



**NOTE:**  
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Brett Carner  
Senior Project Manager  
370 East Crown Point Road  
Winter Garden, Florida 34787

8/1/22

**RE: Sarasota County Bee Ridge WRF Expansion Project - AIS Waiver Request for Large DIP Fittings**

To Whom it May Concern,

The Bee Ridge Water Resource Facility Expansion project is owned by Sarasota County. This project is funded in part by the Water Infrastructure Finance and Innovation Act, State Application Identifier #FL202107029277C, and is required to follow American Iron and Steel requirements. The contractor for this project is Garney Construction and the engineer is Carollo Engineers. Garney is requesting an EPA availability waiver from the American Iron and Steel (AIS) requirements for multiple 42" and 48" ductile iron fittings. The full list of fittings requesting to be waived from the AIS requirements are listed below.

*Table 1: Mechanical Joint Fittings*

Fitting	Quantity	Reason
42" compact 90 Elbow, DIP, P401 lining	1	Domestic lead time disrupts schedule
42" compact 11 ¼ elbow, DIP, cement lining	1	Domestic lead time disrupts schedule
48" compact 90 Elbow, DIP, P401 lining	3	Domestic lead time disrupts schedule
48" x 24" compact Reducing Tee, DIP, P401 lined	5	Domestic lead time disrupts schedule
48" plug, DIP, P401 lined	1	Domestic lead time disrupts schedule

The below information is provided to meet the requirements for the AIS Waiver request checklist.

**Background:**

The existing BRWRF is an Advanced Secondary Treatment facility, located on 143 acres at 5550 Lorraine Road, Sarasota, FL 34240. It is a Type 1 activated sludge domestic wastewater treatment facility, permitted at 12.0 million gallons per day (MGD) maximum monthly average daily flow, with typical flows ranging from 7.0 to 9.0 MGD. The Project is under a Federal Consent Decree Mandate with an aggressive schedule completion deadline. The expansion will increase capacity of the facility, up to 18 MGD, with provisions for future expansions. Further, the treatment process, currently permitted as Advanced Secondary for Public Access Reuse, will be upgraded to Advanced Wastewater Treatment. The project will need to be constructed while the existing facility is on-line, 24/7, operating under normal conditions and meeting permit requirements for treatment, storage, and disposal.

This project includes construction of a headworks facility, bio-nutrient removal basins, membrane treatment basins, multiple pump stations, generator fuel storage, electrical buildings, and multiple blower buildings. Once construction of the expansion is complete, flow will be transferred to the new facilities so demolition and construction can commence at the existing plant. Work on the existing plant cannot begin until the new facilities are complete and able to receive and treat flow to required permit level.

**Reason for Waiver Request:**

Garney Construction was informed by Core and Main (Pipe Vendor) that the fittings mentioned above in Table 1: Mechanical Joint Fittings could not be procured to meet project schedule . Core and Main has reached out to [REDACTED] and [REDACTED] to try and procure these fittings domestically. The below table shows the difference in lead time for each manufacturer and the foreign delivery.

*Table 2: Lead Times*

Fitting	[REDACTED] Domestic Lead Time	[REDACTED] Domestic Lead Time	[REDACTED] Foreign Lead Time
42" compact 90 Elbow, DIP, P401 lining	62+ weeks	24 - 32 weeks	8 weeks
42" compact 11 ¼ elbow, DIP, cement lining	62+ weeks	24 - 32 weeks	12 weeks
48" compact 90 Elbow, DIP, P401 lining	62+ weeks	24 - 32 weeks	8 weeks
48" x 24" compact Reducing Tee, DIP, P401 lined	Unable to Manufacture	24 - 32 weeks	8 weeks
48" plug. DIP, P401 lined	62+ weeks	24 - 32 weeks	In stock

Based on the current project critical path schedule, the last date pipe can be delivered onsite without impacting the schedule is September 30<sup>th</sup>. As shown in the table above, the domestic fittings current schedule will not meet the delivery date required resulting in a delay to the project of more than 2 months. Project Critical path schedule is attached for reference.

Garney Construction has worked with Core and Main to do their due diligence in attempting to procure these fitting within AIS requirements. Due to the above-mentioned project impact, Garney Construction is proposing that the foreign 42" and 48" fittings shown above may be allowed for use on this project.

**Foreign and Domestic Construction Materials:**

Description of construction materials of pertinent fittings.

**Foreign: (proposed)**

Fitting Material	Fitting Type	Quantity	Estimated Value
42" Ductile Iron Mechanical Joint, P401 lining	Compact 90 degree Elbow Fitting	1	[REDACTED]
42" Ductile Iron Mechanical Joint, cement lining	Compact 11 ¼ degree elbow fitting	1	[REDACTED]
48" Ductile Iron Mechanical Joint, P401 lining	Compact 90 degree Elbow Fitting	3	[REDACTED]
48" x 24", Ductile Iron Mechanical Joint, P401 lined	Compact Reducing Tee Fitting	5	[REDACTED]
48" Ductile Iron Mechanical Joint, P401 lined	Plug Fitting	1	[REDACTED]

**Domestic: (to be replaced)**

<b>Fitting Material</b>	<b>Fitting Type</b>	<b>Quantity</b>	<b>Estimated Value</b>
42" Ductile Iron Mechanical Joint, P401 lining	Compact 90 degree Elbow Fitting	1	██████████
42" Ductile Iron Mechanical Joint, cement lining	Compact 11 ¼ degree elbow fitting	1	██████████
48" Ductile Iron Mechanical Joint, P401 lining	Compact 90 degree Elbow Fitting	3	██████████
48" x 24", Ductile Iron Mechanical Joint, P401 lined	Compact Reducing Tee Fitting	5	██████████
48" Ductile Iron Mechanical Joint, P401 lined	Plug Fitting	1	██████████

Garney Construction and the project team are respectfully requesting to use foreign fittings for the 42" and 48" lines in order to not delay a Consent Decree project. If you have any questions regarding the approval of the waiver or information provided within, please do not hesitate to reach out.

Sincerely,

GARNEY COMPANIES, INC.



Brett Carner  
Senior Project Manager

Activity ID	Activity Name	Original Duration	Remaining Duration	Start	Finish	Activity % Complete	Total Float	2023												2024				2025				2026
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1		
<b>Sarasota BRWRF Project</b>		931	931	18-Jul-22	27-Feb-26		0																					
<b>Contract Milestones</b>		224	224	21-Apr-25	27-Feb-26		0																					
A1140	Project Substantial Completion- North Plant	1	1	21-Apr-25	22-Apr-25	0%	0																					
A2570	Project Substantial Completion- South Plant	1	1	27-Nov-25	27-Nov-25	0%	0																					
A2140	Punchlist	20	20	28-Nov-25	25-Dec-25	0%	0																					
A2150	Weather Delay, Unforeseen Delay	45	45	26-Dec-25	26-Feb-26	0%	0																					
A1150	Final Completion	0	0	27-Feb-26	27-Feb-26*	0%	0																					
<b>Phase II - Construction (North Plant)</b>		707	707	18-Jul-22	21-Apr-25		0																					
<b>GMP-1</b>		446	446	18-Jul-22	17-Apr-24		0																					
<b>GMP-1 Procurement</b>		54	54	18-Jul-22	30-Sep-22		0																					
<b>Package #3 - Underground Yard Pipe</b>		54	54	18-Jul-22	30-Sep-22		0																					
S.15.7010	Deliver Underground Yard Pipe 42" & 48" Fittings	54	54	18-Jul-22	30-Sep-22	0%	0																					
<b>Yard Piping</b>		22	22	03-Oct-22	01-Nov-22		0																					
04.15.2370	Install underground 42" & 48" Pipe	22	22	03-Oct-22	01-Nov-22	0%	0																					
<b>BNR Basin - 20 GMP-1</b>		370	370	02-Nov-22	17-Apr-24		0																					
020.02.3001	Prep. Subgrade @ BNR Tanks - GMP 1	10	10	02-Nov-22	15-Nov-22	0%	0																					
020.03.3000	F/P BNR Basin Slabs - GMP 1	62	62	16-Nov-22	15-Feb-23	0%	0																					
020.03.3001	F/P BNR Basin Walls - GMP 1	238	238	03-Feb-23	11-Jan-24	0%	0																					
020.03.3020	F/P BNR Shored Slabs - GMP 1	30	30	12-Jan-24	22-Feb-24	0%	0																					
020.02.3041	F/P BNR Basin Walls - GMP-1	32	32	23-Feb-24	08-Apr-24	0%	0																					
020.03.3100	Leak Test BNR Tanks - GMP 1	3	3	09-Apr-24	11-Apr-24	0%	0																					
020.02.3031	Backfill BNR Tanks - GMP 1	4	4	12-Apr-24	17-Apr-24	0%	0																					
<b>GMP-2 (Remaining Work Packages 5-15)</b>		261	261	18-Apr-24	21-Apr-25		0																					
<b>BNR Basin - 20 GMP-2</b>		210	210	18-Apr-24	07-Feb-25		0																					
020.09.9000	Paint Concrete @ BNR Tanks	30	30	18-Apr-24	29-May-24	0%	0																					
020.15.2000	Install Process Piping @ BNR Tanks	42	42	30-May-24	29-Jul-24	0%	0																					
020.11.8000	Install Weir Gates @ BNR Tanks	14	14	30-Jul-24	19-Aug-24	0%	0																					
020.11.5020	Install Mixers @ BNR Tanks	18	18	19-Aug-24	13-Sep-24	0%	0																					
020.11.5000	Install Diffusers @ BNR Tanks	48	48	13-Sep-24	20-Nov-24	0%	0																					
020.11.5040	Install Internal Recycle Pumps @ BNR Tanks	15	15	20-Nov-24	11-Dec-24	0%	0																					
020.13.3100	Install Field Instruments @ BNR Tanks	5	5	11-Dec-24	18-Dec-24	0%	0																					
020.16.1100	Rough-in Electrical @ BNR Tanks	20	20	18-Dec-24	15-Jan-25	0%	0																					
020.16.1200	Pull & Terminate Wire @ BNR Tanks	10	10	15-Jan-25	29-Jan-25	0%	0																					
020.90.1000	Startup Ready BNR Tanks	7	7	29-Jan-25	07-Feb-25	0%	0																					
<b>MOPO &amp; Commission North Plant</b>		51	51	07-Feb-25	21-Apr-25		0																					
900.01.1000	Plant Startup - Reclaim water loop, Finalize IT Inte,	10	10	07-Feb-25	21-Feb-25	0%	0																					
900.01.1020	Seed Plant	26	26	21-Feb-25	31-Mar-25	0%	0																					
900.01.1030	Commission North Plant	15	15	31-Mar-25	21-Apr-25	0%	0																					
<b>Phase III - Construction (South Plant)</b>		157	157	22-Apr-25	26-Nov-25		0																					
<b>GMP-2</b>		157	157	22-Apr-25	26-Nov-25		0																					
<b>Equalization Basin - 15</b>		142	142	22-Apr-25	05-Nov-25		0																					
040.02.3000	Drain and Clean Existing Basin	20	20	22-Apr-25	20-May-25	0%	0																					
040.15.2100	Demo & Modify Internal Basin Walls	50	50	20-May-25	29-Jul-25	0%	0																					
040.03.3001	F/P New EQ Tank Wall/baffle sections	7	7	17-Jun-25	26-Jun-25	0%	0																					
040.09.9000	Paint Concrete @ EQ Tank	24	24	26-Jun-25	30-Jul-25	0%	0																					
040.05.5000	Install Misc. Metals @ EQ Tank	5	5	30-Jul-25	06-Aug-25	0%	0																					

Sarasota Bee Ridge WRF				Owner Print Out											28-Jul-22 09:03									
Activity ID	Activity Name	Original Duration	Remaining Duration	Start	Finish	Activity % Complete	Total Float	2023				2024				2025				2026				
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1		
040.11.5500	Install Mixers @ EQ Tank	7	7	06-Aug-25	15-Aug-25	0%	0																	■ Install Mixers @ EQ Tank
040.11.5520	Install Covers @ EQ Tank	15	15	06-Aug-25	27-Aug-25	0%	0																	■ Install Covers @ EQ Tank
040.15.2050	Install W3 Piping & Hose Bbbs @ EQ Tank	8	8	27-Aug-25	05-Sep-25	0%	0																	■ Install W3 Piping & Hose Bbbs @ EQ Tank
040.16.1080	Install Elec Panels & Devices @ EQ Tank	3	3	08-Sep-25	10-Sep-25	0%	0																	■ Install Elec Panels & Devices @ EQ Tank
040.13.3100	Install Field Instruments @ EQ Tank	5	5	11-Sep-25	17-Sep-25	0%	0																	■ Install Field Instruments @ EQ Tank
040.16.1100	Rough-in Electrical @ EQ Tank	15	15	18-Sep-25	08-Oct-25	0%	0																	■ Rough-in Electrical @ EQ Tank
040.16.1110	Install Light Fixtures @ EQ Tank	5	5	09-Oct-25	15-Oct-25	0%	0																	■ Install Light Fixtures @ EQ Tank
040.16.1200	Pull & Terminate Wire @ EQ Tank	10	10	16-Oct-25	29-Oct-25	0%	0																	■ Pull & Terminate Wire @ EQ Tank
040.90.1000	Startup Ready EQ Tank	5	5	30-Oct-25	05-Nov-25	0%	0																	■ Startup Ready EQ Tank
<b>Commision South Plant</b>		<b>15</b>	<b>15</b>	<b>06-Nov-25</b>	<b>26-Nov-25</b>	<b>0%</b>	<b>0</b>																	▲ 26-Nov-25
900.01.1010	Commission South Plant	15	15	06-Nov-25	26-Nov-25	0%	0																	■ Commission South Plant

 Actual Work 
  Critical Remaining Work 
  Summary  
 Remaining Work 
  Milestone

## SECTION 15211

### DUCTILE IRON PIPE: AWWA C151

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes: Ductile iron pipe, joints, connections, fittings, and pipe linings and coatings.
- B. As specified in Section 15052 - Common Work Results for General Piping.

##### 1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
  - 1. B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- B. American Water Works Association (AWWA):
  - 1. C104 – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
  - 2. C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 3. C110 - Standard for Ductile-Iron and Gray-Iron Fittings.
  - 4. C111 - Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 5. C150 - Standard for Thickness Design of Ductile-Iron Pipe.
  - 6. C151 - Standard for Ductile-Iron Pipe, Centrifugally Cast.
  - 7. C153 - Standard for Ductile-Iron Compact Fittings for Water Service.
  - 8. C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
  - 9. C222 - Polyurethane Coatings and Linings for Steel Water Pipe and Fittings.
  - 10. C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
  - 11. C606 - Standard for Grooved and Shouldered Joints.
- C. American Welding Society (AWS):
  - 1. D11.2 - Guide for Welding Iron Castings.
- D. ASTM International (ASTM):
  - 1. A536 - Standard Specifications for Ductile Iron Castings.
  - 2. 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.
  - 1. C33 - Standard Specification for Concrete Aggregates.
  - 2. C150 - Standard Specification for Portland Cement.
  - 3. C283 - Standard Test Methods for Resistance of Porcelain Enameled Utensils to Boiling Acid.
  - 4. D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
  - 5. D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

- E. Ductile Iron Pipe Research Association (DIPRA):
  - 1. Thrust Restraint Design Manual.
- F. International Organization for Standardization (ISO):
  - 1. 8179 - Ductile iron pipe, fittings, accessories and their joints - External zinc-based coating –Part 1: Metallic zinc with finishing layer.
- G. National Association of Pipe Fabricators, Inc. (NAPF):
  - 1. 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.
- H. NSF International (NSF):
  - 1. 61 – Drinking Water System Components - Health Effects.
- I. Society for Protective Coatings (SSPC):
  - 1. SP 5 - White Metal Blast Cleaning.
  - 2. SP 10 - Near White Wet Blast.
  - 3. SP 11 - Bare Metal Power Tool Cleaning.
  - 4. PA-2 - Measurement of Dry Coating Thickness With Magnetic Gages.
  - 5. QP 1 - Industrial Contractor Qualification.

### 1.03 SUBMITTALS

- A. Submit as specified in Section 01330 - Submittal Procedures.
- B. Product data.
- C. Manufacturer's qualifications.
  - 1. Manufacturer qualifications and list of projects using the specified material: 5 years minimum.
  - 2. Plural component epoxy and plural component polyurethane field repair: SSPC-QP 1 certification required.
- D. Manufacturer's Quality Assurance Manual:
  - 1. Submit manufacturer's coating and lining application quality assurance manual to Engineer prior to beginning coating application.
    - a. Strict conformance to the requirements of the manual will be required.
    - b. Deviation from the requirements of the manual will be grounds for the Engineer to reject the applied coating.
- E. Shop drawings:
  - 1. Detailed layout drawings showing alignment of pipes, location of valves, fittings, and appurtenances, types of joints, and connections to pipelines or structures.
  - 2. Thrust restraint systems.
  - 3. Photographs, drawings, and descriptions of fittings, gaskets, couplings, grooving of pipe and fittings.
- F. Calculations:
  - 1. Calculations for thrust restraint system design.

- G. Manufacturer's Certificate of Source Testing for ceramic epoxy, glass lined, plural component polyurethane, and zinc materials:
  - 1. Certify successful performance of holiday detection tests on 100percent of lining in accordance with ASTM B1000.
  - 2. Identify each test piece by mark designation and show the actual test results during the final inspection by manufacturer prior to shipment.
  - 3. Zinc coating: Regular measurements in accordance with ISO 8179 Part 4.4.
  - 4. Include Coating Manufacturer's Technical Representative's reports.

#### **1.04 QUALITY ASSURANCE**

- A. Ductile iron pipe shall be supplied by a single manufacturer.
- B. Hydrostatically test each joint of ductile iron pipe in accordance with AWWA C151.
- C. Pre-installation meeting:
  - 1. Arrange for Coating Manufacturer's Technical Representative to attend preconstruction conferences, and to make periodic visits to factory or shop to inspect surface preparation of pipe, fittings, and accessories; and to inspect application of linings to interior and coatings to exterior of pipe, fittings, and accessories.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Block piping and associated fittings for shipment to prevent damage to coatings and linings.
- B. Carefully handle piping and associated fittings during loading, unloading, and installation:
  - 1. Do not drop piping material from cars or trucks.
  - 2. Lower piping by mechanical means.
  - 3. Do not drop or pound pipe to fit grade.
- C. Handle pipe from the outside if lined with ceramic epoxy, glass or plural component polyurethane.
  - 1. No forks, chains, straps, hooks, or other lifting device shall be placed inside the pipe or fittings for lifting, positioning, or laying.
- D. Protect gaskets and polyethylene encasement from long-term exposure to sunlight.
- E. Store piping, fittings, and other accessories such that they do not accumulate and hold rainwater, dirt, and debris.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURED UNITS**

- A. Ductile iron piping:
  - 1. Manufacturers: One of the following or equal:
    - a. American Cast Iron Pipe Co.
    - b. Pacific States Cast Iron Pipe Co.



- c. SIP Industries.
- d. U.S. Pipe.

## 2.02 THRUST RESTRAINT SYSTEM DESIGN

- A. The length of pipe that must be restrained on each side of the focus of a thrust load as indicated on the Drawings.
- B. Design pressure: As specified in the Pipe Schedule.
- C. Laying condition: Type 5 in accordance with AWWA C150.
- D. Soil type: Sand Silt.
- E. Unit friction resistance for polyethylene encasement of pipe: DIPRA factor multiplied by a safety factor of 1.5.

## 2.03 CONCRETE THRUST BLOCK RESTRAINT

- A. Joint thrust restraint system designed by Contractor.
  - 1. Concrete thrust blocks will not be permitted for DIP restraint.

## 2.04 DUCTILE IRON JOINTS AND CONNECTIONS

- A. General:
  - 1. Pressure class or special thickness class as indicated in the Piping Schedule provided in Section 15052 - Common Work Results for General Piping.
  - 2. In accordance with AWWA C150 and AWWA C151.
  - 3. Joints:
    - a. Flanged.
    - b. Grooved.
    - c. Mechanical.
    - d. Push-on Rubber Gasket.
    - e. Integrally Restrained Mechanical.
    - f. Mechanical Wedge Action.
    - g. Integrally Restrained Push-On.
    - h. Push-On Joint Restraint Harness.
  - 4. Connections:
    - a. Tapping saddle.
    - b. Tapping sleeve.
    - c. Welded outlet.
  - 5. Fittings.
- B. Joints:
  - 1. Flanged joints:
    - a. Screw-on flanges:
      - 1) Comply with the diameter, thickness, drilling, and other characteristics in accordance with ASME B16.1.
      - 2) Ductile iron.
      - 3) Long hub, threaded, and specially designed for ductile iron pipe.
      - 4) After attaching to pipe, machine flange face to make pipe end and flange even and perpendicular to the axis of the pipe.
    - b. Bolt holes on flanges: 2-holed and aligned at both ends of pipe.

- c. Cap screw or stud bolt holes: Tapped.
  - d. Bolts and nuts:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
  - e. Gaskets:
    - 1) Standard styrene butadiene copolymer (SBR) unless specified otherwise in Section 15052 - Common Work Results for General Piping.
2. Grooved joints:
- a. In accordance with AWWA C606, as complemented and modified below, radius-cut type.
  - b. Couplings:
    - 1) Rigid type, cast from ductile iron in accordance with ASTM A536, Grade 65-45-12.
  - c. Bolts and nuts:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
  - d. Gaskets:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
  - e. Fittings:
    - 1) In accordance with AWWA C606, rigid radius-cut groove:
    - 2) Center-to-center dimensions: In accordance with AWWA C110.
    - 3) Wall thickness and other characteristics: In accordance with AWWA C606.
  - f. Flanged unit connections:
    - 1) Flanged to grooved joint adapters or a long enough spool with one end flanged and the other end grooved to prevent interference with the operation of adjacent valves, pumps, or other items.
3. Mechanical joints:
- a. In accordance with AWWA C111.
  - b. Gaskets:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
  - c. Bolts and nuts, including T-bolts:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
4. Push-on rubber gasket joints:
- a. In accordance with AWWA C111.
  - b. Gaskets:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
5. Integrally restrained mechanical joints:
- a. Manufacturers: Where restrained mechanical joints are required, use one of the following or equal:
    - 1) American Cast Iron Pipe Co., MJ Coupled Joint.
    - 2) Pacific States Cast Iron Pipe Co., Lock Mechanical Joint.
    - 3) U.S. Pipe, Bolt-Lok.
    - 4) U.S. Pipe, Mech-Lok.
  - b. Application:
    - 1) Where designated mechanical restraint.

- 2) Mechanical joint is indicated on the Drawings, supply a restrained mechanical joint piping system, which includes restrained mechanical joints where necessary based upon thrust calculations.
- 3) Standard mechanical joints as specified above can be used where thrust calculations demonstrate restraint is not required.
- c. Design:
  - 1) Integral retainer weldment type or lugged type joint with Type 304 stainless steel rods and nuts.
  - 2) Restrained mechanical joints of the configuration which utilizes a gripping or friction force for restraint will not be acceptable.
- d. Gaskets:
  - 1) As specified in Section 15052 - Common Work Results for General Piping.
- e. Bolts and nuts, including T-bolts:
  - 1) As specified in Section 15052 - Common Work Results for General Piping.
6. Integrally restrained push-on joints:
  - a. Application:
    - 1) Where designation restrained push-on as indicated on the Drawings, supply a restrained push-on joint piping system, which includes restrained push-on joints where necessary based upon thrust calculations.
    - 2) Standard push-on rubber gasket joints as specified above can be used where thrust calculations demonstrate restraint is not required.
  - b. Design:
    - 1) Restrained push-on joints of the configuration which utilizes a gripping or friction force for restraint will not be acceptable.
    - 2) Suitable for the following working pressures:
      - a) For 4- through 24-inch pipe: 350 pounds per square inch gauge.
      - b) For 30- through 54-inch pipe: 250 pounds per square inch gauge.
  - c. Gaskets:
    - 1) As specified in Section 15052 - Common Work Results for General Piping.
  - d. Manufacturers: One of the following or equal:
    - 1) U.S. Pipe, TR Flex.
    - 2) McWane Ductile, TR Flex.
    - 3) American Cast Iron Pipe Co., Flex Ring or Lok-Ring.
  - e. Limit buried joints to half the manufacturer's published allowable angular joint deflection for purposes of pipeline alignment and elimination of fittings.
7. Push-on joint restraint harnesses:
  - a. Manufacturers: One of the following or equal:
    - 1) EBAA Iron, Inc., Megalug® Series 1700.
    - 2) Star Pipe Products, Split Stargrip Series 3100S.
    - 3) Sigma Corp., One-Lok Model SLDEH.
  - b. Materials:
    - 1) Restraint and backup ring: Ductile iron in accordance with ASTM A536.
    - 2) Wedges and wedge actuating components: Ductile iron in accordance with ASTM A536.
      - a) Wedges shall be heat treated to a minimum of 370 BHN.

- 3) Actuating bolts and nuts:
  - a) Ductile iron in accordance with ASTM A536.
  - b) Provide torque-limiting twist off components to ensure proper installation.
- 4) Tie rods:
  - a) Low alloy steel in accordance with AWWA C111.
- 5) Bolts and nuts, including T-bolts:
  - a) As specified in 15052 - Common Work Results for General Piping.
- c. Coatings:
  - 1) Provide manufacturer applied coating system.
  - 2) Manufacturers: One of the following or equal:
    - a) EBAA Iron Inc., Mega-Bond.
    - b) Star Pipe Products, Star-Bond.
    - c) Sigma Corp., Corrsafe™ Electro-deposition coating.
- d. Working pressure:
  - 1) Shall include a minimum safety factor of 2:1.
  - 2) For sizes 3- through 16-inch: 350 pounds per square inch.
  - 3) For sizes 18- through 48-inch: 250 pounds per square inch.
- e. Restraint shall consist of a backup ring behind the ductile iron bell and a restraint ring consisting of multiple gripping wedges connected with number and type of tie rods as recommended by the manufacturer.
- f. Restraint shall allow post assembly deflection of a minimum of 50 percent of the deflection capability of the push-on joint.

C. Connections:

- 1. Tapping saddle as specified in Owner standard specification.
  - a. If Owner does not have a standard specification, provide tapping saddles as specified in Section 15120 - Piping Specialties.
- 2. Tapping sleeve as specified in Owner standard specification.
  - a. If Owner does not have a standard specification, provide tapping sleeves as specified in Section 15120 - Piping Specialties.
- 3. Welded outlet:
  - a. Not allowed without Engineer approval.

D. Fittings:

- 1. Potable water or reuse water: Ductile iron in accordance with AWWA C110
- 2. Wastewater: Ductile iron in accordance with AWWA C110.
- 3. Joint type:
  - a. Same as that of the associated piping as specified in Section 15052 - Common Work Results for General Piping.
- 4. Plain end-to-flanged joint connectors using setscrews are not acceptable.

## 2.05 CEMENT MORTAR

- A. Line pipe with cement mortar in accordance with AWWA C104 and as specified in this Section.
- B. Cement:
  - 1. Cement: In accordance with ASTM C150, Type II.

- C. Water:
  - 1. In accordance with AWWA C104 and as specified in this Section.
- D. Sand and aggregate:
  - 1. In accordance with AWWA C104.
  - 2. Provide silica sand or other aggregate that is not subject to leaching in accordance with ASTM C33.
- E. Lining:
  - 1. Minimum lining thickness: Standard in accordance with AWWA C104.
  - 2. Apply cement mortar on clean bare metal surfaces.
  - 3. Extend to faces of flanges, ends of spigots, and shoulders of hubs.
  - 4. Line special pieces or fittings by mechanical, pneumatic, or hand placement.
    - a. Extend to faces of flanges and ends of spigots.
    - b. Less than 12 inches in width: Coat with epoxy bonding agent prior to applying cement mortar.
    - c. Larger than 12 inches in width: Reinforced with 2-inch by 4-inch No. 13 gauge welded steel wire mesh prior to applying cement mortar.
  - 5. Provide plastic end caps of sufficient thickness and strength to resist shipping, handling, and storage stresses.
  - 6. Repair damage to the cement mortar lining, including disbondment, or cracking caused by improper curing, shipping, handling, or installation in accordance with AWWA C104 and approved by the Engineer.
    - a. Reinforce coating with 2 layers spirally-wound steel wire positioned approximately in center of mortar coating positioned approximately at the third points of mortar coating:
      - 1) No. 12 gage spaced at maximum 1-inch centers.
      - 2) No. 14 gage steel wire at maximum 1/2-inch centers.

## 2.06 CERAMIC EPOXY

- A. Line pipe with ceramic epoxy.
- B. Manufacturers: One of the following or equal:
  - 1. PROTECTO 401.
  - 2. SP-2000W.
  - 3. Permax CTF lining.
- C. Material:
  - 1. Amine cured Novolac epoxy containing at least 20 percent by volume of ceramic quartz pigment.
- D. Application:
  - 1. The lining shall only be applied by a manufacturer-authorized representative with no less than 5 years of experience in applying the specified material.
  - 2. The application of the lining shall be performed in accordance with manufacturer's published specifications.
  - 3. Pipe and fittings shall be delivered to application facility with no interior lining.
  - 4. Interior of pipe shall be abrasive blasted in accordance with manufacturer instructions.
  - 5. Apply lining in accordance with manufacturer instructions.
  - 6. Minimum dry film thickness (DFT): 40 mills.

- E. Coverage:
  - 1. Gasket and spigot ends on joints:
    - a. Minimum coverage using joint compound: 6 mils.
    - b. Maximum coverage using joint compound: 10 mils.
  - 2. Mechanical joints:
    - a. Extend lining from spigot end to edge of gauging ring.
  - 3. Number of coats:
    - a. in accordance with manufacturer instructions.
  
- F. Source quality control:
  - 1. Test pipe and fitting lining with a magnetic film thickness gauge in accordance with SSPC PA-2 Film Thickness Rating.
  - 2. Test lining integrity of pipes in accordance with coating manufacturer instructions using a holiday detection testing instrument set at the specified voltage.
  - 3. Discard pipe or reline pipe when pinholes or discontinuities are found.
  - 4. Repair holidays with joint compound in accordance with coating manufacturer instructions and re-test.

## 2.07 GLASS LINING

- A. Manufacturers: One of the following or equal, having a minimum of 5 years of experience supplying this product to the wastewater and water industry:
  - 1. Water Works Manufacturing, Ferroch MEH-32 Lining.
  - 2. Vitco Corp., SG-14 Lining.
  
- B. Material:
  - 1. Special glasses and inorganic materials suited for lining of sewage, sludge, and scum piping.
  - 2. Thickness: 0.008 to 0.012 inch.
  - 3. Hardness: 5 to 6 on the Mohs Scale.
  - 4. Density: 2.5 to 3.0 grams per cubic centimeter, measured in accordance with ASTM D792.
  - 5. Thermal shock resistance: Capable of withstanding 350 degrees Fahrenheit change from 430 degrees Fahrenheit to 80 degrees Fahrenheit without crazing, blistering, or spalling.
  - 6. Gloss retention: Capable of retaining gloss after immersion in an 8 percent sulfuric acid solution at 148 degrees Fahrenheit for 10 minutes.
  - 7. Weight loss: Maximum 3 milligrams per square inch when tested in accordance with ASTM C283.
  
- C. Fabrication:
  - 1. Use piping that is suitable for glass lining with minimum Class 53 wall thickness after application of glass lining.
  - 2. Machine interior of pipe.
    - a. Bore or grit blast in accordance with NAPF 500-03 prior to application of glass lining.
  - 3. Screw factory assembled flanges on pipe, align boltholes, and flange faces, unless otherwise specified.
  - 4. Apply lining to surfaces free of chemicals.
  - 5. Place piping in furnaces specially designed for heating piping until glass melts and fuses with an integral molecular bond to the base metal.

6. Test 100 percent of the product in the factory in accordance with ASTM B1000.

## **2.08 POLYETHYLENE ENCASEMENT**

- A. General:
  1. Polyethylene encasement shall be supplied by the pipe manufacturer.
- B. Materials: Supply one of the following polyethylene encasements:
  1. 2 layers of linear low-density polyethylene (LLDPE) film, minimum thickness of 8 mils in accordance with AWWA C105; or,
  2. Single layer of high-density, cross-laminated polyethylene (HDCLPE) film, minimum thickness of 4 mils in accordance with AWWA C105.
  3. Single layer of V-Bio<sup>®</sup> enhanced polyethylene encasement (3 layers of coextruded LLDPE film with anti-microbial additive and volatile corrosion inhibitor infused on the inside surface), meeting all requirements of AWWA C105.

## **2.09 SEAL COAT**

- A. Asphaltic seal coat:
  1. Apply over cement mortar linings and to outside surface of pipes that will not receive another coating.
  2. Apply in accordance with AWWA C151.

# **PART 3 EXECUTION**

## **3.01 INSTALLATION**

- A. General:
  1. Install ductile iron piping in accordance with AWWA C600, or as modified in Section 15052 - Common Work Results for General Piping.
  2. For underground piping, the trenching, backfill, and compaction:
    - a. Inspect coating prior to backfill.
    - b. As specified in Section 02318 - Trenching.
- B. Polyethylene encasement:
  1. Wrap all buried ductile iron pipe and fittings in 2 layers of loose low-density polyethylene wrap or a single layer of high-density polyethylene wrap in accordance with AWWA C105.
  2. Polyethylene encasement shall be continuous and terminated neatly at connections to below grade equipment or structures.
  3. At wall penetrations, extend encasement to the wall and neatly terminate.
  4. At slab penetrations, extend encasement to 2 inches below the top of slab and neatly terminate.
  5. When rising vertically in unimproved areas, extend encasement 6 inches above existing grade and neatly terminate.
  6. Repair tears and make joints with 2 layers of plastic tape.
  7. All work shall be inspected prior to backfilling of pipe and associated items.

- C. Joints:
1. Install types of joints as specified in the piping schedule provided in Section 15052 - Common Work Results for General Piping.
  2. Mechanical joints are not acceptable in above ground applications.
  3. Field closure for restrained push-on pipe:
    - a. Locate field closures in areas where thrust calculations demonstrate restraint is not required.
  4. Grooved joints:
    - a. Install piping with grooved joints where specified in the piping schedule as specified in Section 15052 - Common Work Results for General Piping.
    - b. Assemble grooved joints in accordance with manufacturer's published instructions.
    - c. Support grooved-end pipe in accordance with manufacturer's published instructions.
      - 1) Install at least 1 support between consecutive couplings.
- D. Connection:
1. Tapping ductile iron pipe:
    - a. Direct tapping of ductile iron pipe may be performed but is limited to the following conditions:
      - 1) Maximum allowable tap diameter by pipe diameter and pressure class:

Pipe Size (inches)	Pressure Class				
	150	200	250	300	350
	<b>Maximum Allowable Direct Tap Size (inches)</b>				
3	-	-	-	-	3/4
4	-	-	-	-	3/4
6	-	-	-	-	1
8	-	-	-	-	1
10	-	-	-	-	1
12	-	-	-	-	1-1/4
14	-	-	1-1/4	1-1/2	1-1/2
16	-	-	1-1/2	2	2
18	-	-	2	2	2
20	-	-	2	2	2
24	-	2	2	2	2

- b. The maximum allowable tap diameter for pipelines greater than 24 inches is 2 inches.
- c. 2 layers of 3-mil thread sealant are required to minimize the torque required to effect a watertight connection.



2. Direct tapping of glass lined ductile iron pipe may be performed only when approved in writing by the Engineer. Direct tapping of glass lined pipe shall be performed in accordance with the above conditions for tapping ductile iron pipe in addition to the following conditions:
  - a. Drilling and tapping shall be performed using a hole saw.
    - 1) Use of a large drill bit is not acceptable.
  - b. As the hole saw approaches the glass lining, lessen the inward pressure to avoid excess chipping or cracking of the lining.
  - c. Minor chipping or spalling of the glass lining shall be repaired using an epoxy resin "glass repair kit" provided by the fabricator.
    - 1) Manufacturers: One of the following or equal:
      - a) Devoe - Devran 224 HS.
      - b) Sherwin-Williams Co. - Sher-Tile High Solids Epoxy.
    - 2) Repair kit use is only allowed for areas of damage less than 1/2 inch in diameter.
      - a) Larger areas of damage will require replacement.
    - 3) Surface shall be prepared and repair kit shall be applied in accordance with manufacturer and/or fabricator's instructions.
3. Direct tapping of glass lined ductile iron pipe may be performed only when approved in writing by the Engineer. Direct tapping of glass lined pipe shall be performed in accordance with the above conditions for tapping ductile iron pipe in addition to the following conditions:
  - a. Drilling and tapping shall be performed using a hole saw.
    - 1) Use of a large drill bit is not acceptable.
  - b. As the hole saw approaches the glass lining, lessen the inward pressure to avoid excess chipping or cracking of the lining.
  - c. Minor chipping or spalling of the glass lining shall be repaired using an epoxy resin "glass repair kit" provided by the fabricator.
    - 1) Manufacturers: One of the following or equal:
      - a) Devoe - Devran 224 HS.
      - b) Sherwin-Williams Co. - Sher-Tile High Solids Epoxy.
    - 2) Repair kit use is only allowed for areas of damage less than 1/2 inch in diameter.
      - a) Larger areas of damage will require replacement.
    - 3) Surface shall be prepared and repair kit shall be applied in accordance with manufacturer and/or fabricator's instructions.
4. When direct tapping of ductile iron pipe is not possible due to limited wall thickness, a saddle tap shall be used.

### **3.02 DEFECTS IN COATINGS EXCEPT TAPE WRAP AND CEMENT MORTAR COATING**

- A. Engineer will identify defective coating to be field repaired in accordance with the applicable AWWA standard.
  1. Pipe joints exceeding the following defect maximum will be rejected.
    - a. Minor defects:
      - 1) No more than 1.5 per 100 square feet of surface area.
      - 2) 2 or more minor repairs within an 8-inches diameter circle will be considered a single repair.
      - 3) Repairs for adhesion testing will not be included in the total number of repairs.
      - 4) Repair in accordance with manufacturer's requirements.

- b. Major defects:
  - 1) No more than 3 major repairs on each pipe joint.
  - 2) No more than 30 percent repairs on the pipe surface area with defects.
- 2. Minor repairs:
  - a. Repairs less than 8-inches in the greatest dimension.
  - b. Repair in accordance with manufacturer's requirements.
- 3. Major repairs:
  - a. Repairs that exceed 8-inches in the greatest dimension.
  - b. Repair in accordance with manufacturer's requirements.

### **3.03 CERAMIC EPOXY AND GLASS LINING**

- A. Field testing:
  - 1. Test random samples, as directed by Engineer, in accordance with ASTM B1000.
  - 2. Discard lined piping and fittings found to have pinholes, crazing, or fish scales that expose the metal substrate.

### **3.04 PLURAL COMPONENT EPOXY**

- A. Joints:
  - 1. Field applied coating shall be of the same density, smoothness, and thickness as shop applied coating.
  - 2. Comply with same application requirements as shop applied coating or lining.
    - a. Provide heating and/or dehumidification equipment as required to meet the environmental conditions necessary for proper coating application.

### **3.05 PLURAL COMPONENT POLYURETHANE**

- A. Joints:
  - 1. Field applied coating or lining shall be of the same density, smoothness, and thickness as shop applied coating or lining.
  - 2. Comply with same application requirements as shop applied coating or lining.
    - a. Provide heating and/or dehumidification equipment as required to meet the environmental conditions necessary for proper coating application.

### **3.06 POLYETHYLENE ENCASEMENT**

- A. Wrap buried ductile iron pipe and fittings in accordance with AWWA C105 and as specified in this Section.
- B. Wrap polyethylene encasement to be continuous and terminated neatly at connections to below grade equipment or structures.
- C. At wall penetrations, extend encasement to the wall and neatly terminate.
- D. At slab penetrations, extend encasement to 2 inches below the top of slab and neatly terminate.
- E. When rising vertically in unimproved areas, extend encasement on pipe 6 inches above existing grade and neatly terminate.

### 3.07 FIELD QUALITY CONTROL

- A. Testing ductile iron piping:
  - 1. Test as specified in Section 15052 - Common Work Results for General Piping and Section 15956 - Piping Systems Testing.
  
- B. Repair damaged cement mortar lining to match quality, thickness, and bonding of original lining in accordance with AWWA C104.
  - 1. When lining cannot be repaired or repairs are defective, replace defective piping with undamaged piping.
  
- C. Verify that interior surfaces of ceramic epoxy and glass lined pipe and fittings have continuous coverage:
  - 1. Test random samples, as directed by Engineer, in accordance with ASTM B1000.
  - 2. Discard lined piping and fittings found to have pinholes, crazing, or fish scales, which expose the metal substrate.

END OF SECTION