SECTION 02617

STEEL PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Furnish and install all steel piping complete with all fittings, flanges, pipe hangers and supports, anchors, specials, and other necessary appurtenances

B. Additional Requirements Specified Elsewhere

1. Section 01340: Shop Drawings and Product Data
2. Section 01400: Quality Control
3. Section 01600: Materials and Equipment

C. Related Requirements Specified Elsewhere

1. Section 02200: Earthwork
2. Section 02615: Ductile Iron Pipe
3. Section 02622: Plastic Pipe
4. Section 02641: Valves and Accessories
5. Section 02708: Pressure Pipelines and Appurtenances
6. Section 09900: Painting
7. Division 11: Equipment
8. Division 15: Mechanical

1.2 QUALITY ASSURANCE

A. Reference Standards

1. AWWA C200: Steel Water Pipe 6 Inches and Larger
2. AWWA C206: Field Welding of Steel Water Pipe
3. AWWA C207: Steel Pipe Flanges
4. AWWA C208: Dimensions for Fabricated Steel Water Pipe Fittings
5. AWWA C209: Cold-Applied Tape Coatings for the Exteriors of Special Sections, Connections and Fittings for Steel Water Pipelines
6. AWWA C210: Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
7. AWWA C214: Tape Coating Systems for the Exterior of Steel Water Pipelines
8. AWWA M11: Steel Pipe Manual
9. ANSI B16.5: Pipe Flanges and Flanged Fittings

B. Design Criteria

1. All pipe, fittings, and specials shall be designed for a minimum test pressure of 100 psi
2. All pipe, fittings, valves, couplings and specials associated with air piping shall be rated for a continuous operating temperature up to 300°F

C. Manufacturer's Markings

1. Mark all pipe, fittings, and specials in accordance with laying schedule on marking diagram
2. Mark each end of all fittings and specials and indicate top field centerlines

1.3 SUBMITTALS

A. Shop Drawings and Product Data

1. Material specification data
2. General piping layout and laying schedule or marking diagram
3. Installation instructions

B. Certification of Compliance

1. Manufacturer's affidavit of compliance certifying
   a. All materials comply with applicable standards
   b. All materials comply with these specifications

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Support pipe on 12-inch minimum wide cradles of suitably padded timbers
2. Secure with padded chains, cables, or other equipment
3. Brace each end of pipe with interior supports or spiders to prevent deformation

B. Handling

1. Use wide belt slings and wide padded skids
2. Bar cables, hooks, metal bars, or narrow skids shall not be permitted to come in contact with coating or lining
3. Do not drop pipe or fittings
4. Do not roll, skid, or otherwise move pipe or fittings when in contact with ground at any point

C. Storage

1. Support at both ends of each pipe length on padded wood blocks
2. Do not store with coating on pipe and fittings in contact with ground

D. Pipe Deformation

1. Pipe deformation during delivery, storage, and handling shall not exceed
   a. Two (2) percent of diameter coal tar coated pipe
   b. One (1) percent of diameter for cement mortar lined or vinyl lined pipe
   c. One (1) percent of diameter for all other pipe

1.5 JOB CONDITIONS

A. Environmental Requirements

1. Do not expose coal tar coated or vinyl lined pipe to temperatures below 0°F
2. Do not handle coal tar coated or vinyl lined pipe when the temperature of the pipe is below 32°F

B. Protection

1. Walking on pipe coating shall be permitted only when necessary and then only when shoes with rubber or composition soles and heels are worn
2. Maintain heavy tar paper in the bottom of larger diameter pipe for as long as passage through pipe interior is necessary

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe

1. Type: Fabricated welded steel or mill type
2. Conformance: AWWA C200
3. Material fabricated: Steel plate conforming to ASTM A36; ASTM A283, Grade C or D; or steel sheet conforming to ASTM A570, Grade B or C
4. Mill type: Grade A or B of ASTM A53, A135, or A139
5. Seams: 2 longitudinal seams maximum, 1 girth seam every 6 feet maximum
6. Diameter: As indicated on the drawings
7. Wall thickness: 0.250 inches minimum
8. 6" and smaller: ASTM A120 standard weight (Schedule 40) black or galvanized steel pipe
   a. Conformance: AWWA C200, ASTM A120
   b. Material: ASTM A36; ASTM A283, Grade C and D
   c. Seams: 2 longitudinal seams maximum; 1 girth seam ever 6 feet maximum
   d. Small branch connections
      1) Pipe nipples: CS5, extra strong (Schedule 80)
      2) "Close" nipples permitted only by special authorization in each case
      3) Welded outlets: Bonney "Weldolets," Porter "W-S Teelets," Vogt "Weld Couplets," or equivalent
9. Mill type steel pipe
   a. Wall thickness: Schedule 80
   b. Conformance: ASTM A53 or A139

c. Threads: National Pipe Thread (NPT)

B. Fittings

1. Material: As specified for pipe
2. Conformance: AWWA C208
3. Welding: ANSI B16.9
4. Dimensions: As specified in the referenced standard unless otherwise detailed
5. Thickness
   a. As specified for pipe of same size
   b. Reducing sections same as pipe of the size of largest end

C. Flanges

1. Type: Slip-on, ring type or hub type
   a. Forged steel
   b. Raised face
   c. Compatible with wafer style valves where indicated on Drawings
2. Conformance: AWWA C207, ANSI B16.5, ANSI B16.1
3. Marking: Stamped with size, manufacturer, and class
4. Class: As required for test pressure
5. Gaskets
   a. ASTM D1330
   b. Red rubber, ring type
   c. Thickness: ⅛ inch
   d. Viton®, FKM or equivalent fluoroelastomer for air service rated for continuous temperatures up to 300°F
6. Bolts and nuts
   a. Standard weight and lightweight pipe: ASTM A307
   b. Extra strong pipe: ASTM A325
   c. Provide insulating bolts at all locations exiting structures and where indicated on the Drawings
   d. Length such that after installation bolt will project ⅛ inch to ⅜ inch beyond outer face of nut

D. Mechanical Couplings

1. Type: Mechanical compression sleeve
2. Manufacturer: Dresser, Smith Blair, Baker or equivalent
3. Pipe Stop: Omit on couplings installed within structures and other locations where used as closures or union connections

E. Joint Harness

1. Type: Harness lug or U-type welded to pipe
2. Conformance: AWWA M11, Section 13.10 (1985 Edition)
3. Coating: As specified for adjacent pipe
4. Studs: ASTM A193, Grade B7
5. Nuts: ASTM A194, Grade 2H
6. Lugs: ASTM A283, Grade C; or ASTM A36

F. Protective Coatings

1. Exposed service and underground surfaces in contact with concrete
   a. Shop primed
   b. Field painted in accordance with Section 09900
   c. Contractor shall coordinate compatibility of coating systems
2. Underground service – general
   a. Type: Coal tar epoxy or tape coating system, shop applied
   b. Conformance: AWWA C210 or AWWA C214
   c. Hold back
      1) Welded joints: 10 to 12 inches, or as shown on the Drawings
      2) Coupled joints: 6 to 8 inches
      3) Bell and spigot joints: Continuous on bell end and extend ½ inch inside bell at normal engagement on spigot end
3. Air service
   a. Coating to withstand continuous operating temperatures up to 300°F
   b. Outer insulation as indicated on Drawings
4. Field applied coatings – general
   a. Type: Cold-applied tape
   b. AWWA C209

G. Protective Lining

1. Air service
   a. No protective lining required
2. Water and wastewater service
   a. Type: Epoxy polyamide
   b. Manufacturer: Tnemec "Pota-Pox" system or equivalent
   c. Surface preparation: Sandblast pipe in accordance with manufacturer's recommendations
   d. Application
      1) In accordance with manufacturer's recommendations
      2) Minimum three (3) coats with minimum dry film thickness of five (5) mils

2.2 FABRICATION AND MANUFACTURE

A. Pipe Fabrication

1. Provide flanged, shop-welded and mechanically coupled joints as indicated on the Drawings
   a. Joints as indicated on the Drawings are the minimum allowable
   b. To facilitate installation, additional field mechanically coupled joints may be provided at locations accepted by Engineer
   c. Field-welded joints are not acceptable unless approved by Engineer
   d. All mechanically coupled joints and pipe penetrations through wall sleeves shall be harnessed
2. Flanged joints
   a. Installed in accordance with AWWA C207

b. Coordinate drilling and dimensions between piping, valves and equipment
c. Reinforce blind flanges as required

3. Mechanical couplings
   a. Plain type ends per AWWA C207
   b. Space between pipe ends: ¾-inch minimum for thermal expansion, but not greater than manufacturer's recommendations
4. Joint harnesses
   a. Shop-weld harness lugs to pipe
   b. Locate harness lugs and use bolts of sufficient length so coupling can be slipped clear of joint in at least one direction
   c. Minimum of two bolts per harness
      1) Double nut bolts
      2) Design bolts for minimum 100 psi test pressure
      3) Where exposed in interior locations, harness bolts shall be parallel with finished floor

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine pipe, fittings and specials for

1. Kinks, dents and injury to coating or lining
2. Reject all sections that show such defects
3. Replace or repair all rejected sections as directed by Engineer
4. Prior to installation, repair damage to coatings or linings with materials and in manner specified for the original coating or lining

B. Examine areas for

1. Defects such as weak structural components that adversely affect execution and quality of work
2. Deviations beyond allowable tolerances for piping clearances

C. Start installation only when conditions are satisfactory

3.2 INSTALLATION

A. Field Joints

1. Underground
   a. Sleeve type coupling or mechanically coupled joints unless otherwise specified
2. Pipe installed within structures or above ground
   a. Flanged or mechanically coupled joints unless otherwise specified

B. Jointing

1. Flanged joints
   a. Tighten bolts so that gasket is uniformly compressed and sealed

b. Do not distort flanges
c. Do not complete mechanically coupled joints until flanged joints affected thereby have been completed
d. Leave flange bolts with ends projecting ⅛ inch to ⅜ inch beyond face of nut after tightening

2. Mechanically coupled joints
   a. Remove all oil, dirt, loose scale, and rust from ends of pipe and the coupling
   b. Wipe gasket clean prior to installation
   c. Tighten bolts with wrenches of size and type recommended by coupling manufacturer
   d. Tighten all bolts approximately the same amount with the coupling square and symmetric with pipe
3. Welded joints
   a. Conform to AWWA C206
4. Protection of field joints, underground service
   a. Remove rust and dirt from uncoated portions of pipe and coupling
   b. Remove 2 inches of craft paper from each end of pipe coating
   c. Apply primer to cleaned surface and on 2 inches of each end of factory coating
   d. Apply tape to joint being careful to overlap onto the factory coating
   e. Repair interior coatings damaged by welding

C. Small Branch Connections

1. Connections 2½ inches and smaller
   a. Threaded, extra-heavy half-couplings or thredolets
   b. Welded to pipe
2. Connections 3 inches to 6 inches
   a. Pipe nipples or welded fittings
   b. Welded to pipe wall
   c. Reinforced to meet test requirements for connections
   d. In lieu of fabricated fittings
3. Connections larger than 6 inches
   a. Fabricated fittings

D. Piping Above Ground

1. Keep pipe from contacting walls, structures or installed items
2. Provide pipe supports in accordance with Division 15 and details on Drawings

E. Anchorage

1. Underground
   a. Thrust blocks and/or joint restraints in accordance with Construction Standards
   b. Joint harness
   c. Other acceptable means of preventing pipe movement caused by internal pressure

2. Other locations
   a. Joint restraints
   b. Restrained flange adapters
   c. Joint harness
3. Concrete thrust blocking
   a. Bearing area per Construction Standards
   b. Extend from fitting to solid undisturbed earth
   c. Installed so joints are accessible for repair

F. Corrosion Control

1. Metal surfaces
   a. Coat all steel clamp rods, bolts, and other metal accessories used in anchorages or joint harnesses subject to submergence or contact with the earth and not concrete encased
   b. Apply two (2) coats of coal tar paint to clean, dry, metal surfaces
   c. Allow the first coat to dry and harden before applying the second coat

G. Install air flow straightening vanes where indicated on the Drawings

3.3 FIELD QUALITY CONTROL

A. Leakage

1. All joints shall be watertight and free of leaks
2. Repair each leak discovered by Owner during warranty period

B. Pressure Test

1. Subject all steel piping to a hydrostatic or air pressure test as required in Section 02708
2. Tests performed using water or air
3. Maintain test pressure for at least two (2) hours
4. Provide all necessary pumping equipment, piping connections, pressure gauges, and other required equipment, facilities, and materials
5. Immediately replace all pipe fittings, pipe joints, and other materials found to be defective with new and acceptable material
6. Refer to Section 02708 - Pressure Pipelines and Appurtenances for additional requirements

END OF SECTION