

## **SECTION S901 - WATER MAIN PIPE AND FITTINGS**

### **S901-1 DESCRIPTION**

Work consists of installation of water main pipe and fittings as required in Contract Documents and as directed by Project Manager.

Work is to be in conformance with requirements of Section S900 General Water Provisions.

### **S901-2 MATERIALS**

#### **S901-2.01 Ductile Iron Pipe and Fittings**

Ductile iron pipe shall be Class 52 or Class 56, as indicated in Contract Documents, in conformance with requirements of ANSI/AWWA C151/A21.51

Fittings shall be ductile iron in conformance with requirements of ANSI/AWWA C110/A21.10 for full body fittings, and ANSI/AWWA C153/A21.53 for compact fittings. Fittings for ductile iron pipe that is 4 inches through 24 inches in diameter shall have rated working pressure of 350 pounds per square inch. Fittings for ductile iron pipe that is 30 inches through 48 inches in diameter shall have rated working pressure of 250 pounds per square inch.

Ductile iron pipe and fittings shall be of good quality, strength, of even grain, and soft enough to permit drilling and cutting. Each section of ductile iron pipe shall be free from any defects which would make it unfit for intended use. Ductile iron pipe shall be straight, and true circle in section with concentric inner and outer surfaces. Ductile iron pipe section to be cut during installation shall be fully gauged for field cutting. Ductile iron pipe metal shall be made without any admixture of cinder iron or other inferior material.

Interior of ductile iron pipe and fittings shall be cement mortar lined or epoxy coated. Cement mortar lined ductile iron pipe and fittings shall have interior lined with double thickness of cement mortar in conformance with requirements of ANSI/AWWA C104/A21.4, and have an asphalt coating on interior lining and exterior of pipe and fittings. Epoxy coated fittings shall have interior and exterior coated with 6 mil to 8 mil nominal thickness of fusion bonded epoxy in conformance with requirements of ANSI/AWWA C550 and C116/A21.16. Chips or breaks in the epoxy coating shall be repaired in the field by petrolatum wax tape coating system.

Joints shall be rubber gasketed Tyton Joint® push-on, mechanical joint, or mechanical joint anchoring type. Gaskets shall be made of SBR rubber. For ductile iron water main and fittings located within petroleum hydrocarbon and/or chlorinated solvent contaminated soils, gaskets shall be made of oil resistant Buna-N (Nitrile) rubber. When contaminated soil is encountered unexpectedly in the field, Contractor shall immediately notify Project Manager. All joints shall be in conformance with requirements of ANSI/AWWA C111/A21.11.

Joint restraint devices or anchor pipe shall be required in conjunction with concrete thrust blocking at points of change in direction of flow and at new hydrant branches. Restraining device is to be installed according to manufacturer's instructions. Restraining device is to have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent.

Follower gland for mechanical joint ductile iron pipe shall be in conformance with requirements of ANSI/AWWA C151/A21.51.

#### **S901-2.02 Polyethylene Tube Encasement for Ductile Iron Pipe**

Polyethylene tube encasement for direct bury of ductile iron pipe 4 inches and larger in size shall consist of linear low-density polyethylene film 8 mil minimum thickness and polyethylene adhesive tape.

Material and installation procedures shall be in conformance with requirements of ANSI/AWWA C105/A21.5.

### **S901-2.03 C900 Polyvinyl Chloride (PVC) Pipe and Fittings**

PVC pipe shall be designation DR 14 pressure class 305 pipe in sizes 4 inch through 12 inch in diameter, blue in color, and in conformance with requirements of AWWA C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water Distribution.

PVC pipe and fittings shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being free of sticky or tacky material. PVC pipe and fittings shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of PVC pipe and fittings. PVC pipe or fittings having any indication of cracking or crazing inside or outside shall be rejected. PVC pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of PVC pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. PVC pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings.

Fittings for PVC pipe sizes 4 inches through 12 inches in diameter shall be PVC injection molded fittings in conformance with requirements ANSI/AWWA C907.

Joints shall be SBR rubber gasket push-on type. For PVC water main and fittings located within petroleum hydrocarbon and/or chlorinated solvent contaminated soils, gaskets shall be made of oil resistant Buna-N (Nitrile) rubber. When contaminated soil is encountered unexpectedly in the field, Contractor shall immediately notify Project Manager.

Mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points of change in direction of flow and at new hydrant branches. Mechanical harness restraint shall be used for push-on joints.. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent. All mechanical joints on ductile iron fittings for PVC water main shall require mechanical restraint.

Ductile iron or cast iron fittings may be substituted for PVC fittings upon approval by the City Water Bureau. When so approved, non-epoxy coated ductile and cast iron fittings on PVC or PVCO water mains are to be covered with protective wax tape coating and all non-epoxy coated ductile and cast iron fitting on PVC/PVCO pipe shall be cathodically protected with a 9 pound anode thermite welded to the fitting.

### **S901-2.04 C906 High Density Polyethylene (HDPE) Pipe and Fittings**

HDPE pipe and fittings shall be designation DR 9 pressure class 200 pipe in sizes 4 inches through 20 inches in diameter, color striped blue, and in conformance with requirements of AWWA C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch and larger for Water Distribution. HDPE pipe and fittings shall be made from resin meeting requirements of Plastic Pipe Institute (PPI) as PE3408. Resin material shall be in conformance with requirements of ASTM D3350 cell classification of 345464C.

HDPE pipe and fittings shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being semi-matte to glossy in appearance and free of sticky or tacky material. HDPE pipe and fittings shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of HDPE pipe and fittings. HDPE pipe or fittings having any indication of cracking or crazing inside or outside shall be rejected. HDPE pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of HDPE pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. HDPE pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings when necessary.

Fittings for HDPE pipe sizes 4 inches through 8 inches in diameter shall be thermal butt fusion molded

fittings designation DR 11 with pressure rating of 160 pounds per square inch; except that 22½ degree bends may be fabricated fittings made of designation DR 9 HDPE pipe. Fittings for HDPE pipe 10 inches through 20 inches in diameter shall be thermal butt fusion fabricated fittings made of designation DR 9 HDPE pipe.

Electro fusion couplings, adapters and fittings shall be designation DR 11 or better and shall be installed according to the manufacturer's instructions.

Mechanical joint adapters shall be required for installation of mechanical joint valves, hydrants and metallic fittings. Mechanical joint adapters shall have same rating, material designation and standards equivalent to HDPE pipe. Mechanical joint adapters shall be equipped with stainless steel pipe stiffener insert, ductile iron gland ring, gasket and attachment bolts and nuts. Mechanical joint adapters shall be installed according to manufacturer's instructions.

Mechanical joints shall require SBR rubber gaskets.

Where joints cannot be made by thermal butt fusion or by mechanical joint adapter, mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points of change in direction of flow. See Approved Products List for mechanical joint restraint mechanism 4 inch through 12 inch diameter pipe. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent.

Mechanical joint restraint mechanism shall require pipe stiffener of sufficient length to support full bearing length of restrainer and prevent toe-in of pipe end. Pipe stiffener shall be made of T-304 stainless steel, 8 inches long, with reinforcing wedge. Pipe stiffener shall match DR designation of pipe on which it is to be used, and shall be installed according to manufacturer's instructions.

Small taps 3/4 inch through 3 inch in diameter on HDPE pipe shall be accomplished by Electro fusion transition tapping saddles equipped with internal AWWA brass threads.

For connecting HDPE pipe to ductile iron pipe or PVC pipe, connection shall be made by an adapter kit which includes HDPE bell mechanical joint fitting with stainless steel reinforcing collar, C-110 heavy body ductile iron gland ring, gasket and extra length T-bolts. Installation shall be made with mechanical joint restraining mechanism for ductile iron or PVC pipe. Adapter kit shall be installed according to manufacturer's instructions.

Use of ductile iron and cast iron fittings may be substituted for HDPE fittings upon approval by the City Water Bureau. When so approved, non-epoxy coated ductile and cast iron fittings on HDPE water main are to be covered with protective wax tape coating and all ductile and cast iron fitting on HDPE pipe shall be cathodically protected with a 9 pound magnesium anode thermite welded to the fitting.

### **S901-2.05 C909 Molecularly Oriented Polyvinyl Chloride (PVC0) Pipe and Fittings**

PVCO pipe shall be designation pressure class 235 CIOD pipe in sizes 4 inches through 12 inches in diameter, blue in color. PVCO pipe is to be in conformance with requirements of AWWA C909 Standard for Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, for Water Distribution.

PVCO pipe shall be of good quality and strength and be homogenous throughout, with inside and outside surfaces being free of sticky or tacky material. PVCO pipe shall be free of blisters, cracks, cuts, foreign inclusions, holes, nicks, significant scratches, voids, and other defects that may affect overall integrity of PVCO pipe. PVCO pipe having any indication of cracking or crazing inside or outside shall be rejected. PVCO pipe shall be straight and true circle in section with concentric inner and outer surfaces. Joining surfaces of PVCO pipe spigots and integral-bell and sleeve-reinforced bell sockets shall be free of imperfections that might cause leakage at joints. PVCO pipe shall be manufactured to cast iron pipe equivalent outside diameters to allow direct connection into cast iron and ductile iron pipe and fittings.

Fittings for PVCO pipe sizes 4 inches through 12 inches in diameter shall be PVC injection molded fittings in conformance with requirements ANSI/AWWA C907.

Joints shall be SBR rubber gasket push-on type. When petroleum hydrocarbon or chlorinated solvent contaminated soils are encountered unexpectedly in the field, ductile iron pipe with nitrile gaskets or PVC pipe with nitrile gaskets shall be used in place of PVC pipe.

Mechanical joint restraint mechanism shall be required in conjunction with concrete thrust blocking at points of change in direction of flow and at new hydrant branches.. Mechanical harness restraint shall be for push-on joints. Mechanical joint restraint mechanism shall have epoxy coating or approved equivalent. Hardware shall be coated with blue fluorocarbon coating, 304 stainless steel or approved equivalent. All mechanical joints on ductile iron fittings for PVC water main shall require mechanical restraint.

Ductile iron or cast iron fittings may be substituted for PVC fittings upon approval by the City Water Bureau. When so approved, non-epoxy coated ductile and cast iron fittings on PVC/PVC water main are to be covered with protective wax coating and all ductile and cast iron fittings on PVC/PVC pipe shall be cathodically protected with a 9 pound magnesium anode thermite welded to the fitting.

#### **S901-2.06 Petrolatum Wax Tape Coating System for Metallic Fittings to be used with Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe**

The primer and wax tape coating shall be in accordance with ANSI/AWWA C217. Wax tape coating system shall be composed of synthetic fabric, saturated with blend of petroleum wax, plasticizers and corrosion inhibitors. Wax tape coating system shall consist of primer paste and petrolatum tape.

#### **S901-2.07 Tracer Wire for Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe**

Tracer wire shall be designed specifically for detecting buried utilities. Tracer wire for open cut installation shall be minimum of one (1) - 12 AWG copper wire, solid, coated with a blue colored minimum 30 mil high molecular weight polyethylene insulation (HDPE or HMWPE). Tracer wire for trenchless water main shall consist of minimum two (2) wires or as shown on plans and shall be minimum 12 AWG copper clad steel core wire, solid, with a blue 45 mil HDPE insulation.

#### **S901-2.08 Tracer Wire Termination Box**

Termination box shall be cathode protection test box. Termination box shall be 4 feet long, have shaft size of 4 inches inside diameter, body made of ABS plastic flared at bottom, with cast iron rim and flush fit drop-turn locking lid with words "WATER TEST" cast on top of lid. Non-conductive terminal board designed for minimum of two stainless steel terminal connections shall be attached to inside of lid.

If termination box is to be installed in paved area, termination box shall be installed within 7 inch diameter valve box. Valve box shall be minimum 4 feet long cast iron, screw type with arched base, with word "WATER" cast on top of lid.

#### **S901-2.09 Impervious Clay Trench Plug**

Impervious clay trench plug shall consist of a mixture of silt and clay soils free of rocks, stones and vegetation. All material shall pass through a 0.25 inch sieve and at least 95% by weight of the material shall pass through a #200 sieve. The hydraulic coefficient (coefficient of permeability) of the material shall be less than  $1 \times 10^{-6}$  cm/sec as measured using ASTM D5084.

### **S901-3 CONSTRUCTION DETAILS**

#### **S901-3.01 General**

Water main pipe shall be installed in straight line horizontally and vertically. Deflection of water main

pipe shall be achieved at pipe joints within manufacturer's allowable limits and with bend fittings. Water main pipe and fittings shall be handled in such manner that water main pipe and fittings, coatings and linings are not damaged. Nylon fabric choker sling capable of handling weight of water main pipe and fittings shall be used to lift, place and move water main pipe and fittings. Water main pipe and joints shall be uniformly supported and secured in place within required embedment material. Temporary support under water main pipe shall be removed upon securing water main pipe with permanent embedment material.

Refer to Section S900-3.02 for minimum cover over water main pipe and fittings, as measured between finished grade and top of water main pipe and fittings.

Minimum vertical separation between crossing water main and sewer pipe lines is to be 18 inches when water main pipe passes under sewer pipe, or 6 inches when water main pipe crosses over sewer pipe, as measured from outside of respective pipes at point of crossing. One full standard laying length of water main pipe is to be centered under or over sewer pipe so that both joints of water main pipe will be as far from sewer pipe as possible. In addition, when water main pipe passes under sewer pipe, adequate structural support in form of compacted crushed stone bedding or class K concrete is to be provided for sewer pipe to prevent excessive deflection of sewer pipe joints and any settling of sewer pipe onto water main pipe.

Optimum minimum horizontal separation between parallel water main and sewer pipes, including manholes, vaults and junction chambers, is 10 feet as measured from outside of respective pipes, manholes, vaults and junction chambers. In no case is water main pipe to be installed less than 3 feet horizontally from parallel sewer pipe, including manholes, vaults and junction chambers.

Where water main pipe has less than minimum separation requirements either horizontally or vertically, all of joints of water main pipe located within 10 feet of sewer pipe are to be encased with controlled density fill material. Controlled density fill encasement is to be placed to minimum thickness of 6 inches around water main pipe for minimum length of 2 feet as centered on joint of water main pipe.

In all cases, where water main pipe crosses another utility, vertical separation shall not be less than 6 inches.

Tees, bends, offsets, reducers, caps, plugs and hydrants on water pipe shall be mechanically restrained and solidly braced to prevent any movement due to thrust pressure. Bracing shall be accomplished with use of cast-in-place concrete between fittings/hydrant and undisturbed soil. Water valves shall be mechanically restrained at both ends.

Disinfection/sampling taps are to be installed no more than 1,000 feet apart and at ends of all new water main installations.

Contractor is responsible for making sure that inside of pipe is clean and free of foreign material before pipe installation.

### **S901-3.02 Ductile Iron Pipe and Fittings**

Ductile iron pipe and fittings shall be installed in conformance with requirements of ANSI/AWWA C600, according to manufacturer's latest instructions, and as approved by Project Manager.

Polyethylene tube encasement shall be installed on all ductile iron water mains, water services and hydrant branch pipe in conformance with ANSI/AWWA C105/A21.5.

Plugging, filing, burning-in or welding will not be allowed to repair any ductile iron pipe or fittings that have been damaged.

For ductile iron pipe, sizes 4-inch through 24-inch in diameter, 75-90 ft/lbs is recommended torque on nuts and 'T' bolts used for mechanical joints.

Install magnesium anodes as shown on drawings and as approved by Project Manager.

The maximum allowable angular joint deflection for DIP pipe and DIP/Cast iron fittings shall not exceed the manufacturer's published limits.

Impervious clay trench plugs shall be installed around ductile iron pipe water mains and services where shown on the plans or as directed by the Project Manager to stop the flow of contaminated groundwater through porous water main bedding and backfill material.

### **S901-3.03 Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and Fittings**

PVC/PVCO pipe and fittings shall be installed in conformance with requirements of ANSI/AWWA C605, according to manufacturer's instructions, and as approved by Project Manager.

Field cutting of PVC/PVCO pipe shall be made with square ends. Cut spigot end shall be re-beveled at same angle provided by factory-finished PVC/PVCO pipe using a manufacturer's approved beveling tool. On cut PVC/PVCO pipe an insertion line shall be marked on cut spigot end using factory marked spigot as guide. For connecting spigot end to shallow depth bell, such as mechanical joint valve and iron fitting, spigot end shall be cut so as to leave only slight bevel of 1/4 inch. Spigot end shall be inserted to full limit of shallow depth bell. For PVC (C900) pipe, sizes 4-inch through 24-inch in diameter, 75-90 ft/lbs is recommended torque on nuts and 'T' bolts used for mechanical joints. For PVCO (C909) pipe, 55 ft/lbs is recommended torque on nuts and 'T' bolts for mechanical joints.

In assembling PVC/PVCO pipe, gaskets and pipe ends shall be wiped clean and spigot end lubricated from beveled end to approximately mid-way from insertion line. If recommended by manufacturer, lubricant shall be applied inside bell, using lubricant that is supplied by manufacturer. Joining is complete when spigot end is inserted to insertion line. Care shall be taken not to over-insert spigot end into bell end. It is recommended newly laid pipe be partially backfilled before adding more pipe to minimize over-insertion of pipe joints on previously laid lengths of pipe. Joining shall not be made by use of heavy machinery.

The maximum allowable angular joint deflection for PVC/PVCO pipe and PVC fittings shall not exceed the manufacturer's published limits, which may be 1 degree or less.

Ductile iron or cast iron fittings shall be used when connecting PVC/PVCO pipe to existing ductile or cast iron pipe.

Taps 2 inches in diameter and smaller on PVC/PVCO pipe shall require wide strap, all brass tapping saddles manufactured for C900 PVC pipe. Refer to Section S912, Corporation Stop and Connection, Taps larger than 2 inches in diameter on PVC/PVCO pipe shall require tapping sleeve. Taps shall be made using equipment designed specifically for making taps on PVC/PVCO pipe. Tap shall be no closer than 2 feet from back end of bell or spigot insertion line. Multiple taps shall be staggered at least 18 inches apart lengthwise.

Asphalt coated metallic fittings installed on PVC/PVCO water main including tapping assemblies and hardware, shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer instructions.

One nine pound anode shall be attached to all ductile and cast iron fittings on PVC/PVCO water pipe.

Precast concrete cement blocks or any hard objects shall not be used for thrust blocking or directly supporting PVC/PVCO water pipe.

### **S901-3.04 High Density Polyethylene (HDPE) Pipe and Fittings**

HDPE pipe and fittings shall be installed in conformance with manufacturer's instructions.

Field cutting of HDPE pipe shall be made with square ends.

Individual sections of HDPE water main pipe and fittings shall be joined together by thermal butt fusion method. Mechanical joining shall be used in locations where thermal butt fusion method cannot be used. Socket fusion, hot gas fusion, threading, solvent cements and adhesives such as epoxies shall not be used to join HDPE pipe. Electro fused joining method may be used on fittings.

Thermal butt fusion procedures shall be in conformance with manufacturer's instructions and Plastic Pipe Institute (PPI). Fusion equipment operator shall be trained and certified in recommended procedure. Contractor shall be responsible to verify that fusion equipment is in good operating condition and that operator has been properly trained. Thermal butt fusion equipment shall be capable of meeting all conditions recommended by manufacturer, including, but not limited to, temperature requirements of 400°F, alignment and an interfacial fusion pressure of 75 pounds per square inch. Butt fusion joining shall produce joint weld strength equal to or greater than tensile strength of HDPE pipe itself. Welds shall be made using Data Logger to record temperature and fusion pressure with graphic representation of fusion cycle and shall be part of Quality Control records. Thermal butt fusion and Electro fusion joining methods shall be done in dry environment. Individual sections of HDPE pipe should be joined into continuous lengths on job site above ground. Fusion beads shall not be removed from HDPE pipe.

For installation of mechanical joint adapters, bolts shall be tightened and torqued in conformance with manufacturer instructions.

Asphalt coated metallic fittings installed on HDPE water main including tapping assemblies and hardware, shall be coated with petrolatum wax tape coating system applied in conformance with manufacturer instructions. Hardware for epoxy coated fittings not having blue fluorocarbon coating will require petrolatum wax tape coating system.

Directional drilling method of pipe installation shall require the Contractor to record with survey grade accuracy and provide As Built map of the horizontal location and depth of pipe in reference to project stationing.

Thermite weld 9 pound magnesium anode to each metallic fitting.

### **S901-3.05 Tracer Wire Installation with Polyvinyl Chloride (PVC) Pipe, Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe and High Density Polyethylene (HDPE) Pipe**

Tracer wire shall be installed along and above all PVC/PVCO/HDPE water pipe that is 4 inches in diameter and larger. Tracer wire shall be installed in such manner as to enable its detection with electronic locating equipment. Tracer wire shall be installed on top of PVC/PVCO/HDPE water pipe and shall be secured to water pipe with tape or plastic straps at 8 feet maximum intervals and at pipe bends. Tracer wire shall not be spiraled or otherwise wrapped around water pipe. At water service saddles, tracer wire shall be placed over and across water service saddle and water pipe. At valves, tracer wire shall be placed along the side of the water pipe so that the installation of a valve box will not damage the wire.

Tracer wire shall begin and terminate at all connections to existing metallic water pipes wherever possible. Tracer wire connections to existing metallic pipes shall be made with thermite weld. Thermite weld shall be completely sealed with a brush applied coats of an approved bitumastic coating specifically manufactured for underground use.

Route of tracer wire shall extend continuously along PVC/PVCO/HDPE water pipe, and shall be terminated at tracer wire termination box located near hydrant. Termination box shall be installed flush with finished grade and approximately 3 feet away from any given hydrant. Tracer wire shall extend up termination box and be connected to terminal board. Length of tracer wire extending up termination box shall be such that minimum of 3 feet of tracer wire can be coiled up and left tucked inside termination box.

Number of splices made on tracer wire shall be kept to minimum. Splices shall be made using an approved waterproof connector. Where polyethylene (PE) water services are installed with PVC/PVCO/HDPE water pipe, tracer wire for PE water service shall be spliced to tracer wire for

PVC/PVCO/HDPE water main pipe, using an approved splice connector that slips over the main tracer wire without cutting it.

For directional drilling method of installing water main, Contractor shall attach tracer wires securely at beginning of pipe making sure wires will not become detached from pipe during drilling operation.

After installation of tracer wire on mains and services has been completed, the Contractor shall test the tracer wire for electrical continuity. Upon successful completion of system test and submission of certification form to the City, tracer wire system shall be checked for functionality by a representative of the Bureau of Water. Deficiencies in the tracer wire system shall be repaired by Contractor at no additional cost to the City, and the tracer wire system shall be retested by Contractor.

### **S901-3.06 Additional Fittings**

If required, additional fittings shall be installed on new water main pipe that are not already shown in Contract Documents. Petrolatum wax tape coating system and one (1) 9-pound anode shall be installed on ductile and cast iron fittings on PVC/PVCO water main pipe.

### **S901-3.07 Additional Concrete Thrust Blocks**

If required, additional concrete thrust blocks shall be constructed that are not already shown to be constructed in Contract Documents.

## **S901-4 METHOD OF MEASUREMENT**

### **S901-4.01 Water Main Pipe**

Quantity to be measured for payment shall be number of linear feet of water main pipe installed as measured along centerline of water main pipe, beginning with face of hub forming commencement of new work and extending to face of hub or spigot constituting end of that particular line of water main pipe.

Hydrant branch water pipe and water service pipe 4 inches and larger will be measured and included for payment as water main pipe. Quantity to be measured for payment shall be number of linear feet of hydrant branch water pipe and water service pipe installed as measured from centerline of water main pipe to which hydrant branch water pipe and water service pipe is connected, along centerline of hydrant branch water pipe and water service pipe to face of hub or spigot constituting end of that particular hydrant branch water pipe and water service pipe line.

### **S901-4.02 Additional Fittings**

Quantity to be measured for payment shall be number of pounds of additional fittings installed that were not originally required in Contract Documents. Weight of fittings shall be determined from listed weight in manufacturer catalogue.

### **S901-4.03 Impervious Clay Trench Plug**

Quantity to be measured for payment shall be the actual number of impervious clay trench plugs installed and as shown on the plans or as ordered by the Project Manager.

## **S901-5 BASIS OF PAYMENT**

### **S901-5.01 General all Items**

Unit price bid for all items shall include cost of: water pipe; water pipe fittings; water pipe specials; shop-drawings; hardware; warning tape; approved on site backfill; concrete thrust blocks; encasement;



controlled density fill; joint materials; making water pipe joints; joint restraining devices; furnishing, installing and removing disinfection/sampling taps; blow-off taps; tapping saddles for disinfection/sampling taps and blow-off taps; pressure testing; disinfection, flushing and health sample testing and fees; pavement saw cutting; additional excavation and backfill required for testing and disinfection purposes; preparation and distribution of service interruption notices; preparation and submittal of water service information and cards; pipe installation records; and furnishing all labor, material and equipment necessary to complete work.

Unless provided for under separate payment items in Contract Documents, cost of furnishing, installing, maintaining, and removing temporary water pipes, valves, plugs, taps, corporation stops, curb stops and boxes, blow-off water pipes, and other fittings necessary for construction of new water main, or for providing continuous water service, shall be included in unit price bid for water main pipe.

Unless otherwise noted on plans or ordered by Project Manager, furnishing and installing magnesium anodes will be paid for under Section S966 Magnesium Anode.

Partial payment of eighty (80) percent of unit price bid will be made for installed water main pipe that has not satisfactorily passed pressure and health tests. Remaining twenty (20) percent will not be paid until water main installation has passed both pressure and health tests and has been accepted by Monroe County Health Department and City of Rochester

#### **S901-5.02 Ductile Iron Pipe and Fittings**

Unit price bid shall also include cost of: furnishing and installing ductile iron pipe, anchor pipe and fittings, polyethylene tube encasement, including adhesive tape.

#### **S901-5.03 Polyvinyl Chloride (PVC), Molecularly Oriented Polyvinyl Chloride (PVCO) and High Density Polyethylene (HDPE) Pipe and Fittings**

Unit price bid shall also include cost of: furnishing and installing PVC/PVCO pipe and fittings; ductile iron and cast iron fittings; tracer wire; tracer wire termination box; splices and connections; tracer wire testing and certification. When substitution of a PVC fitting with a ductile or cast iron fitting is approved by the City Water Bureau no additional payment will be made for fitting, glands, hardware, joint restraint devices, petrolatum wax tape coating or 9-pound magnesium anode.

#### **S901-5.04 Additional Fittings**

Unit price bid shall also include cost of furnishing and installing additional pipe fittings, joint restraining devices and hardware.

Unit price shall also include petrolatum wax tape coating and 9-pound anode on ductile or cast iron fittings installed on PVC/PVCO/HDPE water main pipe. Payment weight does not include weight of anode, mechanical joint glands, joint restraining devices, hardware, and tape coating.

The unit price shall also include the cost to furnish and install the additional concrete thrust block.

#### **S901-5.05 Excavation, Backfill and Surface Restoration**

Excavation, rock excavation, furnishing and placing of bedding and select granular backfill (water), and surface restoration will be paid for under separate bid items. All hand or tunnel excavation in and around utility lines, tree roots, pipe joints and curbs shall be included in unit price bid for excavation.

No separate payment shall be made for placement of approved on site backfill material excavated from trench.

#### **S901-5.06 Impervious Clay Trench Plug**

Unit price bid includes cost of excavation and furnishing and placement of clay material at locations shown on the plans or as ordered by the Project Manager.

Payment will be made under:

| <b>ITEM NO.</b> | <b>ITEM</b>  | <b>PAY UNIT</b> |
|-----------------|--|-----------------|
| S901.0401XX     | X" Ductile Iron Pipe Water Main Class 52                           | Linear Foot     |
| S901.0503XX     | X" Ductile Iron Pipe Class 52 for Hydrant Branch                   | Linear Foot     |
| S901.0601XX     | X" Ductile Iron Pipe Water Main Class 56                           | Linear Foot     |
| S901.0603XX     | X" Ductile Iron Pipe Class 56 for Hydrant Branch                   | Linear Foot     |
| S901.07         | Additional Ductile Iron Pipe Fittings                              | Pound           |
| S901.0801XX     | X" Polyvinyl Chloride Pipe Water Main                              | Linear Foot     |
| S901.0802XX     | X" Polyvinyl Chloride Pipe for Hydrant Branch                      | Linear Foot     |
| S901.09         | Additional Polyvinyl Chloride Pipe Injection Molded Fittings       | Pound           |
| S901.11XX       | X" High Density Polyethylene Pipe Water Main                       | Linear Foot     |
| S901.12         | Additional High Density Polyethylene Pipe Fittings                 | Pound           |
| S901.1301XX     | X" Molecularly Oriented Polyvinyl Chloride Pipe Water Main         | Linear Foot     |
| S901.1302XX     | X" Molecularly Oriented Polyvinyl Chloride Pipe for Hydrant Branch | Linear Foot     |
| S901.15         | Impervious Clay Trench Plug  | Each            |

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