SECTION 101

PIPE AND FITTINGS

101-1 GENERAL

101-1.01 Description. - This work consists of furnishing and installing water system pipe and fittings within City of San Jose, San Jose Municipal Water System service areas. Related work is specified in the following sections:

Section 19, "Earthwork"
Section 102, "Valves, Hydrants, and Appurtenances"
Section 103, "Miscellaneous Equipment"
Section 104, "Disinfecting and Pressure Testing"

Sewer and drainage work is specified in Section 1207 through 1501 of these City Standard Specifications.

101-1.02 Submittals. - Within 60 days after the date of the Notice to Proceed, the Contractor shall submit:

1. Working drawings showing the layout of all water lines showing pipe lengths, location and angles of bends, joint locations, and class of pipe.
2. Manufacturers' catalog data and details on the proposed pipe and fittings including joint details.
3. Manufacturers' installation instructions for pipe and fittings.

Test reports required by the various standards shall be submitted not later than the date the material is delivered to the job site.

101-1.03 Trenching. - Attention is directed to Section 5-1.02A, "Trench Excavation Safety Plans" of the General Conditions.

The City of San Jose does not issue a "Permit to perform Excavation or Trench Work," the Contractor shall secure a permit from the State, as required by Section 6500 of the State of California Labor Code.

The permit, together with a copy of approved trench excavation safety plan, shall be maintained on the job site at all times.

101-1.04 Certificates of Compliance. - The manufacturer shall establish the necessary quality control and inspection practice to assure compliance with these specifications. The manufacturer shall furnish a certificate of compliance, as specified in Section 6-1.07, "Certificates of Compliance," that all of the required tests have been made and the results thereof comply with the requirements of these specifications.

101-1.05 Existing Facilities. - Existing facilities shall be protected in accordance with the provisions in Section 7-1.11 "Preservation of Property" and in Section 8-1.10 "Utility and Non-Highway Facilities" of the General Provisions. Any damage done to utility lines shall be reported to the respective utility owner

by the Contractor, and any repair work required shall be done by such company's repair crew. All repair work will be approved by the Engineer prior to backfilling.

All sewer and utility lines that cross or lie along the trench shall be adequately supported during construction and such supports left in place. Care shall be exercised when backfilling around such lines to avoid any damage to them. Any pipeline or lateral, storm or sanitary, cut or damaged in any way shall be replaced in kind by the Contractor at no cost to the City. The damaged pipe shall be replaced between adjacent joints. Patching of damaged pipe will not be permitted.

101-1.06 Delivery, Storage, and Handling. - All materials shall be delivered and distributed at the site by the Contractor. Materials furnished by the City shall be picked up by the Contractor at points designated by the Engineer or at points indicated in the special provisions.

In distributing pipe and fittings at the site of work, each piece shall be unloaded with care opposite or near the place where it is to be laid in the trench. Under no circumstances shall such material be dropped, skidded or rolled against pipe or fittings already on the ground.

Should any part of coating or lining of the pipe or fitting be damaged, the repair shall be equal to, or better than the original coating or lining and the repair shall be done in accordance with the manufacturer's recommendation or in accordance with the applicable standards specified for the work.

101-2 MATERIALS

101-2.01 Ductile Iron Pipe. - Ductile iron pipe shall conform to the requirements of AWWA Standard C151. If the thickness class is not specified on the plans or in the special provisions, the appropriate class for a rated working pressure of 150 psi and for a depth of cover of 10 feet shall be furnished.

101-2.01A Coating and Lining. - Unless otherwise specified in the special provisions, ductile iron pipe shall receive an asphaltic coating as specified in AWWA Standard C151 and a cement-mortar lining as specified in AWWA Standard C104.

101-2.01B Joints. - Joints for ductile iron pipe shall be as specified in the special provisions and shall conform to the requirements of the following:

(1) Rubber gasket joints, push-on or mechanical: AWWA Standard C111
(2) Flanged joints: AWWA Standard C115

101-2.01C Fittings. - Fittings for ductile iron pipe shall be compatible with the pipe joint specified and shall conform to the requirements of AWWA Standard C110. If specified in the special provisions, compact fittings conforming to the requirements of AWWA Standard C153 shall be furnished, unless otherwise indicated on the plans.

101-2.02 Polyvinyl Chloride (PVC) Pipe. - Polyvinyl chloride pipe shall conform to the requirements of AWWA Standard C900 for nominal sizes 4 through 12 inches and AWWA Standard C905 for nominal sizes 14 inches and larger. Dimensions furnished shall be the cast-iron-pipe-equivalent outside diameters. If

the dimension ratio is not specified on the plans or in the special provisions, a pressure class or pressure rating of at least 150 psi at 73.4° F shall be furnished, unless otherwise indicated on the plans.

101-2.02A Joints. - Unless otherwise specified on the plans or in the special provisions, elastomeric gasket joints conforming to the referenced AWWA standards shall be furnished.

101-2.02B Fittings. - Fittings shall be specifically designed for use with dimension ratio and pressure rating of the pipe on which they are to be installed. Fittings shall be of the same material as the pipe and shall be marked as specified for couplings in AWWA Standard C900.

101-2.03 Concrete Pipe. - Concrete pipe shall be either reinforced concrete pressure pipe, steel cylinder type, or reinforced concrete pressure pipe, noncylinder type as specified on the plans or in the special provisions. Steel cylinder pipe shall conform to the requirements of AWWA Standard C300. Noncylinder pipe shall conform to AWWA Standard C302.

Pipe shall be designed for the design pressure and surge pressure specified on the plans or in the special provisions. If the design pressure is not specified, the pipe shall be designed for 150 psi design pressure and 200 psi surge pressure.

Where more than 1 design pressure and surge pressure are required for the project, the highest design-surge pressure combination shall be used throughout each reach of the pipeline. A reach is defined as a definite break in the pipeline such as a structure, open pit valve or other feature apparent at the ground surface. Identification marks of pipe sections shall be indicated on the layout drawings submitted as specified in Section 101-1.02, "Submittals."

101-2.03A Joints. - Joints shall be bell and spigot type employing steel joint rings and rubber gaskets in accordance with the appropriate AWWA standards specified herein.

101-2.03B Fittings. - Fittings shall be in accordance with the approved working drawings and in accordance with the requirements of appropriate AWWA standards specified herein.

101-2.04 Water Service Pipe. - Water service pipe shall be copper water tube . Copper water tube Type K, shall conform to the requirements of ASTM B 88 shall be annealed (Temper 0).

101-2.04A Joints and Fittings. - Joints and fittings shall be compression type. Unless otherwise shown on the plans or specified in the special provisions, component castings of service line fittings shall be composed of Copper Alloy UNS No. C83600, conforming to the requirements of ASTM B 62. The copper alloy consists of 85 percent copper and 5 percent each of tin, lead and zinc. The alloy is also known as red brass or composition bronze.

Threaded joints and fittings shall be made up with teflon tape applied to external threads.

101-2.05 Miscellaneous Materials. -

101-2.05A Anchor and Thrust Blocks. - Anchor and thrust blocks shall be Class A concrete conforming to Section 90, "Portland Cement Concrete" of these City Standard Specifications.

101-2.05B Bedding. - Bedding materials shall be as specified in Section 1301-2, "Materials", the plans and special provisions.

101-3 LAYING

101-3.01 General. - Pipelines shall be laid and maintained true to the line and grade as shown on the plans with fittings, valves and hydrants at the locations shown. If the grade and gradient are not shown on the plans, the pipe shall be laid for a minimum depth of cover from finished grade, of 36 inches for pipe 8 inches or less in diameter, and 42 inches for pipe greater than 8 inches in diameter. In new constructions areas where the proposed pavement section is 12 inches or greater, the pipe shall not be installed until the street base or subgrade has been prepared and accepted.

101-3.02 Excavation and Backfill. - Excavation and backfill shall conform to the applicable provision of Section 19, "Earthwork" of these City Standard Specifications and as specified herein.

The minimum clear width of trench measured at the horizontal diameter of the pipe shall be 18 inches or one foot greater than the outside diameter of the barrel of the pipe, whichever is greater. The maximum clear width of trench at the top of the pipe shall be not more than the outside diameter of the barrel of the pipe plus 2 feet and shall rise vertically to a height of at least 12 inches above the pipe.

101-3.03 Bedding. - Pipe shall be laid on a firm bedding foundation of the type and class as specified on the plans or in the special provisions, and shall have a constant bearing for its entire length except at joints. Bells or couplings shall not rest on solid original trench bottoms; bell or coupling holes shall be excavated. Laying of pipe on earth mounds or blocking will not be permitted.

101-3.03A Bedding Types. -

Type A. - Bedding material shall have a minimum thickness beneath the pipe of 4 inches, or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the trench to 12 inches above the top of the pipe.

Category of Pipe	Type of Bedding	Class of Material
Ductile Iron Pipe	A	I
Concrete Pipe		I
24" Diameter and Less	A	
25" Diameter and Greater	A	
Polyvinyl Chloride Pipe	A	I

101-3.03B Placing. - According to the class and type of bedding specified, the bedding material may be required to be placed and compacted in more than one lift. Class I material requires little or no compacting. Class III material, if specified for

use in the special provisions, requires hand or mechanical compaction. If no imported material is required for bedding the pipe, the initial backfill of the trench shall be native soil carefully shaded around the pipe and carefully compacted to the haunchline of the pipe. Precautions shall be taken to prevent movement of the pipe during placement of initial backfill.

101-3.04 Laying. - Regardless of the type of pipe shown on the plans or specified in the special provisions, the standard procedures for pipe laying specified herein shall apply.

Pipe will be carefully inspected by the Engineer in the field before and after laying. If any cause for rejection is discovered in the pipe, or its installation, the pipe shall be removed and any corrective action taken subject to the approval of the Engineer.

Laying of pipe and assembly of joints shall be in accordance with the printed instructions of the manufacturer and as specified herein.

At the time of laying pipe, the prepared trench shall be in a firm and dry condition. If trench is not in such condition, the contractor shall furnish and operate such pumps or other devices as may be necessary for removing water from trenches during the construction of pipeline system.

Necessary facilities shall be provided for lowering and properly placing the sections of pipe in the trench without damage. Each section of pipe, of the diameter as called for shall be laid true to the lines and grades as shown on the plans.

Pipe interiors shall be thoroughly cleaned of all foreign matter before being lowered into the trench. At all times when work is not in progress, ends of pipe and fittings shall be securely closed so that trench water, earth, or other substances cannot enter.

The pipe shall be laid on a firm bedding foundation of the type and class as indicated on the plans and shall have a constant bearing for its entire length. Wedging or blocking of pipe will not be permitted. Under no circumstances shall pipe be dropped into the trench.

Cutting of pipe for closures or other reasons shall be done in a neat and workmanlike manner by methods which will not damage the pipe or cement lining and will leave the cut end smooth and at right angles to the axis of the pipe.

Deflections from a straight line or grade resulting from horizontal or vertical curves or offsets shall not exceed the limits recommended by the manufacturer. If the required alignment requires deflections in excess of such limits for standard sections of pipe, special bends or a sufficient number of shorter lengths shall be provided to meet the offset limits.

When connections are to be made to any existing pipe or other appurtenances, the actual elevation or position shall be verified before laying any pipe. The engineer will inspect the existing pipe or appurtenance before connection is made. All adjustments in line or grade which may be necessary shall be made. The Contractor will be paid for any additional excavation required, below one foot of the designed grade, as extra work in accordance with the provisions of Section 4-1.03D, "Extra Work" of the General Conditions. The first one foot below designed grade will be considered as being included in the price paid for installing pipe.

101-3.05 Field Joints. -

101-3.05A Ductile Iron Pipe.

(1) Push-on. - The gasket and gasket seal inside the bell shall be wiped clean before the gasket is inserted. A thin film of soft vegetable soap compound shall be applied to the gasket and the outside of the plain-end of the pipe. Lubricant other than that furnished with the pipe shall not be used unless approved by the Engineer. The plain end of the pipe shall be forced completely into the bell socket to complete the joint.

(2) Mechanical. - The outside of the spigot and the inside of the pipe bell shall be thoroughly cleaned of foreign matter. The gland and gasket shall then be slipped on the spigot end of the pipe. The gasket shall be pressed evenly into the bell only after the spigot is seated in the bell.

The gland shall be brought up evenly by tightening alternately the nuts spaced 180 degrees apart.

(3) Flanged. - Flanged joints shall be firmly and fully bolted with machine bolts of proper size. Approved gaskets shall be used at all flanged joints.

101-3.05B Polyvinyl Chloride Pipe. - Polyvinyl chloride pipe shall be joined with elastomeric gaskets in the pipe bell end or in couplings. Spigot ends of pipe and gasket grooves shall be wiped clean. Gaskets shall be inserted in the grooves insuring that they are faced properly and completely seated. Apply lubricant to spigot end or machined end of pipe to the stop shoulder. Use only lubricant supplied with the pipe, unless otherwise approved by the engineer. Do not lubricate rubber rings. Assemble pipe using a bar and wood block or 'level' or 'friction' pullers. After assembly the ring position shall be checked with a feeler gage supplied by the pipe manufacturer.

101-3.05C Concrete Pipe. - Concrete pipe shall be joined with rubber gaskets. Under ordinary laying conditions, the work shall be scheduled so that the bell end of the pipe faces in the direction of laying. Prior to placing the spigot into the bell of the pipe previously laid, the spigot groove, the gasket and the inside of the bell shall be thoroughly cleaned. Then the spigot groove, the gasket and the first 2 inches of the inside surface of the socket shall be lubricated with a compound supplied by the pipe manufacturer.

The gasket after lubrication shall be uniformly stretched when placing it in the spigot groove so that the gasket is distributed evenly around the circumference.

For pipe in which the inside joints are to be pointed, suitable spacers shall be placed against the inside shoulder of the socket to provide the proper space between abutting ends of the pipe.

After the joint is assembled, a thin metal feeler gage shall be inserted between the socket and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket is not in the proper position, the pipe shall be withdrawn, the gasket checked to see that it is not cut or damaged, the pipe relaid, and the gasket position again checked.

Where steel joint rings are used, a suitable cloth, plastic or paper band shall be placed around the outside of the pipe and centered over the joint to prevent dirt from entering the joint recess.

The joint band shall be bound to the pipe by the use of steel box strapping or by an equivalent method, and shall completely and snugly encase the outside joint

except for an opening near the top where grout is to be poured into the joint recess. Grout shall be poured and allowed to set before backfill is placed over the top of the pipe. The grout shall completely fill the outside annular space between the ends of the pipe and around the complete circumference. After the recess has been filled, the jointing band shall be replaced over the opening left for pouring and the mortar allowed to set. After the bedding and backfill have been compacted, the inside joint recess shall first be moistened, then filled with stiff mortar. The finished joint shall be smooth and flush with the adjacent pipe surfaces.

101-3.05D Water Service Pipe. - The various types of water service pipe shall be joined in accordance with the manufacturers' printed instructions, the applicable provisions of this section, and as approved by the Engineer.

Materials used in making joints shall be compatible with the pipe to be joined.

101-3.06 Anchor and Thrust Blocks. - Concrete anchors and thrust blocks shall be furnished and installed as shown on the plans and as specified herein.

Anchor blocks with harnesses, in accordance with the size and details as shown on the plans, shall be provided for vertical angle bend fittings to control upward thrust and for all gate valves 3 inches or larger. Anchor block or collar shall be provided for all reducer fittings 6" x 4" and larger.

Concrete thrust blocks shall be provided for all angle fittings, tees, crosses, and at the bowl of each hydrant. The dimensions of the thrust blocks shall be not less than as indicated on the plans and the block shall bear against firm natural ground. Great care shall be exercised on placement of thrust blocks so that the pipe and fitting joints are free and clear of concrete and are readily accessible for repair.

101-3.07 Connection to Existing Mains. - Connection to existing mains shall be made where indicated on the plans. The actual tap, if required, will be performed by Engineer approved personnel only. Normally, connections of new facilities to existing mains will be made at a "dead end" gate valve. In any case, the newly installed facilities shall be kept isolated from existing systems until the new facilities are bacteriologically acceptable, and pressure and leakage tests have been conducted.

Connections to existing valves prior to obtaining satisfactory leakage and pressure tests of the new facilities shall be at the Contractor's risk. The City will assume no responsibility for the water tightness of existing valves.

101-3.08 Installing Service Lines. - Generally, a water service line connection shall consist of a corporation stop with or without a saddle at the main, copper tubing, or other approved pipe, with coupling nuts, angle meter stop fitting and a meter box with base plate.

The water main shall be tapped at the service locations as shown on the plans. A minimum distance of 18 inches shall be maintained between taps. The tap shall be made at an angle of 45 degrees from top-dead-center of the main and on the same side as the direction of the service run. Under no circumstances shall service lines loop over the top of the water main, nor be laid in same trench with the sewer lateral.

The service line may be installed in open trench or placed through a hole produced by jacking or drilling. Services to adjacent lots may be laid in a common trench, provided 18 inches of clearance is maintained between services. The depth of service line, at the flow line of gutter, shall be not less than 24 inches. The end

of service line shall terminate 12 inches plus or minus one inch behind back of curb. The service line trench shall be backfilled in the same manner as specified in Section 19, "Earthwork" for backfilling pipeline trenches. After backfill has been completed, the meter box with base plate shall be set, with top of box at the same grade as top of curb.

101-3.09 Water Meters. - Meters will be set by City forces only after the following conditions are met: the curb and gutter are constructed, backfill and grading is completed between curb and sidewalk and the meter boxes installed. The Contractor shall notify the City of San Jose Municipal Water System in writing, 5 working days in advance of need for installation of water meters.

101-3.10 Backfill. - All trenches shall be backfilled with Type A bedding and Class I materials as specified in 1301-4.1.1, "Type of Bedding" and 1301-2.1.1, "Class I". The balance of the trench shall be backfilled with native material and mechanically compacted by approved methods. Care shall be exercised while compacting initial backfill so as not to dislodge the pipe, fittings, or appurtenances.

101-3.11 Surface Restoration. - All pavement, sidewalk, curbing, gutters, shrubbery, fences, sod or other disturbed surfaces or structures shall be restored or replaced to a condition equal to that before the work began. Such work shall be in accordance with the applicable provisions of these City Standard Specifications.

101-4 MEASUREMENT AND PAYMENT

101-4.01 Measurement. - The work to be performed under this Section will be listed in the contract item by pipe size, type, thickness, or whatever information is necessary for identification.

The length of pipe mains to be paid for will be the horizontal length measured from centerline of structure to centerline of structure or terminus. Pipe placed in excess of the length designated will not be paid for. Laterals will be measured and paid for by the horizontal measurement from inside face of structure to inside face of structure or terminus. Stub outs will be measured per linear foot and paid for by length designated on the plans or the length actually installed if ordered by the Engineer.

Measurement will be made continuously through bends, wyes, tees, and other special sections.

101-4.02 Payment. - Pipe, measured as specified above, will be paid for at the contract unit price, per linear foot for the various types, sizes, and classes of pipe installed.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing various sizes and classes of pipe including all bends, wyes, tees, and other special sections, connecting new pipe to existing facilities, complete in place, restoration of pavement, testing, flushing and cleaning, disinfecting, all as shown on the plans, as specified in these specifications and as directed by the Engineer.