

PART 9

AUXILIARY WATER SUPPLY SYSTEM FOR FIRE PROTECTION

SECTION 900

GENERAL REQUIREMENTS

900.00 GENERAL. - The Auxiliary Water Supply System (AWSS) is a high pressure water supply system for city fire protection under the authority and management of the San Francisco Fire Department, Superintendent of the Bureau of Engineering and Water Supply. The Contractor shall conduct all his business with the San Francisco Fire Department (SFFD) through the Engineer only.

900.01 QUALITY OF MATERIALS AND WORKMANSHIP. - All materials shall be free from defects throughout their mass, and shall be of uniform high quality.

All castings shall conform to the shapes and dimensions shown on the plans and shall be made in such molds and with such cores as will render the castings clean, smooth, and free from undue cooling strains. Castings shall remain in the flasks a sufficient length of time to prevent unequal contraction in cooling.

The castings shall be true to patterns, sound, smooth, and free from all flaws, defects or imperfections of any kind which, in the judgment of the Engineer, render them unfit for the use for which they are intended. All projections resulting from gates or risers shall be cut off and ground smooth with the surface of the casting.

No plugging, filling or welding of defects in castings will be allowed, except in the case of cast steel castings if specifically approved by the Engineer.

All machined surfaces shall be true and smooth and the parts containing such surfaces shall be finished to conform to gauges, templates or jigs, so that all parts will be interchangeable.

900.02 GUARANTEE OF CASTINGS. - The Contractor shall furnish the Engineer with six copies of a guarantee certifying that the manufacturer has fabricated the castings in conformity with all applicable provisions of the latest ASTM and ANSI Specifications, and that the dimensions and details of the castings comply with the plans and specifications.

900.03 HYDROSTATIC TESTING. - All special castings made under the terms of these Standard Specifications or the Special Provisions shall be hydrostatically tested in the presence of the Engineer or his authorized representative. The Contractor shall give the Engineer sufficient notice of time and place of testing so that arrangements may be made for the Engineer to be present. If the plant or foundry is located farther than 50 miles from San Francisco, the Contractor, at his own expense, shall secure the services of a city approved independent testing laboratory to witness the testing of the castings. The Contractor shall submit to the Engineer for approval the name of the

testing laboratory and a list of the tests performed by same on similar work with dates of tests indicated.

900.04 PATTERNS AVAILABILITY AND PATTERNS MADE BY CONTRACTOR. - Patterns required for use in casting the fittings may be available from the City. The Contractor shall check the availability of the patterns by contacting the San Francisco Fire Department Pipe Yard. Requests for the use of existing patterns shall be made in writing to the Fire Department. In the event the pattern is not available the Contractor, at his own expense, shall make the pattern, templates and gauges of wood or other permanent material satisfactory to the Engineer and all such pattern, templates and gauges shall become the property of the City after use by the Contractor and shall be delivered to the City as directed by the Engineer.

900.05 CONNECTIONS TO BE MADE IN PRESENCE OF FIRE DEPARTMENT REPRESENTATIVE. - The Contractor shall notify the Engineer at least one week in advance of the date on which he proposes to interrupt service to any portion of the system so that the Engineer can notify the San Francisco Fire Department.

The Contractor shall not make any connection to, or otherwise interfere with any part or appurtenance of the Auxiliary Water Supply System, except in the presence of the Engineer and a representative of the Fire Department.

The Contractor shall so conduct his operations that at no time shall more than two adjacent high pressure hydrants be out of service along the line of the work, unless otherwise authorized by the Engineer.

The San Francisco Fire Department may, at its own discretion, activate any portion of the facility for fire fighting.

900.06 SHUT-DOWN OF ANY PORTION OF FIRE PROTECTION SYSTEM TO BE KEPT TO A MINIMUM. - In the interest of public safety, it is essential that the period of shut-down of any portion of the Auxiliary Water Supply System for fire protection be kept, by proper planning and preparation and expeditious work, to the practicable minimum as hereinafter specified.

It is understood and agreed, therefore, that the Contractor, before any such interruption, shall have on hand at the site all labor, materials, equipment and tools necessary in the opinion of the Engineer for the satisfactory completion of all the work, including testing and backfilling, necessary, or required, to restore the fire protection system to service, all where and as shown on the plans and in accordance with the Special Provisions.

Once the Contractor begins work on the AWSS pipeline, he shall continuously prosecute all such work to completion.

900.07 ENGINEER TO BE NOTIFIED. - The Contractor shall notify and make arrangements with the Engineer forty-eight hours in advance of the day that the opening or closing of any AWSS valve is required.

900.08 WORK TO BE COMPLETE. - The Contractor shall do all work and furnish all materials, other than those specified to be furnished by the City, or salvaged by the Contractor, which are necessary, or required, to complete the work, such as bolts, nuts, washers, lead,

yarn, paint, machine oil, graphite, concrete thrust blocks, bracing, brackets, hangers, clamps, inserts, gaskets, etc., in accordance with applicable sections of these Standard Specifications, whether or not specified or shown on the plans or specified in the Special Provisions, and the cost thereof shall be included in the price or prices bid.

SECTION 901

DUCTILE IRON PIPE

901.01 GENERAL. - The Contractor shall install ductile iron pipe including all excavating, lagging, backfilling, restoring pavement and other Incidental Work, necessary or required for a complete, satisfactory installation, where and as shown on the plans, or where directed.

901.02 PIPE. - Ductile iron pipe shall conform to ANSI Specification A21.51.

All pipe shall be thoroughly cleaned inside and outside without the use of acids or harmful liquids.

901.03 JOINTS. - Pipe joints shall be the push-on type and shall conform to Section 11-2.3 of ANSI Specification A21.11.

901.04 TESTS AND TEST SPECIMENS. - Hydrostatic and acceptance tests shall conform to ANSI Specification A21.51. The pipe manufacturer shall furnish in quintuplicate, a written certification to the effect that:

- (a) The pipe has passed successfully a 500-psi hydrostatic shop test in accordance with the Section 51.9 of ANSI Specification A21.51.
- (b) The pipe has passed the acceptance test in accordance with Section 51.12 of ANSI Specification A21.51.

The manufacturer shall also submit with the written certification a physical test report tabulation indicating the tensile and impact test results.

Test specimens, as required by ANSI Specification A21.51 for ductile iron pipe shall be furnished by the Contractor, at his own expense, to the Engineer for testing by the City.

901.05 THICKNESS AND TOLERANCES. - Ductile iron pipe shall be as tabulated below:

Pipe Size Inches	Thickness Class	Wall Thickness Inch
8	2	0.33
10	3	0.38
12	3	0.40
14	4	0.45
16	5	0.49
18	6	0.53
20	6	0.54

Tolerances or maximum permitted variations in dimensions, thicknesses and weights shall conform to Section 51-7 of ANSI Specification A21.51. Each pipe shall be weighed before application of the coating and the weight shall be shown on the outside of the spigot or bell.

901.06 COATING. - The ductile iron pipe shall be coated on the outside with a bituminous coating of either coal-tar or asphalt base approximately 1 mil thick. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun and shall be strongly adherent to the pipe.

901.07 LINING. - The ductile iron pipe shall be cement lined in accordance with ANSI Specification for "Cement Mortar Lining for Cast Iron Pipe and Fittings For Water," Designation A21.4. The thickness requirement shall be 1/16-inch minimum.

SECTION 902

DUCTILE IRON SPECIAL CASTINGS

902.01 GENERAL. - The ductile iron castings covered hereunder are a special design of the City. All ductile iron castings shall be fabricated in a foundry having had at least five years experience in the manufacture of ductile iron castings. The Contractor shall submit to the Engineer for approval the name of the foundry and a list of representative installations with the date of manufacture indicated. All castings shall be in strict accordance with the plans and the following requirements. All fittings specified under this section shall be made of ductile iron.

902.02 DUCTILE IRON. - Ductile iron castings shall conform to the requirements of ASTM "Standard Specification for Ductile Iron Castings," Designation A 536, Grade 80-55-06.

902.03 TESTS AND TEST SPECIMENS. - All fittings shall be subjected to a hydrostatic shop test at a pressure of 600 psi for a period of not less than four minutes. Any casting which shows any defect by leaking or sweating shall be rejected.

Test specimens as required in ASTM Designation A 536 shall be furnished by the Contractor, at his own expense, to the Engineer for testing by the City.

902.04 JOINTS. - Mechanical joint dimensions shall be in accordance with "Standard Mechanical Joint Dimensions" of ANSI Specification A21.11. All mechanical joint fittings shall be supplied with the necessary ductile iron mechanical joint glands, gaskets, and tee bolts manufactured in strict accordance with ANSI Standard A21.11, except that the tee bolt lengths for various sizes of pipe shall be as indicated on the plans.

902.05 FLANGES. - The flange dimensions shall conform to ANS Standard B16.5, 600 lbs. Flanges shall be faced, drilled, spot-faced on the back, and have a raised face 1/4-inch thick.

902.06 TOLERANCES. - Wall thickness, body length, form and dimensions for all fittings hereunder shall conform to the dimensions, standards, and codes shown on the Contract Plans.

The Contractor shall furnish all necessary tolerance gauges which may be required by the Engineer to check dimensions of the castings for conformity with the Contract Plans and allowable tolerances.

- (a) **Diameters:** The inside diameters of the sockets shall not vary from the standard dimensions by more than 0.06 inch.
- (b) **Depths of Sockets:** Depths of sockets shown on the Contract Plans shall be considered minimum with a tolerance not to exceed 0.10 inch.
- (c) **Thickness:** Thickness of the material shall not be more than 1/16-inch less or 1/8-inch more than the dimensions shown on the Contract Plans.

902.07 MARKING CASTINGS. - Each fitting or collar shall have the name or symbol of the manufacture, the letters "AWSS DI" and the size of the fitting or collar on the exterior surface of the casting. The letters and numbers shall be arranged in a manner satisfactory to the Engineer.

The collars shall also have the type of collar marked, such as "Bell Collar" or "Stop Collar" at the locations shown on the Contract Plans.

Where elbows are shown on the plans, the amount of bend shall also be indicated. For example: AWSS DI, 18"-45° Elbow.

The letters or numbers shall be not less than one-half inch in height nor less than one-eighth inch in relief and shall be cast at a distance not less than 12 inches from any spigot end.

In case any casting shall be rejected, the letters AWSS shall be erased by the Contractor under the supervision of the Engineer.

902.08 COATING. - After testing, all castings shall be thoroughly cleaned and coated with two coats of bitumastic coating on the interior and exterior of the castings.

902.09 ACCESSORIES. - All fittings shall be supplied with the necessary accessories as specified or as required. All stop and bell collars shall be supplied with the necessary AISI type 316 stainless steel tie bolts as detailed on the Contract Plans.

SECTION 903

GRAY CAST IRON SPECIAL CASTINGS

903.01 GENERAL. - The castings covered in this Section are of City design, and include sleeves, caps, plugs, offsets, line reducers, valve reducers, hydrant tees, blow-off tees, bell and spigot elbows, double spigot elbows, fire boat wharf manifolds, and other special castings. All castings shall be in strict accordance with the plans or samples provided by the City.

903.02 CAST IRON. - Cast iron shall be in accordance with the requirements for Class "A" of ASTM- "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings," Designation A 126.

903.03 TESTS AND TEST SPECIMENS. - Test specimens, as required by the ASTM Specifications, shall be furnished by the Contractor, at his own expense, to the Engineer for testing by the City.

903.04 TOLERANCES. - The Contractor shall furnish all the necessary tolerance gauges and any other gauges which may be required by the Engineer to check the dimensions of the castings for conformity with the plans and the allowable tolerances.

Diameters. - The inside diameters of the bells and the outside diameters of the spigot ends shall not vary from the standard dimensions by more than 0.10 of an inch.

Depth of Bell. - The depth of bell shown on the standard or detail plans shall be the minimum with a plus tolerance not to exceed 0.10 of an inch.

Thickness. - The variation of the standard thickness shall not exceed 0.12 of an inch.

903.05 MARKING CASTINGS. - Every casting shall have distinctly cast upon the outside surface in raised letters, not less than 1/2-inch in height and 1/8-inch in relief: AWSS, the nominal diameter, and the class. For example: AWSS 12" x 10" GH.

The letters shall be arranged in a manner satisfactory to the Engineer. In the case of elbows, the amount of bend shall also be indicated as required hereinbefore.

Letters and figures for marking castings shall be cast at a distance not less than 12 inches from any spigot end.

In case any castings shall be rejected, the letters AWSS shall be erased by the Contractor under the supervision of the Engineer.

903.06 HYDROSTATIC TESTING. - The castings shall be subjected to hydrostatic shop test pressure for a period of not less than four minutes. The castings shall be subjected to a hammer test while under pressure.

Class A-B specials shall be tested at a pressure of 450 psi and castings of all other classes shall be tested at a pressure of 600 psi.

Any casting which shows any defect by leaking or sweating, which cannot be stopped by peining, will be rejected.

903.07 COATING. - After testing, every casting shall be cleaned and then coated inside and outside with bituminous coating in accordance with ANSI Specification A21.10.

SECTION 904

CAST STEEL SPECIAL CASTINGS

904.01 GENERAL. - The steel castings covered in this Section are of City design, and include sleeves, crosses, tees, valve reducers, double bell elbows, equalizer rings, strongbacks, and other Special castings. All castings shall be in strict accordance with the plans, or samples provided by the City.

Before being coated, as required in Section 903.07, all the castings shall be subjected to a hydrostatic shop test pressure of 650 psi for a period of not less than four minutes. The castings shall be subjected to a hammer test while under pressure.

Any casting which shows any defect by leaking or sweating, which cannot be stopped by peining, will be rejected.

904.02 CAST STEEL. - Cast steel shall be in accordance with the requirements for Grade 70-36 of ASTM "Standard Specifications for Mild to Medium Strength Carbon - Steel Castings for General Application." Designation A 27.

904.03 TESTS AND TEST SPECIMENS. - Test specimens, as required by the ASTM Specifications, shall be furnished by the Contractor, at his own expense, to the Engineer for testing by the City.

904.04 TOLERANCES. - The Contractor shall furnish all the necessary tolerance gauges and any other gauges which may be required by the Engineer to check the dimensions of the castings for conformity with the plans and the allowable tolerances.

Diameters. - The inside diameters of the sockets and the outside diameters of the spigot ends shall not vary from the standard dimensions by more than 0.06 of an inch.

Depth of Socket. - The depth of socket shown on the standard or detail plans shall be the minimum with a plus tolerance not to exceed 0.10 of an inch.

Thickness. - The thickness of metal shall not be more than 1/16-inch less than, or 1/8-inch more than, the dimensions shown on the plans.

904.05 MARKING CASTINGS. - Every casting shall have distinctly cast upon the outside surface in raised letters, not less than 1/2-inch in height and 1/8-inch in relief: AWSS, the nominal diameter, and the class. For example: AWSS 12" x 10" GH.

The letters shall be arranged in a manner satisfactory to the Engineer. In the case of elbows, the amount of bend shall also be indicated as required hereinbefore.

Letters and figures for marking castings shall be cast at a distance not less than 12 inches from any spigot end.

In case any casting shall be rejected the letters AWSS shall be erased by the Contractor under the supervision of the Engineer.

904.06 COATING. - After testing, every casting shall be thoroughly cleaned and shall then be coated inside and outside in the manner specified in Section 903.07 for gray cast iron special castings, all the requirements of which shall apply.

SECTION 905

BOLTS, TIE RODS AND OTHER CONNECTION DEVICES

905.01 GENERAL. - The Contractor shall furnish and install all bolts, tie rods, nuts, sleeve nuts, washers and other connecting devices necessary for the bolting together of pipe joints and other connections and parts of pipe lines. Such devices shall conform to the standard plans, except that special lengths may be required by the Engineer.

All washers shall be perfectly flat and true to required dimensions, and all nuts and bolts shall have their bearing surfaces smooth and at right angles to the axis of the thread.

All threads shall be thoroughly coated with lubricating oil to which has been added flake graphite in the amount of one ounce per quart of oil.

905.02 MATERIAL. - All of the connecting devices described hereinbefore shall be of austenitic stainless steel conforming to American Iron and Steel Institute (AISI) and American Society of Testing Materials (ASTM) specifications. All bolts shall conform to ASTM A 193, Symbol B8M (AISI Type 316). All nuts and sleeve nuts shall conform to ASTM A 194, Symbol 8M (AISI Type 316). All tie rods, threaded rods and washers shall conform to AISI Type 316.

905.03 WIRE BINDERS. - Wire binders, where required to hold bolts and rods firmly in place in the lugs, shall be furnished and installed by the Contractor. They shall consist of 3 turns of No. 10 BWG soft stainless steel wire, wrapped tightly around the entire set of bolts or rods, with the ends twisted tightly together.

For each set of bolts or rods less than 24 inches in length, one binder will be required.

For each set of bolts or rods 24 inches or more in length, two binders will be required when used in open lugged devices, each binder being placed as close to lugs as possible.

905.04 PAINTING. - After installation, following satisfactory hydrostatic test of pipe and appurtenance, all the bolts, nuts, and other connection devices shall be painted with two coats of an approved coal tar base paint applied in accordance with the applicable requirements of Section 809.

SECTION 906

PIG LEAD AND YARN

906.01 PIG LEAD. - Lead shall be in accordance with the requirements for Common Desilverized Lead of ASTM "Standard Specifications for Pig Lead," Designation B 29.

906.02 YARN. - Yarn used for joint packing shall be braided or twisted jute packing yarn, uniform, best quality, free from tar.

SECTION 907

RADIOGRAPHIC INSPECTIONS

When steel castings are specified to be radiographically inspected, the Contractor shall make gamma-ray, or 250 kv (or greater) X-ray, radiographs of complete castings, or any portion thereof, as selected by the Engineer or his authorized representative. The total number of Standard 14-inch x 17-inch radiographic films to be utilized, however, will not exceed 20. Radiographs resulting from such examination shall be properly exposed and easily readable films. Any faulty, underdeveloped, overdeveloped, or excessively foggy films shall be rejected and replacement films shall be exposed, developed and resubmitted for evaluation at no cost to the City. All inspection shall be made in accordance with ASTM "Recommended Practice for Radiographic Testing," Designation E 94.

The quality of such steel castings shall be evaluated by comparing the radiographs of each casting with the standard plates comprising the "Gamma-Ray Radiographic Standards," ASTM Designation E 71. Said standard plates shall be made available by the Contractor to the City.

The comparison shall be made on the basis of either "Class 2," or "Class 3," whichever is indicated on the Standard Plan of the particular casting being examined. The radiographs and standard plates shall be compared in the presence of the Engineer or his authorized representative, and any casting which, in his opinion, is not acceptable in Groups "A" through "G," inclusive, of such standards, will be rejected, and the repair thereof by any means whatsoever will not be permitted.

The Contractor shall furnish all labor, materials and facilities required for the specified radiographic inspection of the steel casting and shall include in his bid prices the entire cost, except the wages of the Engineer, of making such inspection.

SECTION 908

GENERAL INSTALLATION REQUIREMENTS FOR AWSS

908.01 GENERAL. - The Contractor shall lay AWSS pipe, fittings, and appurtenances where and as shown on the plans, or specified, or where directed by the Engineer, and shall do all trenching and excavating necessary for the proper placing of the AWSS facilities, and all required backfilling and restoration of pavement.

The Contractor shall prepare trench subgrade for AWSS facilities not less than 30 linear feet in advance of the AWSS pipe construction.

All abandoned structures shall be removed to a depth of not less than one foot below the bottom of the required construction. Moreover, in order to allow sufficient space for making joints, the clearance between any lead joint in the high pressure pipeline installed and any structure or other interference shall be not less than 18 inches.

Immediately prior to installation, to prevent the entrance of any foreign matter into the lines, all pipes, valves, hydrants, other castings, and appurtenances shall be cleaned by the Contractor by brushing and washing, and all dirt and other foreign matter removed.

As the pipe laying proceeds, an approved mandrel, provided by the Contractor, shall be drawn forward as each pipe or special casting is laid. All branches or other openings shall be protected and kept sealed during installation by inserting turned wooden plugs until permanent connections are made. Plugs shall be at the site before work begins. During the progress of the work the lines shall be kept thoroughly clean throughout, and at the conclusion of the work, left clean. Any obstruction or deposit discovered in the lines during inspection of the work shall be removed at once by the Contractor.

AWSS installation work shall be done and supervised by journeyman plumbers. Qualifications of the journeyman plumbers shall be subject to approval by the Engineer.

908.02 YARD. - AWSS materials are stored at the San Francisco Fire Department Pipe Yard located at 2245 Jerrold Avenue. Except on Saturdays, Sundays and legal holidays, the yard will be open for receiving or delivering materials during the periods 8:00 A.M. to 12:00 noon and 1:00 P.M. to 4:00 P.M. The Contractor shall make all arrangements for pick-up or delivery 48 hours in advance by contacting the supervisor plumber at the Pipe Yard.

908.03 BORROWING OF CITY MATERIAL. - With the approval of the Engineer, the Contractor may borrow materials from the Yard. The Contractor will be required to fill out an irrevocable purchase order prior to removing the materials from the Yard.

908.04 HAULING PIPE AND MATERIALS FURNISHED BY CITY. - All pipe, valves, hydrants and other appurtenances and materials furnished by the City to the Contractor for use in the work, shall be handed, loaded, and hauled by the Contractor from the Pipe Yard or other locations within the City limits to the site of the work.

908.05 RESPONSIBILITY FOR MATERIALS OBTAINED FROM THE CITY. - The Contractor shall carefully inspect all materials and appurtenances delivered to him by the City and shall not accept any materials or appurtenances that are cracked, broken or defective in any way. The Contractor shall be responsible for all materials and appurtenances delivered to him by the City, and should any materials or appurtenances, in the judgement of the Engineer, be damaged after they are delivered to the Contractor, they shall be promptly replaced with new materials or appurtenances by the Contractor at his sole expense. Failure to so replace such damaged materials or appurtenances will be cause for replacement by the City and all expense of such replacement will be deducted from moneys due the Contractor.

908.06 RETURN MATERIALS TO PIPE YARD. - All materials to be returned to the Pipe Yard, and all patterns that are, or become, the property of the City, shall be loaded and hauled by the Contractor to the Pipe Yard or other designated location within the City limits, and there placed by him where directed. The Contractor will be issued a receipt for said materials.

908.07 EXCAVATING AND LAGGING. - Excavating and lagging shall be in accordance with the applicable requirements of Sections 700, 701 and 702, except as otherwise specified.

908.08 ACCESS TO SFFD HYDRANTS AND VALVES. - It is essential that access to San Francisco Fire Department Hydrants and Valves be maintained at all times free and clear of all obstacles which, in the opinion of the Fire Department, will hinder the use of their equipment in cases of emergency.

908.09 REMOVING AND SALVAGING EXISTING FACILITIES. - The Contractor shall, where and as shown on the Contract Plans, or as specified in the Special Provisions, remove and salvage existing facilities.

All lead joints of pipes and fittings and valves to be removed and salvaged shall have the lead completely melted out by means of a welding torch with an appropriate tip.

Salvaged materials damaged or improperly removed by the Contractor shall be cause for rejection and replacement by the Contractor at his expense.

All salvaged pipe and special castings shall be thoroughly cleaned, both inside and outside, by sandblasting, of all dirt, rust, scale, and loose paint. After cleaning, the pipe shall be painted both inside and outside with one coat of Pabco P and B preservative, Polyken No. 927 by Kendall, or equal.

Exterior iron surfaces of any hydrant or valve to be salvaged shall be cleaned by sandblasting and the interior washed with clean water. After all cleaning has been completed, the Fire Department shall be given the opportunity to inspect, overhaul or repair, as necessary each such hydrant or valve.

After the Fire Department completes work on the hydrant or valve, the exterior surfaces of the hydrant or valve to be installed underground shall be painted with one coat of Pabco P and B preservative or pipe line primer Polyken No. 927 by Kendall or an

approved equal. The exterior surfaces of the hydrant to be installed above ground shall be painted prior to the hydrostatic field test with three prime coats of approved red lead paint, and after satisfactory completion of the hydrostatic field test, shall be painted with two finish coats of approved high gloss enamel, all in accordance with the applicable requirements of Section 809.

Materials to be returned to the Pipe Yard at 2245 Jerrold Avenue shall be completely disconnected, cleaned, and painted as specified herein, before being delivered to the Pipe Yard and placed where directed by the Engineer.

Removed bolting materials and lead melted from existing joints shall be salvaged as the property of the City, but shall not be reused in the work.

908.10 REMOVAL AND DISPOSAL OF EXISTING FACILITIES. - All materials to be removed but not salvaged shall be removed and disposed of as the Contractor's property. The Contractor will not be allowed to store such removed materials at the project site.

908.11 INSTALLATION OF HYDRANTS. - The Contractor shall install hydrants where shown on the plans or where directed by the Engineer.

Each hydrant shall be carefully examined, the elbow and foot valve thoroughly cleaned, and all dirt and other foreign matter removed, before setting the hydrant in place.

Hydrants shall be set exactly plumb, and at the proper elevation, each on a block of reinforced concrete or in a vault recess, as shown on the plans.

In compacting the backfill, the hydrants shall be kept plumb, and adequate support to prevent future movement shall be provided. Any hydrant which is out of plumb or not firmly supported shall be properly reset by the Contractor at his sole expense.

908.12 INSTALLATION OF VALVES. - The Contractor shall install valves in the line, each complete with valve box assembly or valve vault, as applicable, where shown on the plans or where directed by the Engineer.

908.13 AIR VALVE ASSEMBLIES. - The Contractor shall tap the line and shall furnish and install air valve assemblies, each complete with valve, riser, and valve box assembly, where shown on the plans or where directed by the Engineer.

908.14 VALVE BOX ASSEMBLIES. - The Contractor shall furnish and construct valve box assemblies over all air valves, 8-inch valves, and 10-inch valves. Each valve box assembly shall be complete with a cast iron cover, dust pan, and frame set on a reinforced concrete block, and shall include a cast iron valve box unless otherwise specified or shown on the plans, and a steel, ductile iron, or gray cast iron pipe casting riser extending from the valve box or valve, as applicable, to the reinforced concrete block, all where and as shown on the plans or where directed by the Engineer. In the case of air valves and 8-inch valves, unless otherwise specified or shown on the plans, no cast iron

valve box will be required, and the cast iron casting shall extend from the backfilled material to the concrete box.

Valve box assemblies shall be constructed true and plumb, and cast iron frames and covers shall be set to the pavement surface. The backfilled material shall be satisfactorily compacted in place before the concrete block is constructed thereon.

908.15 VALVE VAULTS. - The Contractor shall furnish all materials for and shall construct, reinforced concrete valve vaults, each complete, with a cast iron frame, cover and dust pan, for all 12-inch, or larger, valves, where shown on the plans, or where directed by the Engineer.

Valve boxes shall be constructed water tight, and cast iron frames and covers shall be set to the pavement surface in such manner that the length of the lifting handles will be in the direction of vehicular traffic flow.

908.16 BOLTING DEVICES. - All bolting devices shall be brought to a snug fit against the lugs but shall have no excessive tension applied. The Contractor may use the bolting devices as a means of homing the pipe or fitting but shall remove all excessive tension from the bolts and return them to a snug bearing before the hydrostatic field test.

908.17 MINIMUM CLEARANCE. - The minimum clearance between the AWSS pipe, fitting or appurtenance, as the case may be, and other facilities shall be not less than 6 inches. The clearance between any AWSS lead joint installed and any utility or other facility shall be not less than 18 inches.

908.18 THRUST BLOCKS. - All bends, offsets, dead ends, hydrant tees, and crosses with plugged outlet shall be braced with wedge shaped concrete anchor blocks. The blocks shall be of Class 5.5-3000-1-1/2 concrete, of such size as the Engineer may direct, and shall be poured against undisturbed ground in the bottom and side of trench. The backfill around the blocks shall be thoroughly tamped.

908.19 BACKFILLING. - Backfilling shall be in accordance with the requirements of Section 703, except that sand shall be placed to at least one foot above the top of the pipe and to a depth 4 inches below the line of the bells of the pipe.

All excavated materials not suitable for backfilling and all surplus excavated materials shall be removed from the site by the Contractor as his property.

908.20 CISTERN IDENTIFICATION. - Where required on the plans or in the Special Provisions, the Contractor shall mark the existing center cistern manhole frame using the specified outside diameter. The Contractor shall remove the existing brick cistern location ring from the site as his property and fill the resulting voids as set forth under Section 217.01.

908.21 RESTORATION OF PAVEMENTS AND RELATED IMPROVEMENTS. - Pavements and related improvements shall be restored in accordance with the requirements of Section 109, and construction thereof shall be in accordance with the requirements of PART 2 of these Standard Specifications.

908.22 HYDROSTATIC FIELD TESTS AND PERMISSABLE LEAKAGE. -

Installed pipe and appurtenances shall be tested hydrostatically after installation, but before the joints are backfilled, at the pressure specified in the Special Provisions.

The tests shall be made between plugs or valves in the main line and shall include the hydrant branches either up to the 8-inch valve or to the foot valve of the hydrant, as the Engineer may direct. Where the main line test extends only to the valve on a hydrant branch, the portion of the 8-inch pipe between the valve and hydrant shall be separately tested.

The Contractor shall furnish all the labor and materials necessary to make the tests and to perform any work incidental thereto. The trench between joints shall be partially backfilled before making tests.

Prior to the hydrostatic test periods, the Contractor shall furnish and install, as directed, suitable temporary thrust blocks and other anchorages to prevent any movement whatever of the AWSS pipeline and appurtenances during the hydrostatic field tests.

The hydrostatic field tests shall be conducted by the Contractor in the presence of the Engineer, who shall be notified by the Contractor at least forty-eight hours in advance thereof.

The sections of pipe and appurtenances to be tested shall be completely filled with fresh water at line pressure of the respective AWSS pressure zone in which the work is being done, which pressure shall be maintained for a period of not less than sixteen hours. At the end of the period, the hydrostatic pressure shall be increased to the pressure required for the class of pipe installed, as specified. The Fire Department, upon request and at no cost to the Contractor, will increase the hydrostatic pressure to the test pressure hereinbefore specified. The Fire Department may delay this phase of the test, if a large emergency demand upon fire-fighting equipment makes the withdrawal from active service of a pumping engine imprudent. The Fire Department further reserves the right to deny the use of a pumper for a retest where said retest is required due to failure of the Contractor to be present or ready at the original time scheduled for a test or because the installation fails the test due to poor workmanship. If the Fire Department denies the use of a pumper for a retest, the Contractor, shall, at his own expense, provide the equipment to accomplish the retest to the satisfaction of the Engineer. It shall be the Contractor's responsibility to provide connections and appurtenances for supplying water and applying hydrostatic test pressure for sections of pipe and appurtenance which are to be tested and are not connected to an existing Auxiliary Water Supply System.

The Contractor shall take all necessary precautions to prevent any joints drawing while pipe and appurtenances are being tested, and he shall, at his own expense, repair any damage to the pipe and appurtenances, or any other structures resulting from or caused by the tests.

No visible leakage will be allowed for each section tested under the pressures specified. If visible leakage occurs, the Contractor shall remake the joints and replace the defective work until the leakages are eliminated.

SECTION 909

INSTALLATION OF DUCTILE IRON PIPE AND FITTINGS

909.01 CUTTING AND MARKING PIPES AND NIPPLES. - All cutting of pipes or nipples shall be done with a device which, in the judgement of the Engineer, is suitable for this purpose. The cut ends of the pipe or nipples shall be clean and straight, made at an angle of 90 degrees with the longitudinal axis of the pipe. The outside of the cut end shall be tapered about 1/8-inch at an angle of approximately 30 degrees with the centerline of the pipe.

Every reusable nipple cut from a larger piece of pipe shall have painted thereon with yellow paint the word "DUCTILE."

The cutting of all pipe and nipples shall be done as Incidental Work. All measurements for nipple lengths shall be the responsibility of the Contractor.

Closing nipples shall be cut to exact length, with a minus tolerance only, not to exceed 1/8-inch.

Cut pipe and nipples, other than closing nipples, shall, unless otherwise designated on the plans, be cut to a plus-minus tolerance of 1/8-inch.

Under no circumstances will forcing, raising or jacking of the pipe be permitted in order to comply with proper length requirements. A realignment in plan or elevation to comply to the length requirements is also prohibited, unless approved in writing by the Engineer.

909.02 JOINTS. - In constructing joints the Contractor shall not use any method which, in the opinion of the Engineer, would result in damage to the gasket. Excessive forcing, raising or jacking the joints into place from blocks or rollers will not be permitted.

All components of the joint shall be kept clean throughout the assembly.

909.03 PUSH-ON JOINTS. - All foreign matter in the bell shall be removed. The gasket seat shall be thoroughly inspected to be certain it is clean. The gasket shall be wiped clean with a clean cloth, flexed, and then placed in the bell. The gasket shall be fitted snugly in the retainer seat. A thin film of approved lubricant shall be applied to the inside surface of the gasket which will come in contact with the entering spigot end of the pipe. The spigot end of the pipe shall be hung on a sling, aligned and carefully entered into the bell until it just makes contact with gasket. A reasonable force shall be applied so that the spigot end of the entering pipe makes contact with the bottom of the bell.

909.04 GLAND JOINTS. - Prior to slipping the gasket over any spigot end into the bell, the surface to which the gasket comes in contact shall be thoroughly wire brushed clean of all rust, all foreign material shall be removed and the gland lubricated with a soap and water solution or other approved lubricant in order to facilitate the making of a tight joint. Mechanical joint glands shall be tightened evenly with a torque wrench by partially tightening the bolts diametrically opposite

until the gasket is fully seated. The torque obtained in tightening the bolts shall not be less than 60 foot pounds and not more than 90 foot pounds. In no case shall the Contractor tighten the bolts in excess of 90 foot pounds torque in an attempt to correct a faulty joint.

909.05 FLANGED JOINTS. - All flanged joints shall be made in accordance with the best standard practice. The Contractor shall install gaskets where necessary or required when making up joints for flanged fittings. All gaskets shall be carefully cleaned before being fitted and bolted. Flanges and gaskets shall be treated, on assembly, with approved commercial compounds to make all joints tight.

909.06 DEFLECTION. - Deflection at any one joint shall not exceed the deflection listed below for an 18-foot length:

Pipe Sizes	8"	10"	12"	14"	16"	18"	20"
Mechanical Joint	20"	20"	20"	13½"	13½"	11"	11"
Push-on Joint	19"	19"	19"	11"	11"	11"	11"

Lesser deflections for shorter lengths shall be determined by calculating the length ratio times the allowable deflection for the size listed in the table.

909.07 WELDED COLLAR STOPS. - When pipe collars and stops are specified or required, stops of the required form and dimension shall be welded on to the pipes as shown on the Contract Plans.

The welding rod shall be NI-ROD-55, or Xyron 2-24, or equal. The bell and pipe collars, if required, shall be installed prior to welding of the stops on to the pipe.

909.08 WELDER QUALIFICATIONS. - All welders employed by the Contractor to do welding on ductile iron pipe shall be certified welders experienced in the type of welding required. Upon request from the Engineer, the Contractor shall arrange for a representative from the City to witness the techniques to be employed for welding mild steel stops on ductile iron pipe. The Contractor shall follow welding instructions furnished by the weld rod supplier. Special attention shall be given to type and polarity of current and current level to be used. All welders employed by the Contractor on this project shall meet all applicable requirements as prescribed in ASME Boiler and Pressure Vessel Code. Section IX.

909.09 WELD INSPECTION. - The Engineer may provide services of an independent laboratory to inspect the welds on pipe stops. For testing purposes, an ultrasonic testing device or X-ray will be used when required. The Contractor shall arrange the pipe in such a manner that the welds will be readily accessible for testing prior to installation of the pipe. He shall remove or rotate the pipe as required for proper inspection. The Contractor shall notify the Engineer 10 days in advance of any welding, stating where the welds can be inspected. The welds will be rated according to the method outlined in ASME Boiler and Pressure Vessel Code, Section VIII, UW-51. Any weld showing excessive amounts of inclusions, slag, blowholes, surface defects, shallow

penetration or any other fault that will weaken weld shall be rejected. All rejected welds shall be repaired to the satisfaction of the Engineer. Before any welding is begun the metal to be welded shall be cleaned by scraping and wire brushing. No welding shall be performed until the surfaces to be welded are clean and free of paint, rust or any other material that will weaken the weld.

SECTION 910

INSTALLATION OF GRAY CAST IRON PIPE AND FITTINGS

910.01 CUTTING AND MARKING PIPES AND NIPPLES. - All cutting and grooving of pipes or nipples, except the cutting of pipe risers for valve boxes, shall be done in a machine shop with a machine which, in the judgment of the Engineer, is suitable for this purpose. The cut ends of the pipe or nipples shall be clean and straight, and the cut grooves shall conform with the plans as to shape, size and location.

Every reusable nipple cut from a longer piece of pipe shall have painted thereon with yellow paint the size and class of the original full length of pipe, for example:

10"-H

The length of pipe from which the nipples have been cut shall, if the original cast no letter has been destroyed, also have the size and class painted on the outside of the pipe and also on the inside near the spigot end.

The cutting, grooving, machining, and cartage of all pipe and nipples shall be done as Incidental Work. Such cutting and grooving shall be made at an angle of 90 degrees with the longitudinal axis of the pipe. All measurements for nipple lengths shall be the responsibility of the Contractor.

All cut ends of pipe shall be grooved except when the remaining cut pipe is less than the Standard minimum nipple length.

Closing nipples shall be cut to exact length, with a minus tolerance only not to exceed 1/8-inch.

Cut pipe and nipples, other than closing nipples, shall, unless otherwise designated on the plans, be cut to a plus-minus tolerance of 1/8-inch.

Under no circumstances will forcing, raising or jacking of the pipe be permitted in order to comply with proper length requirements. A realignment in plane or elevation to comply to the length requirement is also prohibited, unless approved in writing by the Engineer.

The City reserves the right to furnish pipe for nipples, when specified, in approximate lengths, at no cost to the Contractor, from the Pipe Yard at 2245 Jerrold Avenue.

910.02 MAKING OF JOINTS - GENERAL. - The Contractor shall make all lead joints in accordance with the requirements set forth in Section 901.03 through 910.07, inclusive, as applicable.

910.03 BELL AND SPIGOT JOINTS. - The spigot end of the pipe or special casting shall be inserted into the bell the full depth of the bell, and the spigot adjusted in the bell so as to give a uniform space for the joint, which shall be made up of lead and yarn as specified in Section 906. The packing shall be thoroughly and evenly packed into the bell, filling it tightly for a depth of one inch. The remaining space shall then be filled with lead, a bead being left on the outside of the face of the bell sufficient to allow for caulking so that when the joint is properly caulked the lead will be flush with the face of the bell. The use of cold plugs will not be allowed.

910.04 DOUBLE SPIGOT JOINTS. - In laying double spigot pipe, and in installing sleeves on bell and spigot or double spigot pipe, the sleeve shall be adjusted so as to be centered with both pipes and cover each pipe equally to make a joint symmetrical both radially and along the axis of each pipe. Reference marks satisfactory to the Engineer shall be placed on each pipe to show any displacement of the sleeve in caulking the joint, and the joint shall be caulked so as to prevent a material endwise displacement of the sleeve. The two joints of sleeves shall receive alternate partial caulking, or another method of caulking satisfactory to the Engineer may be employed.

910.05 PIPE LAID ON GRADES. - Where pipe is laid on grades, the bells pointing down grade shall have the lead joint made so as to avoid any material collection of air bubbles at the top of the joints.

910.06 POURING OF LEAD. - Only one pouring shall be made for each joint. The joint shall be perfectly clean and dry when the lead is applied. Dross shall not be allowed to accumulate in the melting pot.

In pouring lead joints, no pour-through will be allowed. Any point in which lead pours through to the interior of the pipe shall be rejected, the joint disassembled, and all lead removed from the interior of the pipe.

Lead extruded 1/8-inch or less from a joint under pressure may be recaulked upon approval of the Engineer; lead extrusion greater than 1/8-inch, and those not approved by the Engineer for recaulking, shall be melted out completely and remade. Furthermore, no leakage will be permitted at the joints. All joints not rendered leakproof by recaulking shall be melted out completely and remade. The hydrostatic field test shall be repeated and repair made as necessary to provide a completely leakproof line.

Pneumatic hammers used for caulking lead joints shall be Chicago Pneumatic Tool Company "Boyer Superior" No. 1, or equal, sleeve valve chipping hammers and each shall have a net weight of 10.50 ± 0.5 pounds, and at 90 psig air pressure shall deliver a minimum of 5.5 foot pounds per blow and approximately 3000 blows per minute.

910.07 MELTING OF JOINTS. - All lead joints of pipes to be disconnected, or altered by deflection, shall be melted out by means of a welding torch with an appropriate tip.

SECTION 911

PAYMENT

Auxiliary Water Supply System for Fire Protection work, satisfactorily furnished, installed, or furnished and installed, as specified, will be paid for as set forth in the Schedule of Bid Prices.

END PART 9