North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

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Secretary

June 30, 2015

Mr. Timothy Connor, Chemical Engineer, Municipal Support Division
via e-mail to: connor.timothy@epa.gov
Located at:
Office of Wastewater Management
Environmental Protection Agency
cwsrfwaiver@epa.gov
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Subject: Winston-Salem and Forsyth County
City/County Utilities Commission
Muddy Creek Consolidated Pumping Station
Engineer: Black and Veatch
Contractor: MWH Constructors
AIS Availability Waiver Request(s)
Project No. CS370399-08

Dear Mr. Connor:

The North Carolina Division of Water Infrastructure (DWI) has reviewed and is forwarding the American Iron and Steel (AIS) Waiver Request information to EPA for Ductile Iron Pipe (DIP) fittings. This information was provided by MWH Constructors for the Winston Salem CWSRF Project No. CS370399-08 on June 24, 2015.

The North Carolina Division of Water Infrastructure (DWI) has reviewed and is forwarding the American Iron and Steel (AIS) Waiver Request information to EPA for Ductile Iron Pipe (DIP) backup rings for use with HDPE Flange Adapters. This information was provided by MWH Constructors for the Winston Salem CWSRF Project No. CS370399-08 on June 29, 2015.

The listed items are not available from any identified domestic sources. The project schedule has been impacted and additional delays will negatively the project schedule and project costs.

Additional information and associated technical documentation for the Ductile Iron Pipe (DIP) backup rings for use with HDPE Flange Adapters portion of this waiver can be found beginning at page 28.

The Division's regular construction inspections of CW and DW SRF Projects cover loan administration, construction, and SRF Requirements. If you have any questions or comments, please contact me at (919) 616-4245 or at tom.poe@ncdenr.gov.

Sincerely,

Tom S Poe

Tom S. Poe
Construction Inspector

TSP/dr
Attachments:
AIS Waiver Request Letters and documentation:
MWH Contractor's Letter dated 6/24/2015, and attachments (25 pages)
MWH Contractor's Letter dated 6/29/2015, and attachments (9 pages)

cc: (via electronic copy)
Jeremy Hogan, Project Engineer, MWH Constructors
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cc: (via paper copy)
NC-CWSRF Project File

MWH
CONSTRUCTORS

6/24/2015

Terry Cornett
Black & Veatch International Company
10715 David Taylor Drive, Suite 240,
Charlotte, NC 28262 USA

Subject: Availability Waiver Request from American Iron and Steel Provisions
Clean Water Revolving Loan Fund (CWSRF)
Muddy Creek WWTP Consolidated Influent Pumping Improvements
Winston-Salem, North Carolina

Mr. Cornett,

MWHC formally requests relief from the AIS provision on the basis of certain iron and steel products not being produced in the United States in sufficient and reasonably available quantities. This waiver request is specifically related to TR-Flex restrained joint ductile iron pipe to be used for the Muddy Creek Wastewater Treatment Plant Improvements Project as specified in the attached contract specifications. MWHC received noticed from their supplier (Fortiline Waterworks) that not all sizes of TR-Flex Ductile Iron Pipe is available from a domestic source, specifically sizes smaller than 24" in diameter. Other means to restrain ductile iron pipe such as mechanical restraints are restricted by the Engineer of Record for this project.

A single/vendor system of pipe is required, however no one vendor manufactures all sizes of pipe required to complete this project (4"diameter to 42" diameter specifically). Additionally, if a change in vendor for ductile iron pipe were to occur, the schedule would be severely impacted, due to lead times in procuring different products, time required for contracting, and product submittal review time.

Feel free to contact me if you have and questions
Sincerely,
MWH Constructors,

Jeremy Hogan
Project Engineer

Attachments:
A) Contract Specifications

The applicant clarified to the EPA the specific fittings at issue in this waiver request.

Quantity	Description	Pressure Class Required	Lining Required	Coating Required
Potable and Non Potable Water Lines				
4	6"Ø TR-Flex 45˚ Bend	350	Cement	Asphaltic
12	4"Ø TR-Flex 45˚ Bend	350	Cement	Asphaltic
7	4"Ø TR-Flex 90˚ Bend	350	Cement	Asphaltic
18	6"Ø x 4"Ø TR-Flex Tee	350	Cement	Asphaltic
2	6"Ø TR-Flex Tee	350	Cement	Asphaltic
6	4"Ø TR-Flex Tee	350	Cement	Asphaltic
1	6"Ø x 4"Ø TR-Flex Cross	350	Cement	Asphaltic
Waste Activated Sludge Lines				
3	6"Ø 45˚ TR-Flex Bends	350	Glass	Asphaltic
Centrate				
2	6"Ø x 4"Ø TR-Flex Tee	350	Glass	Asphaltic
1	6"Ø TR-Flex Tee	350	Glass	Asphaltic
2	6"Ø 45˚ TR-Flex Bend	350	Glass	Asphaltic

Section 15061

DUCTILE IRON PIPE

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of ductile iron pipe. Ductile iron pipe shall be furnished complete with all fittings, specials, adapters, closure pieces, blowoffs, outlets, caps and plugs, temporary bulkheads, access manholes, jointing materials, pipe hangers and supports, anchors, blocking, encasement, appurtenances, and accessories specified and indicated on the Drawings, and as required for proper installation and functioning of the piping.

Piping furnished hereunder shall be complete with all joint gaskets, bolts, nuts and other jointing materials required for installation of any valves and equipment furnished by Owner or others for installation under this Contract.

Pipe hangers and supports, pressure and leakage testing, and cleaning and disinfection are covered in other sections. Cast iron soil pipe is covered in the Cast Iron Soil Pipe and Accessories section. Pipe trenching, embedment, and backfill are covered in the Trenching and Backfilling section.

1-1.01. Pipe Manufacturer's Experience and Field Services. All ductile iron pipe, fittings, specials, bolts, gaskets, other jointing materials, and appurtenances shall be fabricated, lined, coated, and furnished under the direction and management of one pipe manufacturer. The pipe manufacturer responsibilities, which shall include, at a minimum; coordinating and furnishing all pipe materials, gaskets, bolts, and other jointing materials, and pipe appurtenances (except for furnished coupled joints and other similar products by a specified manufacturer) for a complete piping system that meets the specified test pressures and service conditions; ensuring and certifying that all pipe, fittings, specials, and other pipe materials, pipe gaskets and bolts specified herein, are being manufactured in full accordance with the Contract Documents; preparing and submitting all submittal information and shop drawings; and making any corrections that may be required to submittal information and shop drawings.

The pipe manufacturer's minimum required experience qualifications shall include manufacture of interior and buried plant piping of similar diameters of at least two water or wastewater plants with joints, linings, and coatings suitable for the same or higher pressure rating, and a pipeline at least 1 mile in length, of a diameter equal to or larger than the pipe to be provided, with joints, lining, and

coating suitable for the same or higher pressure rating, which has performed satisfactorily for the past 5 years.
All ductile iron pipe shall be installed in accordance with the pipe manufacturer's recommendations.

1-2. SUBMITTALS. Drawings, details, specifications, and installation schedules covering all ductile iron pipe and accessories shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the following:

Certification by manufacturer for each item furnished in accordance with the ANSI/AWWA Standards.

Restrained joints details.

Emergency Repair Manual, including names and telephone numbers of emergency contact persons.

Certification of gaskets by pipe manufacturer, certifying that gasket material is suitable for test pressures and services intended.

Certification of joint lubricant.

Certification of proof-of-design tests for joints, including restrained joints.

Certification of pipe manufacturer or fabricator and certification of proof-of-design tests for welded-on outlets.

Pipe laying schedule complete with a sequence of laying and an explanation of all abbreviations used in the schedule. For long, straight pipe runs, the pipe laying schedule shall list the pipeline station and either the pipe centerline or invert elevation coordinated with the Drawings at least every 100 feet.

Two samples of the polyethylene encasement, each sample clearly identified as required by the Governing Standards and test results from an independent third party laboratory of the requirements specified in ANSI/AWWA C105/A21.5.

The method that the Contractor proposes to use for measuring deflection of pipe joints.

Submittal data shall clearly indicate the country of origin of pipe, fittings, flanges, restraining devices, and accessories. Certified copies of physical and chemical test results as outlined in ANSI/AWWA C151/A21.51 shall be submitted for the materials to be provided.

1-2.01. Emergency Repair Manual. Contractor shall submit an emergency repair manual prepared and furnished by the pipe manufacturer. The manual shall include procedures for handling emergency calls and repairs; a list of stock replacement pipe sections, closures, and other parts needed for emergency repairs; names and emergency telephone numbers of pipe manufacturer's engineering staff and factory-trained field service representatives who can be contacted day or night during an emergency; response and delivery times; and installation instructions for the materials and methods used in making repairs.

1-3. SHIPPING, HANDLING, AND STORAGE. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section, and as specified herein.

Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Unpadded hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with polyethylene lining if such lining is specified.

Contractor-furnished pipe and fittings in which the lining has been damaged shall be replaced by and at the expense of Contractor. With the concurrence of Engineer, small and readily accessible damaged areas may be repaired.

If the lining of Owner-furnished pipe or fittings is damaged by Contractor during unloading or handling, the damaged pipe or fittings shall be replaced by and at the expense of Contractor. Where the damaged areas are small and readily accessible, Contractor may be permitted to repair the lining.

Contractor shall repair any damage to pipe coatings and linings before the pipe is installed.

PART 2 - PRODUCTS

2-1. PIPE CLASS. The class of ductile iron pipe shall be as indicated in the Ductile Iron Pipe Schedule. The specified class includes service allowance and casting allowance.

Pipe wall thickness for grooved and threaded end pipe shall be increased if necessary to comply with the following minimum thickness:

Pipe Size	Minimum Thickness Class	
inches	Threaded Ends (1)	Grooved Ends (2)
4-16	53	53
18	53	54
20	53	55
24	53	56
30-54	53	--
60 & 64	350 (3)	--

(1) Complies with ANSI/AWWA C115/A21.15 for minimum pipe wall thickness for threaded flanges.

(2) Complies with ANSI/AWWA C606 for grooved and shouldered joint ductile iron pipe.

(3) Minimum class for 60 and 64 inch pipe is pressure class 350.

2-2. MATERIALS.

Pipe	Ductile iron, ANSI/AWWA C151/A21.51, Table 1 or Table 3.

Gaskets – All Joint Types	Synthetic rubber unless otherwise specified; natural rubber will not be acceptable. All gaskets shall be furnished by the pipe manufacturer unless another manufacturer's product is indicated. Pipe manufacturer shall submit certificates of gasket suitability certifying that the gasket materials are compatible with the joints specified, are recommended for the specified field test pressure and service conditions. Gaskets for treated or potable water service shall be certified for chlorinated and chloraminated potable water. Gas and oil-resistant gaskets shall be made of Nitrile (NBR [Acrylonitrile Butadiene]) rubber. The name of the material shall be permanently marked or molded on the gasket. Gaskets shall also be certified as suitable where soils may be contaminated with gas and oil products.
Joint Lubricant	Vegetable-based lubricant recommended by the pipe manufacturer. Petroleum or animal-based lubricants will not be acceptable. Lubricants that will be in contact with treated or potable water shall be certified as being in compliance with ANSI/NSF 61.
Fittings	ANSI/AWWA C110/A21.10 (except shorter laying lengths will be acceptable for U.S. Pipe), or ANSI/AWWA C153/A21.53, minimum working pressure rating as follows, unless indicated otherwise on the Drawings.

Fitting Size in.	Material	Type	Min. Working Pressure Rating, psi
4 to 24	DI	Mechanical and Push-on joints	350
4 to 24	DI	Flanged joints	250
30 to 48	DI	All joints	250
54 to 64	DI	All joints	150

All fittings shall be ductile iron and suitable for a factory test pressure of rated working pressure plus 100 psi or 1.5 times rated working pressure, whichever is less, without leakage or damage.

Push-on Joints	ANSI/AWWA C111/A21.11.
Restrained Push-on Joints, locking wedge type, (4 inch through 24 inch)	EBAA Iron "Megalug" Series 1700; U.S. Pipe “TR Flex Gripper Ring”; Star Pipe Products “StarGrip 3100”; or American “Field Flex Ring”, without exception.
Restrained Push-on Joints, positive locking segments and/or rings, (4 inch through 36 inch)	American "Flex-Ring," or "Lok-Ring"; Clow "Super-Lock"; U.S. Pipe "TR Flex" or “HP Lok”; or Griffin "Snap-Lok."
Flanged Joints	ANSI/AWWA C115/A21.15.
Flanges	
Class 250 (Where identified on the Drawings)	Ductile iron, flat faced, with ANSI/ASME B16.1, Class 250 diameter and drilling.
All Others	Ductile iron, Class 125, ANSI/AWWA C115/A21.15.

Flanges	All flanges shall be suitable for test pressure of 1.5 times rated pressure without leakage or damage.
Bolts	ASTM A307, chamfered or rounded ends projecting 1/4 to 1/2 inch beyond outer face of nut.
Nuts	ASTM A563, hexagonal, ANSI/ASME B18.2.2, heavy semi finished pattern.
Gaskets	ASTM D1330, Grade I rubber, full face type, 1/8 inch thick unless otherwise required by pipe manufacturer and accepted by Engineer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.

Insulated Flanges

Flanges	As specified herein, except bolt holes shall be enlarged as needed to accept bolt insulating sleeves.
Insulation Kits	As manufactured by Advanced Products or Pipeline Seal and Insulator, Inc.
Insulating Gaskets	Type E, G-10, 1/8 inch thick, with Nitrile or EPDM sealing element for water and air service and Viton sealing elements for wastewater service unless otherwise required by pipe manufacturer and accepted by Engineer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.
Bolt Insulating Sleeves	G-10, 1/32 inch thick.
Insulating Washers	G-10, 1/8 inch thick, two for each flange bolt.
Backing Washers	Steel, 1/8 inch thick, two for each flange bolt.

Mechanical Joints	ANSI/AWWA C111/A21.11., with ductile iron glands.
Restrained Mechanical Joints, (field cut spigot), (4 inch through 24 inch)	EBAA Iron "Megalug" Series 1100, or Star Pipe Products "StarGrip 3000" without exception.
Wall Pipes or Castings	Mechanical joint with water stop and tapped holes; single casting or fabricated ductile iron pipe; holes sized in accordance with the details on the Drawings and provided with removable plugs.
Mechanical Joints with Tie Rods	As indicated on the Drawings.
Tie Rods	ASTM A307.
Steel Pipe	ASTM A53, Schedule 40 or 80 as indicated on the Drawings.
Washers	ANSI/ASME B18.22.1, plain steel.
Threaded Connections	ANSI/ASME B1.20.1, NPT; with boss or tapping saddle wherever wall thickness minus the foundry tolerance at the tapped connection is less than that required for 4-thread engagement as set forth in Table A.1, Appendix A, of ANSI/AWWA C151/A21.51.
Mechanical Couplings	
Couplings	Dresser "Style 38"; Smith-Blair "411 Steel Coupling"; or Romac "Style 400" or "Style 501"; without pipe stop.
Gaskets	Oil-resistant synthetic rubber gaskets shall be as recommended by the coupling manufacturer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.
Grooved-End Joints	AWWA C606.

Pipe Ends (rigid joints)	Grooved, with dimensions conforming to AWWA C606, Table 3.
Couplings (non-shouldered pipe)	Tyco/Grinnell "Figure 772, or Victaulic "Style 31."
Flanged Coupling Adapters	
Restrained (4 inch through 12 inch)	Smith-Blair "Type 912" or Romac "Style FCA501", with anchor studs of sufficient size and number to withstand test pressures.
Dismantling Joints	
Restrained (3 inch and larger)	Romac "DJ400"; Dresser "Style 131 Dismantling Joint" or Viking Johnson. For use in potable water systems, coating to be in accordance with NSF-61.
Tapping Saddles	Ductile iron, with stainless steel straps and synthetic rubber sealing gasket, 250 psi pressure rating.
Watertight/Dusttight Pipe Sleeves	PSI "Thunderline Link-Seal", insulating type with modular rubber sealing elements, nonmetallic pressure plates, and stainless steel bolts and nuts.
Shop Coating and Lining	
Cement Mortar Lining with Seal Coat	ANSI/AWWA C104/A21.4.
Ceramic Epoxy Lining	Induron "Protecto 401 Ceramic Epoxy".
Glass Lining	Two-coat system applied over blast-cleaned surface; ground and finish coats separately fired; finished lining thickness at least 10 mils , Mohs' Hardness 5 to 6 density as determined by ASTM D792; Fast Fabricators, Inc. "MEH 32" or "SG-14".

Universal Primer	Manufacturer's standard. If in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.
Asphaltic Coating	Manufacturer's standard.
Coal Tar Epoxy	Manufacturer's standard.
Liquid Epoxy	ANSI/AWWA C210, non-coal tar modified, or when in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.
Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Bostik/Never-Seez "Pure Nickel Special" or Permatex "Nickel Anti-Seize".
Corrosion Protection	
Polyethylene Encasement	Seamless, ANSI/AWWA C105/A21.5; LLDPE - 8 mil or HDCLPE - 4 mil.
Wax Tape and Primer	ANSI/AWWA C217, cold-applied petroleum wax primer and cold-applied petroleum wax tape; Trenton Wax-Tape and Primer.
Medium Consistency Coal Tar	Carboline "Bitumastic 50" or Tnemec "46-465 H.B. Tnemecol."

2-3. SHOP COATING AND LINING. The interior of all pipe and fittings, unless noted otherwise, shall be cement mortar lined and seal coated.

Lining for pipe and fittings for gravity sewers and wastewater facilities services shall be as specified below:

Service	Lining
Gravity sewers	Ceramic epoxy.
Grit piping	Glass.
Scum piping	Glass.

Service	Lining
All sludge piping except piping conveying activated sludge from final settling basins	Glass.
Sludge holding tank overflow and supernatant drawoff piping	Glass.
Centrate transfer piping.	Glass.
All other wastewater piping	Cement mortar.

Glass-lined pipe buried or embedded in concrete shall be ductile iron with mechanical or push-on joints; glass-lined pipe installed in interior locations may be flanged ductile iron with flanged cast or ductile iron fittings.

The exterior surfaces of all pipe and fittings which will be exposed in both interior and exterior locations shall be shop primed. Flange faces shall be coated with a suitable rust-preventive compound. Exterior surfaces of all other pipe and fittings shall be coated with asphaltic coating.

PART 3 - EXECUTION

3-1. INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; pipe ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site.

3-2. PROTECTION AND CLEANING. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign material prior to installation and shall be kept clean until the work is completed. Before jointing, all joint contact surfaces shall be wire brushed if necessary and wiped clean.

Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other objects shall not be placed in or allowed to enter the pipe.

3-3. CUTTING PIPE. Cutting shall be done in a neat manner, without damage to the pipe or the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a file or a power grinder to remove all roughness and sharp edges. The cut ends of push-on joint pipe shall be suitably beveled.

All field cutting of existing gray cast iron pipe shall be done with mechanical pipe cutters, except where the use of mechanical cutters would be difficult or impracticable.

Ends of ductile iron pipe shall be cut with a portable guillotine saw, abrasive wheel, saw, milling cutter, or oxyacetylene torch. The use of hydraulic squeeze type cutters will not be acceptable. Field-cut holes for saddles shall be cut with mechanical cutters; oxyacetylene cutting will not be acceptable.

Contractor shall use factory prepared pipe ends unless a field cut is required for connections.

3-4. ALIGNMENT AND GRADE. Buried piping shall be laid to the lines and grades indicated on the Drawings and as specified. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated in Table 3 (for full-length push-on joint pipe) or Table 4 (for full-length mechanical joint pipe) of AWWA C600, unless specially designed bells and spigots are provided. Contractor shall submit his proposed methods to measure deflection of deflected joints in accordance with the Submittal section.

Whenever deflections would exceed the values stipulated in Table 3 or Table 4, either shorter pipe sections or fittings shall be installed where needed to conform to the alignment or grade indicated on the Drawings and as acceptable to the Engineer.

Unless otherwise specified or acceptable to Engineer, laser beam equipment, surveying instruments, or other suitable means shall be used to maintain alignment and grade. At least one elevation reading shall be taken on each length of pipe. If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between the ground temperature and the air temperature within the pipe, precautions shall be taken to prevent or minimize further thermal deflections.

Additional requirements for alignment and grade are covered in the Project Requirements and Trenching and Backfilling sections and on the Drawings.

3-4.01. Tolerances. Each section of pipe shall be laid to the alignment and grade indicated on the Drawings and pipe laying schedule with pipe ends within the following tolerances;

+/- 0.10 foot in grade at any point

+/- 0.20 foot in alignment at any point

In addition, piping shall be visually straight or on a smooth curve between the points of defection or curvature indicated on the Drawings. Stricter tolerances than specified above shall be used as necessary to maintain minimum cover, to maintain required clearances, to make connections to existing pipe, to maintain the correct slope to avoid high or low points along the pipeline other than at locations indicated on the Drawings, or to meet other restrictions as required or directed by the Engineer.

3-5. LAYING PIPE. Buried pipe shall be protected from lateral displacement by placing the specified pipe embedment material installed as specified in the Trenching and Backfilling section. Under no circumstances shall pipe be laid in water, and no pipe shall be laid under unsuitable weather or trench conditions.

Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug. All water in the trench shall be removed prior to removing the plug.

Pipe shall be laid with the bell ends facing the direction of laying, except where reverse laying is specifically acceptable by Engineer.

The pipe laying schedule shall be annotated during the progress of the work to show all changes made during construction for record documentation. Upon completion of the installation of the piping, the annotated pipe laying schedule shall be submitted to Engineer in accordance with the Submittals Procedures section.

3-6. FIELD JOINTS. Joints in buried and tunnel locations shall be mechanical or push-on type unless otherwise indicated on the Drawings or where required to connect to existing piping or to valves. Bells on wall castings and wall sleeves shall be mechanical joint type, with tapped holes for tie rods or stud bolts. All other joints shall be flanged unless otherwise indicated on the Drawings.

Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11, Section 4.7, Performance Requirements, as modified herein. The joint test pressure shall be not less than 2 times the working pressure or 1-1/2 times the test pressure of the pipeline, whichever is higher. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and

manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.

Each joint, including restrained joints, shall be checked by Contractor as recommended by the pipe manufacturer to verify that the joint and the restraints are installed properly. Restrained joints shall be extended after they are assembled to minimize further take-up.

Field closure pieces shall be located away from the bends beyond the length over which joints are to be restrained.

Use of locking wedge type joint restrained joints will be allowed on a case by case basis and only with the prior approval of Engineer.

3-7. MECHANICAL JOINTS. Mechanical joints shall be carefully assembled in accordance with the pipe manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Over tightening of bolts to compensate for poor installation practice will not be acceptable.

The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top centerline for horizontal piping.

3-8. PUSH-ON JOINTS. The pipe manufacturer's instructions and recommendations for proper jointing procedures shall be followed. All joint surfaces shall be lubricated with a soap solution provided by the pipe manufacturer immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

Pipe ends for restrained joint pipe shall be prepared in accordance with the pipe manufacturer's recommendations.

3-9. FLANGED JOINTS. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

When bolting flanged joints, care shall be taken to avoid restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress in the flanges. One flange shall be free to move

in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually in a crisscross pattern and at a uniform rate, to ensure uniform compression of the gasket around the entire flange. All flange joint bolting procedures shall be in accordance with the pipe manufacturer's recommendations.

Special care shall be taken when connecting piping to any pumping equipment to ensure that piping stresses are not transmitted to the pump flanges. All connecting piping shall be permanently supported to obtain accurate matching of bolt holes and uniform contact over the entire surface of flanges before any bolts are installed in the flanges.

Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened. Each pump shall be leveled, aligned, and wedged into position which will fit the connecting piping, but shall not be grouted until the initial fitting and alignment of the pipe, so that the pump may be shifted on its foundation if necessary to properly install the connecting piping. Each pump shall, however, be grouted before final bolting of the connecting piping.

After final alignment and bolting, the pump connections shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no movement of the piping relative to the pump or opening of the pump connection joints. If any movement is observed, the piping shall be loosened and re-aligned as needed and then the flanges bolted back together. The flange bolts shall then be loosened and the process repeated until no movement is observed.

3-10. FLANGED COUPLING ADAPTERS. Flanged coupling adapters shall be provided for restrained couplings 12 inch and smaller where indicated on the Drawings and as specified herein. Flange coupling adapters shall be installed in accordance with the coupling manufacturer's recommendations. After the pipe is in place and bolted tight, the locations of holes for the anchor studs shall be determined and the pipe shall be field-drilled. Holes for anchor studs shall be drilled completely through the pipe wall. Hole diameter shall be not more than 1/8 inch larger than the diameter of the stud projection. Unless indicated on the Drawings, all flange coupling adapters shall be restrained.

Unless indicated otherwise on the Drawings, all flange coupling adapters 12 inch and smaller shall be restrained. Flange coupling adapters 14 inch and larger may only be used in unrestrained pipe applications.

The inner and outer surfaces of couplings, except flange mating surfaces, shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The flange mating surfaces shall be cleaned and shop primed with universal primer.

3-11. DISMANTLING JOINTS. Dismantling joints shall be provided for restrained couplings 6 inch and larger piping where indicated on the Drawings and as specified herein. Dismantling joints shall comply with AWWA C219 and shall be restrained flange by flange couplings manufactured as a single unit. Dismantling joints shall be installed in accordance with the coupling manufacturer's recommendations. Unless otherwise indicated on the Drawings, dismantling joints shall be restrained.

The inner and outer surfaces of dismantling joints, except flange mating surfaces, shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The flange mating surfaces shall be cleaned and shop primed with universal primer.

3-12. MECHANICAL COUPLINGS. Mechanical couplings shall be installed in accordance with the coupling manufacturer's recommendations. A space of at least 1/4 inch, but not more than 1 inch, shall be left between the pipe ends. Pipe and coupling surfaces in contact with gaskets shall be clean and free from dirt and other foreign matter during assembly. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks, and all parts of the coupling are square and symmetrical with the pipe. Following installation of the coupling, damaged areas of shop coatings on the pipe and coupling shall be repaired to the satisfaction of Engineer.

All surfaces, including the interior surfaces of the middle rings, shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210.

3-12.01. Restrained Mechanical Couplings. Pipe restraining glands with tie bolts shall be provided to restrain mechanical coupling connections where indicated on the Drawings. The connecting pipe shall be furnished with welded retainer rings as recommended by pipe manufacturer. The pipe manufacturer shall also coordinate the restrained connection with the pressure rating, length, and diameter dimensions of the mechanical coupling being furnished to assure proper clearance is provided for completing the restrained coupling installation.

3-13. GROOVED-END JOINTS. Grooved-end joints with rigid type grooving shall be installed in accordance with the coupling manufacturer's recommendations. Completed joints shall be rigid and shall allow no angular deflection or longitudinal movement. Except for closure pieces, field grooving of pipe will not be acceptable.

Grooved-end couplings shall not be used in the following applications: chemical service, except lime slurry piping, flammable liquid or flammable gas piping, compressed air or compressed gas piping operating at pressures above 25 psig , toxic gas piping, hot liquid with operating temperatures above 120°F, or steam piping.

3-14. GAS AND OIL-RESISTANT GASKETS. Gas and oil-resistant gaskets shall be installed where specified, indicated on the Drawings, or directed by Engineer where jointing gaskets may be subject to permeation when piping passes through areas where soil may be contaminated with gas or petroleum (oil) products or organic solvents or their vapors.

3-15. CORROSION PROTECTION.

3-15.01. Polyethylene Encasement. All buried pipe, including all straight pipe, bends, tees, adapters, closure pieces, and other fittings or specials, shall be provided with at least one wrap of polyethylene encasement. Other locations where ductile iron pipe and accessories shall be double wrapped with polyethylene encasement shall be as specified herein . Where ductile iron pipe is also embedded or encased in concrete the polyethylene encasement shall be installed around the pipe for 5 feet extending into each end of the concrete encasement.

All buried flanged valves, mechanical joint couplings with tie rods, mechanical couplings, restrained mechanical couplings and other pipe harness assemblies at valves or structure walls shall be provided with two wraps of polyethylene encasement in addition to other corrosion protection coatings as specified herein.

Polyethylene tube protection shall be installed in accordance with ANSI/AWWA C105/A21.5, Method A. Preparation of the pipe shall include, but shall not be limited to, removal of lumps of clay, mud, cinders, etc., prior to installation.

The terms "polyethylene tube protection" and "polyethylene encasement" are interchangeable and shall have the same meaning in these Contract Documents.

3-15.01.01. Inspection and Testing. Tests for preliminary acceptance of polyethylene encasement materials as required in the submittal paragraph shall be made at the expense of the Contractor.

At the Owner's expense, the Owner may obtain samples from the material supplied in the field and have test conducted of the requirements specified in ANSI/AWWA C105/A21.5 by an independent third-party laboratory,

3-15.02. Mechanical Joint Couplings with Tie Rods. The mechanical joint tie rods, bolt studs, pipe spacers and washers of buried mechanical joint couplings as detailed on the Drawings shall be protected by wrapping them with wax tape in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

Following application of the wax tape protection, the entire mechanical joint coupling assembly shall be wrapped with two layers of polyethylene encasement as specified herein. The two wraps of polyethylene encasement shall be lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the coupling assembly.

3-15.03. Flanged Valves. The flange bolts and nuts on buried flanged valves shall be protected by wrapping them with wax tape in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

Following application of the wax tape protection, the entire valve, including the bottom housing and the actuator to the wrench nut, shall be wrapped with two layers of polyethylene encasement as specified herein. The two wraps of polyethylene encasement shall be lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the valve.

3-15.04. Mechanical Couplings. The tie bolts and nuts on all buried mechanical couplings shall be coated with two coats of medium consistency coal tar.

After the protective coating has been applied to the tie bolts, the entire mechanical coupling shall be encapsulated with a shrink sleeve as indicated on the Drawings. The shrink sleeve shall extend a minimum of 6 inches on to the pipe on each side of the coupling. A primer shall be applied to the piping on each side of the coupling prior to installing the shrink sleeve. The application of the shrink sleeve shall be in accordance with ANSI/AWWA C216 and as

recommended by the shrink sleeve manufacturer. There shall be no bare or unprotected ferrous metal surfaces. Following installation of the shrink sleeve, the entire assembly shall be encapsulated with two wraps of polyethylene encasement lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the assembly as specified herein.

3-15.05. Restrained Mechanical Couplings. The corrosion protection for the mechanical coupling and its tie bolts and nuts of all buried restrained mechanical coupling assemblies shall be protected with two coats of medium consistency coal tar and shrink sleeve as specified herein for buried mechanical couplings.

The tie rods and bolts of the restraining glands of the coupling assembly shall be protected by wrapping them with wax tap in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

Following the application of the wax tape, the entire restrained mechanical coupling assembly shall be encapsulated with two wraps of polyethylene encasement lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the assembly as specified herein.

3-15.06. Other Assemblies. All ferrous metal clamps, tie rods, bolts, and other components of buried joint harnesses, tapping saddles, or pipe reaction anchorages in contact with earth or other fill material and not encased in concrete, shall be protected by wrapping them with wax tape in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

Following the application of the wax tape, the entire assembly shall be encapsulated with two wraps of polyethylene encasement lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the assembly as specified herein.

3-15.07. Surfaces Exposed in Manholes and Vaults. Unless otherwise specified, all uncoated surfaces exposed in manholes and vaults shall be cleaned and coated with two coats of medium consistency coal tar. The first coat shall be dry and hard before the second coat is applied. There shall be no unprotected, bare, or uncoated ferrous metal surfaces.

3-15.08. CathodicCorrosion Protection Systems. Not used.

3-16. OUTLETS. Where a 12 inch or smaller branch outlet is indicated and the diameter of the parent pipe is at least twice the diameter of the branch, a tee, a factory welded-on boss, or a tapping saddle will be acceptable.

Where a 4 inch or larger branch outlet is indicated on the Drawings and the diameter of the branch pipe for a given diameter of parent pipe is less than or equal to the maximum diameter listed herein, a factory welded-on outlet fabricated from centrifugally cast ductile iron pipe will be acceptable.

Parent Pipe Diameter Versus Maximum Branch Pipe Diameter for Welded-On Outlets

Parent Pipe Dia inches	Max Branch Pipe Dia inches	Parent Pipe Dia inches	Max Branch Pipe Dia inches
8	4	30	20
10	6	36	24
12	8	42	30
14	8	48	30
16	10	54	36
18	12	60	36
20	14	64	36
24	16		

All 30 inch and smaller branch pipe diameter welded-on outlets shall be rated for a working pressure of 250 psi, 36 inch branch diameter welded-on outlets shall be rated for a working pressure of 200 psi, and all outlets shall have a minimum factor of safety of 2.0. The pipe manufacturer shall provide test data and certification of proof of design. It is not necessary that these tests be performed on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.

Welded-on outlets may be provided as a radial (tee) outlet, a tangential outlet, or a lateral outlet fabricated at a specific angle to the parent pipe (in 15 degrees increments between 45 degrees and 90 degrees from the axis of the parent pipe), as indicated on the Drawings. The fillet weld dimensions for welded-on outlets shall be as specified herein. Parent pipe and branch pipe shall meet hydrostatic test requirements in accordance with ANSI/AWWA C151/A21.51, Sec. 5.2, prior to fabrication.

Welded-on Outlet Fillet Weld Dimensions for Specified Outlet Configurations

Radial and Lateral Outlets			Tangential Outlets		
Parent Pipe Dia inches	Branch Pipe Dia inches	Weld Fillet Size inches	Parent Pipe Dia inches	Branch Pipe Dia inches	Weld Fillet Size inches
24 and smaller	24 and smaller	1 x 1	8-30	24 and smaller	1-1/4 x 1-1/4
30-48	24 and smaller	1-1/4 x 1-1/4	36-54	24 and smaller	1-1/2 x 1-1/2
54-64	24 and smaller	2-1/4 x 2-1/2	60-64	24 and smaller	2-1/2 x 2-1/2
42-64	30	2-1/2 x 2-1/2	42-54	30	2-1/2 x 2-1/2
54-64	36	2-3/4 x 2-3/4	60-64	30	2-3/4 x 2-3/4

All joints on welded-on branch outlets shall be made in accordance with the latest revision of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15, as applicable. All outlets shall be fabricated from centrifugally cast ductile iron pipe designed in accordance with ANSI/AWWA C150/A21.50 and manufactured and tested in accordance with ANSI/AWWA C151/A21.51. Ni-Rod FC 55® electrodes manufactured by International Nickel Corporation (or an electrode with equivalent properties) shall be used in the manufacture of the fillet welds. Carbon steel electrodes will not be acceptable. Special Thickness Class 53 pipe shall be used for all branch pipe and parent pipe in 4 to 54 inch sizes. Pressure Class 350 pipe shall be used for 60 inch and 64 inch parent pipe. After welding, each fabricated outlet shall be subjected to a 15 psi air test. A soap and water solution shall be applied during the testing procedure to inspect the weld for leakage. Any welds that show air seepage shall be refabricated and retested.

Welded-on outlets shall be fabricated by the pipe manufacturer at its production facilities. Manufacturers of welded-on outlets shall have at least 5 years of satisfactory experience in the manufacture and performance of these products. The manufacturer shall have a documented welding quality assurance system and shall maintain resident quality assurance records based on ANSI/AWS D11.2, the Guide for Welding Iron Castings. The manufacturer shall also maintain appropriate welding procedure specifications (WPS) and procedure qualification (PQR), and welder performance qualification (WPQR) records.

The type of pipe end for the branch outlet shall be as specified or indicated on the Drawings. The maximum size and laying length of the welded-on branch outlet shall be as recommended by the pipe manufacturer and shall be acceptable to Engineer for the field conditions and the connecting pipe or valve. Pipe embedment material and trench backfill shall be placed and compacted under and around each side of the outlet to hold the pipe in proper position and alignment during the subsequent pipe jointing, embedment, and backfilling.

At locations acceptable to Engineer, drilling and tapping of the pipe wall for 2 inch and smaller pipe connections will also be acceptable, provided that the wall thickness, minus the casting allowance, at the point of connection equals or exceeds the wall thickness required for 4-thread engagement in accordance with Table A.1, Appendix A of ANSI/AWWA C151/A21.51.

3-17. WALL AND FLOOR PIPES Wall and floor pipes shall be installed where ductile iron pipes pass through concrete walls or floors, unless otherwise indicated on the Drawings.

Where a flange and mechanical joint pipe piece is to connect to a mechanical joint wall pipe or casting, the bolt holes in the bell of the wall pipe or casting shall straddle the top centerline of the horizontal pipe or casting and shall align with the bolt holes in the flange and mechanical joint piece. The top centerline shall be marked on the wall pipe or casting at the foundry or fabrication shop.

In vertical piping, the bolt holes of flanged and mechanical joint floor pipes or castings shall be aligned with the bolt holes of the flange or mechanical joint connecting piece. The required centerline alignment and orientation of the floor pipe or casting shall be marked on the floor pipe or casting at the foundry or fabrication shop.

3-18. WALL AND FLOOR SLEEVES. Wall and floor sleeves shall be installed where indicated on the Drawings and shall be installed where ductile iron pipe passes through concrete walls and floors or masonry walls, unless otherwise noted. To minimize sleeve size, piping on either side of the sleeve shall be provided with a screw-on flange, grooved coupling, or mechanical coupling with anchor studs to allow the pipe to pass through the sleeve. Where required, sleeves in masonry walls may be enlarged enough for flange or other joint restraint to pass through the sleeve.

Where specified or indicated on the Drawings, one or two sets of modular casing seals shall be installed at the face of walls to seal against soil or provide a dust or water tight seal. Contractor shall coordinate the diameter of wall or floor sleeves with the modular casing seal manufacturer. When soil may be present at wall

sleeves, two sets of modular casing seals shall be installed, one at each face of the wall. Unless otherwise indicated on the Drawings, modular casing seals shall not be used in submerged conditions unless the hydrostatic pressure is less than 20 feet and piping is less than 24 inch size.

3-19. REDUCERS. Reducers shall be eccentric or concentric as indicated on the Drawings. Reducers of eccentric pattern shall be installed with the straight side on top, so that no air traps are formed.

3-20. BLOWOFFS. Each blowoff shall be located and arranged as indicated on the Drawings.

3.21. ACCESS OPENINGS. Access openings shall be installed at the locations indicated on the Drawings. Access openings shall be 36 inch diameter outlets for 36 inch and larger diameter pipe and the same size as the pipe for 24 and 30 inch diameter pipe. Access openings shall be provided with either flanged outlets with blind flange cover or mechanical joint outlets with restrained mechanical joint plugs. Unless otherwise indicated on the Drawings or acceptable to the Engineer, covers shall be designed for the same external loads and internal pressures as the adjacent pipe. Covers shall be fabricated from steel plate and shall have two handles fabricated from 1 inch diameter rod or shall be manufacturer's standard blind flange with integrally cast lifting devices, either one in the center or two or more symmetrically located around the perimeter of the cover. At the option of the Contractor, and if acceptable to the Engineer, reinforced or dished covers of lighter weight and equal strength may be provided.

3-22. CONNECTIONS WITH EXISTING PIPING. Connections between new work and existing piping shall be made using fittings suitable for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of all water removed from dewatered lines and excavations without damage to adjacent property.

Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing potable water piping. Trench water, mud, or other contaminating substances shall not be permitted to enter the lines. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then swabbed with, or dipped in, a 200 mg/L chlorine solution.

3-23. INSULATED FLANGED JOINTS. Insulated flanged joints shall be installed where indicated on the Drawings. In addition to one full-faced insulated

gasket, each flange insulating assembly shall consist of one full-length sleeve, two insulating washers, and two backing washers for each flange bolt. The insulating gasket ID shall be 1/8 inch less than the ID of the flange in which it is installed. The insulated flanged joint accessories shall be installed in accordance with the instructions and recommendations of the insulating kit manufacturer.

3-24. CONCRETE ENCASEMENT. Concrete encasement shall be installed where indicated on the Drawings. A pipe joint shall be provided within 12 inches of each end of the concrete encasement. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipe to be encased shall be suitably supported and blocked in proper position, and shall be anchored to prevent flotation.

3-25. REACTION ANCHORAGE AND BLOCKING. Not used.

3-26. PRESSURE AND LEAKAGE TESTS. After installation, pipe and fittings shall be subjected to a pressure test and a leakage test in accordance with the Pipeline Pressure and Leakage Testing section.

3-27. CLEANING AND DISINFECTION. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean of any foreign matter until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

End of Section

MWH
CONSTRUCTORS

6/29/2015

Terry Cornett
Black & Veatch International Company
10715 David Taylor Drive, Suite 240,
Charlotte, NC 28262 USA

Subject: Availability Waiver Request from American Iron and Steel Provisions
Clean Water Revolving Loan Fund (CWSRF)
Muddy Creek WWTP Consolidated Influent Pumping Improvements
Winston-Salem, North Carolina

Mr. Cornett,

MWHC formally requests relief from the AIS provision on the basis of certain iron and steel products not being produced in the United States in sufficient and reasonably available quantities. This waiver request is specifically related to ductile iron backup rings to be used for the Muddy Creek Wastewater Treatment Plant Improvements Project as specified in the attached contract specifications. MWHC received noticed from their supplier (Ferguson Enterprises Inc.) that ductile iron backup rings which are used with high density polyethylene flange adapters are not available from a domestic source.

MWHC has contacted several other venders and has not been able to find a source that can provide ductile iron backup rings.

During the research into this matter, MWHC did find a similar situation where the EPA received and approved another case in which ductile iron backup rings were not available domestically. This decision memorandum is attached.

Feel free to contact me if you have and questions
Sincerely,
MWH Constructors,

Jeremy Hogan
Project Engineer

Attachments:
A) Decision Memorandum dated 2/20/2015
B) Contract Specifications

Section 02634

HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE

PART 1 - GENERAL

1-1. SCOPE. This section covers buried high density polyethylene (HDPE) pressure pipe. HDPE pressure pipe shall be furnished and installed complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances.

Pressure and leakage tests and cleaning are covered in other sections. Pipe trenching, bedding, and backfill are covered in the Trenching and Backfilling section.

1-2. GENERAL.

1-2.01. Governing Standard. Except as modified or supplemented herein, all HDPE pressure pipe shall conform to the applicable requirements of ANSI/AWWA C906.

The supplementary information required in the foreword of the governing standard is as follows:

Affidavit of Compliance (Sec. 6.3)	Required.
Plant Inspection by Purchaser (Sec. 5.9)	Not required.
Markings (Sec. 6.1.4)	Not required.
Preparation for Shipment (Sec. 6.2)	Not required.
Quality Assurance Testing (Sec. 5)	Required.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Drawings and data shall be submitted in accordance with the Submittals Procedures section. Drawings and data shall include, but shall not be limited to, the following:

Details of joints.

Gasket material.

Pipe length.

Affidavit of Compliance (ANSI/AWWA C906, Sec. 6.3).

Quality Assurance Testing (ANSI/AWWA C906, Sec. 5).

1-4. QUALITY ASSURANCE.

1-4.01. Qualifications. The pipe manufacturer shall provide the services of an experienced, competent, and authorized representative to visit the Site of the Work to advise and consult with Contractor during the first 2 weeks of joining and installation of the pipe. The manufacturer's representative shall not directly supervise Contractor's personnel, and Contractor shall remain responsible for the pipeline work.

1-5. STORAGE AND HANDLING. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition.

PART 2 - PRODUCTS

2.1. MATERIALS.

Pipe	ANSI/ AWWA C906; material designation (ASTM D3350) PE3408, minimum cell classification 345464C, IPS (iron pipe size). Wall thickness of DR 7.3.
Joints	
HDPE to HDPE	Thermal butt fusion joints, ASTM D3261.
HDPE to Transition Fitting	Flanged made up of HDPE flanged adapter with ductile iron back-up ring rated for working pressure of pipe. Back-up ring drilling conforming to ANSI/ASME B16.1, Class 125.
Gaskets for Flanged Joints	Oil-resistant synthetic rubber.

Wall Anchor	HDPE machined to meet OD/ID/ Wall thickness of HDPE pipe and butt fused in place.
Transition Fitting	Steel pipe, ASTM A53, Type E, standard weight, Grade A or B; or ASTM A106, of equivalent thickness with ANSI/ ASME B16.1, Class 125 flanges.
Conductive Tracer	Detection tape, 3 inches wide; aluminum foil core, 0.5 mil thick, encased in a protective inert plastic jacket; 5,000 psi min tensile strength; 2.5 lb/inch per a 1,000 feet min weight; color coded in accordance with APWA Uniform Color Code; Labeled per the pipe service; Allen Systems "Detectatape", Linequard "Type III", or Reff Industries "Terra Tape D".
Epoxy Enamel	PPG Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", Sherwin-Williams "Macropoxy 646".or Tnemec "Series N69 Hi-Build Epoxoline II".
Polyethylene Encasement	Seamless ANSI/AWWA C105/A21.5; LLDPE-8 mil or HDCLPE - 4 mil.

2-1.01. Coating for Transition Fitting. Steel pipe in buried locations shall have exterior surfaces protected with a shop applied tape wrap.

All surfaces to be tape-wrapped shall be thoroughly cleaned and primed in accordance with the tape manufacturer's recommendations immediately before wrapping. The tape shall be applied by two-ply (half-lap) wrapping or as needed to provide a total installed tape thickness of at least 60 mils.

Coatings shall be as indicated.

External Coatings	
Tape Wrap	ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils; Protecto Wrap "200" or Tapecoat "CT".

2-1.02. Coating for Back-up Ring. Ductile iron back-up rings shall be coated with two coats of epoxy enamel with total dry film thickness of 10 mils.

PART 3 - EXECUTION

3-1. INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation, with special attention to pipe ends. All defective pipe and fittings shall be removed from the Site of the Work.

3-2. INSTALLATION.

3-2.01. Laying Pipe. Pipe shall be protected from lateral displacement by pipe embedment material installed as specified in the Trenching and Backfilling section. Pipe shall not be laid in water or under unsuitable weather or trench conditions, and shall be protected against entry of foreign matter.

During freezing weather, particular care shall be taken in handling and laying pipe to prevent damage by impact.

Whenever pipe laying is stopped, the open end of the line shall be closed with a tight-fitting end board to keep out sand and earth. The end board shall have several perforations near its center to admit water into the pipe, to prevent flotation in the event the trench is flooded. Any standing water shall be removed from the trench before the end board is removed.

Pipe shall be kept as cool as possible during installation, and shall be covered with backfill immediately after installation.

Conductive tracer shall be buried above the center line of all HDPE pipe, approximately 18 inches below the ground surface.

3-2.02. Cleaning. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

3-2.03. Alignment. Piping shall be laid to the lines and grades indicated on the Drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the maximum deflection specified by the manufacturer. Piping shall be laid in a manner that will prevent localized high and low spots.

3-2.04. Cutting Pipe. Cutting shall be in accordance with the pipe manufacturer's recommendations. Cuts shall be smooth, straight, and at right angle to the pipe axis. After cutting, the end of the pipe shall be dressed to remove all roughness and sharp corners and shall be beveled in accordance with the manufacturer's instructions.

3-2.05. Jointing. Jointing shall be done in accordance with the instructions and recommendations of the pipe manufacturer. Sections of HDPE pipe shall be joined above ground into continuous lengths by the thermal butt fusion method in accordance with the pipe manufacturer's recommendations for the specified service. Socket fusion and extrusion welding or hot gas welding will not be acceptable.

Flanged joints shall be assembled in the trench with adjacent piping and valves properly supported before bolting together. Flange bolts shall be installed and torqued in accordance with the manufacturer's instructions.

All joining procedures shall be acceptable to Engineer.

3-2.06. Connections with other Piping. Transition fittings shall be used to transition from HDPE to ductile iron pipe or valves as shown on the Drawings. The transition fittings along with the back up rings shall be wrapped in polyethylene encasement in accordance with ANSI/AWWA C105/A21.5, Method A. Polyethylene shall be taped to HDPE pipe in accordance with pipe manufacturer's instructions.

3-2.07. Concrete Encasement. Concrete encasement shall be installed as indicated on the Drawings. Concrete and reinforcing steel shall be as specified in the Cast-In-Place Concrete section. All pipe to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.

3-2.08. Pipe Thrust Restraint. The pipe line shall be designed to handle the test pressure without need for external reaction blocking, anchors, joint harnesses, or other external restraints to prevent movement of the pipe caused by internal pressure.

3-3. FIELD QUALITY CONTROL.

3-3.01. Hydrostatic Tests. After installation, HDPE piping shall be hydrostatically tested for defective workmanship and materials as specified in the Pipeline Pressure and Leakage Testing section. Pipe shall be filled and pressurized for 4 hours before starting the test.

3-3.02. Leakage. All HDPE piping shall be watertight and free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3-4. CLEANING. The interior of all pipe and fittings shall be kept clean of any foreign matter until the Work has been accepted.

End of Section