

**STANDARD SPECIFICATIONS  
FOR THE  
FURNISHING OF MATERIALS  
AND THE  
CONSTRUCTION  
OF  
WATER FACILITIES**

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**SECTION I**  
**GENERAL REQUIREMENTS**

**1-01 DEFINITIONS**

The word "District" shall mean the East Valley Water District.

The word "Board" or words "Board of Directors" shall mean the Board of Directors of the District.

The words "District Engineer" shall mean a civil engineer registered as such in the State of California appointed by the Board acting either directly or through his properly authorized agents, assistants, inspectors and superintendents.

The word "Contractor" shall mean the person, persons, partnership or corporation duly licensed as such in the State of California to enter into a contract for the performance of the work required.

The word "Applicant" used herein shall mean the person or persons and duly authorized representatives of the party or parties requesting an extension or an addition to the District's water system.

The word "Plates" shall refer to the Water System Construction Plans that have been prepared by the Applicant's engineer and approved by the District.

**1-02 CONDITIONS**

On all questions relating to the acceptability of the material, machinery or plant equipment, classifications of material or work, the proper execution, progress or sequence of the work, quantities and the interpretation of the specifications or drawings, the decision of the District shall be final.

The Contractor shall obtain copies of and comply with all applicable current statutes, laws, ordinances, rules, regulations and specifications of the United States Government, the State of California, the County of San Bernardino, and any other governmental agencies having jurisdiction and shall make application for all required permits and bear cost of same.

Street cut permits for the construction of the domestic water system shall be obtained by the District from the appropriate governmental agencies, prior to construction.

In the event of conflict between the requirements of these Specifications and the Requirements of the permits, the requirements of the permits shall govern.

The Contractor shall furnish to the District copies of all required permits and licenses prior to initiation of the work. Upon completion of the work, the Contractor shall supply to the District, a letter of approval from the governing body having jurisdiction that the Contractor has met the requirements and conditions of the permits or licenses.

### **1-03 SUPERVISION AND INSPECTION**

The District Engineer shall decide within the provisions of the specifications all questions which may arise concerning the quality or acceptance of materials furnished and work performed by the Contractor.

### **1-04 CAL-OSHA SAFETY CODE**

All work shall be done in a manner that complies with all Cal-Osha Title 8 Safety Codes.

### **1-05 DEFECTIVE WORK OR MATERIALS**

No work which is defective in its construction or deficient in any of the requirements of these specifications will be considered as accepted in consequence of the failure of any inspector connected with the work to point out said defects or deficiency during construction. The Contractor shall correct any imperfect work, without compensation from the District, before final acceptance of the work by the District.

### **1-06 MAINTENANCE OF EXISTING IMPROVEMENTS**

Unless otherwise indicated in the plans or in these specifications, or unless otherwise cared for by the owner of a public utility or franchise, all water, gas, oil or irrigation lines, structures or house laterals, in place, and other subsurface structures or lines, shall be maintained by the Contractor and shall not be disturbed, disconnected or damaged by him during the progress of the work. Should the Contractor in the performance of the work disturb, disconnect or damage any of the above, all expenses, of whatever nature arising from such disturbance or in the replacement or repair thereof shall be borne of the Contractor.

### **1-07 PROXIMITY TO SEWERS**

If the horizontal separation between parallel sewer and water lines must be less than 10 feet, or if the sewer crosses below the water line with less than one foot of separation, special construction as required by the State Department of Health Services and approved by the District is required.

### **1-08 AS-BUILT DRAWINGS**

The Contractor shall keep a separate set of construction plans upon which he shall designate as-built conditions using sufficient sketches to properly delineate locations of valves, hydrants, services and other pertinent items. Prior to filing of the Notice of Completion, the Contractor shall certify the as-built information in a letter transmitting the plans and sketches to the District.

## **SECTION 2 MATERIALS**

### **2-01 GENERAL**

The Contractor shall furnish Cement Mortar Lines and Cement Mortar Coated Steel Pipe Or Ductile Iron Pipe. All material in the pipeline work shall be new and unused. All material in the pipeline work shall be of the selected type of pipe. All materials shall be suitable for 150 psi working pressure unless specified otherwise. All pipelines shall have a detectable locating tape laid with the pipe. The tape shall be highly visible and shall be impervious to alkalis, acids, chemical reagents and solvents found in the soil. The metallic core shall have a minimum overall thickness of 5 mils. Tape shall have imprinted continuously over its length, in permanent ink, a message in the form of "CAUTION WATERLINE BURED BELOW". Maximum imprint length shall be 36 inches per message. Locating tape shall be a minimum of 3 inches wide.

### **2-02 FABRICATED STEEL PIPE**

Steel pipe and fittings 5 inches in diameter and larger shall be lines and coated with cement mortar. Pipe and joint shall be bell and spigot "O" ring, flanged, or gasket sleeve-type unless otherwise specified. Applicable sections of the following standards apply:

#### **STANDARD**

A.W.W.A. C200  
A.W.W.A. C205  
A.W.W.A. C206  
A.W.W.A. C207  
A.W.W.A. C208  
A.W.W.A. C300 or C301

#### **ITEM**

Steel Water Pipe  
Cement-Mortar Lining & Coating  
Field Welding  
Steel Pipe Flanges  
Steel Pipe Fittings  
Rubber Gaskets

The wall thickness of pipe shall be as follows:

<u>PIPE DIAMETER</u>	<u>THICKNESS</u>
6 I.D.	10 ga.
8 I.D.	10 ga.
12 I.D.	10 ga.
16 I.D.	3/16 in

### **2-03 STANDARD (SEAMLESS STEEL) PIPE**

Standard steel pipe shall be seamless steel pipe conforming to AST A53 or A120. Pipe sizes up to and including 3 inches shall be galvanized and have threaded ends. Pipe 4 inches and larger shall be black unless otherwise specified and have plain ends for welded flange connections.

### **2-04 DUCTILE IRON (DI) PIPE**

Ductile iron pipe and fittings shall be cement mortar line. Pipe joints shall be mechanical joint or push-on type. Applicable sections of the following standards apply.

<u>STANDARD</u>	<u>ITEM</u>
A.W.W.A. C151	Ductile Iron Pipe
A.W.W.A. C104	Cement Mortar Lining
A.W.W.A. C110	Fittings
A.W.W.A. C1111	Rubber Gasket Joints

All materials shall be suitable for 150 psi working pressure. Ductile iron pipe shall be thickness Class 50.

### **2-05 BUTTERFLY VALVES**

Butterfly valves will be acceptable for size 12 inches or larger. Butterfly valves shall conform to all requirements of A.W.W.A. C504 for buried service. Valves shall be flanged and provided with O-ring shaft seals and manual operators with an operator nut to open counterclockwise. The dimensions of the operator nut shall be in accordance with Sec. 3.16, "Wrench Nuts and

Handwheels” of A.W.W.A. C500. Valves shall be as manufactured by Mueller or approved equal.

## **2-06 RESILIENT-SEATED GATE VALVES**

Resilient-seated gate valves 3 inch through 12 inch nominal pipe size shall conform to all requirements of A.W.W.A. C509-80 or latest revision thereof. Valves shall have non-rising stems, opening by turning counter-clockwise. Valves shall be provided with O-ring shaft seals and operating nuts and handwheels in accordance with the applicable sections of the above referenced standard. Valves shall be manufactured by Mueller or approved equal.

## **2-07 VALVE BOXES**

Valve boxes and caps shall be furnished and installed with all buried valves. The valve boxes shall be of the two piece adjustable type with cast iron caps or as directed by the District. The valve boxes shall have walls not less than 10 gauge and the nominal diameter shall not be less than 8 inches. Valve box caps shall have the word “WATER” cast into them.

## **2-08 FIRE HYDRANTS**

Fire hydrants shall be of the break-off traffic type and shall conform to A.W.W.A. C502 with 6 inches flanged inlet and 5-1/2 inch valve opening. Nozzle threads shall be American National Standard. Operating nut shall be 1-1/2 inch National Standard pentagon. The main valve shall be equipped with “O” ring seals and shall open when turned left or counter-clockwise. Fire hydrants shall be painted as specified by the District. Hydrants shall be Mueller or an approved equal and shall be equipped with two 2-1/2 inch hose nozzles and one 4 inch pump nozzle. The drain plug shall be permanently sealed before installation.

## **2-09 BLOWOFF**

The hydrant head on the 4-inch Blowoff assembly (Std. Dwg. W-103 and W-104) shall be a model J-344 by James Jones Company with a 4-inch inlet and

2-1/2 inch hose connection outlet. The Blowoff assembly shown in Std. Dwg. W-103 and W-104 shall be used at all low points along water mains.

## **2-10 AIR VALVE**

Air valve shall be designed to permit automatic escape of large quantities of air from the pipeline when the line is being filled and permit air to enter the pipeline when the line is being emptied. It shall also allow accumulating air to escape while the line is in operation under pressure. Valves shall be APCO "Heavy Duty" combination air release valves. The size shall be specified on the plans.

## **2-11 STEEL FLANGES**

Steel flanges shall be A.W.W.A. C207, Class D, ring type or blind type as required, sizes as shown.

## **2-12 GASKETS**

Gaskets for flanged joints shall be ring type 1/16 inch thick for pipe 10 inches and smaller and 1/8 inch for larger pipe. Gaskets shall be Johns-Manville Type 60 or approved equal, and shall conform to applicable requirements of A.W.W.A. C207.

## **2-13 FLEXIBLE COUPLINGS**

Flexible couplings shall be Rockwell 411 steel couplings by Rockwell International or approved equal.

## **2-14 FLANGED COUPLING ADAPTORS**

Flanged coupling adaptors between flanged fittings and asbestos cement pipe shall be Rockwell 916 Ring Type FCA. For ductile iron pipe use Rockwell 912 Cast FCA. For steel pipe use Rockwell 913 Steel FCA or approved equal.

## **2-15 COPPER WATER SERVICE LINES**

All 1" copper tubing shall be seamless copper water tubing, type K, soft temper or approved equal.

All 1 1/2" and 2" copper tubing shall be seamless copper water tubing, type K, soft temper or approved equal and shall be delivered in approximately 20' straight length. No coiled copper tubing shall be used in sizes 1 1/2" and larger.

## **2-16 SADDLES, CORPORATION STOPS, ANGLE METER VALVES**

All service saddles, corporation stops, angle meter stops and such appurtenances shall be compatible with material selected and be equal to those manufactured by James Jones Company, Mueller Company, Ford Meter Box Company, Inc. or approved equal.

## **2-17 METERS**

Unless otherwise specified, all meters will be provided by the District at the Applicants expense. All water service meters shall be in accordance with A.W.W.A. C708 Standard for Cold-Water Meters Multi-Jet Type for Customer Service. An affidavit of compliance shall be submitted stating that all meters furnished comply with all applicable requirements of A.W.W.A. C708. Size and quantity shall be as shown on the plans or directed by the Engineer. The main casing shall be of a copper alloy as specified in A.W.W.A. C708.

Casing spuds for all meters 5/8 thru 2 inch shall have external ANS pipe threads. Registers shall be straight reading and shall read in cubic feet. The registers shall be the dry type. Meters shall be Precision Meters or approved equal.

A workmanship and materials warranty shall be furnished requiring the manufacturer to replace without charge, those parts in which defects have developed within 15 years of installation and acceptance.

## **2-18 METER BOXES**

Meter boxes and covers shall be constructed of Solid Fiberglass Reinforced Polymer Concrete (RPC) material and "Concrete Gray" in color as manufactured by Armorcast Products Company. Size shall be as appropriate to accommodate the size and number of meters and shutoff valves to be installed within each.

## **2-19 CONNECTION WITH EXISTING SYSTEM**

All materials necessary to make connections between proposed and existing water systems per details shown on the Plans shall be furnished by the Contractor and shall be of the size and class shown on the accompanying Plans. Items indicated to be salvaged on the Plans but not used on this project are the property of the District.

## **2-20 STEEL CASING FOR BORED CROSSINGS**

Steel pipe shall have a minimum one-quarter (1/4) inch wall thickness for 12 inch to 20 inch nominal diameters and a minimum three eighths (3/8) inch wall thickness for pipe sizes up to 36 inch nominal diameter or in accordance with the requirements of the governing agency whichever is greater, and shall be manufactured in accordance with American Water Works Association (A.W.W.A.) Standard C200, latest revision entitled "A.W.W.A. Standard for Steel Water pipe 6 inches and larger". The casing shall be round and straight, free from protruding bolts, rivets or welds, and shall have an inside diameter of not less than the maximum diameter of the water main plus six (6) inches. The ends of the Steel Casing Pipe to be jacked or bored into place shall be prepared to withstand pressures created by jacking the pipe into place.

## 2-21 CONCRETE

- a. Portland Cement shall conform to ASTM Standard Specification C150, latest revision, entitled "Portland Cement", and shall be Type I or II. Cement in containers that have been broken in shipment or handling, may be used only if approved by the District.
- b. Sand shall consist of well-graded, natural or artificially washed and that has clean, hard, strong matter. Sand shall not contain over three (3) percent clay or silt by weight.
- c. Coarse Aggregate shall consist of gravel, or a combination of gravel and crushed rock, having clean, hard, tough, durable and uncoated pieces free from injurious amounts of soft, friable, thick, elongated pieces, alkali, oil, organic or other deleterious substances. Aggregate shall be properly graded, from 1/4 inch to 1/2 inch in size, to secure the required compressive strength concrete.
- d. Water shall be clean, free from injurious amounts of oil, acids, organic matter or other injurious substance.
- e. Mixing - Concrete required for thrust blocks and other water system items shall be composed of the following relative volumes of materials:

1 cubic foot of cement (1 sack, 94 lbs.)

2 cubic feet of sand (dry, loose)

3 cubic feet of coarse aggregate

Only sufficient water shall be used to produce a concrete with a slump not exceeding 5 inches, as determined by ASTM Standard Method of Test, C143m latest revision. The total volume of sand and coarse aggregate measured separately shall not exceed 6 cubic feet

per sack of cement. Concrete shall be placed within 30 minutes of mixing and no retampering will be permitted. Batch slips shall be furnished by the Contractor when requested by the District, if Transit Mix Concrete is supplied. Unless otherwise specified, all concrete shall have a 28-day compressive strength of 2,500 psi minimum and shall contain 5.5 sacks of cement per cubic yard of concrete.

## **2-22 COAL TAR COATING**

Coal tar mastic for buried ferrous metal surfaces shall be Kopper's Bitumastic No. 505, Tnemec 46-450, Pasco Pipe Wrap Primer No. 9047 or approved equal.

**SECTION 3**  
**EXCAVATION, TRENCHING AND BACKFILL**

**3-01 GENERAL**

The work covered by this portion of the specifications consists of the furnishing of all plants, labor, equipment, appliances, and materials and the performance of all operations in connection with excavation, trenching, and backfilling for water mains and appurtenant structures, in strict accordance with the specifications and the applicable drawings.

In case of conflict in requirements for excavation, trenching and backfilling between these specifications and any statutes, laws, ordinances, rules, regulations and specifications of any political subdivision or agency having jurisdiction, it shall be understood that the more exacting requirements shall govern. In general, these specifications will apply in District right of ways and easements and the aforementioned statutes, laws, ordinances, rules, regulations and specifications of any political subdivision or agency having jurisdiction will apply within the political boundaries or public rights of way to which they apply.

**3-02 EXCAVATION**

The Contractor shall perform all excavation of every description and whatever substances encountered, to the depths and alignment indicated on the construction drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted by the Contractor at the direction of the District.

Such grading shall be done as necessary to prevent surface water from flowing into trenches or other excavations. The Contractor shall remove, by

pumping or other means approved by the District, any water accumulated in the trench from any source.

In accordance with the requirements of Section 6705 of the California Labor Code, the Contractor, prior to beginning any trench or structure excavation in excess of 5 feet deep, shall be in receipt of the District's written acceptance of the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared by a civil or structural engineer licensed in the State of California.

Unless otherwise indicated, excavation shall be by open except that short sections of a trench may be tunneled if, in the opinion of the District, the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

All spoil shall be thrown on one side of the trench only to facilitate distribution and installation of pipe in such a manner that it will not endanger the work and will avoid obstructing roads and driveways. Adequate provisions shall be made for maintaining the flow of water courses, drains, sewers or ditches crossing the trench and, upon completion of the work, they shall be restored to their original condition.

The use of trench digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations, hand methods shall be employed to avoid such damage. Trees, fences, poles and other property shall be protected unless their removal is authorized. Any property damaged shall be restored to its original condition by the Contractor to the satisfaction of the District.

Minimum cover over the pipe in areas where grade is not shown on the plans shall be forty-two (42) inches. Depth of cover shall be measured from the established street grade or the surface of the permanent improvement to the top of the pipe barrel. In the case of lines outside of the existing or proposed street right-of-way, additional cover may be average natural ground surface. Any deviation shall be subject to approval by the District.

The width of the trench at the top level of the pipe shall be in accordance with the following table:

<b>PIPE SIZE-INCHES</b> <b><u>Inside Diameter</u></b>	<b>TRENCH WIDTH-INCHES</b>	
	<b><u>Minimum</u></b>	<b><u>Maximum</u></b>
4	20	28
6	22	32
8	24	32
10	26	36
12	30	36
14	32	42
16	34	42

The Contractor shall maintain a minimum clearance of seven (7) inches for pipe sizes four (4) inches through ten (10) inches in diameter and eight (8) inches for pipe sizes twelve (12) inches through sixteen (16) inches in diameter. The clearance shall be on each side of the pipe between the trench wall and the outside surface of the pipe barrel as measured at the horizontal centerline of the pipeline.

Where the bottom of the trench is in rock or hard materials, the trench shall be excavated six (6) inches below grade. Where the trench has been excavated below grade for any purpose, the trench shall be refilled to the proper trench grade with selected backfill material compacted to (90) percent of its maximum density as determined by ASTM 1556 and D 1557.

Excavation behind all fittings requiring thrust blocks shall not be machine dug, but shall be hand dug to keep the trench wall solid and undisturbed.

The Contractor shall at his own expense provide his own monuments and necessary survey work to indicate at the site of the work the alignment and grade for the pipelines to be laid in accordance with the Plans and such grade shall be uniform. No high or low points in the line shall be permitted except as shown on the Plans or to conform to the general grade of the street or contour of the terrain through which the pipe is to be laid. No deviation shall be made from the required line or grade except with the written consent of the District. In event a "High Point" is created at locations other than shown on the Plans or as directed by the District, air and vacuum release valves of suitable capacity shall be installed, at no expense to the District, to permit air to be released from or taken into the pipeline at said "High Point". Drainage assemblies shall be installed at low points at no expense to the District.

In event blasting is necessary for excavation, the Contractor's method and procedure shall conform to all applicable laws and regulations and shall require approval of the District.

All excavations shall be kept free of water while concrete or pipe is being placed and until concrete has attained its initial set to eliminate any possible damages from such water. The Contractor shall furnish, install and operate all necessary machinery, appliances, and equipment to keep excavations sufficiently free from water from any source during construction of the work to permit proper pipe laying and jointing and shall dispose of water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public.

Where ground water control is necessary, the contractor shall submit a dewatering method to be approved by the District.

### 3-03 BACKFILL

- a. General - Backfilling of the trench around the pipe and excavation around appurtenances shall follow the installation as closely as possible. Backfill shall be accomplished in two stages: (1) initial backfill from proper trench grade to twelve (12) inches over the pipe; (2) Final backfill from twelve (12) inches over the pipe to the surface.
  
- b. Initial Backfill - Initial backfill should be accomplished as soon as possible after the pipe has been laid. The backfill material shall be approved by the District and shall contain no particles larger than one (1) inch or other objectionable material. The material shall be sufficiently damp to permit thorough compaction on all sides of the pipe and free from voids. Initial backfill shall consist of placing the backfill from proper trench grade to an elevation of twelve (12) inches over the top of pipe by the following procedures:

The first lift of material shall be uniformly placed on both sides of the pipeline for the full width of the trench and have a maximum loose depth of not more than six (6) inches as measured from the trench bottom. This material shall then be tamped under and around the pipe and joints until all voids underneath and around the pipe and joints have been filled.

After the voids beneath the pipe have been filled, the material between the trench walls and the pipe shall be compacted, with each layer firmly compacted, prior to placing the subsequent material, until the material has reached a minimum depth of the horizontal centerline of the pipe line to a depth of twelve (12) inches over the pipe lines, the backfill material shall be placed in horizontal layers not exceeding eight (8) inches in depth and properly compacted by tamping.

Flooding of the initial backfill may be permitted with prior approval of the District. Flooding of the initial backfill will be permitted when the material contains no rocks larger than one (1) inch and has a sand equivalent value of not less than 30 as determined by Test Method No. 217 of the California Division of Highways.

- c. Alternate – Initial backfill shall consist of placing saturated sand approved by the District, from either onsite or off-site sources, from proper trench grade to a compacted elevation of twelve (12) inches above the top of the pipe. The sand shall be properly saturated before placement in the trench. This material may be placed in one lift provided adequate rodding or vibrating during placement is performed to assure filling of all voids under and around the pipe. Care should be taken to avoid floating of pipe in all cases. This method of initial backfill shall be used only when the native material in the trench permits adequate drainage and is suitable in the opinion of the District. There shall be no free water standing on the surface of the initial backfill at the time final backfill is placed.
  
- d. Final Backfill - The balance of backfill shall contain no particles larger than six (6) inches in its greatest dimension or such smaller dimensions as specified by the governing body having jurisdiction and shall be free from brush or any other perishable or objectionable matter than would prevent proper compaction, consolidation or that might cause subsequent settlement. Backfill in easements not subject to vehicular traffic shall be compacted to a minimum of 85 percent of maximum density as determined by ASTM D1556 and D1557. In roadways, shoulders, driveways, etc. which are subject to vehicular traffic the backfill shall be compacted to a minimum of 90 percent of maximum density. Compaction within existing or proposed streets shall also meet any higher standard of the governing authority.

Flooding and/or jetting of the material to accomplish compaction will not be permitted without prior authorization by the District. For trenches eight (8) feet in depth or less, the final backfill may be placed in compacted lifts of twenty-four (24) inches, or one-half (1/2) of the trench depth, whichever is the greater depth. For trenches greater than eight (8) feet in depth, the material shall be placed in maximum compacted lifts of four (4) feet. The depth of fill lifts in trenches on slopes may be reduced by the Engineer to facilitate compaction.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement shall be supplied by the Contractor. Surplus spoil shall be crowned over the trench, spread or hauled away as directed by the District.

Backfill within traveled streets or highways, existing or proposed, shall meet the standards and approval of the agency having jurisdiction over same.

Trenches improperly backfilled, or where settlement occurs shall be reopened to the depth required for proper compaction, then backfilled and compacted, with the surface restored to the required grade.

Where flooding and/or jetting has been approved by the District, backfill shall be thoroughly consolidated by use of water jets. The Contractor shall use water jets of at least one and one-quarter (1-1/4) inches in diameter and of sufficient length to extend to within one foot of the top of the pipe.

Where water is not readily available in sufficient quantity and pressure, the backfill may be flooded by the following method. The water shall be allowed to flow slowly into the trench from the upper end, and shall be worked down to the bottom of the trench by "poling". Care shall be taken to insure that water does not flow through the trench before it has penetrated down to the pipe line.

### **3-04 PAVEMENT REPLACEMENT**

When it is necessary to break pavement in order to lay the pipe lines shown on the construction drawings, the existing pavement shall be cut vertically as nearly as possible to a straight line by an approved method. The pavement so removed shall be hauled away as directed by the District and shall be replaced with like material. All pavement removal and replacement shall conform to the standards and specifications of the governing body having jurisdiction and shall meet with their approval. The Contractor shall be responsible for removing and replacing all necessary pavement.

## **SECTION 4 INSTALLATION**

### **4-01 GENERAL**

All foreign matter and dirt shall be removed from the interior of the pipe prior to its installation. Before lowering, the pipe shall be inspected for defects. Any defective, damaged, or unsound pipe shall be rejected. The entire joint including coupling, machined sections of the pipe and the rubber gasket or ring shall be thoroughly cleaned at the time the joint is made. The entire procedure and method of installation of the pipe and making joints shall be done in a workmanlike manner and shall be in strict accordance with the pipe manufacturer's direction and recommendations.

All pipe shall be laid according to the size, class, location and grade shown on the Plan. The faces of all spigot ends and all shoulders in the hubs or sockets must be true and brought into firm contact. Rubber ring installation shall be checked with suitable gauges to insure that they are located in the proper position relative to the pipe ends.

When pipe laying is not in progress the unfinished end of the pipe shall be securely closed with a suitable water tight plug or cover to prevent the entrance of animals or foreign matter into the line.

The Contractor shall take all necessary care and precautions to prevent the pipe from floating due to water entering the trench from any source. The Contractor shall be responsible for damage caused by floating pipe and shall, at his sole expense, restore and replace the pipe to its proper condition, alignment and grade.

Where pipe is laid on a curve or at horizontal or vertical angles in the trench, the maximum deflection at the joint shall not exceed sixty (60) percent of

the limitations specified by the pipe manufacturer and each joint shall be adequately blocked to take the thrust until properly backfilled.

Location tape shall be installed over all pipelines. The tape shall be securely attached to each valve box and shall be continuous between adjacent valves. The tape shall be installed 12" below the finish grade, and in the case of two pipes in a single trench the tape shall be installed at midpoint between the pipes.

#### **4-02 HAULING AND UNLOADING PIPE**

During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe, its lining and its coating. No pipe shall be dropped from cars or trucks nor allowed to roll down skids without proper restraining ropes. Each pipe shall rest upon suitable pads, strips or blocks during transportation and while awaiting installation in the field, and shall be securely wedged or tied in place. Padding shall be used on all car stakes, skids and other material to prevent damage of the coating during transportation and handling.

Where necessary to move the pipe longitudinally along the trench, it will be done in such a manner as not to injure the pipe or its coating. Pipe shall not be rolled or dragged on the ground.

Where pipe is placed in stock piles, it shall be neatly piled and blocked with strips between tiers.

#### **4-03 PROTECTION OF WORK AND MATERIALS**

The Contractor shall at all times take care to protect and preserve all materials to be used in the laying of the pipe. The pipe shall be handled in such a manner as not to injure its shape. All pipe and materials which, in the opinion of the District, have been damaged shall be replaced by the Contractor at his own expense.

The Contractor shall be responsible for the safe storage of all material furnished by him until it has been incorporated in the completed project. All material damaged or broken by the Contractor, shall be replaced in exact type and kind by the Contractor at his expense. All materials received by the Contractor and not used shall be removed by the Contractor at his expense.

#### **4-04 HANDLING OF PIPE AND ACCESSORIES**

Pipe and accessories shall be loaded at the point of delivery, hauled to , and distributed at the site of the project by the Contractor at his expense. They shall at all times be handled with care to avoid damage. Whether mobed by hand, skyways or hoists, material shall not be dropped or bumped against pipe or accessories already on the ground or against any other object on the ground.

In distributing material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.

Pipe shall be handled in such a manner as to avoid damage to machined or special ends. When such damage cannot be repaired to the District's satisfaction they shall be replaced by the Contractor at his expense.

The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

All pipe, fittings and accessories shall be carefully lowered into the trench in a workmanlike manner, using proper tools and equipment. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

#### **4-05 INSTALLATION OF STEEL MAINS**

Steel pipe shall be laid according to size, line and grade designated on the Plans.

Before any steel pipe is lowered in place, the trench bottom shall be prepared so that each length of steel pipe shall have a firm and uniform bearing over the length of the barrel. Proper excavation shall be made to receive the bell of each pipe section. All adjustments in line and grade shall be made by scraping away or filling and tamping in under the barrel of the pipe. Wedging or blocking will not be permitted.

All welding shall be in accordance with the American Water Works Association C206 "Standards for Field Welding of Steel Water Pipe:.

Fittings shall be installed at locations shown on the Plans shall correspond to the sizes and types indicated on the Plans. Shop fabricated fittings shall be furnished unless field fabricated fittings are designated on the Plans.

Steel pipe joints shall be thoroughly cleaned and coated with cement mortar to a minimum thickness equal to the thickness of the cement mortar to a minimum coating on the pipe. For all sizes of steel pipe, both the inside and outside of joints shall be coated.

The field joint procedure shall be as described in the Appendix shown in A.W.W.A. C205, "Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe", and in accordance with the manufacturer's instructions.

#### **4-06 INSTALLATION OF DUCTILE IRON PIPE**

The ductile iron water mains shall be laid and the work incidental thereto performed in accordance with applicable requirements of A.W.W.A. C600- "Standards for Installation of Cast Iron Water Mains."

All pipe shall be carefully inspected for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No pipe or fitting which is cracked or which shows defects excluded by the Specifications for such fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor with coat tar pitch varnish. The pipes, valves, and fittings shall be carefully cleaned immediately before installation. Every open end of a pipe shall be carefully plugged or capped before leaving the work.

#### **4-07 FIRE HYDRANT ASSEMBLY INSTALLATION**

Fire hydrants shall be installed by the Contractor at the locations shown on the accompanying Plans in accordance with details show on Std. Dwg. W-113 herein, and positioned to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians. The size and type of hydrant shall correspond to the designation shown on the Plans. The entire hydrant assembly shall be plumb. Nozzles shall be at right angles to the street or as directed by the District. The hydrant shall be located so that the centerline of the riser or barrel is approximately twenty-four (24) inches in back of the curb face or face of berm or the edge of the street pavement unless otherwise directed.

The Contractor shall provide and install all necessary fire hydrant bury extensions to permit installation of the hydrant assembly to proper grade. The Contractor shall be responsible for determining proper grade.

The Contractor shall make certain that the automatic drain openings of the fire hydrant are satisfactorily plugged before installation.

Upon completion of the water main installation and after the field tests have been performed, each fire hydrant shall be operated by the Contractor in the presence of the District representative. Operation shall consist of opening

the fire hydrant assembly and allowing water to flow freely from one or more of its outlets. Upon completion of this sequence, the fire hydrants shall be turned off and all protective caps properly placed on each outlet.

#### **4-08 VALVE INSTALLATION**

Valves shall be installed at the locations shown on the Plans and shall correspond to the size and types of ends shown on the plans. All valves shall be equipped with a valve box and cap.

The cutting of pipe for inserting into the bells of valves shall be done in a neat and workmanlike manner without damage to the pipe, its coating or lining and in accordance with the manufacturer's instructions.

Except as directed by the District, the Contractor shall not operate gate valves without a District representative present. During the course of water main installation, all valves shall be left completely open or completely closed unless otherwise authorized by the District. Upon completion of the water mains and all appurtenances, all valves shall be operated through a complete open and closed cycle by the Contractor in the presence of the District representative. After completion of this operational cycle, all valves shall be left in an OPEN position unless directed otherwise by the District.

#### **4-09 VALVE BOX AND CAPS**

Valve boxes and caps to be installed in proposed pavement areas of presently unpaved street rights-of-way shall be installed ten (10) inches below finished grade of street or such greater depth as determined by the District. The Contractor shall be responsible for future location of all valve boxes and caps until completion of paving. At least two properly designed witness markers shall be provided and installed by the Contractor to aid future location of valve boxes and caps.

When installed in paved areas, the valve cap shall be installed with its top one-quarter (1/4) inch above finished grade, and feathered into the existing pavement.

#### **4-10 BLOWOFF ASSEMBLY INSTALLATION**

Blowoffs shall be installed by the Contractor at the locations shown and in accordance with the details shown on Std. Dwg. W103 and W104 herein. The entire assembly shall be plumb with nozzles at right angles to the street or as directed by the District.

Blowoffs shall be located to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians.

Upon completion of the water main and system installation, each Blowoff shall be operated by the contractor in the presence of the District representative. Operation shall consist of opening the hydrant head on the assembly and allowing water to flow freely from its outlet. Upon completion of this sequence, the Blowoff assembly shall be turned off and all protection caps properly placed on the outlet.

#### **4-11 AIR AND VACUUM ASSEMBLY**

Air and vacuum assemblies shall be installed at the locations indicated on the Plans at sites adjacent to the roadway or on back lot lines as selected by the District. They shall be completely accessible and protected from possible damage from vehicles or equipment. The assemblies shall be installed in accordance with details shown on Std. Dwg. W105 herein, in a workmanlike manner and in accordance with accepted water works standards. Pipe joints shall be assembled in a proper manner to assure that they are free of leaks.

#### **4-12 SERVICE INSTALLATION**

Service connections shall be installed at the locations designated by the District and per details shown on the Plans and in accordance with details shown on Std. Dwg. W101 and W102 herein. Service stubs shall be installed in a like manner and in accordance with accepted water works standards, with a minimum cover of thirty (30) inches.

#### **4-13 CONCRETE ENCASEMENTS**

Concrete encasement shall be installed in a manner to completely surround the pipe barrel at all water course crossings to provide protection from flood flows and eliminate possible water infiltration. The entire procedure shall be in accordance with the pipe manufacturer's recommendations as approved by the District.

#### **4-14 THRUST BLOCKS**

Concrete thrust blocks shall be installed at all dead ends, tees, elbows, bends, crosses, blowoffs, drains and fire hydrants shown on the Plans. The thrust blocks shall be adequate in size to provide for a test pressure on the size of pipe under consideration per Std. Dwg. W108 and W109.

Thrust blocks shall be constructed of concrete between the fitting of pipe and the trench wall. The concrete shall be placed so that it extends to the trench wall in a manner that enables the entire bearing area to be in contact with undisturbed freshly cut material.

Concrete shall be kept behind the bell of the fitting and shall not be permitted to run against the pipe. Concrete shall be kept clear of all bolts on flanged fittings to enable proper future removal of all such bolts.

#### **4-15 FLANGED FITTINGS AND CONNECTIONS**

All Flanged valves and fittings shall be properly positioned and aligned in the trench in such a manner as to relieve any stress or strain on the connecting

pipe or flanged and being fitted, with the pipe system resting in its final position and all fittings and valves plumb. Welding, if required, shall be made in the trench bottom, except where otherwise approved by the District.

#### **4-16 FLEXIBLE COUPLINGS WITH TIE DETAILS**

Where flexible couplings are installed in steel water lines the coupling may be provided with tie rods in lieu of thrust blocks for short runs.

#### **4-17 CONNECTION WITH EXISTING SYSTEM**

Connections with the existing system will be made by the District or approved licensed contractor at the locations indicated on the Plans per details shown on the Plans. All material necessary for making the system connections shall be furnished by the Contractor.

The outlet of the system connection will be flanged gate valve equipped with a blind flange. The Contractor shall remove and salvage the blind flange and make the pipe extension at the direction of the District.

#### **4-18 BAFFLES**

When the natural slope of a traveled roadway or access roads is greater than 15%, baffles shall be installed at the top of the trench. These baffles shall be constructed of a 2" x 12" redwood plank set on edge at the top of the trench. The plank shall be two (2) to three (3) feet wider than the trench and shall be held in place by 2" x 4" redwood stakes driven into the natural ground on the downhill side of the baffle. These stakes shall be driven a minimum of two (2) feet into solid ground. The top of the baffle shall be set two (2) to three (3) inches above the surface of the adjacent ground and the trench backfill shall be increased so as to be flush with the top of the baffles throughout the area in which they are installed. Baffles shall start at the top of the slope with spacing based on the following schedule:

**SLOPE GRADIENT**

15%  
20% (5:1)  
25% (4:1)  
33% (3:1)  
50% (2:1)  
67% (1-1/2:1)

**BAFFLE SPACING**

20 Feet  
15 Feet  
12 Feet  
9 Feet  
7 Feet  
5 Feet

**4-19 BORED CROSSING**

- a. General - The work covered by this paragraph of the specifications includes all pipe, fittings, casing, special appurtenances and materials between the stations indicated as bored crossings on the drawings.
  
- b. Installation - Before starting an excavation, the contractor shall submit drawings of jacking pit bracing, casing (or conduit) and jacking head proposed to be used.

Unless otherwise specified, the methods and equipment used in jacking casing or conduit shall be optional with the contractor, provided that the proposed method is approved by the Engineer. Such approval, however, shall in no way relieve the contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workers experience in jacking operations shall be used in performing the work.

The leading section conduit shall be equipped with a jacking head securely anchored there to prevent any wobble or variation in alignment during the jacking operation.

The driving ends of the conduit shall be properly protected against spilling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the jacking stresses. Any section of conduit

showing signs of failure shall be removed and replaced with a new section of precast conduit, or with a cast-in-place section, which is adequate to carry the loads imposed upon it.

Sluicing and jetting with water not permitted. Limited use of water for lubrication of drills may be permitted by the Inspector.

Excavation shall not be made in excess of the outer dimensions of the conduit being jacked unless approved by the Engineer. Every effort shall be made to avoid any loss of earth outside the conduit as excavation progresses, and no accumulation of such material within the conduit will be permitted.

Once the jacking operation has commenced, it shall be continued uninterrupted around the clock until the conduit has been jacked between the specified limits.

Upon completion of the jacking operations, all voids around the outside face of the conduit shall be filled by grouting.

Grouting equipment and material shall be on the job site before jacking operations and drilling of grout holes are completed in order that grouting around the jacked conduit may be started immediately after the jacking operations have finished.

Should appreciable loss of ground occur during the jack operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the contractor shall import suitable material

at his expense. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

Carrier pipe shall be installed as per manufacturer's recommendations and as per approved submittal. Closure of the casing shall be done only after pipeline tests have been completed and approved. Closure shall be done with brick rubble masonry.

**MINIMUM SIZE CASING REQUIRED  
(IN INCHES)**

<u>PIPE SIZE</u>	<u>CASING SIZE (inside diameter)</u>
4	10
6	12
8	16
10	18
12	20
14	24
16	26

**4-20 DISINFECTION**

During the laying of the pipelines covered by these specifications, they shall be carefully protected against contamination, and all dirt and foreign material shall be removed. Before being placed in service, the lines shall be thoroughly flushed out and then disinfected by the Contractor in accordance with A.W.W.A. C601, "Standards for Disinfecting Water Mains". All necessary chlorine shall be furnished by the Contractor. The main shall be thoroughly flushed before and after chlorination. If the first application of chlorine is sufficient to clear the mains of coliform bacteria, the procedure shall be repeated until the water will meet the bacteriological drinking water standards of San Bernardino County Health Department and the State Department of Health Services.

The District will take samples for bacteriological testing. Tests that indicate acceptable disinfection will be at the District's expense. Any tests that fail will be at the Contractor's expense.

#### **4-21 COAL TAR COATINGS**

All buried valves, valve boxes, flanged joints, sleeve-type couplings and other buried ferrous metal items which are not galvanized or mortar coated, shall be thoroughly cleaned and shall be coated with coal tar to a minimum dry film thickness of 16 mils.

## **SECTION 5 FIELD TESTS**

### **5-01 GENERAL**

After the pipe has been laid, backfilled and compacted, all laid pipe shall be given a pressure and leakage test. The test section should be tested with proper bulkheads rather than against a "closed" valve to preclude the problems associated with leaking valves. In no case shall a section of pipe which is connected to a potable system, be pressurized until that entire section has been disinfected and satisfactory bacteriological test results have been received by the District.

Before conducting the field tests, the pipe shall be completely filled with water, and all free air shall be expelled from the line. Any additional taps, valves or blowoffs needed to assure all air is expelled shall be provided by the Contractor. Water to be used to fill the pipelines will be furnished to the Contractor by the District. The Contractor shall provide his own pumps and other equipment to properly fill the line with water and produce the required test pressures. The required pressures shall be measured at the point of lowest elevation in the line to be tested.

Should any test of a section of pipeline disclose joint leakage, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the permitted allowance. The pipe shall then be retested by the contractor at his expense.

All thrust blocks forming a permanent part of the line to be tested shall be installed in ample time prior to the test to enable the concrete to properly set. The test end of the pipe shall be adequately braced to withstand the pressures that will result during the test.

The District will not accept the pipeline until backfill and pavement operations are complete, all gate valve boxes are raised to proper grade and until the pipelines are probed free from running leaks and other defects to the satisfaction of the District. The acceptance of the dedication of the water system by the District of the completed work as herein specified is a subject to the written guarantee of the Contractor that any defects, excessive settlement of backfill and/or running leaks in such pipelines arising from defective workmanship or by any negligence of the contractor which may develop within one (1) year from such acceptance, shall be repaired and made good by said Contractor in accordance with the provisions of Section 6 entitled "Guarantee".

#### **5-02 PRESSURE TESTS**

The pressure test shall be performed with a District approved pressure gauge prior to conducting the leakage tests set forth in 5.03 herein. The pressure test shall consist of maintaining a pressure of one hundred seventy five (175) pounds per square inch continuously for a period of at least two (2) hours.

#### **5-03 LEAKAGE TESTS**

The leakage test shall be conducted after completion of the pressure test prescribed in 5-02 above. The test pressure shall not drop below one hundred fifty (150) pounds per square inch (psi) and shall be maintained for at least four (4) hours. The leakage shall be measured by determining the quantity of water required to maintain the test pressure. Regardless of the rate of leakage, all visible leaks shall be stopped.

Unless another method is approved, measurement of leakage shall be by positive displacement measurement of water pumped out of an open container after the pipeline test pressure has been obtained and stabilized or through the use of the District supplied meter. The container shall be of a size and shape to allow simple and accurate determination of capacity and change in volume.

No pipe installation will be accepted for dedication by the District until or unless the leakage for the section of line tested is less than the rate of leakage specified herein.

The quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula:

$$L = \frac{ND(P)}{7400} 0.5$$

in which:

- L = Allowable leakage, gallons/hour
- N = No. of joints in the length of pipeline tested
- D = Nominal diameter of the pipe in inches
- P = Average test pressure during the leakage test, psi

#### **5-04 COMPACTION TESTS**

Compaction tests of the trench backfill is required approximately every 250 feet, or more often if tests indicate the need, along the alignment of the main pipeline. In addition, approximately 20 percent of all laterals within the street right-of-way shall be tested. Location of tests will be determined by the District Engineer. Additional tests may be required at the District's discretion. The tests shall be made at varying depth. Compaction tests which meet the specified requirements shall be made at the District's expense through an approved soil testing laboratory. All compaction tests which do not meet the specified requirements shall be at the Contractor's expense without any compensation therefore. Any additional requirements of governing bodies having jurisdiction must be met. If the work is done under a permit, the Contractor shall obtain written confirmation that the work is acceptable to the governing body having jurisdiction.

**SECTION 6**  
**GUARANTEE**

The Applicant shall be virtue of a bond, satisfactory to the District, guarantee the completed work against repairs caused by defective workmanship or materials furnished and installed for a period of one (1) year from the date of acceptance by the District of the Dedication of the Water System.

The Applicant shall furnish to the District a satisfactory bond in the amount of 100 percent of the total installation cost upon a form furnished by the District to guarantee the fulfillment of such obligation.