



**SPECIAL PROVISIONS**  
**for**  
**SANITARY SEWER FORCEMAIN SYSTEM**

**Johnson County**

**ESIM-080-6(285)243- -0S-52**

**Effective Date**

**December 15, 2009**

**THE ENGLISH STANDARD SPECIFICATIONS, SERIES OF 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

## **PART 1 DESCRIPTION**

### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Underground force main piping, fittings, joints and appurtenances.
  - 2. Testing and reporting results.

### **1.02 REFERENCES**

- A. This special provision references the following documents. In their latest edition, the referenced documents form a part of this special provision to the extent specified herein. In case of conflict, the requirements of this specification shall prevail. One copy of all references shall be kept on the site, readily available and accessible to the Engineer during normal working hours. Copies may be obtained from the organizations or from the City of Iowa City Water Department at cost plus 15%.
- B. *American National Standards Institute and American Water Works Combined Standards:*
  - 1. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission; American Water Works Association, 2007.
  - 2. ASTM D 3261 – Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Butt Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing
  - 3. ASTM A48 – Standard Specification for Gray Iron Castings.
  - 4. ASTM A126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 5. ASTM A536 – Standard Specification for Ductile Iron Castings.
  - 6. AWWA C550 – Standard Specification for Protective Epoxy Interior Coatings for Valves and Hydrants.
  - 7. AWWA C606 – Standard Specification for Grooved and Shouldered Joints.
- C. *American National Standards Institute and American Society for Testing Materials Combined Standards:*
  - 1. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 kg) Rammer and 18 inch (457 mm) Drop.
- D. *American Association of State Highway and Transportation Officials:*
  - 1. AASHTO T180 - Moisture-Density Relations of Soils Using a 10 lb. (4.54 kg) Rammer and an 18 in. (457 mm) Drop.

### **1.03 SUBMITTALS**

- A. Product Data: Provide data indicating pipe and pipe accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Test Reports: Indicate results comparative to specified requirements.

### **1.04 QUALITY ASSURANCE**

- A. The Contractor shall employ and pay for services of the independent testing laboratory for tests required to show compliance with the specifications. Test results submitted directly to the Engineer. Selection of the testing laboratory is subject to approval of the Engineer.
- B. Whenever a percentage of compaction is indicated or specified, use percent of maximum density at optimum moisture as determined by ASTM D698-00a.
- C. Perform work in accordance with ANSI/AWWA C651.
- D. Pipe: Nominal pipe size, material code designation, standard dimension ratio, pressure rating, manufacturer's name or trade mark, National Sanitation Foundation seal, and appropriate ASTM designation numbers marked on pipe.
- E. Valves: Manufacturer's name and pressure rating marked on body.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products in accordance with manufacturer's instructions.
- B. Deliver and store valves in shipping containers with labeling in place.
- C. Deliver, store and handle materials according to manufacturer's instructions.
- D. Protect plastic materials from sunlight.

**1.06 WARRANTY**

- A. Full warranty against defects in materials and quality for two years after final acceptance by the Contracting Authority, including all parts, labor, and expenses.

**1.07 SEQUENCING/SCHEDULING**

- A. Coordinate scheduling, submittals, and work elements to assume efficient and orderly sequence of installation of interdependent construction elements.

**1.08 PROJECT RECORD DOCUMENTS**

- A. Accurately record location of pipe runs, fittings, connections, valves, and depth of cover.
- B. Identify and describe unexpected variations in subsoil conditions or discovery of uncharted utilities.

**1.09 FIELD MEASUREMENTS**

- A. Verify that field measurements and elevations are as indicated.

**1.10 REGULATORY REQUIREMENTS**

- A. Conform to applicable Iowa Department of Natural Resources and State Health Department code or regulation for performing the work of this Section.

**PART 2 MATERIALS****2.01 SANITARY SEWER FORCE MAIN HDPE**

- A. Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-99 with a cell classification of PE:345464C. Pipe shall have a manufacturing standard of ASTM F714. Pipe shall be DR 11 (160psi WPR) unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. Outside diameters shall be based on iron pipe size (IPS). Pipe shall be manufactured from a PE 3408 resin.
- B. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
- C. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

**2.02 BORINGS**

- A. Casing pipe: Uncoated, smooth wall welded steel pipe, ASTM A139; use for railroad, street and highway crossings or where shown on the Plans.
  - 1. Minimum wall thickness:

| <u>Pipe Diameter</u> | <u>Wall Thickness</u> |
|----------------------|-----------------------|
| (Inches)             | (Inches)              |
| 20 or less           | 0.375                 |
| 24                   | 0.375                 |
| 30 or greater        | 0.375                 |
  - 2. Welded joints: Comply with American Welding Society Code of Arc and Gas Welding in Building Construction.
  - 3. Bevel or space ends of pipe to insure penetration of weld for full thickness of pipe.
- B. Casing skids: Force main 4 inches diameter and larger installed through casing shall have pressure treated wood skids thick enough to provide clearance between the casing and the pipe couplings strapped to the pipe.
- C. Casing skid strapping material: Stainless steel bands or straps and not wires.
- D. Grouting for voids, abandoned holes by boring, jacking or tunneling; and annular space at ends of casing: Shall be a sand cement slurry with a minimum of two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.
  - 1. Annular space at ends at ends of casing can be sealed with concrete or grout (as specified above).

### 2.03 VALVES

- A. Plug Valves:
  - 1. General:
    - a. All Valves shall be of the tight-closing, resilient-faced plug type.
    - b. Valves shall be capable of submerged service.
    - c. No metal-to-metal seating surfaces shall be permitted.
    - d. Valves shall be of bi-directional eccentric seating such that the opening movement of the plug results in the plug rising off the body seat contact.
    - e. Valves shall be drip tight at the rated pressure.
    - f. Valves shall be satisfactory for throttling service, frequent operation, very infrequent operation, and open/close valve operation.
    - g. Valve plug shall rotate 90 degrees from the full open to tight shut position.
  - 2. All valves by the same manufacturer.
  - 3. Plug/Shaft: Cast Iron ASTM A126, Class B; Cast Iron ASTM A48, Class 40; ductile iron ASTM A536; Grade 65-45-12, Integral plug and shaft; or ductile iron ADTM A395 Grade 64-45-15. A two piece shaft is acceptable.
  - 4. Resilient facing: neoprene, Buna-N, or Isoprene, 70 durometer hardness.
  - 5. Body, Bonnet, Stuffing Box: Cast iron or ductile iron.
  - 6. Bolts and Nuts: Stainless steel.
  - 7. Valve Ends: Mechanical joint or push-on ends.
  - 8. Body seats: Stainless steel 300 series or 90% nickel, welded in.
  - 9. Bearings: Stainless Steel or reinforced Teflon, sleeve type trunnion bearings and top and bottom thrust bearings, non-lubricated.
  - 10. Shaft Seals: V-Type self adjusting packing or bronze cartridge type with two O-rings, replaceable without disassembling valve and while the valve is under operating pressure.
  - 11. Stem Extensions: Steel, noted on the Plans if required.
  - 12. Operator: 2" square nut.
  - 13. Coating: Buried valves shall have manufacturer's standard exterior asphalt or epoxy coating.
  - 14. Pressure Rating: 150 psi, bubble-tight closure.
  - 15. Direction of Operation: Counterclockwise to open.

16. Wrap valves with polyethylene encasement.
17. Approved Manufacturers:
  - a. Dezurik
  - b. Pratt
  - c. MilliKen
  - d. Engineer-approved equivalent.

- B. Valve Boxes: Furnish valve boxes for all buried valves. Boxes shall include standard or oval base as required, center section and top section with cover. Boxes cast iron with screw type adjustment. For valves on sewer system, the cover marked SEWER. Tyler series 6650, or Engineer approved equivalent.

#### **2.04 TRACER WIRE**

- A. Use tracer wire on force mains: No. 12 AWG solid copper conductor with Type THHN insulation in yellow or orange. Tracer wire to be installed on all buried force main. Terminate neatly in tracer wire terminal box as shown on plans.
- B. Splices: Use 3M Vinyl Insulated Butted Seam butt connectors (MVU14BC) and 3MITCSN Heat Shrinkable cable sleeves (ITCSN-0400), Twister DM Plus Wire Connectors or Engineer-Approved Equivalent.
- C. Ground rod: Copperweld or Engineer-Approved Equivalent installed as shown on Plans.

### **PART 3 CONSTRUCTION**

#### **3.01 EXAMINATION**

- A. Verify that trench cut and excavation base are ready to receive work and excavations, dimensions, and elevations are as indicated on Plans.
- B. Verify that piping system has been cleaned, inspected and pressure tested.
- C. Perform scheduling and disinfection activity with startup, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

#### **3.02 PREPARATION**

- A. All mains shall be bedded with granular material from trench bottom, and up a minimum of 1-foot above the top of the main. Cost of bedding shall be considered incidental to pipe installation.
- B. Trench backfill shall consist of suitable backfill placed in one-foot lifts in accordance with the plans.
- C. Where new construction crosses or closely parallels existing utilities or utility services, excavate in advance or pipe laying; determine locate and crossing arrangements including line and grade.

#### **3.03 PIPE AND FITTING INSTALLATION**

- A. Install pipe and appurtenances in accordance with AWWA C600 and C605.
- B. Lay pipe to slope gradients noted on Plans.
- C. Refer to plans for trenching, backfilling, and compacting requirements. Do not displace or damage pipe when compacting.
- D. Handling: Handle pipe and appurtenances in such a manner as to ensure delivery to the trench in a sound, undamaged condition. Use of web slings or end hooks not allowed.
- E. Inspection for Defects: Before installation, inspect pipe and appurtenances for defects and, when applicable, tap the pipe with a light hammer to detect cracks. Reject defective, damaged, or unsound pipe and appurtenances.
- F. Cutting: Cut pipe, when necessary, in a neat and good quality manner without damage to the pipe, interior lining, and exterior coating. Perform cutting with an approved mechanical cutter.

- G. Cleaning and Protection of Pipelines: Clean pipe interior of foreign material before lowering into trench; keep clean at all times; when pipe laying is not in progress, including lunch breaks, nights, weekends, and other non-working periods, securely close open ends of pipe and fittings with watertight plugs.
- H. Pipe Gradient:
  - 1. In certain instances, it may be required that a positive gradient be maintained for pressure lines. All such locations are noted on the Plans.
  - 2. Where changes from positive to negative grades occur, air release or combination air release and air/vacuum valves and utility accesses required as shown on the Plans.
- I. Depth of Cover: The depth of cover over force mains from the top of the pipe to the ground surface shall be sufficient to prevent freezing. The minimum depth shall be 5 ½ feet, or otherwise as shown on the Plans.
- J. Installation - Valves
  - 1. Set valves on solid bearing.
  - 2. Center and plumb valve box over valve. Set box cover flush with finished grade.
  - 2. Install all buried valves and operators with polyethylene encasement, 8-mil (0.20 mm) thickness, as per ANSI/AWWA C105.

### **3.04 PROTECTION**

- A. Protect finished installation.
- B. Maintain areas free of waste materials, debris, and rubbish.

### **3.05 BORING AND CASING**

- A. General: Install by boring and casing certain force mains and service lines under specific highways and streets as designated on the Plans.
- B. Encase all mains and service lines that cross State highways as a minimum from toe of foreslope to toe of foreslope.
  - 1. All lines with inside diameter greater than two (2) inches must be encased from right-of-way line to right-of-way line or as otherwise shown on the plans.
  - 2. Pits for boring, tunneling, or jacking not permitted closer to the roadway than toe of fill in fill sections or toe of foreslopes in ditch sections or two feet from back-of-curb in urban sections.
- C. Casing and pipeline installations accomplished by dry jacking, augering, or tunneling methods.
  - 1. The use of water under pressure (jetting) or puddling will not be permitted to facilitate augering, pushing, or jacking operations.
  - 2. Some borings may require water to lubricate cutter and pipe, and under such conditions are considered dry boring.
- D. Conduct boring or tunneling operations in such a manner as not to be detrimental to the roadway being crossed where suitable soil conditions exist.
- E. If excessive voids or too large a bored hole are produced during casing or pipeline installations, or if it is necessary to abandon a bored or tunneled hole, prompt remedial action shall be taken by the Contractor, subject to the approval of an authorized representative of the IDOT or the County or City.
- F. Fill all voids or abandoned holes by boring, jacking, or tunneling by pressure grouting when deemed necessary by the IDOT or the County or City. Grout material shall be sand cement slurry with a minimum of two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.
- G. Bored or tunneled installations shall have a hole diameter which shall not exceed the outside diameter of the force main or casing by more than 1-1/2 inches on pipes with an inside diameter of 12 inches or less, or 2 inches on pipes with an inside diameter greater than 12 inches.

- H. Minimum length of casing pipe determined by toe to toe of foreslopes of road being crossed, or right-of-way line to right-of-way line of State highway being crossed, or as shown on the Plans.
- I. All main 4 inches in diameter and larger installed through casing shall have pressure treated wood skids thick enough to provide clearance between the casing and the pipe couplings strapped to the pipe before it is installed in the casing.
  - 1. Strap four wooden skids in place at 90-degree axis points along the full length of the pipe, excluding the bell and spigot areas at both ends of the pipe.
  - 2. Skid leading edges shall be rounded and notches cut for the strapping so the assembled unit is smooth.
  - 3. Strapping material: Stainless steel bands or straps and not wires.
  - 4. Install pipe and skid assembly through the casing by pushing or pulling as per the pipe manufacturer's recommendations.
- J. Space between the carrier pipe and the casing shall be left open and not filled. Securely close ends of casing.
- K. All borings under Federal and State highways in strict accordance with these specifications, the IDOT permit for the work, the IDOT Policy Manual for Accommodating Utilities on the Primary Road System, latest revision, and requirements of the IDOT Resident Maintenance Engineer.

## **PART 4 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

### **4.01 FORCE MAIN**

- A. Payment by the lineal foot of pipe laid in the trench as measured, for each diameter, type, and class in the Bid Schedule. The contractor will be paid the contract unit price per lineal foot of each size of force main pipe installed. Deductions will be made from the measured length for valves and other appurtenances. The unit prices as bid shall include the furnishing of all labor, equipment and materials necessary to install the force main in accordance with the contract documents. This work shall include all excavation, installing and joining of pipe and fittings, removal and disposal of water, backfill, sheeting and shoring, disposal of excess excavated material, protection of existing structures and utilities, clean-up and all other operations unless specifically covered by other pay-items specified under this contract.

### **4.02 FITTINGS**

- A. Each fitting shall be considered incidental to the installation of force main pipe.

### **4.03 SPECIAL FITTINGS**

- A. Any special connection shall be considered incidental to the installation of the force main pipe.

### **4.04 BORED, JACKED AND TUNNELED PIPE**

- A. Payment by the lineal foot of jacked, bored or tunneled distance called out on Plans. Includes casing pipe, skids, bands, excavation, backfill, materials, and labor. The contractor will be paid the contract unit price per lineal foot of each size of carrier pipe installed. The unit prices as bid shall include the furnishing of all labor, equipment and materials necessary to install the force main in accordance with the contract documents. This work shall include all excavation, installing and joining of pipe and fittings, removal and disposal of water, backfill, sheeting and shoring, disposal of excess excavated material, protection of existing structures and utilities, clean-up and all other operations unless specifically covered by other pay-items specified under this contract.

### **4.05 VALVES**

- A. Each valve will be measured as a single unit. The contractor will be paid the contract unit price for each valve installed. This shall be considered full payment for equipment, excavation, installation and materials including concrete blocking, crushed stone, bolts, gland rings, gaskets, valve box and lid, and extension if required.

**4.06 TRACER WIRE**

- A. Tracer wire shall be considered incidental to the installation of force main pipe and fittings.

**4.07 POLYETHYLENE WRAP**

- A. Polyethylene wrap shall be considered incidental to the installation of valves.

**4.08 REMOVAL OF EXISTING FORCE MAIN**

- A. Payment by the lineal foot of existing force main removed as measured. The contractor will be paid the contract unit price per lineal foot of force main pipe removed. The unit prices as bid shall include the furnishing of all labor, equipment and materials necessary to remove the pipe in accordance with the contract documents. This work shall include all cutting, removal and disposal of pipe, excavation, plugging, backfill, sheeting and shoring, disposal of excess excavated material, protection of existing structures and utilities, clean-up and all other operations unless specifically covered by other pay-items specified under this contract.

**4.09 REMOVAL OF EXISTING VALVES**

- A. Each valve shall be measured as a single unit. The contractor will be paid the contract unit price for each valve removed. The unit prices as bid shall include the furnishing of all labor, equipment and materials necessary to remove the valve and hydrant in accordance with the contract documents. This work shall include all cutting, removal and disposal of valve, excavation, plugging, backfill, sheeting and shoring, disposal of excess excavated material, protection of existing structures and utilities, clean-up and all other operations unless specifically covered by other pay-items specified under this contract.