SECTION 400

WATER MAIN

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400 GENERAL

A. Water main construction shall consist of all excavation materials, installation, restoration, and related work as specified herein or shown on the drawings.

B. CONTRACTOR shall comply with requirements of Sections 200 and 600, and with NR 811.74 for all water main construction.

401 MATERIALS

A. Pipe and Fittings:
   1. Water main shall be Class 52 ductile iron pipe in 18-foot or 20-foot nominal lengths and shall conform to AWWA C151. Joints shall have cable bond or strap conductors.
   2. Unless otherwise required by the Contract Documents, joints shall be push-on. Where restrained joint pipe is required in the Contract Documents, pipe shall be TR Flex® as manufactured by U.S. Pipe, or approved equal. In limited cases, ENGINEER may approve of the use of Field Lok 350® gaskets as manufactured by U.S. Pipe, in lieu of TR Flex pipe.
   3. All water main fittings shall be ductile iron mechanical joint meeting the specifications of AWWA C153 or C110. The mechanical joints shall be provided in accordance with AWWA C111. Fittings shall have cable bond or strap conductors. Metal tipped rubber gaskets for joint fittings shall not be used.
   4. Mechanical joint restraint shall be provided using EBAA Iron Series 1100 Megalug. Megalug gland body and restraint components shall be 60-42-10 ductile iron meeting ASTM A536. Ductile iron restraining wedges shall be heat treated for a Brinell hardness number (BHN) between 370 and 470.

B. Fire Hydrants: Fire hydrants shall conform to AWWA C502 and the Standard Detail Drawings.

C. Gate Valves:
   1. All valves through 12-inch diameter shall be Mueller 2360 series resilient wedge gate valves, or approved equal, conforming to AWWA C509 (cast iron) or C515 (ductile iron) and shall have the following features:
      a. Type: Class 150 iron body, non-rising forged bronze stems, resilient seat wedge type with epoxy coating inside.
      b. Valve Ends: Mechanical joint with rubber gaskets.
      c. Stem Seal: Two O-rings Buna-N or NBR rubber meeting ASTM D2240.
      d. Open: Left.
      e. Valves shall be designed for direct bury installation on distribution mains.

D. Butterfly Valves:
   1. All valves in excess of 12-inch diameter shall be Mueller Lineseal III butterfly valves, or approved equal, conforming to AWWA C504 and shall have the following features:
      a. Valves shall be Class 150B with cast iron valve body with epoxy coating.
      b. Valves shall be designed for direct bury installation on distribution mains.

c. Valves shall be furnished with a standard AWWA 2-inch square nut for manual wrench operation shall be positively secured to the operator input shaft (in conformance with AWWA C500).
d. Shaft seals shall be the self-adjusting split-V type of standard O-ring seals.
e. A self-draining, self-aligning 4-3/4 inch to 5-inch diameter concentric base with the input shaft, shall be provided to accept a circular valve box base.
f. The operator shall be self-locking with a permanent factory set stop at each end of its travel. The disc shall not creep or flutter under service conditions. The valve shall seat close at an angle of 90° from full open.
g. The operator shall be designed for the output torque according to AWWA C504. Maximum input torque required to develop the rated output shall not exceed 150-foot pounds for any size valve.
h. The operator case shall be completely watertight, sealed by means of approved gaskets, gasket compounds, O-rings or threaded plugs. Operators shall be filled with a suitable oil lubricant or thoroughly coated with an approved grease at the factory. If the operator lubricant is oil, provide suitable fill and drain plugs.

E. Service Leads: New services shall be minimum 1-inch. All services up through 2 inches shall be Type "K" copper tubing with compression fittings unless otherwise specified. Services larger than 2 inches shall be ductile iron to property line. Ductile iron service line fittings shall be mechanical joint.

F. Corporation Stops: A corporation stop shall be installed on the main for each copper service. The corporation stop shall be Mueller 300 ball type valve, or equivalent Ford, with AWWA taper threads and compression joints. All corporation stops shall comply with AWWA C800 specifications.

G. Curb Stops: A curb stop shall be installed on all copper services. The curb stop shall be a Mueller 300 ball type valve, or equivalent Ford, with compression connections at both ends and Minneapolis Pattern curb box top threads. All curb stops shall comply with AWWA C800 specifications. Curb stops shall be laid to a depths below finish grade as specified in the standard detail drawings to ensure accessibility by standard valve wrenches without use of riser rods.

H. Curb Box: A curb box and lid with plug shall be provided for each curb stop. The curb box shall be a Mueller extension type, or equivalent Ford, with Minneapolis Pattern base to match curb stop (without riser rod). Upper section of curb box shall be 1-1/4 inch. Riser rods shall not be allowed. Curb boxes shall not be constructed in a paved surface. For existing boxes where pavement is to be placed, OWNER will provide a cast iron collar to be set in the pavement. Collars are to be set to lowest abutting grade of pavement and be plumb and centered on curb box.

I. Valve Box: A three-piece cast iron valve box shall be provided for all fire hydrant auxiliary valves and for all valves on non-copper service lines. Valve box shall be Tyler 6860, or equal. Lids shall be marked "Water".

J. Valve Manholes: Manholes and catch basins shall be precast reinforced concrete and shall conform to Specifications for Precast Reinforced Concrete Manhole Sections (ASTM C478) and the standard detail drawings. Joints shall be tongue and groove. Joint seal shall be circular O-ring conforming to ASTM C443, Ram Nek, Mas-Stik, butyl rubber gasket, or butyl rubber rope.

K. Manhole Casting and Adjusting Rings: Castings and adjusting rings shall conform with the standard detail drawings.

L. Polyethylene Encasement: All ductile iron pipe, including mains, valves, fittings, ductile iron services, hydrant leads, and hydrant risers shall be encased in 8 mil polyethylene installed in accordance with recommendations of the Ductile Iron Pipe Research Association (DIPRA). The polyethylene shall be lapped and taped sufficiently to prevent the soil from coming in contact with the pipe. Care shall be taken in backfilling to prevent tearing or puncturing of the polyethylene encasement.

402 CONSTRUCTION PROCEDURES

A. Foreign material must not be allowed to enter the pipe while it is being installed.

B. Unless otherwise directed, pipe must be placed with bell end facing in the direction of the laying.

C. Whenever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or to plumb stems or where long radius curves are provided, the amount of deflection allowed shall not exceed that recommended by pipe manufacturer and approved by ENGINEER.

D. For pipelines intended to be straight, deviation from the line shall not exceed 1-inch.

E. Where water main crosses sanitary or storm sewer, the water main pipe shall be laid so that joints are approximately one half of one pipe length distant from the sewer.

F. Hydrants shall be placed in accordance with standard detail drawing at locations shown on the drawings or requested by ENGINEER.

G. All hydrants shall stand plumb and shall have the pumper nozzle perpendicular to the roadway. Each hydrant shall be connected to the main with a 6-inch ductile iron lead.

H. New water services shall be installed in accordance with detail drawing at locations identified by ENGINEER. Joints shall not be provided between main and curb box unless service is being reconnected, or as otherwise approved by ENGINEER.

I. Replacement water services and reconnections of existing water services shall be installed within 2 feet of the existing service unless otherwise allowed by ENGINEER. In general, existing lead, galvanized, steel, or undersized copper services shall be replaced between the new main and new curb box.

J. Location of Service Laterals: The locations of all newly constructed or repaired or replaced water service laterals shall be accurately recorded by the following means:
   1. Field measurements shall be made during construction to provide measurement from the downstream manholes to the lateral connections to the main. These measured distances shall be shown on the record drawing in proximity to each lateral.
   2. Field measurements shall be made during construction to obtain coordinates to Dane County Datum of the center of each water valve manhole and each curb stop. The coordinates shall be used to draw the location of each manhole to scale on the record drawing. These coordinates shall be used to draw the lateral locations to scale on the record drawing.

K. Water service connections shall not be made within 2 feet of a water main joint.

L. Curb boxes shall be placed in the terrace 7 feet from the right-of-way. Additional tubing extending a minimum 10 feet beyond the property line shall be provided where sidewalk is to be placed. CONTRACTOR shall provide a 4-inch by 4-inch by 8-foot timber at the end of each unconnected lateral. Timber shall be placed so that its top is 1 foot above the finished ground surface and painted APWA blue.

M. No services shall be connected to the main until a bacteria test report has been received indicating that the water is safe for drinking.

N. All bends, tees, plugs, and fittings shall be provided with thrust restraint using Megalug® retainer glands with mechanical joints. Thrust restraint shall be provided for all joints within 20 feet of the above items.

O. Megalug restraining wedges shall be positioned against piping with torque limiting twist off nuts. All nuts shall be tightened to 100-120 foot-pounds prior to applying additional torque to twist off nuts.

P. Except as modified herein, all pressure pipe shall be installed in accordance with AWWA C600 for ductile iron pipe.

Q. All manhole lift holes shall be filled with a conical plug and sealed watertight with hydraulic cement applied to exterior surface.

403 DISINFECTION AND TESTING

A. Prior to filling and flushing new mains, CONTRACTOR shall backfill the trench to its full depth. All bends and special connections to the main shall be adequately restrained prior to filling. Any damage caused to the water main or its appurtenances during disinfection or testing shall be corrected by CONTRACTOR at his expense.

B. Flushing.

1. CONTRACTOR shall be responsible for notifying OWNER 24 hours in advance of need for filling and flushing main. **Operation of valves and hydrants shall be done by Water Utility personnel only.** CONTRACTOR shall make provisions to dechlorinate flush water, and stabilize splash zones from erosion. Prior to flushing, CONTRACTOR shall provide to ENGINEER a written De-chlorination and Flushing Plan, subject to review and approval by ENGINEER. The Plan shall include as a minimum the following:
   a. Specific description of the chemical de-chlorination product to be used
   b. Description of the equipment to be used for de-chlorination, capable of fitting the 2.5” nozzle on hydrants
   c. If flush water is to be trucked off site, a specific quantity and size of trucks that will be used, along with a rotation schedule for truck trips to ensure adequate capacity to capture and haul a continuous flow of flush water
   d. Description of any needed erosion control measures
2. Flushing shall not commence until all materials, equipment, trucks and erosion control measures to be used are on site and operational. CONTRACTOR shall provide a representative on site during the entirety of the flushing process to address any erosion control or equipment issues that may arise.
3. Flushing to sanitary sewer shall not be allowed.

4. On-site de-chlorination shall reduce the chlorine concentration to no greater than 1.0 ppm (mg/l).

C. Water Main Disinfection: CONTRACTOR shall furnish all material, equipment and labor necessary to disinfect all new water mains and all existing mains disturbed by construction in accordance with AWWA C651. Sampling and testing will be completed by OWNER. CONTRACTOR shall schedule this work to be completed within the Contract Times. Items of material for testing shall be furnished in the size and quantity necessary to properly complete the test. Interruption or delay of CONTRACTOR's work progress caused by testing and sampling shall not be cause for extra payment under the Contract nor shall it be cause for extension of Contract Time. Costs for items furnished under this section shall be included as incidental work under the various items included in the Bid. No water system improvements shall be put into service until safe samples have been confirmed. CONTRACTOR shall obtain all necessary permits for disposal of water flushed from new water mains.

D. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.

E. Where connections are made to existing mains for testing, it shall be the responsibility of CONTRACTOR to provide the necessary hydrostatic tests on all new mains installed. This may necessitate, but is not limited to, the installation of temporary valves to isolate the new system from the existing system. All materials, work, and equipment necessary for this work shall be furnished by CONTRACTOR at his expense.

F. Water Main Testing:
   1. Leakage/Pressure Test: CONTRACTOR shall conduct hydrostatic pressure tests and leakage tests of all joints in accordance with the requirements of AWWA C600. During performance of the hydrostatic pressure and leakage test the main shall be subjected to a test pressure of 1-1/2 times normal static pressure (with a minimum pressure of 100 psi) for 2 hours. All air shall be removed from the water main prior to testing by flushing and by installing corporations at high points as necessary. Pressure test of the mains shall be conducted after installation of the service corporation stops and water laterals.
   2. Continuity Test:
      a. All water main shall be tested for continuity.
      b. CONTRACTOR shall provide all materials, labor, and equipment necessary to perform continuity test on water main installed under this Contract. Test shall be performed in presence of ENGINEER.
      c. Test segments shall be continuous between two fire hydrants. In areas where there are no hydrants available, test sections shall be between valves or other locations subject to approval of ENGINEER.
      d. CONTRACTOR shall use an ohmmeter or continuity tester to verify that electrical continuity exists across all joints.
      e. Any sections of water main that fail the continuity test shall have defective connections or tracer wire breaks identified and repaired.

404 ABANDONMENT OF EXISTING WATER MAIN FACILITIES

A. Mains. Where existing water main facilities are required to be abandoned, or where existing abandoned facilities are discovered during construction, CONTRACTOR shall abandon these facilities as follows:

1. Remove existing pipes or seal ends with a minimum 2-foot thick grout plug, mechanical joint plug, or mechanical joint cap.
2. Remove existing fire hydrants and valve boxes. Remove valve manholes to at least 2 feet below finished grade. Provide a minimum 6-inch hole in the bottom of the structure and fill the remaining portion with bedding stone.
3. Salvage all castings, valve boxes, valve stems, and fire hydrants, and any other appurtenances identified for salvage in the Special Provisions, and deliver them to OWNER at the City Water Utility yard behind water tower at 3640 High Road.
4. Cost for this work, as identified on the drawings, shall be paid for according to the lump sum bid.

B. Laterals. Where use of existing water service laterals is to be discontinued, or where existing abandoned laterals are discovered during construction, CONTRACTOR shall abandon these laterals as follows:
1. All laterals to be abandoned shall be abandoned at the main.
2. For copper laterals, the copper shall be cut a near the corporation stop and the two exposed ends pinched shut. The corporation stop shall be turned off.
3. For larger diameter laterals, the pipe shall be abandoned at the TEE, and a plug or cap be placed on both exposed ends, held in place by a mechanical joint. The mechanical joint on the TEE shall include Megalugs® if no bell is present. Appurtenances to be removed from service shall be salvaged as described in 404 A.

405 MEASUREMENT AND PAYMENT

A. Cost for work shall be paid for according to the various prices bid. Bid prices shall include all equipment, materials, and labor to complete the work including excavation, bedding, water main, fittings, thrust restraint, conductivity connections, polyethylene wrap, cover, insulation, backfilling, installation, testing and restoration as specified herein.

B. Water main and hydrant leads shall be measured by length in feet of each of the various sizes of pipe measured along the centerline of the pipe center-to-center of junctions and fittings.

C. Water main valves shall be measured and paid for according to the various prices bid for each size and shall include valve manhole, castings, steps and adjusting rings.

D. Water services shall be measured by length in feet of each of the various types, classes, and sizes of pipe installed measured along the centerline of the pipe from the center of the main to the end of the pipe for new services. Reconnection of existing services shall be paid per each reconnection regardless of service length required.

E. Corporation stops, curb stops, and curb boxes shall be considered incidental to service line installation or reconnection.

F. Fire hydrant shall be paid for according to the unit price bid. Price shall include hydrant, auxiliary valve, and valve box.

END OF SECTION