

PART 1. GENERAL

- 1.1 The work specified by this section shall consist of repairing or replacing all damaged pavement, whether public or private caused by installation of water lines. Dirt shoulders, roads, streets, drives, and walks are to be restored to their original condition as an incidental part of the installation of utilities. Repair damaged base on either side of a trench wherever necessary. Trim the oxidation surface to neat lines outside of the trench wall, and repave the entire area as specified below and as shown on the drawings or on the standard drawings.
- 1.2 Both these specifications and the drawings make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, construction methods, and materials specifications contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable.
 - A. Refer to other sections for work related to that covered by this section.

PART 2. PRODUCTS

- 2.1 MINERAL AGGREGATE BASE: Class A, Grading D crushed stone (TOOT specifications, Section 303, subsection 903.05)
- 2.2 BITUMINOUS PRIME COATS: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)
- 2.3 CRUSHED STONE CHIPS: Size 6 or Size 7 (Subsection 903.14)
- 2.4 DOUBLE BITUMINOUS SURFACE: for both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.02 and 904.03)
- 2.5 ASPHALTIC CONCRETE BINDER: Grading Bor C, as directed by the AJE (Section 307)
- 2.6 BITUMINOUS TACK COAT: Grade AE-3 (Section 403, Subsection 904.03)
- 2.7 ASPHALTIC CONCRETE SURFACE: Grading E (Section 411)

2.8 QUICK DRY TRAFFIC MARKING PAINT (WHITE AND YELLOW): Subsection 910.05.

PART 3. EXECUTION

3.1 SUBGRADE

- A. Before any base material is installed, compact the subgrade of the area to be paved to 95% of optimum density as determined by ASTM D698 (Standard Proctor).
- B. The backfill material shall contain no topsoil or organic matter. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection of 1 inch or more. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.
- C. When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1 foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

3.2 BASE

- A. Install a mineral aggregate base of the type specified above in accordance with Section 303 of the TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

3.3 SEAL COAT SURFACE

- A. Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallon per square yard. Immediately after application, uniformly cover the entire area with Size 7 crushed stone chips at a rate of 12 pounds per square yard.

3.4 DOUBLE BITUMINOUS SURFACE

- A. Apply the first course at a rate of 0.38 to 0.42 gallon per square yard with either emulsified asphalt, Grade RS-2, or cutback asphalt, Grade RC-800 or RC-3000, and then immediately cover with Size 6 crushed stone chips at a rate of 33 to 37 pounds per square yard. After this is rolled, apply the second course at a rate of 0.30 to 0.35 gallon per square yard, and at once uniformly cover with Size 7 chips at a rate of 20 to 25 pounds per square yard. Then roll the entire area.
- B. After the application of the cover aggregate, lightly broom or otherwise maintain the surface for a period of 4 days, or as directed by the DISTRICT. Maintenance of the surface shall include the distribution of cover aggregate over the surface to absorb any free bitumen and cover any areas deficient in aggregate. Sweep excess material from the entire surface with rotary brooms. Sweep the surface at the time determined by the DISTRICT.

3.5 ASPHALTIC CONCRETE BINDER

- A. Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.38 to 0.42 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs and gutters, walls, walks, trees, etc; if such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder to the thickness shown on the standard drawings or the plans.
- B. Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

3.6 ASPHALTIC CONCRETE SURFACE

- A. If the asphaltic concrete surface course is to be placed directly on the mineral aggregate base, place a bituminous prime coat as described above. If, however, the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under PRODUCTS at a rate of 0.05 to 0.10 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime or tack coat has been properly cured, apply the asphaltic concrete to the thickness shown of the drawings or standard drawings.

Apply the surface course as described above for the binder course.

3.7 SMOOTHNESS

- A. The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4 inch in any direction when tested with a 12 foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

3.8 SAMPLING AND TESTING

- A. Submit to the District test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his approval of these reports before starting paving operations.
- B. Tests shall be made of the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests.
- C. When making surface tests, furnish one man to mark all surface defects for corrections.

END OF SECTION

PART 1. GENERAL

- 1.1 Refer to other sections for work related to that specified under this heading.

PART 2. PRODUCTS

2.1 VALVES & VALVE BOXES

- A. Valves on water lines twelve (12) inches and smaller shall be resilient seat, ductile iron body. All gate valves shall be in accordance with or exceed AWWA C509. Working pressure shall be 250 psi.
- B. Valves shall be supplied with O-ring seal stuffing boxes and shall open to the left utilizing a non-rising stem. The valve body, bonnet and bonnet cover shall be fully coated with fusion bonded epoxy to a minimum thickness of 8 mils. Gate valves twelve inches and smaller shall be Mueller, American Flow Control, or M & H, or equal, with mechanical joints ends. Threaded ends are acceptable for 2-inch gate valves.
- C. All valve box castings shall be made accurately to the required dimensions, and shall be sound, smooth, clean and free from blisters and other defects. Defective casting which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers shall be machined so that the covers rest securely in the frames with no rocking and with the cover in contact with the frames for the entire perimeter of the contact surface. All castings shall be thoroughly cleaned subsequent to machining and before rusting begins, painted with a bituminous coating so as to present a smooth finish, tough and tenacious when cold, but not tacky with no tendency to scale. Install valve boxes on each proposed valve in accordance with the details shown on the standard drawings. The cover of the valve box shall read "WATER".

2.2 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves for use in tapping PVC or DIP lines shall be stainless steel, full circle sleeves, Smith - Blair Model 664 or equal. The outlet flange dimensions and drilling shall comply with ANSI B16.1, Class 125 and MSS SP-60.
- B. Tapping valves for use in tapping PVC cast iron or ductile iron water lines shall be flanged by mechanical joint valves meeting or exceeding all

applicable requirements of ANSI/AWWA Standard C500. The inlet flange shall comply with ANSI B16.1, Class 125 drilling and with MSS SP-60. The mechanical joint outlet shall comply with ANSI/AWWA Standard C111. The valves shall be of the double disc, parallel seat type with a non-rising stem and a 2" square operating nut. Valves shall be Mueller H-667 or equal.

2.3 BLOW-OFF HYDRANTS

Blow-off hydrants shall be post type standard fire hydrants, M&H Style 33, with 2-1/8 inch valve opening and one 2-1/2 inch hose nozzle, appropriate bury depth, and a with 3 inch mechanical joint shoe. Hose nozzle threads, operating nut, and cap shall conform to local government standards. Install a gate valve of the size indicated on the plans ahead of each blow-off hydrant.

2.4 FIRE HYDRANTS

- A. Fire hydrants shall comply in all respects with AWWA C502 and shall be of the compression type, with the main valve opening against the pressure and closing with the pressure. The main valve opening shall be not less than 4-1/2 inches in diameter. The main valve facing of the hydrant shall be made of balata or similar material especially suited and proven for the service intended. The bottom stem threads of the main valve rod shall be fitted with an acorn nut or suitable means for sealing the threads away from the water. Hydrants shall be connected to the main by a 6 inch mechanical joint shoe, unless otherwise shown on the drawings, and fitted with strapping lugs. Two 2-1/2 inch hoses and one 4-1/2 inch steamer nipple shall be threaded and screwed into the nozzle section and then pinned to prevent turning.
- B. Operating nut shall be provided with convenient means to afford lubrication to ensure ease of operation and the prevention of wear and corrosion.
- C. Hydrant shall be the dry barrel type, and hydrant shoe shall have two positive acting noncorrodible drain valves that drain the hydrant completely by opening as soon as the main valve is closed and by closing tightly when the main valve is open. Drain valves operated by springs or gravity will not be acceptable.
- D. The packing gland located in the bonnet shall be solid bronze, and gland bolts shall be steel with bronze nuts. A double O-ring seal may be used in lieu of conventional stuffing box.
- E. The hydrant shall open by being turned to the left and be so marked on the bonnet in cast letters with an arrow.
- F. Threads on hose and steamer nipples, operating nut, and cap nuts shall conform to local Water Department standards.

- G. Bury shall be as required for the installation, with the depth being measured from grade line to bottom of trench or connecting pipe.
- H. Hydrants shall be 4 1/2" M&H™ Model 129 and painted yellow from the factory unless otherwise specified on the drawings.
- I. Any hydrant extensions that are required for grade adjustment of the fire hydrant assembly must be factory-furnished M&H™ parts. No aftermarket extensions will be approved.

PART 3. EXECUTION

3.1 SETTING VALVES AND FITTINGS

A. General

- 1. Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
- 2. All valves and fittings shall be restrained by Romac Grip Ring, Mega-lug™, Sigma or, Ford UFR1500SA, UFR1400DA, or equal. See Water Lines for specifications regarding mechanical restraint devices.
- 3. Valves deeper than 36 inches shall be provided with valve nut extensions with set screws.

B. Location of Valves

- 1. Valves in water mains shall, where possible, be located on the street property lines extended unless otherwise shown on the drawings.

C. Valve Boxes

- 1. Provide a valve box for every valve.
- 2. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the DISTRICT.

3.2 SETTING HYDRANTS

A. Location

- 1. Locate hydrants as shown on the drawings or as directed by the

DISTRICT and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position

1. All hydrants shall stand plumb. Set hydrants to the established grade, with center of steamer nozzle at least 12 inches above the finished grade, as shown on the drawings or as directed by the DISTRICT. In no circumstance shall more than one (1) hydrant adjustment device be allowed to be installed on a new hydrant installation to achieve proper ground clearance.

C. Connection to Main

1. Connect each hydrant to the main with a 6-inch ductile iron anchor tee, and a 6-inch gate valve. The hydrant shoe and the valve shall be connected with an anchor coupling. In the event the hydrant has to be placed further from the valve than allowed by a coupling, the hydrant shall be rodded to the gate valve with a minimum of 3 anchor rods.

D. Hydrant Drainage

1. Provide drainage at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to a sewer.

E. Anchorage for Hydrants

1. If using an anchor coupling, brace the bowl of each hydrant well against unexcavated earth at the end of the trench with concrete blocking.
2. Anchor Couplings - Tyler Union D132 will be used between the gate valve and tee, and the gate valve and the fire hydrant.
3. Ford Uni-Flange - Use Ford Uni-Flange series 1400 for all ductile iron pipe and Ford Uni-Flange Series for all PVC pipe. The Developer shall use the Uni-Flange unless the conditions do not allow.

F. Final Painting

1. Each completed hydrant shall have the bonnet painted the color of flow capability with an industrial enamel alkyd paint. Paint and painting shall be provided by the Contractor. Paint shall be by the Sherwin-Williams Co. and colors are as follows:

<u>Hydrant Classification</u>	<u>Flow Capacity, GPM</u>	<u>Bonnet Color</u>	<u>Paint Brand & Product No.</u>
Class AA	Greater than 1,500 GPM	Light blue	Sherwin-Williams Custom Color* <u>BAC Colorant(Oz-32-64-128)</u> W1-White (- 60 – 1 - 1) B1 – Black (- 46 – 1 - -) L1 – Blue (6 – 20 – - 1)
Class A	1,000 to 1,499 GPM	Green	Sherwin-Williams Custom Color* <u>BAC Colorant Oz-32-64-128</u> W1-White (- 49 – - 1) G2 – New Green (6 - 53 - - 1) Y3 – Deep Gold (- 25 - -)
Class B	500 – 999 GPM	Orange	Sherwin-Williams Color No. B54E39
Class C	Less than 500 GPM	Red	Sherwin-Williams Color No. B54R38

*Confirm custom colors with the District prior to ordering of paint.

END OF SECTION

PART 1. GENERAL

1.1 Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

1.2 Wherever reaction blocking is necessary, it shall be considered an integral part of the water line work, and no separate payment shall be made for it.

1.3 All new pipe shall be ductile iron. PVC pipe will only be allowed for repair or connection to existing PVC water lines.

PART 2. PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile cast iron pipe shall be made of good quality ductile iron that meets the requirements for nodular iron castings of ASTM E8. It shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 except that all pipe with a diameter of 12 inches or less shall have a wall thickness of Class 52 and all pipe with a diameter of 14 inches or more shall have a thickness of Class 51 unless otherwise specified on the drawings.
- B. Ductile iron pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to the specifications of ANSI A21.51/AWWA C151. It shall be made and tested in accordance with ASTM A339 and shall be subjected to and able to withstand a hydrostatic pressure of 500 psi. The maximum depth of pits shall be half that allowed in the AWWA specifications.
- C. The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- D. The push-on, single gasket joints shall be either Fastite (manufactured by American Cast Iron Pipe Company), Tyton (U. S. Pipe and Foundry Company), Super Bell-Tite (Clow Corporation), or other joints of similar type and equal quality. They shall be UL approved and able to withstand 200 psi of operating pressure. Pipe shall be furnished in lengths of 18' to 20'.

- E. Where noted on the drawings, restrained joint pipe may be accomplished by the use of gripper-style restraint gaskets. Gripper style restraint gaskets shall be Fast-Grip™ by American Cast Iron Pipe Co., Field-Lok 350™ by US Pipe Co., Sure Stop 350™ by McWane Pipe Co., or approved equal.
- F. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- G. The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- H. Enough lubricant shall be furnished with each order to provide a thin coat on the spigot end of each pipe. This lubricant shall be approved for being in contact with potable water and shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe. In no case shall lubricant other than that supplied by the pipe manufacturer be used.
- I. Standard and special fittings shall be ductile iron. Use compact mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C153.
- J. Pipe and fittings shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- K. Fitting laying lengths shall conform to ANSI A21.10/AWWA C153, compact body.
- L. Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

- M. The pipe manufacturer is to furnish the DISTRICT a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ANSI A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipment is to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.
- N. Where noted on the drawings, polyethylene film shall be furnished and installed with ductile iron pipe. PE films shall be either linear low-density polyethylene film with an 8-mil minimum thickness or high-density, cross-laminated polyethylene film with a 4-mil minimum thickness meeting the requirements of ANSI/AWWA C105/A21.5; minimum film thickness and material size (LLDPE or HDCLPE); applicable range of nominal pipe diameter size; and labeling stating "*Warning-Corrosion Protection-Repair Any Damage*".

2.2 PVC PIPE

- A. All plastic pipe shall meet the requirements of AWWA C905 and be made from Class 12454 polyvinyl chloride plastic (PVC 1120) as defined by ASTM 01784.
- B. All C900 SDR 14 pipe shall have NSF approval and be manufactured in accordance with ASTM 02241. The following tests shall be run for each machine on each size and type of pipe being produced, as specified below:
 - 1. Flattening Test: once per shift in accordance with ASTM 02412. Upon completion of the test, the specimen shall not be split, cracked, or broken.
 - 2. Acetone Test (Extrusion Quality Test): once per shift in accordance with ASTM 02152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the test.
 - 3. Quick Burst Test: once per 24 hours in accordance with ASTM 01599.
 - 4. Impact Tests: for 6 inches and larger, once per shift in accordance with ASTM 02444; for 4 inches and smaller, once each two hours in accordance with ASTM 02444.
 - 5. Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM 02122.
 - 6. Bell Dimension Test: once per hour in accordance with ASTM 03139.

- C. If any specimen fails to meet any of the above mentioned tests, all pipe of that size and type manufactured between the test periods must be scrapped and a full set of tests rerun.
- D. Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimensions, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.
- E. All pipe shall be manufactured in the United States of America. All pipe for any one project shall be made by the same manufacturer.
- F. All 4 inches and 6 inches pipe may be furnished in the manufacturer's standard laying lengths of 20 feet. Pipe 8 inches and larger shall be furnished in 20 foot lengths. The Contractor's methods of storing and handling the pipe shall be approved by the District. All pipe shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed water line routes will not be allowed.
- G. Certain information shall be applied to each piece of pipe. At the least, this shall consist of:
 - 1. Nominal size
 - 2. Type of material
 - 3. DR or class
 - 4. Manufacturer
 - 5. NSF Seal of Approval
- H. Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.
- I. The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.

- J. The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.
- K. Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be approved for being in contact with potable water and shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name. In no case shall lubricant other than that supplied by the pipe manufacturer be used.
- L. Joints shall be manufactured in accordance with ASTM 03139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell and ring joints with rubber compression gaskets as manufactured by the Clow Corporation, Johns-Manville, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain- Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.
- M. Standard and special fittings shall be gray iron or ductile iron. Use standard or short body mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.
- N. Fittings shall be lined with enameled or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices.
- O. Fitting laying lengths shall conform to ANSI A21.10/AWWA C110.
- P. Fittings shall be in accordance with the standard or short body mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.
- Q. All fittings shall be installed using Mega-Lugs mechanical restraint devices or approved equal. Devices shall be Ebaa Mega-Lug™ Series 1100; Sigma One-Lock™, Ford Series 1400 Wedge Action™ device or Romac RomaGrip™

PART 3. EXECUTION

3.1 INSTALLATION OF WATER LINES

- A. Lay water lines to and maintain at the lines and grades required by the drawings. All fittings, valves, and hydrants shall be at the required locations, the spigots centered in the bells, and all valves and hydrant stems plumb.
- B. Unless otherwise indicated by the drawings, all water pipes shall have at least thirty-six (36) inches of cover. No departure from this policy shall be made except with the approval of the DISTRICT.
- C. Provide and use tools and facilities that are satisfactory to the DISTRICT and that will allow the work to be done in a safe and convenient manner. All pipe, fittings, valves, and hydrants are to be unloaded from the trucks using suitable tools and equipment. Use a derrick, ropes, or other suitable tools or equipment to lower all pipe, fittings, valves, and hydrants into the trench one piece at a time. Lower each piece carefully so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances drop or dump water line materials into the trench.
- D. Any pipes strung out along the route of the proposed lines before the actual installation of those lines is due to take place shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. PVC pipe shall be strung out a maximum of one day ahead of pipe laying. Remove all unnecessary material from the bell and spigot end of each pipe. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell, and leave dry and oil-free.
- E. Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside, then put a heavy, tightly woven canvas bag of suitable size over each end of the pipe, and leave in place until it is time to connect that pipe to the one adjacent to it.
- F. Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- G. After a length of pipe has been placed in the trench, center the spigot end in the bell of the adjacent pipe, and then insert to the depth specified by the manufacturer and bring to the correct line and grade. Secure the pipe in place by tamping an approved backfill material around it.

- H. Bell holes shall be big enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so that each pipe barrel will rest on a solid foundation for its entire length.
- I. Restraining of Pipe, Valves and Fittings
 1. All fittings and valves shall be installed using mechanical restraint devices. All fittings including tapping tees shall be installed with a concrete restraint thrust device poured for each fitting and matching the requirements of the standard details for concrete thrust blocks. Dead end lines shall be restrained with a concrete reverse thrust block matching the requirements of the standard details for concrete thrust blocking matching the requirements of the standard details for reverse concrete thrust blocks. Restraint gaskets placed in pipe joints may be used in circumstances where directed and approved by the DISTRICT but do not eliminate the need for concrete thrust blocks. Vertical oriented fittings shall be restrained with stainless steel rods and clamps or by other means as directed by the DISTRICT.
 2. Prior to pouring concrete for thrust blocks, all loose material and trash shall be removed from the excavated areas, forming to be in place with either forms or sandbags matching the standard thrust block dimensions and the excavation shall be free from standing water and mud. Plastic sheeting shall be placed in a manner to protect the glands and bolts from being covered or embedded in the concrete. The DISTRICT shall review all thrust block forms prior to placement of concrete.
 3. Concrete pours shall occur at temperatures above freezing (32°F). Thrust blocks shall be poured using 4,000 psi f_c concrete. Concrete slump should be in the 4"-5" slump range. Slumps greater than 5 inches are not permitted. Se of bagged. Pre-manufactured concrete mix (Sak-crete™) placed directly in the excavation in bagged form without mixing for use as a thrust block is not allowed. Bagged, pre-manufacturer concrete is permissible if mixed onsite in a mixer and poured into the thrust block form area.
 4. Concrete thrust blocks shall be poured and have at least seven (7) days of cure time prior to testing of new water lines.
- J. Whenever pipe laying is not in progress, close the open ends of pipe either with a watertight plug or by other means approved by the DISTRICT. If the joints of any pipe in the trench cannot be completed until a later time, caulk them with packing in order to make them as watertight as possible; this shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, leave this seal in place until the trench has been pumped completely dry.
- K. Cut pipe so that valves, fittings, or closure pieces can be inserted in a

neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.

- L. Lay pipe with the bell ends facing in the direction of laying unless otherwise directed by the DISTRICT.
- M. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the DISTRICT.
- N. Lay no pipe in water or when it is the DISTRICT's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, its use is considered incidental to the project, and no separate payment will be made for its use.
- O. Where a water line crosses over a sanitary sewer, use a full joint of pipe with a standard mechanical joint, and center over the sewer. Where a water line is to be parallel to a sanitary or storm sewer, lay it at least 10 feet from the sewer. If it is not practical for the water and sewer lines to be separated as described above, then lay the water line at least 18 inches above the top of the sewer.
- P. Joint all pipe in the exact manner specified by the manufacturer of the pipe and jointing materials.
- Q. For detection purposes, a 12 gauge solid strand copper tracing wire (shielded) shall be installed as per the manufacturer's instructions. Connections between wires shall be soldered or connected with wire nut fasteners and wrapped. The wire shall be brought completely up into every valve box so that a locator can be hooked directly to it.

3.2 HYDROSTATIC TESTS

- A. Pressure Test
 - 1. After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main.
 - 2. The duration of each pressure test shall be at least two hours.

3. Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the NE. Furnish the pump, pipe, connections, gauges, and all necessary apparatus.
4. Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.
5. Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the DISTRICT.

B. Leakage Test

1. Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.
2. The duration of each leakage test shall be two hours; during the test, subject the main to a pressure of 200 psi.
3. Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
4. No pipe installation will be accepted until the leakage is zero.

3.3 DISINFECTION

1. The District will keep a log of all disinfection procedures, including but not limited to:
 - a. time when line was filled,
 - b. time when line was disinfected,
 - c. how much disinfection,
 - d. flushing procedures,
 - e. how long (time) line was flushed,

- f. time between flushing
 - g. Bac-T sampling.
- A. During construction, take precautions to protect pipe interiors, fittings, and valves against contamination. When pipe laying is not in progress (e.g., at the end of the day's work), place watertight plugs in the ends of all pipe already in the trench; if water accumulates in the trench, leave the plugs in place until the trench is dry. Complete the joints of all pipe in the trench before stopping work for any reason.
 - B. If dirt or other foreign material that has gotten into a pipe will not, in the opinion of the DISTRICT, be removed by flushing, clean the interior of the pipe, and swab with a disinfecting solution of 5% hypochlorite.
 - C. Make water flow from the existing distribution system or some other source approved by the DISTRICT into the newly laid pipeline, and add chlorine to it. Feed water into the pipe, and chlorine into the water, at constant, measured rates so proportioned that the chlorine concentration in the water in the pipe is kept at a minimum of 25 mg/l available chlorine. To ensure that this concentration is maintained, measure the chlorine residual at regular intervals.
 - D. Table I shows how much chlorine is needed for each 100 feet of line for pipes of various diameters. A 1% chlorine solution may be prepared either with 1 pound of calcium hypochlorite for each 8.5 gallons of water or with sodium hypochlorite.

TABLE I

CHLORINE REQUIRED TO PRODUCE A 50 MG/L
CONCENTRATION IN 100 FEET OF PIPE, BY DIAMETER

Pipe Size (Inches)	100% Chlorine (Pounds)	1% Chlorine Solutions (Gallons)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
14	0.328	3.96
16	0.428	5.12
18	0.540	6.48
20	0.680	8.00
24	0.980	11.52

- E. While the chlorine is being applied, manipulate valves so that the treatment dosage will not flow back into the line that is supplying the water. Continue the application of chlorine until the entire line being treated is filled with the chlorine solution. Then retain the chlorinated water in the line for at least 24 hours, during which time all valves and hydrants in the line being treated shall be operated so that appurtenances can also be disinfected. After 24 hours, the treated water shall have a chlorine concentration of at least 10 mg/l throughout the line.
- F. After the applicable retention period, flush the heavily chlorinated water from the line until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/l. Perform such flushing only at sites where there is adequate drainage.
- G. The velocity of the water used to flush a line shall be at least 2.5 fps. The flow rates required to produce this velocity in various sizes of pipe are shown in Table II.

TABLE II

REQUIRED OPENINGS TO FLUSH PIPELINES
(40 PSI RESIDUAL PRESSURE)

Pipe Size (Inches)	Flow Required To Produce 2.5 fps Velocity (gpm)	Orifice Size (Inches)	Hydrant Outlet Nozzles	
			<u>Number</u>	Size (Inches)
4	100	15/16	1	2-1/2
6	220	1- 3/8	1	2-1/2
8	2390	1- 7/8	1	2-1/2
10	610	2- 5/16	1	2-1/2
12	880	2- 13/16	1	2-1/2

- H. Once a line has been flushed, test to make certain that the residual chlorine in the water is within acceptable limits.
- I. It must be noted that flushing is no substitute for taking preventative measures before and during the laying of water lines. Certain contaminants--especially those in caked deposits--are difficult or even impossible to remove

by flushing, no matter how high the velocity. Further-more, in pipes with diameters of 16 inches or more, it can be difficult to achieve even the minimum recommended flushing velocity of 2.5 fps.

- J. After flushing the line for the suitable amount of time, the line must set inactive for 48 hours before taking any Bac-T samples.

3.4 BACTERIOLOGICAL TESTS

- A. After a water line has undergone final flushing but before it is placed into service, collect a sample for bacteria-logical testing every 1,200 feet and at every branch or dead end.
- B. Collect these samples in sterile bottles treated with sodium thiosulfate. Do not use a hose or fire hydrant to collect samples. One suggested sampling method is to install a standard corporation cock in the line with a copper tube gooseneck assembly; after the samples have been taken, the gooseneck assembly can be removed and retained for later use.
- C. Take the samples collected to an approved laboratory to be tested for bacteriological quality in order to determine if they contain any coliform organisms. If the initial disinfection fails to produce satisfactory samples, repeat disinfection until satisfactory samples are obtained.
- D. When the samples tested are found to be satisfactory, the water line may be placed in service.

3.5 DISINFECTION PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING LINES

- A. The procedures outlined above apply primarily to cases in which the lines are wholly or partially dewatered.
- B. However, leaks or breaks that are repaired with clamping devices while the lines remain full of water under pressure present little danger of contamination and require no disinfection.
- C. When an existing line is opened, whether by accident or design, the excavated area could be wet and contaminated because of the presence of sewers nearby. The danger of contamination from such pollution can be lessened if liberal quantities of hypochlorite are applied to the open trenches. It is better to use tablets for disinfection in such cases because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation site.
- D. Where practical, treat the lines by the slug method in accordance with AWWA C601.
- E. The following disinfection procedure is considered the minimum that may be

used when existing lines are repaired:

1. Swab the interior of all pipes and fittings (particularly couplings and tapping sleeves) that are to be used in repairing an existing line with a solution of 5% hypochlorite before installing them.
2. The most practical means of removing contamination introduced into a line during repairs is to give the line a thorough flushing. If the locations of valves and hydrants make it possible, flushing in both directions is recommended. Start flushing as soon as repairs are completed, and continue until all discolored water is eliminated.

3.6 CLEANUP

- A. After completing each section of water line, remove all debris and all construction materials from the work site. Then grade and smooth over the surface of both sides of the line. Leave the entire area clean and in a condition satisfactory to the District.

END OF SECTION

PART 1. GENERAL

1. Refer to other sections for work related to that specified under this heading.

PART 2. PRODUCTS

- 2.1 The service assembly shall include a corporation cock, Rehau Munipex service pipe gooseneck, copper setter, meter, meter box, and tapping saddle as required.
- 2.2 Any brass goods furnished under this specification shall be new and unused and as manufactured by Ford. All fittings shall conform to ANSI/AWWA Standard C800, latest revision. All brass components in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of 0.25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. Brass saddles shall be made from CDA/UNS C83600.
- 2.3 CORPORATION STOP: The corporation cock shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main at a vertical angle. This cock shall be a Ford FB1000-3-Q-NL (3/4") or Ford FB1000-4-Q-NL (1").
- 2.4 SERVICE PIPE: Service pipe shall be 3/4 inch or 1" Rehau Municipex Tubing with inserts . Goosenecks shall be a minimum of 3 feet long. Service lines shall be installed with a twelve (12) gauge coated copper wire from the water line to the meter box. Long side services shall be encased in PE piping having no joints from back of sidewalk to back of sidewalk and or curb.
- 2.5 COPPER SETTERS: Copper setters 5/8 inch x 3/4 inch with compression fittings shall be VBH72-7WR-44-33-Q-NL with integral angle stop and provisions for locking. Each assembly shall include an angle meter check valve.
- 2.6 WATER METERS: All meters shall be frost proof, sealed register, displacement type with bronze castings similar to Neptune T-10 with R900i radio read register. Meters shall have the capability of automatic meter reading compatible with the District's integration devices. Meters shall be straight reading in gallons. Water meters shall comply in all respects to AWWA C-700, latest revision.
- 2.7 METER BOXES: Meter boxes for 5/8 inch x 3/4 inch assemblies shall be Mid-State, Sigma or equal, MSBC1015-18 (Box). The meter box lid shall be a Sigma Corporation Catalog Number LC-225T cast iron (ASTM A48, Class

30B), non-traffic load rated lid.

- 2.8 TAPPING SADDLES: Tapping saddles shall be used for tapping all DIP pipe and shall be Ford FC202, and shall be threaded to accept the corporation cock specified above. Saddles used for tapping C900 DR14 shall be Ford S - 90 and saddles used for tapping existing SDR21 Class 200 shall be Ford S - 70. No taps larger than one (1) inch shall be made in any size pipe without approval by the District.

PART 3. EXECUTION

- 3.1 Make no taps on dry lines without approval from the District.
- 3.2 The service line shall have a minimum of 18 inches cover. After the line is installed and yoke set, turn water on service pipe between yoke and main, blowing any accumulated trash out of the pipe.
- 3.3 In general, install the meter box where the plans show off the road right-of-way. Set plumb approximately one (1) inch above the existing or proposed grade and so that surface drainage will not enter it. Fill from the existing or proposed grade to the top of the meter box at a slope of one (1) inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the AJE.
- 3.4 The service main shall not be taut from stop to cock.
- 3.5 Set the yoke plumb and level with a brace placed in the middle where designed.
- 3.6 All service lines crossing state, county or city roads shall be bored or jacked. The service lines under paved roads shall be cased with 2" diameter PE pipe, continuous with no joints. Service line casings shall extend from toe of slope to toe of slope or to a point 2 feet beyond the back of curb or to a point 3 feet beyond the back of ditch. Where casing crosses a ditch, the minimum depth of cover below the ditch shall be 24 inches.
- 3.7 All service lines crossing state, county, or city roads shall be bored and jacked.
- 3.8 All service taps will be made separately and away from any asphalt or concrete unless approved by the LaGuardo Utility District.

END OF SECTION

**Standard Specifications for Water Lines
LaGuarda Utility DISTRICT**

Large Meters, Double Detector Check Valves & Appurtenances

PART 1. GENERAL

- 1.1 Refer to sections for work related to that specified under this heading.

PART 2. PRODUCTS

2.1 PRECAST METER VAULTS

- A. Shall meet the requirements of ACI 318, latest edition.
- B. Shall meet the requirements of ASTM C857 and AASHTO Standard Specifications for Highway Bridges
- C. Be rated for 300 psf loading condition.
- D. Have a concrete compressive strength at 28 days of at least 4,000 psi.
- E. Be reinforced with ASTM A615, Grade 0 reinforcing steel.
- F. Include four (4) lifting rings on top slab exterior.
- G. Include ladder bars/steps on interior aligned beneath the hatch at 12 inch centers.
- H. Include an integral cast-in-place aluminum hatch in the top lid for the box.
- I. Include provisions for a sump in one corner.
- J. Be sized as shown on the standard details.
- K. Include butyl sealant between all precast sectional joints.

2.2 ALUMINUM HATCHES

- A. Hatches shall be single leaf or double leaf as shown on the drawings.
- B. hatch shall have a ¼" thick one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor.
- C. Door panels shall be ¼" aluminum diamond plate, reinforced to withstand a live load of 300 PSF uniform live load.
- D. Door shall open to 90 degrees and automatically lock with T-316 stainless steel hold open arms with aluminum release handles. Unit shall lock with a non corrosive lock bar and non-corrosive handle.
- E. Hatches shall be by Halliday Products or approved equal.

2.3 ELECTRO-MAGNETIC WATER METERS FOR IRRIGATION SERVICE

- A. Electro-magnetic water meters shall be a battery powered meter using Faraday's Law of electromagnetic induction.
- B. The meter body shall be stainless steel grade 304 and the flow tube shall be stainless steel grade 316.

- C. The liner shall be polyethylene epoxy and the electrodes shall be stainless steel grade 316.
- D. The register shall be stainless steel with glass lens. The register housing and lid shall be UV resistant.
- E. Meter shall conform to AWWA C701 laying lengths and be equipped with ANSI/AWWA Class 125 pound flanges.
- F. Meter shall be equipped with a pulse output device that can be attached to a radio transceiver. The pulse output shall be programmed in the factory to meet the Owner's AMR capabilities.
- G. Meter sampling rate shall be 0.5 seconds and be equipped with battery for a minimum 10-year life.
- H. A LCD readout shall be provided incorporating totalized flow, and a flow rate indicator.
- I. Include an evoQ4 Sensus Protocol encoder module designed for use with 3 wire radio endpoints to allow interface with pit pads for touch reading or AMR devices. Encoder module shall be NEMA 6P/IP68 rated and have a lithium battery with minimum 10-year life.
- J. Include a Neptune R900i pit antenna.
- K. Meter size shall be as shown on the drawings.
- L. Meter shall be Elster evoQ4. No substitution allowed.

2.4 COMPOUND WATER METERS FOR COMMERCIAL APPLICATIONS

- A. A meter for cold water measure of flow in one direction.
- B. NSF/ANSI 372 certified and NSF/ANSI 61 compliant.
- C. Meet and exceed the requirements of AWWA C702.
- D. Maximum operating pressure rated of 150 psi.
- E. An AWWA Class II Turbine, hydro-dynamically balanced rotor and Nutating disk.
- F. Include a R900i® pit style, meter interface unit (MIU).
- G. Bronze companion flanges.
- H. Meter size shall be as shown on the drawings
- I. Neptune TRU/FLO® brand. No substitution allowed.

2.6 DOUBLE CHECK DETECTOR ASSEMBLIES

- A. Double Check Detector Valves shall be NSF/ANSI 6.1, ASSE 1048 approved.
- B. The device shall be furnished complete with OSY shutoff valves and test cocks.
- C. The main body shall be epoxy coated ductile iron.
- D. The device shall be accessible for maintenance without removing the device from the main line.
- E. The bypass meter shall be Neptune Model T10 with encoder suitable to work with the Owner's AMR meter system.
- F. Size shall be as shown on the plans.
- G. Devices shall be Watts Series 709DCDA or Wilkins Model 350Da or

approved equal.

2.6 INSULATED ENCLOSURES

- A. Insulated enclosures shall be provided for double check detector assemblies.
- B. Material of fabrication shall be 5052-H32 marine grade aluminum, mill finish.
- C. Enclosure shall be insulated with 1.5 inches (9.0 R-value) minimum thickness polyisocyanurate foam laminated to a glass fiber reinforce facer on each side.
- D. Structural members shall be redwood.
- E. Enclosure shall be provided with two (2) access panels with one access panel containing the drain panel. Access panels shall be completely removable and include built-in lockage folding t-handles. The drain panel shall have a stainless steel hinge and spring as a positive means of closure. The drain panel shall be designed to remain closed except during water discharge.
- F. Enclosure shall be furnished with a heater to maintain an interior temperature of 40°F with an outside temperature of -30°F.
- G. Enclosures shall be Safe-T-Cover™ Series X00-AL or approved equal.

2.7 SUMP PUMPS

- A. Where positive drainage from meter pits is not available with gravity discharge, a sump pump shall be furnished in the meter vault.
- B. Sump pump shall be 120V with a 15-foot power cord.
- C. Cast iron housing with permanently lubricated maintenance free motors and baked on epoxy finish.
- D. Non-clog vortex impeller.
- E. 1-1/2 inch discharge and automatic vertical mount float actuated on/off.
- F. 0.3 HP with 43 GPM discharge rate at 15' TDH.
- G. Pumps shall be Zoeller or Dayton or approved equal.

2.8 PIPE STANDS

- A. Pipe saddles shall be adjustable constructed of electro-galvanized steel.
- B. Adjustable pipe saddle supports shall be Cooper B-Line Type B3093 with B3088T (galvanized) threaded pipe stand for 2" through 8" diameter pipe.

2.9 PIPE SEAL DEVICES

- A. Pipe seal devices shall consist of rubber sections to form a mechanical seal between pipes penetrating through walls. Belt is to provide a watertight seal to withstand up to 20 psig. Rubber sections to be manufactured of EPDM. Metal hardware to be 316 stainless steel.
- B. Acceptable models to be Pipe Seal™ Type E or Link-Seal™ Type S316 or approved equal.

PART 3. EXECUTION

3.1 SETTING VALVES AND FITTINGS

A. General

1. Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
2. All valves and fittings shall be restrained by Romac Grip Ring, Mega-lug™, Sigma or, Ford UFR1500SA, UFR1400DA, or equal. See Water Lines for specifications regarding mechanical restraint devices.
3. Valves deeper than 36 inches shall be provided with valve nut extensions with set screws.

B. Location of Valves

1. Valves in water mains shall, where possible, be located on the street property lines extended unless otherwise shown on the drawings.

C. Valve Boxes

1. Provide a valve box for every valve.
2. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the DISTRICT.

3.2 SETTING HYDRANTS

A. Location

1. Locate hydrants as shown on the drawings or as directed by the DISTRICT and in a manner that will provide complete accessibility and also minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position

1. All hydrants shall stand plumb. Set hydrants to the established grade, with center of steamer nozzle at least 12 inches above the finished grade, as shown on the drawings or as directed by the DISTRICT. In no circumstance shall more than one (1) hydrant adjustment device be allowed to be installed on a new hydrant

installation to achieve proper ground clearance.

C. Connection to Main

1. Connect each hydrant to the main with a 6-inch ductile iron anchor tee, and a 6-inch gate valve. The hydrant shoe and the valve shall be connected with an anchor coupling. In the event the hydrant has to be placed further from the valve than allowed by a coupling, the hydrant shall be rodded to the gate valve with a minimum of 3 anchor rods.

D. Hydrant Drainage

1. Provide drainage at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the waste opening in the hydrant to a distance of 1 foot around the elbow. Connect no drainage system to a sewer.

E. Anchorage for Hydrants

1. If using an anchor coupling, brace the bowl of each hydrant well against unexcavated earth at the end of the trench with concrete blocking.
2. Anchor Couplings - Tyler Union D132 will be used between the gate valve and tee, and the gate valve and the fire hydrant.
3. Ford Uni-Flange - Use Ford Uni-Flange series 1400 for all ductile iron pipe and Ford Uni-Flange Series for all PVC pipe. The Developer shall use the Uni-Flange unless the conditions do not allow.

F. Final Painting

1. The finished hydrants shall have the bonnet painted to the color of flow capability. The DISTRICT will dictate the color coding of the bonnet.

3.3 SETTING METER VAULTS AND METERS

- A. Meter vaults shall be set plumb and level. Top of vault shall extend at least 3 inches above surrounding finish grade with positive drainage away from meter vault. A minimum of 8 inches of clear excavation shall occur around the exterior walls of the vault and 2 feet where pipe connections or fittings occur on the exterior of the vault. A minimum of 8-inches of crushed stone shall be placed beneath the vault.
- B. Butyl mastic shall be placed in continuous strips between each precast joint section of the vault.
- C. All pipe penetrations shall be sealed with pipe-seal devices to insure a watertight fit between vault openings and pipe and to prevent groundwater intrusion into the vault.

- D. Sump pumps shall be piped with 1-1/2-inch diameter Schedule 40 PVC pipe from the pump to and through the top of the vault and be discharged onto the ground surface beyond the top of the vault lid. A 90° bend is required at the top discharge. The pump discharge line shall be equipped with a check valve and a true union inside the vault to allow for ease of removal of the pump without removal of all pipe.
- E. A GFCI outlet shall be furnished by the developer to provide power to the sump pump. The DISTRICT will not provide the power for the sump pump.
- F. Where available, drainage of vaults may be accomplished with gravity drainage using 2" Schedule 40 PVC pipe.
- G. The DISTRICT shall be provided with a lock handle to open the lid.
- H. Meter radio read antenna shall be wired with enough slack to allow for opening of the lid without damage to the wiring or antenna. The antenna shall be mounted in the lid with an adequately sized field drilled opening.
- I. Meters shall be set level and plumb. All 2-inch meters shall be equipped with a meter setter. Larger meters shall be equipped with a flange coupler adaptor to facilitate meter removal.
- J. Meters shall be supported with a minimum of two (2) pipe supports beneath the meter. In the case of use of a linesetter, two (2), 1/2 inch PVC braces shall be placed on the linesetter for bracing.
- K. Meters shall be set with at least 12 inches of vertical clearance above the floor of the vault.

3.4 BACKFLOW PREVENTION ASSEMBLIES REQUIREMENTS

Refer to Sections 01100 and 01200 for this information.

END OF SECTION

PART 1. GENERAL

- 1.1 The work to be performed hereunder shall consist of the installation of a casing pipe for the purpose of installing a water line as shown on the drawings or as called for in these specifications. It shall include the excavation of a boring pit, auger boring between the points as specified on the drawings, furnishing and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.

PART 2. PRODUCTS

2.1 CASING PIPE

- A. The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications" for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have a minimum yield strength of 35,000 PSI and shall have the minimum wall thickness shown in the following table:

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
FOR EBO LOADING

<u>Carrier Pipe Diameter</u>	<u>Casing Pipe Diameter</u>	<u>Nominal Thickness</u>
4 inches	8 inches	0.250 inches
6 inches	12 inches	0.250 inches
8 inches	16 inches	0.312 inches
10 inches	20 inches	0.312 inches
12 inches	24 inches	0.312 inches

- B. When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inches greater than the thickness shown.
- 2.2 CARRIER PIPE: The carrier pipe shall be Class 52 DIP, unless otherwise noted on the drawings.

- 2.3 CASING SPACERS: The casing spacer shall be a two (2) piece shell made from T- 304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edges of the shell and prevents slippage. Bearing surfaces (runners) shall be ultrahigh molecular weight polymer for abrasion resistance and a low coefficient of friction. The runners shall be attached to support structures (risers) at appropriate positions to properly support the carrier within the casing and to ease installations. The runners shall be attached mechanically by punched riser section and bolt heads TIG welded for strength. Riser shall be made of T-304 stainless steel of a minimum 10 gauge. All risers 6" and over in height shall be reinforced and MIG welded to the shell. *Standard positioning within the casing* will require the height of the risers and runners combined shall be sufficient to provide not less than three fourths inch between the casing pipe and the outside diameter of the bell. *Centered positioning within the casing* will require the risers and runners to be dimensioned to center the carrier pipe in the casing with a top clearance of one half inch minimum. All welds and metal surfaces shall be chemically passivated. Casing spacers shall be Model CCS as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL or prior approved equal.

The size of the casing spacers shall be determined by the manufacturer's recommendation for each size carrier pipe and casing. The length and size of casing, the quantity of spacers needed and the configuration requirement to be determined by the Engineer, based on the application required. But in no case, will the minimum number of casing spacers per pipe joint be less than three (3).

2.4 CASING END SEALS

- A. Casing ends shall be sealed with casing end seals. Casing end seals shall be 1/8" thick neoprene rubber with 1/2" wide T304 stainless steel worm gear bindings. Seals shall be pull-on type.

PART 3. EXECUTION

3.1 BORING

- A. The boring shall be accomplished by means of auguring to the size, line, and grade shown on the drawings.

3.2 INSTALLATION OF CASING PIPE

- A. For open cut of casing pipes, install the steel casing pipe into the open cut as the trench excavation proceeds. Weld sections of casing pipe together to provide watertight joints, and replace the protective coatings in areas where it is damaged by welding.

- B. For boring casing pipes, jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints. Casing pipe shall extend to a from toe of slope to toe of slope or from a point 2 feet beyond back of curb or from a point 3 feet beyond center of ditch line.
- C. Do not remove unacceptable casing without prior approval from the DISTRICT. If the removal of casing pipe is permitted, make proper provisions to prevent caving in of the earth surrounding the casing. All abandoned openings shall be filled with flowable fill.

3.3 INSTALLATION OF CARRIER PIPE

- A. The carrier pipe shall be furnished by the Contractor. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing utilizing casing spacers to align the carrier pipe to offset any minor variations in the alignment of the casing.
- B. Ductile iron pipe Class 52 shall be installed in the casing pipe.

3.4 LAYOUT OF WORK

- A. The Owner will provide the necessary control points required by the Contractor for this construction. The Contractor will provide the detailed layout required to keep the tunnel or bore on grade.

4. GUARANTEE OF WORK

- 4.1 Guarantee a usable completed casing between the points specified and to the line and grade specified. The allowable tolerance at the downstream end point of the bore shall be such that the invert of the carrier pipe may be positioned within a vertical area limited on the top by an elevation no higher than the elevation shown on the drawings and on the bottom by an elevation no lower than the existing inlet pipe invert. For sewers, the sides shall be a minimum of 8 inches inside the interior face of the manhole at the end of the bore.
- 4.2 The allowable tolerance at the upstream end point of the bore shall be such that the invert of the carrier pipe may be positioned at the elevation shown on the drawings.

END OF SECTION

PART 1. GENERAL

- 1.1 This item shall include furnishing and installing concrete blocking, cradles, anchors, caps, pipe protection, and/or encasement at the locations shown on the drawings and/or directed by the DISTRICT.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

- 3.1 Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements below:
 - A. Strength
 1. The strength of concrete shall be 4,000 psi unless otherwise shown on the drawings.
 - B. Durability
 1. All concrete exposed to weather shall be air entrained.
 - C. Slump
 1. Concrete shall be proportional and produced to have a slump of 3 inches with a 1 inch tolerance.
 - D. Admixtures
 1. Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the DISTRICT.
 - E. Reinforcing Steel
 1. Yield strength of reinforcing steel shall be 60,000 psi.

END OF SECTION