

SECTION 13300

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Under this section of the specifications all water distribution piping and appurtenances shall be furnished and installed.
- B. The work covered by this section of the specifications shall include, in general, furnishing and installation of all distribution piping, fittings, valves, hydrants, valve vaults, pumping units, road and stream crossings, metered services, service lines, connections to existing mains, testing, disinfection and etc., unless covered in separate sections.

1.02 RELATED SECTIONS

- A. All applicable sections of these specifications and the plans.

1.03 QUALITY ASSURANCE

- A. Products/materials - AWWA Standards.
- B. Installation - AWWA Standards.
- C. All products, devices, materials, and accessories shall be new and never before used. They shall be clean and/or restored to like new condition prior to approval of submittal by the Engineer.
- D. The front end of each load of pipe shall be completely tarped to prevent fumes from entering pipe.

1.04 SUBMITTALS

- A. Provide shop drawings in accordance with Section 01340.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE (NOT C-900)

- A. Polyvinyl chloride (PVC) pipe for water distribution and transmission mains shall be pressure rated pipe with push-on gasketed joints as manufactured by Certain-Teed Products Corp., Valley Forge, Penn.; Johns-Manville, New York, N.Y.; Anesite Division, Clow Corp., Chicago, Illinois; or an Engineer approved equal product.
- B. Rigid PVC (polyvinyl chloride) pressure pipe described herein shall be designed to carry portable water at pressures (including surge) up to the maximum class rating.
- C. Material used to produce the pipe shall conform to ASTM D1784, Type 1, Grade 1, 2000 psi design stress.

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- D. The standard dimensional ratio for the pipe shall be SDR 21 through 13.5 as called for in the contract documents and as indicated on the Engineer's drawings (plans).
- E. All PVC pipe shall conform to the latest revisions of ASTM Specification D2241 and Department of Commerce Specification PS22-PR (SDR-PR) for pressure rated pipe.
- F. Pipe identification code marking shall include the following data, and shall be marked continuously down each pipe length.
 - 1. Nominal size
 - 2. Type of material
 - 3. SDR, Class Pressure Rating
 - 4. Manufacturer's name
 - 5. NSF (National Sanitation Foundation Seal of Approval)
- G. Markings of pipe-printing shall be color coded for pressure class identification. Pipe shall be furnished with a minimum of one (1) contrasting color circumferential stripe painted on the plain end or uncoupled end of each length to allow field checking of pipe construction joints, said stripes shall indicate manufacturer's recommended F-stop mark.
- H. Each lot shipment of pipe and related materials shall include a shipment itemized check list for recording damages and/or deficiencies.
- I. Plastic pipe shall be installed in accordance with the manufacturer's published instructions, modified only as may be directed herein or by the Engineer. PVC pipe installation shall comply with applicable paragraphs of Part 3 of this Section.
- J. All fittings shall be Mechanical Joint Ductile Iron and shall be restrained.
- K. All PVC material for pipe shall be light gray, light blue or white in color to minimize material heat gain. The use of white pipe is encouraged.
- L. The PVC pipe joints shall be designed and manufactured so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint (single rubber gasket joint) shall be assembled by positioning a continuous, molded, rubber ring gasket in an annular recess in the pipe bell end socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing that gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the manufacturer's standard practice. The joints shall be so designed so as to provide for the thermal expansion of contraction experienced with a total temperature change of at least 75° in each joint per length of pipe.
- M. All rubber gaskets incorporated in the assembled push-on joints of PVC pipe shall meet the requirements of ASTM F477 on elastomeric seals, conform to the standard ASTM E-1869 and applicable requirements of ASA Standard A21.11.

2.02 AWWA C-900 POLYVINYL CHLORIDE (PVC) PIPE

- A. AWWA C-900 polyvinyl chloride (PVC) pipe shall meet all requirements of AWWA C-900, latest edition, and shall be of the dimension ratio or pressure class rating indicated on the plans and in the Bid Schedule. Fittings shall be mechanical joint ductile iron and shall be restrained.

- B. Where joint restraint is required for push-on joints, it shall be provided by restraint devices (harnesses) as manufactured by Uni-Flange or approved equal.

2.03 AWWA C-905 POLYVINYL CHLORIDE (PVC) PIPE (14" THRU 36")

- A. AWWA C-905 polyvinyl chloride (PVC) pipe shall meet all requirements of AWWA C-905, latest edition, shall be CI outside diameter, and shall be of the dimension ratio or pressure class rating as indicated in the Bid Schedule. Fittings shall be mechanical joint ductile iron and shall be restrained.
- B. Where joint restraint is required for push-on joints, it shall be provided by restraint devices (harnesses) as manufactured by Uni-Flange (Block Buster Series 1350) or approved equal.

2.04 RESTRAINED JOINT POLYVINYL CHLORIDE (PVC) PIPE

- A. Restrained Joint Polyvinyl Chloride (PVC) Pipe shall meet the performance requirements of AWWA C-900, "Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4" thru 12" for Water Distribution" and shall be furnished in cast iron pipe equivalent outside diameters with Certa-Lok, or equal, restrained rubber gasketed joints.
- B. Minimum pressure class shall be 150 psi. Where pipe is used in conjunction with PVC SDR 17 or AWWA C-900 Class 200 pipe, the restrained joint pipe shall be minimum Class 200.
- C. Each length of pipe and each coupling shall be factory tested at four (4) times the pressure class, minimum 600 psi, for five (5) seconds.
- D. Pipe and couplings shall not fail when subjected to the following test as specified in AWWA C-900: sustained pressure, burst pressure, flattening and extrusion quality.

2.05 DUCTILE IRON (DI) PIPE

- A. Ductile iron pipe shall conform in all respects to ANSI A21.51 (AWWA C-151) and ANSI A21.50 (AWWA C-150) latest revisions, except as modified herein. D.I. pipe shall be minimum Class 350 for 4" thru 12" and for larger pipe shall be as noted on the plans and/or in the Bid Schedule. All interior surfaces of the pipe and fittings shall have a factory applied bituminous coated cement mortar lining per ANSI A-21-4. The standard coating for buried piping and fitting shall be a bituminous coating and shall conform to ANSI Specification A21-10 (AWWA C-110), Section 10-8 and ANSI Specification A21.51 (AWWA C-151).
- B. Five percent of the pipe furnished shall be manufactured and inspected so as to insure that whenever a cut is made at any point along the pipe barrel, the cut end will socket properly into a push-on joint bell. This pipe shall be identified by a painted green stripe along the length of the pipe barrel.
- C. Ductile iron non-restrained joint pipe shall be of the push-on joint type meeting the requirements of AWWA C-151/ANSI A21.51 and AWWA C-111/ANSI A21.11. The pipe shall be "Tyton Joint" pipe - U.S. Pipe and Foundry, "Super Bell Tite" - Clow Corp. or "American Fastite Joint" pipe - American Cast Iron Pipe Company or equal.
- D. Push-on type joints shall have an annular recess in the pipe socket to accommodate a single rubber gasket. Plain ends shall be suitably beveled to permit easy entry into the bell. The

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gasket and annular recess of the socket shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled.

- E. Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell, with exterior flange and interior recess for the sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts.
- F. Restrained joints of the flexible, positive locking type shall have pipe barrel thickness remaining at grooves cut for restraint not less than the nominal wall thickness of the class specified. Ductile iron restrained joint pipe shall be "Lok-Tyton" joint type - U.S. Pipe and Foundry Co., "Lok-Fast" joint pipe - American Cast Iron Pipe Co., or "Super-Lock" joint pipe - Clow Corp. or Engineer approved equal. This type of joint is acceptable whenever restraint is required.
- G. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced, the letters "DI" or words "DUCTILE" and the standard thickness class designation.
- H. "MegaLug" type joint restraints are required at mechanical joint fittings; the following manufacturers are acceptable: EBAA Iron and Ford.
- I. Where joint restraint is required for push-on joints, it shall be provided by "FieldLok" type gaskets as approved by the pipe manufacturer.

2.06 POLYETHYLENE (PE) PIPE FOR DIRECTIONAL DRILLING

- A. The water service piping 1" to 3" diameter pipe shall be high performance, high molecular weight, high density polyethylene pipe, Driscoplex 5,100, as manufactured by C.P. Chem. Performance Pipe, Plano, Texas, Endopoly as manufactured by Endot Industries, or equal, and shall conform to ASTM D 1248 (Type III, Class C, Category 5, P34). Minimum cell classification values shall be 355434C as referenced in ASTM D 3350.
- B. The water distribution piping 4" and larger shall be high density, extra high molecular weight, Driscoplex 3408 PE as manufactured by C.P. Chem. Performance Pipe, Plano, Texas, Lamson Vylon Pipe, Cleveland, Ohio, or equal, and materials shall meet ASTM D-3350 Cell Classifications 345464C or 345464E.
- C. The Owner or the specifying Engineer may request certified lab data to verify the physical properties of the materials supplied under this specification or may take random samples and have them tested by an independent laboratory.
- D. The P.E. pipe supplied under this specification shall be iron pipe (I.P.S.) O.D. SDR 7, 200 psi, unless otherwise specified.
- E. The P.E. pipe sizes ½" through 3" diameter shall meet all applicable requirements of AWWA-C-901.
- F. The P.E. pipe sizes 4" through 22" diameter shall meet all applicable requirements of AWWA C-906.
- G. Polyethylene piping shall have NSF certification for potable water use.

2.07 RIVER CROSSING PIPE

- A. River crossing pipe shall be flexible joint ductile iron pipe. The following specifications shall apply:

Ductile Iron Pipe - Shall be centrifugally cast, boltless flexible joint pipe and meet the requirements of ANSI/AWWA C151/A21.51-96 and C110-A21.10-87 for ductile iron pipe. The joint components, not centrifugally cast shall conform with the requirements of ASTM A339, Grade 80-60-03 or ASTM A138, Grade 9-60. Ductile Iron Pipe shall be "Flex-Lok" boltless, ball joint, flexible joint pipe as manufactured by American Cast Iron Pipe Company, or equal.

Classes and thicknesses of pipe shall be as per the following chart:

<u>Nominal Pipe Size</u>	<u>D.I. ASA Thickness Class No.</u>	<u>D.I. Working Pressure</u>	<u>D.I. Nominal Thickness Inches</u>
4"	54	250	.35
6"	54	250	.37
8"	55	250	.42
10"	55	250	.44
12"	56	250	.49
14"	56	250	.51
16"	57	250	.55

Pipe shall be furnished in nominal laying lengths of 20'-6". Pipe shall be coated outside and cement lined seal coated inside in accordance with ANSI/AWWA C104/A21.4 - latest edition.

The maximum design deflection for the joint is 15°; however, a deflection of no more than 12° will be permitted.

2.08 NOT USED

2.09 DUCTILE IRON FITTINGS AND ACCESSORIES

- A. Ductile iron fittings shall be Class 350 ductile iron mechanical joint compact fittings conforming to ANSI Specification A21.53 (AWWA C153) and ANSI 21.11 (AWWA C-111). All lining and coating for fittings shall be as specified for pipe. The fittings shall be designed to withstand the same pressures as required for the adjoining pipe and shall have the same type of joints.
- B. Fittings shall be coated outside with a standard bituminous material equal to that specified for ductile-iron pipe under AWWA Specification C-110 or C-153.
- C. Fittings shall be as manufactured by U.S. Pipe and Foundry Co., American Cast Iron Pipe Co., Clow Corp. or Engineer approved equal.
- D. NOT USED
- E. NOT USED
- F. Flanged joint fittings shall conform to ANSI A21.10 (AWWA C 110) or ANSI B16.1.

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- G. All flanged joints shall be furnished with 1/8 inch thick red rubber gaskets. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in Americana Standard for Wrench Head Bolts and Nuts and Wrench Openings (ANSI B18.2). Material for bolts and nuts shall conform to ASTM A-307 Grade B.

2.10 TAPPING SLEEVES

- A. Tapping sleeves shall be designed for a water working pressure of 150 pounds, and shall be provided with the necessary test plugs for pressure testing. Dimensions shall be such that the tapping sleeve can be installed on the size and type of pipe for each connection. All material shall be in accordance with AWWA Specifications.

- B. Tapping sleeves will be as manufactured by the following:

<u>Company</u>	<u>Model</u>
1. Romac Industries, Inc.	SST
2. Power Seal Co.	3480
3. Ford Meter Box Co.	FAST
4. Smith - Blair	662 or 663
5. JCM	432 (for C-905)

- C. Tapping sleeve to have a flange connection to receive a flange by mechanical joint tapping valve, with a proper gasket between the sleeve and valve. The flange on the sleeve may be stainless steel, carbon or ductile. All-thread may NOT be substituted for bolts in the valve-to-sleeve connection.

2.11 TRACE WIRE and WARNING TAPE

- A. Warning tape shall be inert bonded layer plastic with metallized foil core, 6 inches wide, resistant to alkalis, acids and other destructive chemical components encountered in soils; APWA Uniform Color Code, brightly colored; imprinted indicating pipe type; Griffolyn Company Terra Tape "D". Trace wire shall be Seton Name Plate Corporation, or as approved, 12 AWG THW wire minimum.

2.12 VALVES

- A. All gate valves, shall conform to the latest standard specifications of AWWA C-515 for resilient seated valves. All gate valves installed under this contract shall be of the same class as the pipe on which they are installed. Valves shall have mechanical joint ends, non-rising stems, 2" square operating nut and shall open "left". All bolts on buried valve bodies shall be stainless steel.
- B. Buried valves shall be provided with boxes and covers. Boxes shall have adjustable cast iron bodies. All bolts on buried valve bodies shall be stainless steel.
- C. Buried butterfly valves shall be deZurik or approved equal and shall conform to the latest standard specifications of AWWA C-504. They shall be gear operated with mechanical joint ends and capable of operating at 150 psi. Valves shall open "left". All bolts on buried valve bodies shall be stainless steel.
- D. Valve boxes shall be fitted with Box Seats (No. 45158) as manufactured by Quality Water Products, Lima/West Carrollton, Ohio (800-288-4668), or approved equal.

2.13 HYDRANTS

- A. Hydrants shall be installed at locations shown on the plans. Included with each hydrant shall be its own gate valve and valve box. The hydrant, valve, and tee shall be connected with anchoring pipe. The specific placement of the hydrants shall be determined in the field with the Engineer prior to final installation. Hydrants shall be furnished and installed in accordance with the "Typical Hydrant Installation" detail on the drawings. Hydrant, tee and valve shall be paid as a unit price item; anchoring pipe shall be paid by the linear foot. Hydrants shall be ordered and supplied with factory-applied paint of the color indicated during shop drawing review (generally safety yellow for fire hydrants, or safety red for two-way hydrants). If any hydrants are supplied with an incorrect color, they will be rejected. If paint must be field-applied to repair imperfections caused during handling, the area shall be roughed up, cleaned, and receive two coats of the type and color of paint to match the rest of the hydrant.
1. Approved Manufacturers: Mueller, M&H, Kennedy, and American-Darling. Also Kupferle for post hydrants only.
 2. Fire and Two-way hydrants: AWWA C502, compression type, 5¼-inch main valve opening, open by turning left (counterclockwise); traffic model with frangible barrel section and stem coupling; positive operating drain valve installed in open position; 6-inch mechanical joint base, designed so water hammer will be prevented when properly operated.
 3. Fire hydrant: Two 2½-inch hose nozzles, and one 4½-inch pumper nozzle. Mueller Centurion A423, M&H Fire 129, Kennedy K81A/D, American-Darling B-84-B-5.
 4. Two-way hydrant: Two 2½-inch hose nozzles. Mueller Centurion A422, M&H Style 129, Kennedy K81A/D, American-Darling B-84-B-5.
 5. Post hydrant: M&H #33, Kupferle Eclipse Post #2.
 6. Suitable for setting in trenches of depths and in locations shown; Contractor responsible for determining hydrant depth of bury based on location shown.
 7. Verify that the direction of opening, hydrant pumper nozzle, operating nut, outlet nozzle cap nuts, and hose threads conform to those in the system before the new hydrants are shipped.
- B. Piping:
1. Ductile Iron Pipe: AWWA C150, AWWA C151, bituminous coated on outside, cement mortar lined with seal coat in accordance with AWWA C104.
 2. AWWA C153 mainline tees with standard mechanical joint branch for connecting to anchoring pipe and fittings, and mechanical joint anchoring type branch when connecting to a watch valve.
 3. Anchoring pipe, plain end mechanical joint type incorporating an integral cast shoulder and follower gland.
 4. Anchoring Pipe Manufacturers: Clow Corporation, American Cast Iron Pipe Company, United States Pipe and Foundry Company, or approved equal.

2.14 LEAK DETECTION METER

- A. Components of the leak detection meter assembly on a 6-inch main are as follows: approximately 12 feet of 1-inch IPS Class 200 PE 3408 service line; eight one-inch steel pipe inserts; two Ford F1001-4-PJ corp stops; two 6X1 Ford saddles (S70-604 if main is PVC, FS101-690-CC4 if main is C900, and FRS202-760-CC4 if main is DIP); one Ford VH72-15W-66-44 setter; one Ford C-3T lid; one Ford FC-3 ring; one Mid-States straight-sided PVC 20-inch by 30-inch meter box; two Ford Z66-444 curb stops; two P-93-E Amtex curb stop boxes.

2.15 METERED SERVICES

A. Components of a metered service include:

1. Tapping saddle: epoxy-coated ductile iron body with stainless steel band, and 1" CC outlet thread.
 - a. For ductile iron or C900 water mains, use FC101 or FC202 by Ford or equivalent by Mueller or A.Y. McDonald.
 - b. For steel sized PVC (SDR) water mains, use FC202 by Ford or equivalent by Mueller or A.Y. McDonald.
 - c. For ductile iron pipe, the corp. stop may be tapped directly in the water main.
2. Cast bronze corp stop with 1" AWWA inlet thread and 1" pack joint for copper pipe (CTS). FB1000-4-NL by Ford or equivalent by Mueller or A.Y. McDonald.
3. AWWA C800 inverted key curb stop, bronze or brass, complete with required fittings for connection to service pipe. B44-444-NL by Ford or equivalent by Mueller or A.Y. McDonald.
4. Cast iron curb box and cover; adjustable body.
5. Copper meter setter for 5/8 x 3/4 meter (unless otherwise indicated) with brass 90° self-stabilizing type meter valve with O-ring stem seal and smooth contour unobstructed waterway with check valve on outlet side. Integral pack joint for 1" CTS inlet. Integral pack joint for 1" PEP outlet. Bracing eye for 1/2" rigid PVC or iron pipe. VBH72-15W-46-44 by Ford or equivalent by Mueller or A.Y. McDonald.
 - a. For meter facilities with an IPRV and S-tube, as indicated on the drawings, tandem setters shall be used (TVBH72-15W-46-44).
6. 1-inch ASTM B88, Type K, Pressure Class 250 copper flexible service line
7. 2" casing pipe, SDR21 or HDPE, for service lines under pavement.
8. Pigtail on outlet side of meter setter. 1-inch Schedule 40 PVC.
9. Connection to customer service line, when needed. All brass fittings with integral pack joints. Ford, Mueller, A.Y. McDonald.
10. Meter enclosure. 20" X 30" PVC smooth straight wall meter box with notches. Carson #00202013 or Owner-approved equal. Ring and lid to be Ford C3-T or Owner-approved equal.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE

- A. All pipe shall be installed in accordance with the manufacturer's published instructions and with the applicable sections of AWWA C600 or C605, modified only as may be directed herein or by the Engineer. All piping locations shall be as shown on the plans and staked out prior to installation. The Contractor and Resident Inspector shall agree on the staked location of the water main prior to installation. No installation shall be made without documentation of easement or permit. Construction outside of easement or permit area shall be at the Contractor's expense.
- B. Pipe Bury Depth - normal laying depth shall be 48 inches of cover depth minimum regardless of pipe diameter. Depth of cover over water main shall not exceed five feet at any location without Engineer's approval.
- C. All piping shall be assembled in accordance with the layout shown on the plans with only such modifications as may be necessary to conform to the final detail dimensions or location of existing water mains, hydrants, existing utilities, tanks, valve vaults, booster stations, valves, county roads, highway and stream crossings, etc. In crossing under ditches and streams the

standard depth of trench shall be maintained. Standard fittings shall be used if required to depress the pipe but in no case shall the approach to the crossing be laid at a steeper angle than forty-five degrees (45°) with the horizontal.

- D. Trench width at the top of the pipe shall not exceed the pipe diameter plus 18 inches unless approved by the Engineer. For pay items with quantities determined by the trench width, payment shall be determined by assumed vertical trench walls for the actual trench width used, as measured at the top of the pipe, but not exceeding the pipe outside diameter plus 18 inches. Payment will not be made for over removed work or for replacement materials. Pipe shall be installed in the trench as follows:
1. Ductile iron pipe shall be laid directly on a flat bottom trench or on 4 inches of loose soil bedding containing coupling or bell joint holes with trench shaped to provide continuous contact with the pipe between coupling or bell joint holes as recommended by the pipe manufacturer or as directed by the Engineer. This conforms to Type 2 or Type 3 trenches as per AWWA C600.
 2. PVC or C900 pipe shall be laid atop 4 inches of Select Fill bedding and with bell joint holes.
- E. Trace wire shall be connected to each valve and shall be brought up to grade with a minimum of two feet of looped extra wire at each valve and meter facility. Curb boxes with two feet of looped extra wire shall also be installed if distance between valves and meter facilities exceeds 500 feet. Wire shall be securely taped to the water main with 1-1/2" PE tape wrapped around twice at every fitting and at a maximum spacing of 6 feet along the main. If splicing is needed, use 3M Type DBR, or Klick-It Model C8816 by Absolute Automation, or Copperhead Snakebite splicer with filled moisture displacement silicone for corrosion resistant protection, part #SBC-OL Direct Bury Splice Kits or approved equal. Contractor shall schedule a conductivity/locate test and shall repair any defects.
- F. If, in the course of construction, ground water is encountered, the Contractor shall, by means of well points or other acceptable methods reduce the water level to the invert of the main or bottom of the structure. The Contractor shall maintain this dewatered condition until the area around the structure has been backfilled to existing grade. No pipe shall be laid in water, or when the trench conditions or the weather is unsuitable for such work, except by permission of the Engineer. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe. It shall be borne in mind that precautions must be taken to prevent empty pipe from floating, should the trench become flooded before backfilling has been completed.
- G. Each piece of pipe shall be lowered into trench and installed separately. All pipe shall be laid in the trench so that it is firmly supported on the bedding material or the flat bottom trench throughout its length.
- H. As shown on the plans, or as directed by the Engineer, the Contractor shall provide concrete anchors or thrust blocks (against undisturbed earth), joint harness, and concrete encasement where required. This work shall be included in the unit prices bid for installing pipe, fittings and appurtenances.
- I. Pieces of pipe or fitting which are known to be defective shall not be laid or placed. Any defective piece of pipe or fitting discovered after the piping is laid shall be removed and replaced with satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Cuts shall be made with proper tools for cutting the pipe. In the event the pipe is damaged as a result of

the pipe being cut, the affected joint shall be rejected. Ductile pipe shall be field gaged before cutting.

- J. Select Fill bedding shall be required where rock, either loose or solid, is exposed at trench bottom at the required bury depth. It is intended that the pipe at all times is protected against damage from protruding objects and rests on a smooth and continuous bedding of earth or sand. Also, sand bedding shall be required whenever the excavated material is not acceptable, as directed by the ENGINEER.
- K. All ductile iron pipe and fittings shall be encased with linear low-density polyethylene film with a minimum thickness of 0.008 in. (8 mil). The materials of the film, the dimensions of the tubes or sheets used, the marking of the film, and the installation of the film shall be according to AWWA C105.

3.02 PRESSURE TESTING

- A. After the pipe has been laid and partially backfilled all newly laid pipe, or any valved section of it, including hydrants shall unless otherwise specified, be subjected to hydrostatic testing in accordance with AWWA Specification C-600 or C-605. The Contractor shall furnish all labor, materials, and equipment necessary to test the system as described herein.
- B. Allowable leakage shall not exceed the limits established in AWWA Specification C-600 or C-605, latest revision, as measured in a manner approved by the Engineer,
- C. If directed by the Engineer or required by the specifications, further leakage tests shall be run upon combined lengths of the newly laid mains.
- D. Should any tests of combined sections of pipe laid disclose leakage per mile of pipe greater than that specified or if individual sections show leakage greater than the specified limit, the Contractor shall, at his own expense, locate and repair the defective joints and/or pipe and retest the section until the leakage is within the specified allowance.
- E. Before applying the specified test pressure, all air should be expelled from the pipe. To accomplish this, valved taps shall be made at points of highest elevation along the water main as required for installation of manual air release valve pits. These air vent installations are necessary for the Contractor to satisfactorily pressure test, flush and sterilize the water mains.
- F. The air release valve and combination air/vacuum release valve installations shall be in accordance with the Water Facility Details contained in the plans.
- G. Any exposed pipes, fittings, valves, hydrants and joints shall be carefully examined during the test. Any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced with sound material at the Contractor's expense, and the test shall be repeated until satisfactory to the Engineer.
- H. The Engineer and/or his authorized representative shall supervise the testing specified herein and complete test results in report form shall be submitted to or filed by the Engineer. The test shall be conducted using pressure gauges furnished by the Owner.

3.03 CONNECTIONS

- A. Type A Connection

The Contractor shall furnish and install complete pressure taps where indicated on the plans or indicated in the proposal forms. These taps shall include a mechanical joint tapping sleeve with flanged by mechanical joint tapping valve. The installation shall also include a valve box. A lump sum price for each tap shall be submitted in the proposal forms for all labor, material, and equipment necessary to provide a complete tap as set out above and hereinafter.

The Contractor shall provide competent personnel to make all pressure taps.

The Contractor shall, after the tapping sleeve and valve are installed and properly supported on concrete pads, pressure test the installation at 150 pounds in the presence of the Inspector to prove no leakage is present. After this test and before the tap is made, the Contractor shall provide a poured concrete thrust block behind the tapping sleeve providing a bearing area of not less than 15 square feet against undisturbed soil.

B. Type B Connection

A separate lump sum bid item has been established for each Type B connection which includes cutting into an existing main and installing a tee and/or other fittings, concrete blocking, etc., to provide a complete connection at each location. The cost of abandonment of existing water mains at Type B Connections shall be included in the price bid for Type B Connections. The cost of any valves shown at Type B Connections shall be included separately with the appropriate bid item(s) for valves.

C. Type C Connection

A separate lump sum bid item has been established for each Type C connection, which includes all connections to the end of an existing main.

D. The Contractor shall include in the lump sum price for each Type B and Type C connection the cost of valving off the existing main, flushing and bleeding air from the existing line once the connection is made. The existing line shall not be valved off until the Contractor has all necessary equipment and materials at the site to make the proper connection.

E. All connections to existing mains shall be provided as indicated on the plans and proposal forms. The Contractor shall provide 7-days notice to the Owner prior to the connection or line outage. All connections shall be under the supervision of the Owner unless directed otherwise by the Engineer.

3.04 DISINFECTION

A. No water distribution piping installed shall be placed in service until it has been pressure tested and disinfected. Disinfection procedures shall be in accordance with AWWA C-601. The continuous feed method must be used. Tablet disinfection is NOT allowed.

B. Contractor shall dechlorinate the water used for disinfection before discharging. The dechlorination procedure shall be approved by the Engineer, and shall result in discharge of water with a chlorine residual of no more than 0.2 ppm. ~~Equipment may be rented from the Owner for this purpose. Neutralizing chemical may be purchased from Owner at cost.~~

C. Samples shall not be taken from flushing hydrants or any unsterilized equipment. Samples may be taken through sampling yokes at individual meter installations or rise pipe from corporation cocks installed in the water main. All sampling locations shall be approved either by the Engineer or the Public Health Agency having jurisdiction.

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- D. All water required for the filling, hydrostatic testing, disinfection and flushing of water mains shall be obtained from the Owner.
- E. After disinfection and flushing, the Contractor shall notify the Owner to secure and obtain satisfactory bacteriological samples and results of the finished water. Disinfection procedures shall be continued until approved samples have been obtained. The Owner shall provide the testing at no cost to the Contractor.

3.05 INSTALLATION OF VALVES

- A. The Contractor shall make all valves tight under their working pressure after they have been installed and before they are placed in operation. Any defective parts shall be replaced at the Contractor's expense.
- B. All valves shall be pressure tested and sterilized in conjunction with their adjoining piping.
- C. Valves shall be installed in accordance with the installation manual furnished by the valve manufacturer. Extreme care shall be used in the handling, storage and installation of these valves to prevent damage or distortion of the equipment and to insure proper performance.
- D. Each valve box shall be fitted with a Box Seat as per 13300.2.12.D.

3.06 INSTALLATION OF HYDRANTS

- A. Hydrants shall be installed according to the detail included in the Drawings, and shall be cleaned and field coated with enamel paint according to color selection by Owner. Hydrants shall be rotated on the barrel section, at the time of installation, to face the adjacent roadway, or as directed by the Owner.

3.07 RAILROAD CROSSINGS

- A. As shown on the plans and as required by the proposal forms, the Contractor(s) shall install welded standard steel casings (Section 13310 Steel Encasement Pipe) under railroads and install water mains by sliding into the steel casing. The Owner shall obtain the necessary permit(s) from the railroad prior to the authorization of the project. The Contractor(s) shall have on the site, during construction of any crossing, a copy of the approved railroad permit. The Contractor shall also provide railroad liability insurance, as required by each railroad company.

3.08 STREAM CROSSINGS

- A. As noted on the plans, provide PVC casing for at least the noted length to protect the water main below the flowline of the stream. Casing spacers and end seals shall be as specified in Section 13310 Steel Encasement Pipe.

3.09 LEAK DETECTION METER

- A. Tap the main approximately five feet either side of the gate valve indicated on the drawing and install corp stops. Install meter box with ring and lid approximately five feet away from the gate valve. Install setter inside meter box. Use 1-inch PE with steel inserts to connect corp stops to inlet and outlet sides of the setter, installing curb stops at mid-point each side.

3.10 INSTALLATION OF METERED SERVICES

- A. Refer to detail in the plans. Main shall not be tapped for services until after pressure testing and disinfection of the main is complete.
- B. Copper service line shall be bedded in 2 inches of Type C Select Fill (refer to Section 02220.2.01.C). A minimum of 12 inches of Type C Select Fill shall be placed above the copper service line.
- C. Trace wire shall be installed with all service lines according to Section 13300-3.01.E. Splices between service line trace wire and water main trace wire shall be made using Mainline-to-Service Connectors by Copperhead Industries, DryConn Direct Bury Lug by King Innovation, or equal.

3.11 ABANDONMENT OF EXISTING FACILITIES

- A. WATER MAINS: Cut water main at the noted locations and seal with a mechanical joint cap, gasket, and mechanical joint gland (restraint glands are not required). If the water main to be abandoned is at a tee, the water main shall be removed from the tee and a mechanical joint plug installed in the tee. Backfill excavation/voids and restore surface.
- B. VALVES (including curb stops): Close valve and remove top section of valve box; backfill voids (LSM-50 in pavement) and restore surface. If valve is in a manhole, remove the top section of the manhole, backfill voids (LSM-50 in pavement) and restore surface. Scrap metal shall be given to the District's representative.
- C. METER FACILITIES: Remove meter lid and casting, copper setter, and meter enclosure; backfill voids and restore surface. Scrap metal shall be given to the District's representative.
- D. HYDRANTS: Close auxiliary valve and remove top section of valve box; remove hydrant/lower barrel/shoe; backfill voids and restore surface. Return hydrant/lower barrel/shoe and scrap metal to the District.

END OF SECTION