

WATER MAIN MATERIAL AND CONSTRUCTION SPECIFICATIONS

WATER MAIN MATERIALS

1. SCOPE

- A. Furnishing and installing all water main pipe, valves, valve boxes, and fittings and related work and appurtenances to complete the work shown or specified is a part of the contract unless specifically excepted.

2. MATERIALS

- A. Materials for Water Mains shall comply with the following specifications:

(1) Plastic water mains shall be polyvinyl chloride plastic and shall conform to Commercial Standard PS 22-70 and ASTM D-2241. Water main shall be rated for 200 psi @ 73 degrees Fahrenheit and shall meet SDR 21 requirements. All water mains shall meet ASTM D-1784 and PVC compounds and shall meet ASTM D2241.

Water main pipe shall have push-on-joints conforming to ASTM D3139.

PVC material shall be clean, virgin, "NSF" approved, Type I, Grade 1. Each piece of pipe shall be stamped with NSF approval, ASTM D-2241, PS-70, Pressure Rating of Pipe and SDR 21 rating.

(2) Fittings for PVC pipe shall be mechanical joint cast ductile iron fittings meeting all applicable requirements of ANSI A21.11 (AWWA C-111) specifications. A duck-tipped transition gasket shall be used for all mechanical joints. All fittings shall have a pressure rating of 250 psi.

(3) Gate Valves - shall be cast iron body, removable cast iron bonnet, bronze seats, fully bronze-mounted, and of the double disc parallel seat type, with non-rising stem. Valves, 4" through 12" shall be designed for a working pressure of 200 psi on either side of the gate and shall be tested to 350 psi. Valves shall conform to AWWA Standard C-500 or to Federal Specification W-M-V-38b, Type II, Class I. Valves shall have mechanical joint ends. Gate valves shall have a clear waterway equal to the full nominal diameter of the valve and shall be opened by turning counter clockwise.

(4) Tapping Sleeves and Valves - Tapping sleeves shall be of the mechanical joint type having large and properly reinforced cross-section to give maximum strength and shall be suitable for use with AWWA Specification pipe. All sleeves shall be designed and constructed for a working pressure of 200 psi. Outlet flange shall be class 125 standard. Tapping valves shall conform to the same specifications as for gate valves except that they have a mechanical joint for tapping sleeve.

(5) Valve Boxes - shall be cast iron, complete with cover. Cast iron boxes shall be of the extension type with screw-type adjustment. The minimum thickness of metal shall be 3/16 inch. The word "WATER" shall be cast in the cover. Boxes shall be installed over each outside gate valve unless otherwise shown on the drawings.

(6) Hydrants - shall have a break flange one-way hydrant. Hydrant shall be furnished complete with all necessary fittings and connections to water mains in location as shown on plans. The hydrant shall comply with the Specifications of the AWWA C-502 and be furnished with a restrained gate valve, designed for 200 PSI working pressure.

Flushing hydrants shall have 3" mechanical joint inlet connection and a pair of 2-1/2" hose connections with standard hose thread. Flush hydrant shall be equal to Model A-24058 by Mueller.

PROVIDE 4-1/2" STEAMER CONNECTION. Hydrant shall be of proper length for direct connection into the water line mains through a horizontal branch connection pipe. The hydrant branch from the water main to the base of the hydrants shall not be less than 3" nominal diameter.

Hydrants shall be of the compression type and design for not less than 150 psi working pressure and 300 PSI working pressure. The hydrant shall be of such design that the valve will, if closed, remain tightly closed if the upper part of the barrel is broken off or removed.

The operation nut shall be of pentagonal shape, non-corrosive metal and shall turn to the left to open. Hose caps shall be of cast iron and secured to the barrel by a chain. Base connections shall be adaptable for the type of pipe to which they are being connected.

WATER MAIN TRENCHES:

1. SCOPE

- A. Excavation, sheeting and backfilling trenches for water main and appurtenant construction necessary to complete the work shown or specified are part of the contract.

- B. Perform all excavation of every description and of whatever substance encountered, including clearing and grubbing, over the water lines routes. Excavation for pipe lines shall be by open cut unless otherwise specified or approved by the Engineer.

2. ALIGNMENT

- A. Water mains shall be laid and maintained to the required line and grade with fittings, valves and hydrants at the required locations: spigots centered in the bells and all valve and hydrant stems plumb.

3. TRENCHES TO BE DRY

- A. Trenches shall be completely dewatered prior to pipe laying. Discharge from trench dewatering pumps shall be conducted to natural drainage channels, drains or storm sewers.

4. TRENCH WIDTH AND DEPTH

- A. Excavation shall be of sufficient depths and width to permit the installation of the work to the lines, grades and dimensions called for on the drawings or as otherwise specified, except that the width of the trench at the top of the pipe shall not exceed 18 inches. The trench for pipeline shall be dug only so far in advance of the pipe laying as the Engineer shall permit.

- B. Bell holes may be provided at each joint to permit the jointing to be made properly.

- C. All pipe shall be laid to the depth specified on the plans or as specified, but in no case shall it be laid to a depth so that not less than (5'-6") three feet six inches of cover shall be provided over pipe. Any variation from the specified cover shall be made only at the order of the Engineer.

- D. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material, thoroughly compacted as directed by the Engineer.

- E. The subgrade beneath the centerline of the pipe shall be generally straight line between pipe joints.

- F. If the trench is excavated below grade, the subgrade shall be made by backfilling with an approved material in 3-inch uncompacted layers. The layers shall be thoroughly tamped as directed by the Engineer so as to provide a uniform and continuous bearing and support for the pipe at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. The finished subgrade shall be prepared accurately by means of hand tools.

- G. When material in the trench bottom is too soft to provide sufficient bearing to support the pipe, excavation shall be carried to a minimum overdepth of 6 inches, and the overdepth then backfilled with loose, granular material and thoroughly tamped. No extra payment will be allowed for such overdepth excavation and/or granular backfill, and compensation for these items shall be included in the contract unit price for the water line.

- H. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill under this contract shall be disposed of in the areas off the project site.

5. SHEETING AND BRACING

- A. Open-cut trenches shall be sheeted and braced as required by any governing state laws and municipal ordinances, and as may be necessary to protect life, property or the work. When close sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting. Where sheeting and bracing are used, the trench width shall be increased accordingly.

- B. The Contractor will be held accountable and responsible for the sufficiency of all sheeting and bracing used, and for all damage to persons or property resulting from the improper quality, strength, placing, maintaining or removing of the same. This includes damage to trees and other property in the area, as well as on private grounds. In no case shall sheeting be removed until the trench backfill has reached within two feet of the top of the trench, except that the lower course of sheeting may be removed from a double sheeted trench. In all cases, sheeting shall be driven ahead of excavation.

6. EXISTING UNDERGROUND STRUCTURES

- A. Existing storm sewers, sanitary sewers, water mains, gas mains, electric ducts, telephone ducts, steam mains and other underground structures and their house connections have been shown on the plans according to the best available information. The exact location and protection of these facilities and structures, their support and maintenance in operation during construction, (in cooperation with the proper authorities of the utility involved), is the express responsibility of the Contractor in the performance of his contract and in the preparation of his bid.

- B. Where the water mains are to be constructed parallel to and close to existing buried utilities, the exact location of which is unknown, an adjusted alignment will be made to least interfere with these utilities.

- C. The Contractor shall proceed with caution in the excavation and preservation of the location of underground structures. The Contractor shall make explorations and excavations for such purpose. If the Contractor is required to perform additional work in the making of such explorations and excavations, extra compensation will be allowed for such additional work as expressly and specifically authorized by the Engineer.

- D. Whenever, in the opinion of the Engineer, it is necessary to explore and excavate to determine the location of underground structures, the Contractor shall make explorations and excavations for such purpose. If the Contractor is required to perform additional work in the making of such explorations and excavations, extra compensation will be allowed for such additional work as expressly and specifically authorized by the Engineer.

7. CARE OF EXISTING STRUCTURES AND PROPERTY

- A. All poles, fences, or other pipes, wires, conduits, structures and property along the route of the said water main shall be supported and protected from injury by the Contractor, during the construction and until the completion of said main and its appurtenances.

- B. Wherever pipes or conduits cross the trench, the Contractor shall support said pipes and conduits without damage to them and without interrupting their use during the progress of the work under this contract. The manner of supporting such pipes, etc., shall be subject to the approval of the Engineer, and/or the inspector for the utility involved.

- C. The Contractor shall so conduct the work that no equipment, material, or debris will be placed or allowed to fall upon private property in the vicinity of the work unless he shall have first obtained the Owner's written consent thereto and shall have shown said written consent to the Engineer.

- D. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing driveways. Gutters shall be kept clear or other satisfactory provisions made for drainage, and natural watercourses shall not be obstructed.

8. BARRICADES

- A. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, yellow flashers, and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the highway. All material, piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor. The rules and regulations of the local authorities respecting safety provisions shall be observed.

- B. The Contractor shall place sufficient yellow lights on or near the work, and keep them burning from twilight in the evening until sunrise and will be held responsible for any damages that any part or the Owner may sustain in consequence of neglecting the necessary precaution in prosecuting this work.

9. ROCK EXCAVATION

- A. Contractor shall include rock excavation where rock is encountered in the line of the water main as shown on the drawings and as actually encountered in the progress of the work.

- B. Rock excavation shall be made six (6) inches below the outside surface of the pipe and a bedding of sand shall be provided as shown on plans.

- C. ENGINEER AND OWNER EXPRESSLY PROHIBIT the blasting of rock on the work under this contract.

10. REMOVAL OF MATERIALS

- A. As trenches are backfilled, the Contractor shall remove all surplus material and regrade and leave free, clean and in good order all roadways affected by the construction of the work. During the progress of, and until the expiration of the guarantee period, he shall maintain in good and safe condition the surface over the trenches, and promptly fill all depressions over and adjacent to trenches caused by settlement of backfilling.

11. BACKFILLING

- A. Backfill material shall be subject to the approval of the Engineer and shall be free of sticks, wood scrap, frozen material, sod, and other deleterious material. Rocks with maximum dimension smaller than 12 inches may be used in trench backfill above an elevation 12 inches above the top of the pipe, except that the top four (4) inches of the backfill shall contain no stone or object larger than 1-inch in maximum dimension. Unless otherwise shown, specified, or ordered, all backfill shall be the material excavated from the trench.

WATER MAIN CONSTRUCTION:

1. SCOPE

- A. Installation of water main pipe, valves, fittings, hydrants, connections to mains, and all related items necessary to complete the work shown or specified are part of the contract.

2. PIPE LAYING

- A. Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

- B. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other material shall be placed in the pipe.

- C. The pipe and fitting shall be inspected for defects and while suspended above grade be rung in case of metal pipe with a light hammer to detect cracks.

- D. All lumps, blisters, and excess coal tar or other protective coating shall be removed from the bell and spigot end of each fitting and the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry free from oil and grease before the fitting is laid.

- E. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought in correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

- F. In event of rock excavation, the bottom of the trench shall be lowered so that the bottom of the trench is six (6) inches below the outside surface of the pipe. The space between the rock and the pipe shall be filled with sand or granular material.

- G. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means approved by the Engineer.

- H. The bottom of the trench shall be shaped to give substantially uniform circumferential support to the lower fourth of each pipe. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe pointing in the direction of the flow.

- I. Deflection from a straight line or grade, as required by horizontal or vertical alignments or offsets shall be in accordance with the manufacturer's specifications.

- J. If the alignment requires deflections in excess of the allowable deflection per joint, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide regular deflections within the limit set forth, as approved by the Engineer.

- K. All pipe shall be laid and maintained to the required lines and grades as indicated on the drawings or as directed by the Engineer. Fittings, valves, and fire hydrants shall be installed at the locations shown on the drawings.

- L. Concrete thrust blocks shall be provided at vertical and horizontal deflection points, tees, and crosses as shown on the drawings, or as directed by the Engineer.

- M. Where indicated on the drawings, new water lines constructed across existing or proposed roadways shall be bored and cased in conformance with the details shown on the drawings.

- N. No pipe shall be laid in water or when the trench or weather conditions are unsuitable for proper installation as deemed by the Engineer.

CONNECTIONS TO EXISTING MAINS

1. Tapping valves and sleeves for making wet connections shall be of the type suitable for installation under pressure, where shown on the drawings.

2. In order to avoid interference with the existing mains and in order to allow ample time for the making of any necessary changes in the connection details from that shown, the Contractor shall locate the existing mains both vertically and horizontally and verify their exact size in advance of the time of making connections.

3. The connection work includes all necessary cutting and fitting of the existing mains to measurement for installation of the new pipe, fittings, wyes, sleeves, tees, crosses, plugs, bends and reducers as required to make a complete connection.

HYDROSTATIC TEST:

1. A leakage test must be successfully performed on the new waterline in accordance with the following provisions:

- A. Said test shall include all water lines in this contract as shown on drawings. The Contractor shall make arrangements with the Engineer for scheduling the test after the piping has been accepted as being ready for testing. All concrete thrust blocks shall have been in place for a period of at least ten (10) days prior to test. The test shall be performed on the day mutually agreed upon in the presence of the Engineer.

- B. Water for testing may be obtained from the Owner. The Contractor shall furnish all necessary equipment, piping, pumps, fittings, gauges, and operating personnel to properly conduct the test. The system shall be tested in conformance with Section 13 of AWWA Specification C600 at static pressure of one hundred fifty (150) pounds per square inch over a period of not less than eight (8) consecutive hours. The system will not be acceptable until all leaks have been repaired to the satisfaction of the Engineer.

STERILIZATION OF MAINS:

1. Upon completion of the work, or any usable portion thereof, and prior to placing the system or part thereof in operation, all new mains, valves, etc., shall be thoroughly flushed and sterilized, using a chlorine-gas mixture or a hypochlorite and water mixture applied in amounts sufficient to produce a dosage of 50 ppm.

PRELIMINARY DRAWINGS
NOT FOR CONSTRUCTION

DATE 11/22/89

Robert E. Curry & Associates, Inc.
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ELROD WATER COMPANY, INC.

DISTRIBUTION SYSTEM ADDITION

SPECIFICATIONS

DATE APPROVED BY *Robert E. Curry* DRAWING NUMBER 3 OF 3

