/A283M	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A1011/A1011M	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM A572/A572M	High Strength Low Alloy Columbium-Vanadium Steels of Structural Quality
AWWA C200	Steel Water Pipe 6 Inches (150 mm) and Larger

Reference	Title
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe, DN100 mm and Larger, Shop Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Services--Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coating for Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipe
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C218	Liquid Coating Systems for the Exterior of Aboveground Steel Water Pipelines and Fittings
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
AWWA C606	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606	Grooved and Shouldered Joints
AWWA M11	Steel Pipe, a Guide for Design and Installation
SSPC-SP10	Near-White Blast Cleaning.

#### 1.04 SUBMITTALS

##### A. Action Submittals:

1. Procedures: Section 01 33 00
2. A copy of this specification section, addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations.
3. Manufacturers' product data, catalog cuts, installation details, and dimensions. Indicate each piping system that will use each steel pipe product or installation detail described in the Manufacturers' product data, catalog cuts, and installation details.
4. Pipe wall thickness calculations for pipe fabricated per AWWA C200. Demonstrate the maximum permissible internal design pressure in the pipe based on the wall/shell thickness specified in the Piping System Schedule for the associated Process Service and pipe size and the support and/or bedding conditions specified on the Drawings. Steel pipe design calculations conform to AWWA M11.
5. Pipe wall thickness and reinforcement calculations for fittings fabricated per AWWA C208. Demonstrate that the maximum permissible internal design pressure for fabricated fittings matches or exceeds the maximum permissible internal design pressure in the connecting pipe for the support and/or bedding conditions specified on the Drawings. Fabricated steel pipe fitting design calculations conform to AWWA M11.
6. Calculations for any pipe and fittings that are not fabricated per one of the components standards listed in the specified ASME B31 code.
7. Affidavits of Compliance with the provisions of AWWA C200, ASTM A53, or ASTM A106, as applicable for the specified pipe materials.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- ##### A. Procedures: Section 01 66 00 for Shipment and Storage.

- B. Deliver pipe and fittings with stalling end protectors in place. Do not remove stalling or end protectors until materials are about to be installed.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. All pipe system materials to be new, free from defects and conforming to the requirements and standards identified in the Piping System Schedules in Section 40 05 02.00 through 40 05 02.99.

### **2.02 PIPE LINING**

- A. Provide pipe with lining as specified in Piping System Schedules in Sections 40 05 02.00 through 40 05 02.99. Requirements for each lining type are specified in this Section. Apply linings for steel pipe at the factory or shop. Unless specifically prohibited in this Section, repair of steel pipe linings damaged after the pipe has left the factory or fabrication shop may be performed at the project site.
  - 1. Epoxy Lining.
    - a. Line pipe and fittings with a liquid epoxy as specified in AWWA C210.
    - b. Do not incorporate coal tar products into the liquid epoxy.
    - c. Apply to a minimum thickness of 16 mils in not less than two coats.
    - d. Patch field welds, connections and damaged lining in accordance with AWWA C210.
  - 2. Cement Mortar Lining.
    - a. Line pipe and fittings with cement mortar as specified in AWWA C205.
    - b. Fittings and specials larger than 24 inches, not fabricated from centrifugally lined straight sections, require 2 inch by 4 inch by 13 gage self-furring wire mesh reinforcement for hand applied lining.
    - c. Patch field welds, connections and damaged lining in accordance with AWWA C205.
  - 3. High Temperature Service Epoxy Lining.
    - a. Steel pipe and fittings: epoxy lined with not less than 15 mils of epoxy suitable for temperatures to 750 degrees F.
    - b. Prepare surfaces in accordance with SSPC SP 10 Near White Blast Cleaning, and apply lining as recommended by the manufacturer.
    - c. Patch field welds, connections and damaged lining per coating manufacturer's recommendations.
    - d. Candidate manufactures:
      - 1) Dampney, Thurmalox 225 HD.
      - 2) PPG, Hi Temp 1027.
      - 3) Approved equal.
  - 4. Glass Lining.
    - a. Factory or Shop applied.
    - b. Grind all internal welds smooth and grind out any voids or slag holes. Re-weld to fill ground out voids and slag holes and grinds smooth.

- c. Line pipe and fittings with glass lining, 10 mils minimum thickness, using a dual layer coating system of vitreous material.
  - d. Provide continuous coverage glass lining as tested by a low voltage holiday detector with only isolated voids permitted due to casting anomalies. Voids, other than isolated pinholes, shall be cause for rejection.
  - e. Damaged glass lining cannot be repaired. Damaged glass lined pipe must be replaced.
  - f. Candidate manufacturers:
    - 1) Ferrock, MEH 32.
    - 2) Vitco SG 14.
    - 3) Approved equal.
5. Polyurethane Lining.
- a. Line pipe and fittings with polyurethane as specified in AWWA C222.
  - b. Patch field welds, connections and damaged lining in accordance with AWWA C222.
  - c. Candidate manufacturers:
    - 1) Lifelast Durashield 210.
    - 2) Approved equal.

## 2.03 PIPE COATING

- A. Provide pipe with coating as specified in Piping System Schedules in Sections 40 05 02.00 through 4 05 02.99. Requirements for each coating type are specified in this Section. Apply coatings to steel pipe at the factory or fabrication shop. Unless specifically prohibited in this Section, repair of steel pipe coatings damaged after the pipe has left the factory or fabrication shop may be performed at the project site.
- B.
  - 1. Epoxy Coating.
    - a. Coat pipe and fittings with a liquid epoxy as specified in AWWA C210.
    - b. Do not incorporate coal tar products into the liquid epoxy.
    - c. Apply coating to a minimum thickness of 16 mils in not less than two coats.
    - d. Patch field welds, connections and damaged coating in accordance with AWWA C210.
  - 2. Polyethylene Tape Coating.
    - a. Coat and wrap pipe and fittings with prefabricated multilayer cold applied polyethylene tape coating in accordance with AWWA C209 and AWWA C214.
    - b. Apply coating in a continuous step operation in conformance with AWWA C214, Section 3.
    - c. The total coating thickness: not less than 50 mils for pipe 24-inch and smaller and not less than 80 mils for pipe 30-inch and larger.
    - d. Patch field welds, connections and damaged in accordance with AWWA C209 and AWWA C214.
  - 3. Polyurethane Coating.
    - a. Coat pipe and fittings with polyurethane as specified in AWWA C222.

- b. Patch field welds, connections and damaged coating in accordance with AWWA C222.
- c. Candidate manufacturers:
  - 1) Lifelast Durashield 210.
  - 2) Approved equal.
- 4. Three Coat Zinc/Epoxy/Urethane Coating.
  - a. Coat pipe and fittings with a three coat system as specified in AWWA C218.
  - b. Patch field welds, connections and damaged coating in accordance with AWWA C218.
- 5. Cement Mortar Coating.
  - a. Coat pipe and fittings with cement mortar as specified in AWWA C205.
  - b. Patch field welds, connections and damaged coating in accordance with AWWA C205.

#### **2.04 FUSION BONDED EPOXY COATING AND LINING.**

- 1. Line and coat per AWWA C213.
- 2. NSF 61 certified for potable water applications.
- 3. Application Method: fluidized bed method, attaining 12 mils minimum dry film thickness.
- 4. Surface Preparation: in accordance with SSPC SP 10 Near White Blast Cleaning.
- 5. Patch field welds, connections and damaged areas according to the manufacturer's instructions with 3M Scotchkote 306 and AWWA C213.
- 6. Candidate manufacturers:
  - a. 3M Scotchkote 206N.
  - b. Approved equal.

#### **2.05 FITTINGS**

- A. Steel fittings: Provide straight tapered reducers for fabricated fittings. Fabricated flanged and flued reducers and bushing type abrupt reducers are not permitted.

#### **2.06 JOINT TYPES**

- A. BAS – Bell and Spigot
  - 1. Bell end and spigot end formed into the ends of the pipe cylinder.
  - 2. Swedged bell and roll formed groove that retains an O-ring gasket in the spigot end.
  - 3. Insertion of the spigot compresses the O-ring against the inner wall of the flared bell end to form a watertight seal.
- B. CPO – Compression Type Push-On (Carnegie O-ring Gasket Joint)
  - 1. Prefabricated bell end and spigot end are welded to the ends of the pipe cylinder.
  - 2. Carnegie spigot ring with formed groove that retains an O-ring gasket.
  - 3. Weld on bell ring.
  - 4. Insertion of the spigot compresses the O-ring against the inner wall of the bell ring to form a watertight seal.

## 2.07 WELD JOINT TYPES

- A. BW – Butt Weld Joint
  - 1. Unmodified pipe cylinder ends butted end to end and joined by welding.
- B. BSW – Butt-Strap Joint
  - 1. Unmodified pipe cylinder ends with an end gap and an exterior strap spanning the end gap.
  - 2. Pipe cylinders joined to strap with circumferential fillet welds on the exterior of the pipe cylinder.
- C. SLW – Single Lap Weld (Inside or Outside)
  - 1. Bell end formed into end of pipe cylinder.
  - 2. Unmodified end of pipe cylinder for Spigot end.
  - 3. Single circumferential fillet weld to join lapped bell end to spigot end.
- D. DLW – Double Lap Weld
  - 1. Bell end formed into end of pipe cylinder.
  - 2. Unmodified end of pipe cylinder for Spigot end.
  - 3. Two circumferential fillet welds join lapped bell end to spigot end. One weld on the exterior of the pipe and the other on the pipe interior.
- E. SW – Socket Weld
  - 1. Fittings, valves, and couplings include a recess or socket for insertion of plain end pipe.
  - 2. A single circumferential fillet weld joins the pipe and coupling or fitting.

## 2.08 COUPLINGS

- A. Grooved Coupling, cut or cast groove (CGRV) and rolled groove (RGRV):
  - 1. Installed with rolled, cast, or cut groove dimensions per AWWA C606.
  - 2. Flexible or Rigid Couplings as specified in the Piping System Schedules (Sections 40 05 02.00 through 40 05 02.99).
  - 3. Candidate manufacturers.
    - a. Victaulic
    - b. Gruvlok
    - c. Approved equal.
- B. Proprietary Grooved Coupling (PGRV):
  - 1. Groove dimensions per coupling manufacturer's requirements.
  - 2. Flexible or Rigid Couplings as specified in the Piping System Schedules (Sections 40 05 02.00 through 40 05 02.99).
  - 3. When pipe wall thickness does not meet the minimum requirements for the specified groove joint(s), provide shoulder ends or ring adapters welded to pipe ends.
  - 4. Candidate manufacturers.
    - a. Victaulic AGS

- b. Approved equal.
- C. Ring Joint Coupling (RJC):
  - 1. Circumferential coupling segments bolted together to engage shouldered end or ring adapters. Groove dimensions per coupling manufacturer's requirements.
  - 2. Flexible or Rigid Couplings as specified in the Piping System Schedules (Sections 40 05 02.00 through 40 05 02.99).
  - 3. When pipe wall thickness does not meet the minimum requirements for the specified groove joint(s), provide shoulder ends or ring adapters welded to pipe ends.
  - 4. Candidate manufacturers.
    - a. Victaulic Vic-Ring
    - b. Approved equal.
- D. Bolted split sleeve couplings (BSS):
  - 1. AWWA C227 compliant sleeve with single or double arch cross section of the same material with a body thickness equal to or greater than that of connecting pipe wall thickness.
  - 2. Candidate manufacturers.
    - a. Victaulic, Style 231 through 234.
    - b. Approved equal.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. General.
  - 1. Use couplings and prefabrication of pipe systems at the factory to minimize field welding to the greatest extent possible. Field welds conform to specified field welding requirements.
  - 2. Install pipe in accordance with AWWA M11, Chapter 16.
- B. Weather conditions.
  - 1. Perform welding only when the surfaces are completely free of any moisture.
  - 2. Do not weld the pipe during periods of high winds or rain unless the areas to be welded are properly shielded.
- C. Field welding.
  - 1. Except where the Piping System Schedule specifies compliance with ASME Pressure Piping Codes (ASME B31.1, ASME B31.3, etc.) make field welds per AWWA C206 using shielded metal arc, gas shielded arc, or submerged arc welding methods. Make welds per the specified Pressure Piping Code when these codes are specified for the Piping System in the Piping System Schedule.
  - 2. Provide double-groove (double-vee) circumferential welds for butt welds on 30 inch diameter and larger joints. Provide single-groove (single-vee) circumferential welds for butt welds on joints less than 30 inch diameter. If backing rings are used, completely remove them after welding is complete and deburr, grind, and clean the area per AWWA C206.
  - 3. Apply pipe lining and coatings at field joints as specified in this Section.

- D. Coating.
  - 1. Field coat buried mechanical couplings and valves as specified in Section 40 05 01.
- E. Anchorage.
  - 1. Provide concrete thrust blocks only where specified on the drawings.
  - 2. Submit calculations and drawings for proposed alternative thrust restraint or pipe anchorage.
- F. Provide weld neck flanges on both sides of wafer, lug body, or flanged valves.

**3.02 REPAIR/RESTORATION**

- A. Per Section 40 05 01.

**3.03 COMPONENT TEST PHASE**

- A. Per Section 40 05 01.

**END OF SECTION**