STANDARD SPECIFICATIONS FOR PUBLIC WORKS

DECEMBER, 1989

MALAGA COUNTY WATER DISTRICT
3580 SOUTH FRANK STREET
FRESNO, CALIFORNIA 93725

STANDARD SPECIFICATIONS
FOR
PUBLIC WORKS

These are the Malaga County Water District Standard Specifications and Drawings for sewer and water facilities installed as part of the improvements required in subdivisions or other development work. By referral, these standards become a part of the the plans for any project in the Malaga County Water District. Measurement and payment provisions apply only to District projects. Complete sets and individual sheets are available for distribution.

Whenever a material, article or piece of equipment is identified on the plans or in the specification by refernce to manufacturers' or vendors' names, model, or catalogue numbers, it is intended merely to establish a standard; and any material, article or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article or equipment so proposed is, in the opinion of the District Engineer, of equal quality, substance and function. Contractor shall not install the item without written approval of the Engineer.

Where certain equipment or articles of a particular brand or manufacturer have been previously installed or established as a standard item within a local area and this area is to be extended or enlarged upon, identical equipment shall be installed as a continuation of the established item.

The "Standard Specification" of the State of California, Department of Transportation, are the basic reference. All work shall conform to the Standard Specification and these Malaga County Water Distict Standard Specifications.

All public works and any work in the public right-of-way must be performed under a permit issued by Fresno County. All connections to Malaga County Water District facilities shall require prior approval and plans must be filed with the District. Work performed on Malaga County Water District facilities will be inspected by District personnel.

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SECTION 1

Sanitary Sewer Facilities

1.01 General

This work shall consist of furnishing all sewer pipe, wye branches, house branches, manholes, stub-outs, and other sewer facilities as shown on the Plans and Specifications, as indicated on the Standard Drawings and as directed by the Engineer. Also included is the testing and internal inspection of all sewer lines.

1.02 Materials

Sewer pipe and fittings shall be vitrified clay as specified herein. Unplasticized polyvinyl chloride (PVC) may be used when permitted by the District .

Vitrified clay pipe and fittings shall be extra strength, bell and spigot, and shall conform to ASTM Specifications Designation C-278 with preformed factory fabricated plastisol joints complying with ASTM Specification Designation C-425. Vitrified clay sewer pipe shall also conform to standards of the Clay Products Institute. Each wye branch for sewer service shall be provided with an end cap approved by the pipe manufacturer for use with this product.

PVC gravity sewer pipe and fittings shall conform to the quality requirements and strength characteristics of ASTM D3034 "Type PSM Poly-Vinyl Chloride (PVC) Sewer Pipe Fittings" (sizes 4 inch through 15 inch). The standard dimension ratio (SDR) shall be 35 minimum where the SDR is the ratio of pipe diameter to wall thickness. Minimum pipe stiffness shall be 46 pounds per square inch (psi). Pipe straightness shall be a maximum of 1/16th inch per foot unless otherwise approved. Pipe shall have integrated bell gasketed joints. Rubber sealing gaskets shall meet the requirements of ASTM D3212. Pipe bells shall have the rubber ring present in the bell groove at the factory. No solvent cement joints will be allowed. Standard lengths shall be 20 feet, and 12.5 feet $\pm$ one inch. At manufacturer's option, random lengths of not more than 15 percent of total footage may be shipped in lieu of standard lengths.

PVC Pipe shall be clearly marked as follows at intervals of five feet or less:

Manufacturer's name or trademark
Nominal pipe size
PVC cell classification 12454-B or 12454-C or 13364-B
Legend "Type PSM SDR-35 Sewer Pipe"
ASTM D3034

PVC Fittings shall be clearly marked as follows:

Manufacturer's name or trademark
Nominal size
Material Designation "PVC"
"PSM"
"ASTM D3034"

PVC fittings and accessories shall have bell and/or spigot configurations identical to that of the pipe. Injection molded PVC wye fittings shall be used for future house branch connection at the time of installation of the sanitary sewer main. Each wye branch for sewer service shall be provided with an end cap or plug approved by the manufacturer for use with its product.

Precast reinforced concrete pipe, tapered sections and adjustment rings for manholes shall conform to ASTM Specification Designation C-478, Class II. Elliptical single line reinforcement is not allowed. Materials used in manhole frames and covers shall conform to ASTM Specification Designation 48-30, and shall conform to the standard drawing pertaining thereto. Concrete for manholes shall meet the requirements of Section 90 of the State Standard Specifications, and shall be Class A.

1.03 Lift Stations

Sewage lift stations may be used when allowed by the District. They must be individually approved by the District Engineer.

1.04 Sand & Grease Interceptors

Sand and grease interceptors shall be constructed in accordance with the Standard Drawings of these Specifications and the Plans and as specified and directed by the Engineer.

1.05 Trenching and Excavating

Trenching for sanitary sewer pipes and service laterals, and excavating for sewer manholes shall conform to the requirements of these Specifications.

All excavations shall be made in accordance with the Trench Construction Safety Orders issued by the Division of Industrial Safety of the Department of Industrial Relations of the State of California, including Chapter 9, Section 6700 and following of the Government Code.

Where pipe is laid under an oiled road, the oil cake shall be excavated and removed from the site and disposed of at a site agreeable to the Engineer.

The width of trenches at approximately the level of the top of the pipe to be installed be no more than the allowable limits specified by the pipe manufacturer. The clearances may be increased to accommodate shoring and also provide space for banding at points required. Excavation for structures shall be at least 12 inches beyond dimensions of structures as shown on the Plans.

If the Contractor is unable to maintain the trench width allowed in previous paragraphs, the Contractor shall provide additional bedding to compensate for the additional loading on the pipe. Such additional bedding may require crushed rock or other suitable granular bedding material or concrete encasement as necessary to obtain satisfactory pipe support.

Trenches shall be excavated to the depths required for the foundation of sewers or storm drains and their appurtenances shown on the Plans and where conditions make it necessary to such depths as may be directed by the Engineer. The bottom of the trench shall be excavated or backfilled so that the barrel of the pipe shall be uniform bearing for its entire length, except for the area necessary for bell holes. All adjustments of pipe to line and grade must be made by scraping away or filling and tamping. An additional depth and width shall be hand dug at joint or bell locations of sufficient depth to relieve the bell of any load and to allow ample space for making the joint.

If ground water or seepage is encountered from the existing canal, river or perched water tables, it shall be the Contractor's responsibility to provide all necessary shoring and trench or bore pit dewatering equipment, materials, labor and incidentals required to construct the project the project as specified.

Where the pipe is to be laid on sand having less than optimum moisture, as determined by the Engineer, the Contractor shall apply sufficient water and compact the sand prior to placing the pipe.

All existing gas pipes, water pipes, conduits, sewers, drains, fire hydrants, and other structures which are not, in the opinion of the Engineer, required to be changed in location shall be carefully supported and protected from injury by the Contractor, and, in case of injury, they shall be restored by him, without additional compensation, to as good a condition as that in which they were found.

The Contractor shall provide, without additional compensation, suitable temporary channels for the water that may flow along or across the site of the work when necessary.

If all excavated material cannot be stored on the roadway in such a manner as to maintain access to property along side of the work, the surplus material shall be removed from the work and stored until needed for backfill at which time it shall be brought back. If the surplus material is to be stored on other than private property, prior approval must be obtained from the Engineer for the site to be used. The cost of removing and returning the material shall be at the Contractor's expense.

1.06 Separation Criteria

All sanitary sewers and water mains shall meet the separation standards of the "California Waterworks Standards", contained in Section 6403, Title 22, of the California Administrative Code, or shall be installed in accordance with alternate construction criteria as specified therein.

1.07 Pipe Installation

Construction of sewer lines shall begin at existing sewer line locations and shall proceed upstream with the spigot end of the pipe in the direction of flow, unless otherwise approved in writing by the Engineer. Existing sewer lines shall remain operational at all times.

Sewer pipe fittings shall be laid and jointed in compliance with the manufacturer's recommendation and shall be carefully adjusted to grade by scraping away or filling and tamping the trench bottom. Use of blocks to support the pipe is prohibited. Each joint of pipe must be fully pressed into place so that there will be no unevenness or settlement of one length of pipe with the other at the joint.

The Contractor shall furnish and use a laser device for control of alignment and grade of the sewer pipe. When conditions are such that this method is impracticable, such as on short pipe runs, the Contractor shall have an Engineer on the ground to set grade of each joint of pipe by means of an Engineer's level.

The grade line shown on the Plans indicates the flow line or invert of the pipe and all cuts, unless otherwise indicated, refer to this line.

All pipe shall belaid to true line and grade. Occasional variations as follows will be permitted: above grade, 1/4 inch; below grade, not to exceed 1/2 inch; alignment not to exceed 2 inches if gradual over a distance of 20 feet.

The interior of the pipe shall be kept free from dirt and other foreign material as the laying progresses. Any pipe which shows undue settlement, or is damaged shall be taken up and replaced or relaid at the Contractor's expense. The open ends of all sewer lines being installed must be covered to keep out animal life, etc., whenever the line is left unattended for any length of time, such as overnight. The end of any sewer that does not terminate at a manhole shall be closed at the bell end with a plug manufactured for that purpose.

PVC pipe exposed to the sun during the summer months must be allowed to cool before connection is made to manholes and other facilities, and prior to backfill.

1.08 Installation of Service Laterals

Service laterals shall be furnished and installed by the Contractor at the locations shown on the Plans. Installation shall conform to the standard drawing pertaining thereto, the Plans and Specifications and the directions of the Engineer.

Pipe for sewer service laterals shall conform to the requirements of Subsection 1.02 of these Specifications, and shall be installed in accordance with the requirements of Subsection 1.07 of these Specifications.

Sewer service laterals 4 inches or 6 inches in diameter shall be connected to sewer mains less than 8 inches in diameter at prefabricated wye fittings conforming to Subsection 1.02 of these Specifications, or may be connected directly using a machine core. Sewer service laterals 4 inches or 6 inches in diameter may be connected directly to existing sewer mains 10 inches in diameter or greater, providing that a machine core is used in connecting to the main sewer. Sewer service laterals 8 inches in diameter or greater connecting to sewer mains shall require the construction of a manhole at the point of connection. All connections shall be of materials and methods as approved by the Engineer.

Sewer wye fittings, unless otherwise specified or directed, shall be inclined at an angle of not greater than 45 degrees from the horizontal. Service laterals shall extend from the sewer main to the right-of-way line of the street or alley, where the service lateral shall be promptly closed at the bell end with a plug manufactured for that purpose.

The Contractor shall mark the location of the end of the service lateral by putting an "S" mark on the curb. Said mark is to be chiseled into the concrete or stamped when the concrete has not set. In cases where a concrete curb does not exist, the Contractor shall mark the location of the terminus of the house branch by driving a 1/2 inch diameter by 24 inch long iron pipe or rod in the end of the trench before backfiling. The pipe or rod shall extend to within 6 inches of ground surface.

Excavations for laying service laterals shall be made in such a manner that, at no time will an existing street be closed to traffic. Whenever service laterals are to be installed in existing major streets that have been resurfaced within the last 10 years, they shall be installed by boring methods rather than open cut trenches.

1.09 Manholes

Manhole structures shall be constructed as shown on the Plans and Specifications and as indicated on the standard drawings pertaining thereto. The exact locations of manholes will be indicated in the field. Manhole covers shall be marked "MALAGA COUNTY WATER DISTRICT SEWER"in 3/4 inch high letters. Control manholes for observation and monitoring shall be required for industrial sewer services pursuant to Section 707 of Malaga C.W.D. Ordinance No.1.

Manholes shall be complete structures in place and backfilled including the furnishing and placing of all materials involved. Precast concrete pipe manholes shall consist of a poured in place concrete base section, reinforced concrete pipe section(s), cast iron frame and cover and a poured in place concrete collar with paving patch. Invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent pipe invert, or flow channels may be provided by use of the bottom half of the specified main pipe. The floor and wall of the manhole outside the channels shall be smooth and shall slope toward the channels.

The top of the manhole base section shall be keyed to receive the tongue end of the riser section. The key shall be formed in the freshly poured concrete by using a template manufactured to the dimensions of the riser section. If the riser is cast-in-place monolithically with the base section by using a slip form or other means, the key may be omitted between the base and riser. If the base and riser sections are not poured monolithically, but separately, a key shall be provided in the base section. In either case, a key will be required in the top of the riser section to receive the tongue end of the tapered cone. Cast-in-place riser sections shall have the minimum wall thicknesses specified on the Standard Drawings.

The joints between the base and all precast elements of the manhole, including adjustment rings and manhole frame, shall be filled with cement mortar prior to joining the elements.

The interior of the manhole shall be troweled smooth with a wooden trowel, removing excess mortar extruded out of joints for the entire height of the manhole, from the manhole frame to the floor. All excess mortar and any other debris shall be removed from the manhole.

Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.

Stub-outs shall be installed in manholes at the locations and sizes shown on the Plans. All stub-outs shall be sealed with a plug of a type approved by the manufacturer of the pipe.

All manholes shall be completed to finish grade with concrete collar and paving patch (where indicated) as shown on the Standard Drawings and as herein specified. In undeveloped areas where no street or alley surfacing is to be done on conjunction with or immediately after utility installation, the manhole cover shall be finished off to a level 1-1/2 inches above ground elevation and shall be provided with 12 inches of grade rings. In existing street areas where surfacing exists and no new street regrading is contemplated in conjunction with or immediately after utility installation, the manhole cover shall be brought to existing street grade and finished off. In areas where street or alley surfacing is to be done in conjunction with or immediately after utility installation, such as new subdivisions, manholes shall initially terminate with the top of the cone 6 inches below subgrade and shall be brought to street or alley surface with grade adjustment rings and completed after street paving is accomplished. Unless specifically otherwise indicated in the Special Provisions, it will be the responsibility of the sewer Contractor to return and install the manhole covers to finish grade as specified and as shown on the Standard Drawings.

The Contractor should be aware that connections to existing sewers will be "wet" and the Contractor shall make whatever arrangements are necessary to complete the manhole connections under the "wet" conditions.

Where necessary, mounds or dikes shall be placed around the perimeter of manhole covers to prevent rainwater or other inflow of water from entering the manholes. No steps shall be installed in manholes.

1.10 Backfilling, Compacting and Restoration of Surfaces

Backfilling, compacting and restoration of surfaces of trenches and excavations for sewer facilities shall conform to the requirements of these Specifications.

For vitrified clay pipe, the backfill procedure shall conform to ASTM C-12 and shall meet the relative compaction and select material requirements specified for PVC pipe.

All other rigid conduits or pipe shall be laid to line and grade, the trench shall be backfilled to (1) foot above the top of the pipe, in layers not to exceed eight (8) inches in depth and tamped by hand or pneumatic tampers to a relative compaction of 90%. Selected excavated material at optimum moisture, which is free of all rocks, hardpan, paving material, organic matter, or other deleterious substances and any other lumps over two (2) inches in diameter shall be used as backfill.

The method of obtaining the density requirements shall be such that the bedding material shall be completely compacted around the lower haunches of the pipe and the pipe's line and grade is not disturbed.

All backfill shall be compacted and tested per the dry method of California Test Method 216.

No free water will be allowed in the top 24 inches of backfill.

For PVC pipe, after the pipe has been laid to line and grade, place Class 2 or Class 3 material to the spring line of the pipe and compact by hand or mechanical tamping to 90% relative compaction. This should extend to the undisturbed trench walls and care should be taken to ensure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. From the spring line to 12 inches above the top of the pipe, select native material shall be placed by hand and compacted to 90% relative compaction. Selected excavated material at optimum moisture and free from all rocks, hardpan, paving material, organic matter or other deleterious substances shall be used for the remaining backfill. The relative compaction from the pipe zone to the finish surface shall be 90%, except that in areas to be paved, the top 2 feet shall be 95% if specified. .

Compaction tests will be required at intervals not to exceed 300 feet. Test locations shall be determined by the Engineer upon notification from the Contractor that the trenches are ready for tests.

All tests shall be performed by a qualified testing laboratory licensed in the State of California. All tests must meet the minimum requirements of these Specifications.

1.11 Leakage Test of Sewer Lines and Service Laterals

After completing the installation, backfill and compaction of a section of sewer line with service laterals, and after all other underground utilities (including gas, electric, telephone, cable television, water and storm drain) are in and compacted, but prior to the placement of aggregate base or asphalt-concrete pavement, the Contractor shall, at his expense, conduct a leakage test using low pressure air. The test shall be performed using the following procedures and under the supervision of the inspecting Engineer.

Each section of sewer between two successive manholes shall be tested by plugging all pipe outlets with suitable test plugs.

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 pounds per square inch gauge pressure (psig). The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

To commence the leakage test, air shall be slowly added until the internal pressure is raised to 4.0 psig. The compressor used to add air to the pipe shall have a blow-off valve set at 5 psig to assure that at no time the internal pressure in the pipe exceeds 5 psig. The internal pressure of 4 psig shall be maintained for at least 2 minutes to allow the air temperature to stabilize after which the air supply shall be disconnected and the pressure reduced to 3.5 psig. The time in minutes that is required for the internal air pressure to drop from 3.5 psig to the lower pressure indicated in the appropriate table below shall be measured and the results compared with the values tabulated below.

Gauges used to measure test pressures shall read from 0 psig to 10 psig (maximum) with 1/2 psig increments. If required, the Contractor shall supply necessary fittings to accept a District supplied gauge.

PVC Gravity Sewer Pipe

Minimum Acceptable Time Required For
Pressure Decrease from 3.5 to 3.0 psig

Pipe Diameter (Inches)	Test Time (Minutes)	(Seconds)
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
15	9	30

Vitrified Clay Sewer Pipe

Minimum Acceptable Time Required For
Pressure Decrease From 3.5 to 2.5 psig

Pipe Diameter (Inches)	Test Time (Minutes)	(Seconds)	Minimum Distance Between Manholes (Feet)	K Value
4	2	0	430	.428
6	2	45	380	.592
8	3	45	320	.702
10	4	46	260	1.10
12	5	40	215	1.58
15	7	0	170	2.47
18	8	36	145	3.56
21	10	6	125	4.85
24	11	6	105	6.34
27	12	42	95	8.02
30	14	1	85	9.90
33	15	0	75	12.0
36	16	41	70	14.3
39	18	5	65	16.7
42	19	24	60	19.4

The above tabulated values shall be used for respective diameter pipes except where the distance between successive manholes is less than the above tabulated values, in which case, the following formula will be used to determine the test time:

T=KL
T=test time in seconds
K=value from table
L=distance between successive manholes in feet

Failure of the leakage test will be grounds for rejection of the section tested, until discovery and correction of the reason for the failure, and successful retesting of the section.

11.12 Deflection Test of PVC Sewer Lines

PVC sewer pipe, which is designated as flexible in nature, shall be tested for excessive deflection. This test shall be performed after backfilling and compaction, but prior to the placement of aggregate base or asphalt-concrete surfacing, and prior to television inspection as specified in Subsection 1.13 of these Specifications.

The Contractor shall demonstrate that the maximum pipe deflection does not exceed 5 percent by pulling a properly sized rigid ball or a mandrel through the main line pipe. A "rubber flush ball" does not meet this requirement for deflection testing.

Failure of the deflection test shall be grounds for rejection of the section tested, until correction of the reason for the failure and successful retesting of the section.

1.13 Television Inspection of Interior of Installed Pipe

The Contractor shall furnish closed circuit television equipment for an interior inspection of the newly installed sewer mains. The television check of the sewer mains shall be made after leakage and deflection tests have been performed and prior to the placing of street aggregate base or asphalt paving. Any broken pipe, separation of joints, or any pipe exceeding the permitted tolerances for line and grade shall be replaced or repaired.

Any pipe repaired or replaced as a result of television inspection shall be retested for leakage and deflection. A tape cassette of the television inspection (1/2 inch wide tape) shall be provided the District at no additional cost to the District. The Contractor shall be responsible for all costs associated with furnishing the television inspection and making final repairs to the sewer mains.

1.14 Measurement

Measurement for sewer main installation and service lateral installation shall be by the lineal foot of pipe installed, and shall be the actual horizontal length installed, measured through wye fittings.

Measurement for wye fittings shall be per each wye fitting installed.

Measurement for manholes shall be per each manhole installed.

11.15 Payment

The unit price paid per lineal foot for sewer mains shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting, testing and internal inspection.

The unit price paid per lineal foot for service laterals shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, including, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting and testing.

The unit price paid per each for wye fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, in excess of the cost of installing main line pipe and service lateral pipe. This shall include, but not be limited to, furnishing and installing the wye fitting and plug, trenching, backfilling, compacting, and testing.

When the contract does not include a pay item for wye fittings as above specified, and unless otherwise provided in the Special Provisions, full compensation for wye fittings shown on the Plans shall be considered as included in the prices paid for other sewer pipeline items of work and no spearate payment will be made therefor.

The unit price paid per each for manholes, greasetraps, sandtraps or lift stations shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, including, but not be limited to, furnishing and installing the manhole and stub-outs, greasetraps, sandtraps or lift station, excavation, backfill and compaction, adjusting manhole lids and frames to final grade following street or alley construction or reconstruction, and connections to all pipes, wet or dry.

1.16 As-Built Plans

The Contractor shall have on the project site at all times, an up-to-date record of the work being performed. At the completion of any construction, installation, modification, addition or deletion of any sewer facility, the Contractor shall furnish the District with a reproducible, "Mylar" or better, copy of the As-Built Construction Drawings.

SECTION 2

Water Distribution Facilities

2.01 General

This work shall consist of furnishing and installing water mains, water services, fire hydrants, valves, valve boxes, meters, back-flow prevention devices and all appurtenances, including excavation and backfill, at the locations and sizes shown on the Plans. All work shall be done in accordance with the Plans and Specifications, the Standard Drawings and as directed by the Engineer.

2.02 Materials

All materials used in constructing water facilities shall be new, and shall conform to the following specifications.

1. Ductile Iron Water Pipe and Fittings: Ductile iron pipe shall be manufactured in 18 foot nominal laying lengths, and shall be constructed in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, as latest amended. Ductile iron pipe shall be manufactured with cement mortar lining and seal coated in accordance with ANSI/AWWA C104/A21.4, as latest amended. Rough or uncoated lining shall be cause for rejection of the pipe.

   The ductile iron pipe shall be centrifugally cast bell and spigot type. The joint shall be of the push-on boltless type, capable of being deflected after assembly, employing a single gasket to effect the joint seal, such as manufactured by the United States Pipe and Foundry Company or the Pacific States Cast Iron Pipe Company, known as the "Tyton Joint", or approved equal, and shall conform to ANSI/AWWA C111/A21.11, as latest amended. The Bidder shall furnish the joint complete with all rubber gaskets and accessories.

   The fittings for ductile iron pipe shall conform to ANSI/AWWA C110/A21.10, as latest amended, and shall have push-on boltless joints, cast iron flanged joints or mechanical joints conforming to ANSI/AWAA C111/A21.11, designed for use with the specified ductile iron pipe. Short bodied "TrimTyton", or approved equal, fittings may be utilized. Flanged joints are required where shown on the Standard Drawings. The wall thickness of fittings shall be the equivalent of ductile iron Class 54. the working pressure rating shall be 350 psi. Fittings shall be cement mortar lined and seal coated as specified under ANSI/AWWA C104/A21.4. Push-on fittings shall be capable of being deflected after assembly.

2. Polyvinyl Chloride Plastic Pipe shall be Class 150 and shall conform to all requirements of ASTM Specifications D-2241 and AWWA C-900. Pipe shall be suitable for use at maximum hydrostatic working pressure of 150 psi at 73 degrees F. (4 to 1 hydro safety factor).

All pipe must meet requirements as set forth in Product Standard 22-70 with standard dimension ratio SDR 13.5 and bearing the National Sanitation Seal for potable water pipe. Provisions must be made for contraction and expansion at each joint with a rubber ring, and integral bell as part of each joint. Pipe and fitting must be assembled with a non-toxic lubricant. Pipe lengths shall be 20 feet plus or minus 1 inch.

Pipe shall be made from clean, virgin, NSF approved Class 12454-A PVC compound conforming to ASTM resin Specification D 1784.

The PVC pipe shall be designed to pass without failure, to hoop stress of 8000 psi, applied in 60 to 70 seconds when tested in accordance to Product Standard PS 22-70 as referenced in ASTM Specification 1599.

The PVC pipe shall be designed to pass without failure, for 1,000 hours, a hoop stress of 5,000 psi when tested in accordance to PS 22-70 as referenced to ASTM Specification 1598.

Acetone immersion test shall conform to ASTM Specification 2152.

3. Gate Valves: Gate Valves shall conform to the requirements of AWWA Standard Specificaton C-500, and shall be manufactured by Mueller Co., Rich, Stockham, or District approved equal, with iron body, bronze mounted, non-rising stem, nut operated and turning counterclockwise to open, resilient seat type.

Valves shall be manufactured to be compatibly jointed with the water pipe or fittings being valved. Valves for connection to asbestos-cement pipe and PVC pipe shall have hub ends, valves for connection to ductile iron pipe shall have slip-on joint ends and valves for direct connection to fittings shall have flanged ends. Valves at hydrant and/or wet tap locations shall be flanged on one side to directly connect to the tee on the main supply side of the valve, as shown on the Standard Drawings.

4. Valve Boxes: Each valve shall be provided with a valve box in conformance with the Standard Drawings pertaining thereto. Valve boxes shall be precast concrete with heavy cast iron ring seating a deeply ribbed cast iron cover and provided 8" diameter clear opening, and shall be Brooks No. 3RT, Christy No. 65 traffic box, or approved equal. Cover marking shall read "Water". A one piece 8" inside diameter asbestos-cement or PVC riser extension shall be provided to allow unobstructed access to the valve operating nut.

5. Fire Hydrants: Fire hydrants shall be furnished as indicated on the Standard Drawings pertaining thereto. shall be of the dry barrel type with each outlet operated by an independent valve. The number and sizes of openings shall be as shown on the Standard Drawings. Inlet to hydrant shall be 6 inch formed to connect to feeder pipe. Hydrants shall be provided with break-off fittings and with 30 inch bury and extensions as necessary. Fire hydrants, not in publicly maintained rights of ways or easements, and are not behind concrete curbing or otherwise protected, shall have 4" steel protection posts as shown on the Standard Drawings.

Fire service detector check valve and bypass meter shall conform to the Standard Drawings and as directed by the District Engineer.

6. Copper Tubing: All copper tubing shall be new and conform to the latest revision of ASTM Specification Designation B 88, as latest amended. The tubing shall be made of cooper having a purity of at least 99.9 percent as determined by electrolytic assay, except that silver may be counted as copper.

Seamless copper tubing shall be of one grade and shall be designated type "K" soft as listed in the above specifications. The tubing is to be furnished in annealed 60 foot coils except for 1-1/2 and 2 inch sizes, which may, on approval, be furnished in 20 foot lengths and crated. The tubes shall be clean, smooth, round, of proper dimension, free from grooving, indentations, cracks, flaws and scale and shall not crack when flaring.

The name or trademark of the manufacturer and a symbol indicative of the type shall be permanently marked at intervals not greater than 18 inches on the tubing.

7. Meters: Meters shall be Hersey Products, Inc. disc meters 3/4 inch to 2 inch, meters larger than 2 inches shall be as directed by the District Engineer.

8. Backflow Prevention: Backflow prevention devices shall be installed pursuant to State and County Health Department and District requirements. Approved backflow prevention assemblies are listed in these Standards and may be used with the District's permission and as directed by the District Engineer.

9. Nut, Bolts,Screws and Fastners: All nuts, bolts, screws and fasteners used for connecting flanges, valve body parts, etc., below the ground surface shall be manufactured of nickel-cadmium steel, or approved equal (equipment within valve boxes is considered below ground).
Nuts and bolts used for above ground installation on pipe flanges, etc., shall be hexagonal and head machine bolts and hexagonal nuts conforming to ASTM Specification Designation A307, Grade B. All bolt threads shall be lubricated with graphite and oil. Exposed portions of nuts and bolts shall be coated with a bitumastic material to retard corrosion.

10. Concrete Thrust Blocks: Concrete for thrust blocks shall be Class A or Class B in conformance with Section 90 of the State Standard Specifications.

11. Other Service Material: All service material shall be as indicated on the Standard Drawings, and as directed by the Engineer.

2.03 Trenching and Excavating

Trenching and excavating for water mains and service lines shall conform to the requirements of Section 1.05 of these Specifications.

2.04 Separation Criteria

All water mains and sanitary sewers shall meet the separation standards of the "California Waterworks Standards", contained in Section 6430, Title 22, of the California Administrative Code, or shall be installed in accordance with alternate construction criteria as specified therein.

2.05 Installation of Water Mains, Fittings and Valves

Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the sale and convenient prosecution of the work. All pipe, fittings, and valves shall be carefully lowered into the trench or excavation by means of a derrick or other suitable tools or equipment in such manner as to prevent damage to the pipe or fittings. Severe damage shall be grounds for rejection of the material. Any repairable damage to the pipe, lining or fittings shall be repaired by the Contractor at his expense. The Contractor shall be responsible for any damage to materials until the time of acceptance of the finished work.

As installation progresses, all pipe, valves, fittings, hydrants, etc., shall be thoroughly cleaned of all dirt, rocks and other debris that may be found in the interior of the material as stockpiled. If considered necessary by the Engineer, he may direct the Contractor to swab the pipe to clean it. At the end of each day's work, all ends of the pipe shall be closed by means of a special bulkhead or by other means approved by the Engineer.

Water pipe and fittings shall be installed in compliance with the manufacturer's recommendatons, with each length of pipe having an even bearing on a properly prepared trench bottom for its entire length, with depressions cut for couplings, bells and fittings. Optional alternate methods of supporting the pipe slightly above the bottom of the trench on earth mounds may be implemented by the Contractor if approved by the pipe manufacturer and the procedures are carried out in strict compliance with his instructions. Use of blocks to support pipe or fittings is prohibited.

Rubber gasketed joints shall be made in compliance with the manufacturer's recommendations and as follows:

The gasket seat in the socket and the gasket shall be wiped clean with a cloth. The gasket shall be placed in the socket with the large end entering first. It shall then be sprung into the gasket seat so that the groove fits over the head in the seat. A thin film of lubricant shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe.

The plain end of the pipe to be entered shall be wiped clean and placed in proper alignment with the bell of the pipe to which it is to be joined. In some cases, it may be desirable to apply a thin film of lubricant to the outside of the plain end.

The joint shall then be made by exerting sufficient force on the entering pipe (by methods approved by the Engineer) so that its plain end is moved past the gasket until it makes contact with the base of the socket and had been shoved "home". Allowance shall be provided, in making the joint, for expansion of the pipe.

Whenever necessary to deflect the pipe from a straight line either in vertical or horizontal plane to avoid obstructions, or where long radius curves are permitted, the degree of deflection of joints shall be approved by the Engineer.

Pipe may be cut by methods approved by CAL-OSHA which will produce a square cut. No wedge type roller cutters will be allowed. PVC pipe, machined overall, in lengths shorter than 3.25 feet may be used to make connections where approved by the Engineer. Such PVC pipe shall conform to AWWA C-900 and shall be pressure rated equal to, or greater than, the main line pipe.

Valves and fire hydrants shall be installed as indicated on the Standard Drawings and as directed by the Engineer. Hydrants shall be installed plumb, with steamer outlet facing the curb.

Concrete thrust blocks shall be provided on water mains at all points in the line where a change in direction of more than 5 degrees occurs, at all gate valves 10 inches or larger, at all fire hydrant buries and at all dead ends. Thrust blocks shall be installed between the fittings and undisturbed earth of the trench wall and shall be at least the minimum dimensions shown on the Standard Drawings. For conditions not covered on said standard, the bearing area shall be as required by the Engineer.

Wet tap connections shall be made by the District unless permitted otherwise by the District at the locations shown on the Plans and as directed by the Engineer.

2.06 Valve Box Installation

Valve boxes shall be installed as shown on the Standard Drawings. The valve box cover shall be centered over the valve operating nut, with boxes and extensions plumb.

In existing surfaced areas, valve boxes shall be installed to finish grade, concrete collars poured and the pavement patched. In undeveloped areas where no surfacing exists or is contemplated in conjunction with the water installation, valve boxes shall be brought to a level 1-1/2 inches above existing ground elevation and concrete collars poured. In areas where street or alley surfacing is to be done in conjunction with or immediately after utility installation, such as new subdivisions, valve boxes shall be installed to finish grade after paving has been completed, a concrete collar poured, and the pavement patched. Unless specifically provided otherwise in the Special Provisions, it will be the responsibility of the water Contractor to return and install the valve box to finish grade as specified.

2.07 Water Service Installation

Water service lines (including domestic metered service lines and fire service lines), equipment and appurtenances shall be installed in accordance with the manufacturer's recommendations, as shown on the Plans and indicated on the Standard Drawings. The Contractor shall mark the location of water service lines by putting a "W" mark on the curb face. Said mark is to be chiseled into the concrete or stamped when the concrete has not set.

2.08 Backfilling, Compacting and Restoration of Surfaces

Backfilling, compacting and restoration of surfaces of trenches and excavations for water facilities shall conform to the requirements of these Specifications.

2.09 Sterilization of Water Facilities

Prior to pressure testing and prior to acceptance of work, the entire pipeline, including all valves, fittings, hydrants, service laterals, and other accessories shall be sterilized in accordance with AWWA Specification C 601 which provides detail specifications for:

(a) Limiting contaminated materials from entering the water mains during construction or repair;

(b) Removing, by flushing, contaminating materials that may have entered the water main during construction or repair;

(c) Disinfecting any residual contamination that may remain after cleaning; and

(d) Determining the bacteriologic quality of fresh water in the main after disinfecting the main.

All mains shall be flushed with potable water after completion of construction and prior to disinfection. The Contractor shall provide a sufficient number of suitable outlets at the end(s) of the line(s) being sterilized in addition to those required by the Plans, to permit the main to be flushed with water at a velocity of at least 5.5 feet per second over its entire length. The outlets provided shall meet the requirements for fittings as specified for the type main constructed. Temporary blow-offs may be installed during the sterilization and flushing to satisfy those requirements. Drainage facilities shall be constructed such that the water lines cannot be contaminated through flushing outlets.

After flushing, chlorine gas or chlorine compound solution made with liquid chlorine, calcium hypochlorite in solution or sodium hypochlorite solution shall be water mixed and introduced into the mains to form a chlorine concentration of approximately 100 parts per million (ppm) or that which will provide a minimum residual of 50 ppm in all parts of the line after 24 hours have elapsed. During the sterilization process, all valves, hydrants, and other accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply.

The placing of HTH capsules or tablets in pipe sections during the laying process will be considered as an acceptable method of introducing chlorine for the test.

The chlorine water solutions shall be diluted to a chlorine concentration of not more than 100 ppm and not less than 50 ppm measured in the water lines. The Contractor shall keep adequate chlorine residual testing and indicating apparatus available on the site during the entire sterilization period.

After final flushing, the flushing fittings shall be plugged with devices intended for this purpose, at the pressure class of the pipe. Where the water main is coated, plugs and outlets shall be similarly coated.

Bacteriologic samples of water for the specified bacteriologic test shall be taken from each end of the sterilized main (located downstream of the point of introduction of chlorine disinfectant), and at other locations as determined necessary by the Engineer. When an entire water main is to be tested, it shall be completely isolated from the existing system. Bacteriologic samples shall be taken a minimum of 48 hours after the mains have been flushed of all chlorine. Such samples shall be obtained by the Contractor using pipe and fittings supplied by the Contractor as directed by the Engineer. Bacteriologic samples shall be obtained in the following manner:

At corporation stops, risers shall be installed that will discharge water directly downward towards the ground. The discharge point of the risers shall be a minimum of 2 feet above the ground. Risers shall include the necessary bends to accomplish the foregoing, and shall be equipped with in-line valves near the discharge points to regulate the flow. The Contractor shall provide and supply these hookups, full compensation therefor to be included in the amount bid for the various water main bid.

For mains over 1,300 feet inlength with no services, samples in addition to those obtained at each end shall be taken at intermediate points in such a manner that at least one sample is taken for each 700 feet of main.

The recommended procedure of sterilization and testing water mains is as follows:

1. Chlorine residual of between 50 and 100 ppm is introduced into the water mains;
2. 24 hours later, treated water is flushed from the water mains;
3. 48 hours after flushing, water samples are taken for bacteriologic tests;
4. 96 hours after samples are taken, results of water samples are reported to the Contractor; and
5. If the bacteriologic tests show a coliform M.P.N./100 ML water of 2.2 or less on all samples, the water facilities tested will be considered clear. In the event the coliform number is above 2.2, the sterilization procedure shall be commenced again within 24 hours of notice by the District that the bacteriologic tests failed.

Should the end of any of the foregoing periods fall on a District nonworking day, the order of procedure will be continued to the next regular District working day.

2.10 Hydrostatic Pressure Test

After the pipe and all appurtenances have been laid, backfill has been placed and compacted and all compaction tests have passed, but prior to placement of aggregate base or pavement material, a hydrostatic pressure test shall be conducted for each reach between adjacent valves. Valves shall be in a closed position. The test time period shall be 30 minutes and shall consist of subjecting the reach of pipeline being tested to a hydrostatic pressure of 200 pounds per square inch gauge (psig). In addition, a hydrostatic test shall be conducted on the entire pipeline, while completely isolated from any existing water mains, for a period of one hour at a hydrostatic pressure of 200 psig. All valves in the pipeline shall be in the open position during system testing. Any leaks, failures, or imperfect construction revealed by such test shall be promptly corrected by the Contractor and retested until all leaks have been stopped. The District may allow the following leakage tolerance.

The allowable leakage shall be determined from the following table. The allowable leakage is calculated by multiplying the table value for the average test pressure and for the diameter of pipe tested by the duration of the test in hours by the total number of joints in the line divided by 100.

Average Test Pressure at lowest point in line (PSIG)	50	75	100	125	150	200	220
Pipe Diameter, (Inches)	Allowable Leakage per 100 Couplings (Gallons Per Hour)						
4	0.71	0.87	1.00	1.02	1.23	1.42	1.5
6	1.06	1.29	1.51	1.68	1.84	2.12	2.2
8	1.42	1.72	2.00	2.24	2.45	2.84	3.0
10	1.77	2.15	2.50	2.79	3.07	3.54	3.7
12	2.12	2.58	3.00	3.35	3.68	4.24	4.5

Tests shall not be made until at least 36 hours after the last concrete thrust or reaction blocking shall have been cast with high early strength cement or at least 7 days after the last concrete thrust or reaction blocking shall have been cast with standard cement. All equipment, testing and repair shall be furnished by the Contractor.

2.11 Measurement

Measurement for water main installation and fitting installation shall be by the lineal foot of pipe installed, and shall be the actual horizontal length installed, measured through fittings.

Measurement for gate valves shall be per each gate valve installed.

Measurement for fire hydrants, complete, shall be per each fire hydrant assembly installed.

Measurement for water service lines shall be per each water service line installed.

Measurement for fire service lines shall be per each fire service line installed.

2.12 Payment

The unit price bid per lineal foot for water mains and fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe and fittings, installing concrete thrust blocks, trenching, backfilling, compacting, testing, sterilization and all incidentals.

The unit price bid per each for gate valves shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the valve and valve box, installing concrete thrust blocks, trenching, backfilling, compacting, testing, sterilization, returning and installing valve box to final grade following street or alley construction or reconstruction, and all incidentals.

The unit price bid per each for fire hydrants, complete and painted, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the hydrant assembly (pipe, fittings, structures, break-off fittings, bury, extensions, gate valve and valve box), furnishing and installing protection posts where required, excavation, backfill and compaction, returning and adjusting valve box to final grade following street or alley construction or reconstruction, testing, sterilization, and all incidentals. Unless otherwise indicated in the Special Provisions, the cost of furnishing and installing any wet tap required for the hydrant shall be included in the unitprice bid for fire hydrants, complete.

The unit price per each for water service lines shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the service pipe and appurtenances (including all taps, fittings, stops, saddles, spacers, meters, meter box and lid, etc.), trenching, backfilling, compacting, testing, sterilization, adjusting meter box to finish sidewalk grade, and all incidentals.

The unit price bid per each for fire service lines, complete, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the fire service pipe, detector check valves, fittings, structures, gate valve and valve box, thrust blocks, connection to main pipe, and all excavation, backfill and compaction, returning and adjusting valve box to final grade following street or alley construction or reconstruction, testing, sterilization, and all incidentals. Unless otherwise indicated in the Special Provisions, the cost of furnishing and installing any wet tap required for the fire service line shall be included in the unit price bid for fire service lines, complete.

Payment for wet taps, except those directly associated with fire hydrant or fire service installation, shall be as set forth in the Special Provisions or on the Bid Proposal.

12.13 As Built Plans

The Contractor shall have on the project site at all times, an up-to-date record of the work being performed. At the completion of any construction, installation, modification, addition or deletion of any water facility, the Contractor shall furnish the District with a reproducible copy of the As-Built Construction Drawings.

SECTION 3

JACKING PIPE

3.01 General

This work shall consist of furnishing, boring, and jacking into place the type of pipe shown on the Plans or specified in the Special Provisions at locations and between the limits shown on the Plans or specified, and in accordance with these Specifications, the Standard Drawings and as directed by the Engineer.

Reinforced concrete pipe with rubber gasket joints, as a carrier pipe, as specified below, may be jacked into place directly without a jacked steel casing. All other carrier pipe must be installed within a jacked steel casing.

3.02 Materials

The casing pipe (or reinforced concrete pipe jacked without casing pipe) designated on the Plans shall be of the size and class (or strength designation) shown on the Plans or specified, except that the class of pipe designated has been determined for vertical loads only. Additonal facilities, reinforcement, or strength of pipe required to withstand jacking pressure shall be determined and furnished by the Contractor at his expense.

Where reinforced concrete pipe, as a carrier pipe, is specified to be jacked into place directly without a jacked steel casing, said reinforced concrete pipe shall be furnished with rubber gasket joints, all in conformance with these Specifications. The reinforced concrete pipe shall be constructed such that no bells protrude from the outside periphery of the pipe. Sleeves for joints on reinforced concrete pipe shall be furnished and manufactured of galvanized steel, stainless steel, or fiberglass, sufficient in strength to withstand all loads, and which will maintain a water tight joint.

Steel casing pipe shall have a wall thickness not less than that shown on the Plans, and shall be butt welded of sheets conforming to ASTM A-570 commercial grade or of plate conforming to ASTM A-283. All field joints also shall be butt welded full circumference or by other means approved by the Engineer. Joints to be field welded shall be shop cut to ensure a true 90 degrees to the longitudinal axis of the pipe. Use of a jacking band to reinforce the end of the pipe receiving the jacking thrust will be required. It shall be the Contractor's responsibility to provide joints which are capable of resisting the jacking stresses without failure.

Carrier pipe to be installed within steel casing shall be as indicated on the Plans and/or Special Provisions.

Redwood blocks for supporting carrier pipe within steel casing shall be construction heart redwood, rough graded in accordance with the current Standard Specifications for structural grades of California redwood approved by the Board of Review, American Lumber Standards Committee and published by the Redwood Inspection Service. All material shall be well manufactured. Only pieces consisting of sound wood, free from decay, will be accepted in the work. Redwood blocks shall be v-cut to fit the contour of the pipe.

Concrete for plugs to be placed at ends of casing pipe as shown on the Standard Drawings shall be Class B, in conformance with Section 90 of the State Standard Specifications.

3.03 Excavation of Jacking and Receiving Pits

Excavation of jacking and receiving pits shall conform to the requirements of these Specifications, and shall be sheathed, shored, sloped or braced in accordance with the Safety Regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety. Reference is made to these Specifications.

Reference is also made to these Specifications, relative to the Contractor's responsibility for protecting workers and others from toxic or explosive gases.

3.04 Boring and Jacking

Pipe shall be jacked in conformity with the prescribed lines and grades obtained from the stakes set by the Engineer. Excavation for the pipe shall be accomplished by boring or by hand digging. Sluicing or jetting with water will not be permitted.

The excavated hole, whether bored or/hand dug, shall not be more than 0.10 foot in diameter greater than the outside limits of the casing (or reinforced concrete pipe jacked without casing pipe). If the nature of the material is such that caving will likely occur and which may result in a greater space than above specified, a metal shield or jacking head shall be installed which extends a minimum of 18 inches ahead of the jacked casing or pipe. The metal shield shall cover a minimum of the upper 1/2 of the periphery of the jacked casing or pipe. Excavation shall not proceed beyond the shield.

Where ground conditions at the face of the jacking pit are such that sloughing or caving of ground is likely to occur at the face of the excavation upon commencement thereof, the face of the pit shall be made stable so that an excessive void is not carried with the face of the excavation for the length of the casing or pipe. This may be accomplished by solid sheathing at the portal of the jack, or excavating and backfilling the face of the pit with cohesive material.

Cavities or voids outside the limits specified above, regardless of cause, shall be backfilled with sand, soil, cement, or cement mortar as directed by the Engineer. The method by which backfill is to be performed shall be approved by the Engineer. All casing pipe 24 inches in diameter or larger, and all reinforced concrete pipe 24 inches in diameter or larger, shall be furnished with preinstalled fittings suitable for attachment to grout pumping equipment. Such grout connections, unless otherwise indicated on the Plans, shall be placed at 30 degrees, 120 degrees, 240 degrees and 330 degrees, measured clockwise, from vertical, around the circumference of the casing or pipe, and at intervals in each row, along the pipe, of no greater than 10 feet. Alternate bottom holes shall be staggered, and alternate top holes shall be staggered, so that one hole will occur at the top of every 5 feet and one hole will occur at the bottom of every 5 feet.

Immediately after completion of the jacking or boring operation, lean grout shall be injected through the grout connections in such a manner as to completely fill all voids outside the casing pipe or reinforced concrete pipe resulting from the jacking or boring operation. The lean grout shall consist of one part portland cement to not more than 4 parts sand by volume, placed at low pressure. Grout pressure is to be controlled so as to avoid deformation of casing pipe and/or avoid movement of the surrounding soil. Sand for grout to be placed outside the casing shall be of such fineness that 100 percent will pass a No. 8 sieve and not less than 35 percent will pass a No. 50 sieve. After completion of grouting, the grout connections shall be closed with cast-iron threaded plugs.

In general, excavated material shall be removed from the casing or reinforced concrete pipe as jacking progresses and no accumulation of excavated material within the casing will be permitted. Should appreciable loss of ground occur in installations where the face of the excavation is accessible, the voids shall be backpacked promptly to the extent practicable with an approved soil cement.

For jacked reinforced concrete pipe, if the annular space in the joints on the inside of the pipe exceeds one inch, the space shall be filled with cement mortar for the full periphery of the joint and finished smooth and flush with the interior walls of the pipe. Filling and finishing annular spaces shall be accomplished after the entire installation is completed for larger pipe.

Where carrier pipe is to be installed within a jacked casing, carrier pipe as shown on the Plans or indicated in the Special Provisions shall be installed within the casing pipe to the lines and grades shown on the Plans, and as indicated on the Standard Drawing pertaining thereto. The carrier pipe shall be supported on skids during the installation of the pipe. The skids shall be installed in such a manner as to relieve the couplings from all load and bearing. At the successful completion of the installation, concrete end seals (concrete plugs) shall be installed in accordance with the Standard Drawings. Care shall be taken during the placement of these seals that the pipe is not damaged, deflected or displaced.

3.05 Grade Tolerance

Reinforced concrete pipe jacked into place without steel casing shall not vary from theoretical alignment and grade at the time of completion of jacking by more than 0.50 foot in 100 feet for storm drain, and 0.10 foot in 100 feet for sanitary sewer.

Steel casing pipe of the minimum size and thickness specified on the Plans shall be installed in place to grades required to install the carrier pipe at the design grade. The Contractor's attention is called to the fact tht extreme care will be required in placing the casing pipe so as to permit the construction of the carrier pipe to thelines and grades shown on the Plans. It shall be the Contractor's responsibility for selecting a size of casing, at or above the minimum specified, in order that the jacking may be done with a sufficient degree of accuracy to permit installation of the carrier pipe to the grade as shown on the Plans within the tolerances set forth in these Specifications for the particular carrier pipe installed. Any and all increased costs resulting from the Contractor's use of steel casing pipe with greater diameter or thickness than the minimum specified shall be borne solely by the Contractor. Variations from theoretical alignment and grade of the steel casing pipe at the time of completion of jacking shall not exceed one percent of the distance from the jacking point.

3.06 Backfill, Compaction and Restoration of Surfaces for Jacking and Receiving Pits

Jacking and receiving pits shall be backfilled and compacted, and the surface restored, in accordance with these Specifications.

3.07 Measurement

Measurement for reinforced concrete pipe with rubber gasket joints (without steel casing), jacked into place, shall be by the lineal foot of pipe jacked into place as shown on the Plans or as directed by the Engineer.

Measurement for steel casing pipe jacked into place shall be by the lineal foot of casing pipe jacked into place as shown on the Plans or as directed by the Engineer

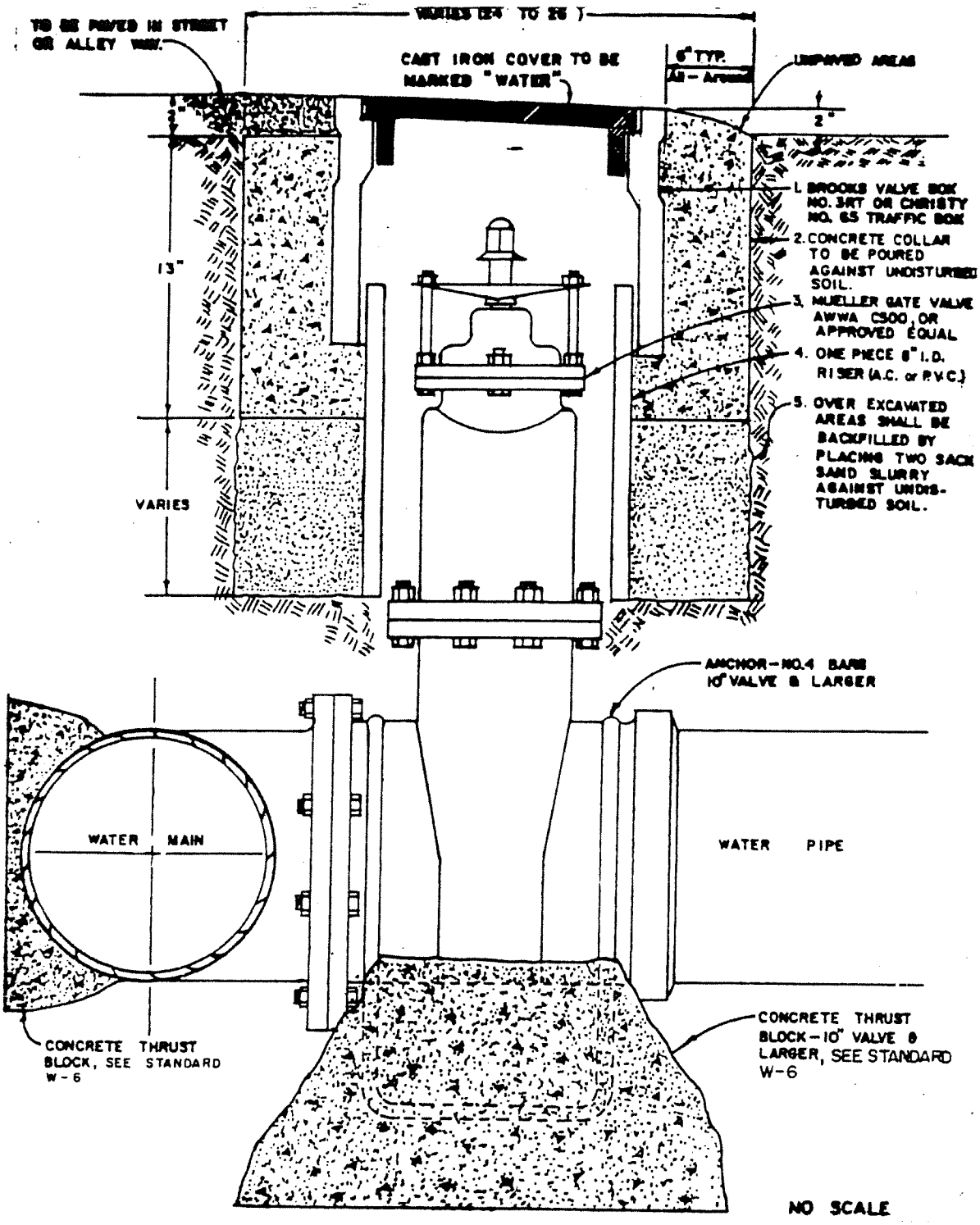
Where carrier pipe is indicated on the Plans to be placed within a jacked casing pipe, carrier pipe will be measured by the lineal foot of pipe installed.

3.08 Payment

The unit price bid per lineal foot for reinforced concrete pipe with rubber gasket joints, jacked into place, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specification, and as directed by the Engineer. This shall include, but not be limited to, excavating, backfilling and compacting the jacking and receiving pits, boring and tunneling, furnishing and installing the pipe complete with grout fittings, furnishing and installing metal shields, grouting and backfill of voids, and all incidentals.

The unit price bid per lineal foot for steel casing, jacked into place, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in these Specifications, and as directed by the Engineer. This shall include, but not be limited to, excavating, backfilling and compacting the jacking and receiving pits, boring and tunneling, furnishing and installing the casing complete with grout fittings, furnishing and installing metal shields, furnishing and installing skids and tie downs, grouting and backfill of voids, sealing ends of casing, and all other incidental work over and above that associated with the normal work of furnishing and installing the carrier pipe in a trench situation.

Carrier pipe to be placed in casing as shown on the Plans will be paid for as normal in-trench pipe as set forth in these Specifications for the particular type of pipe to be installed.



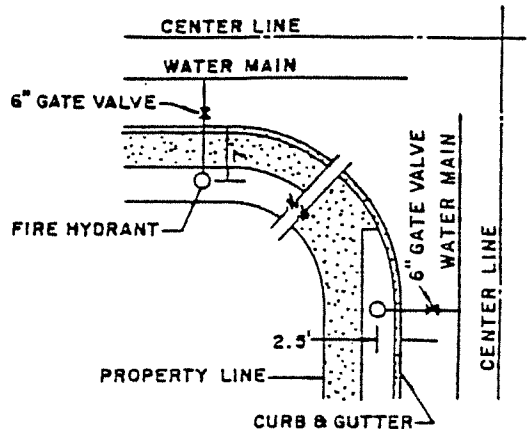
DESCRIPTION

VALVES, BOXES, AND COVERS

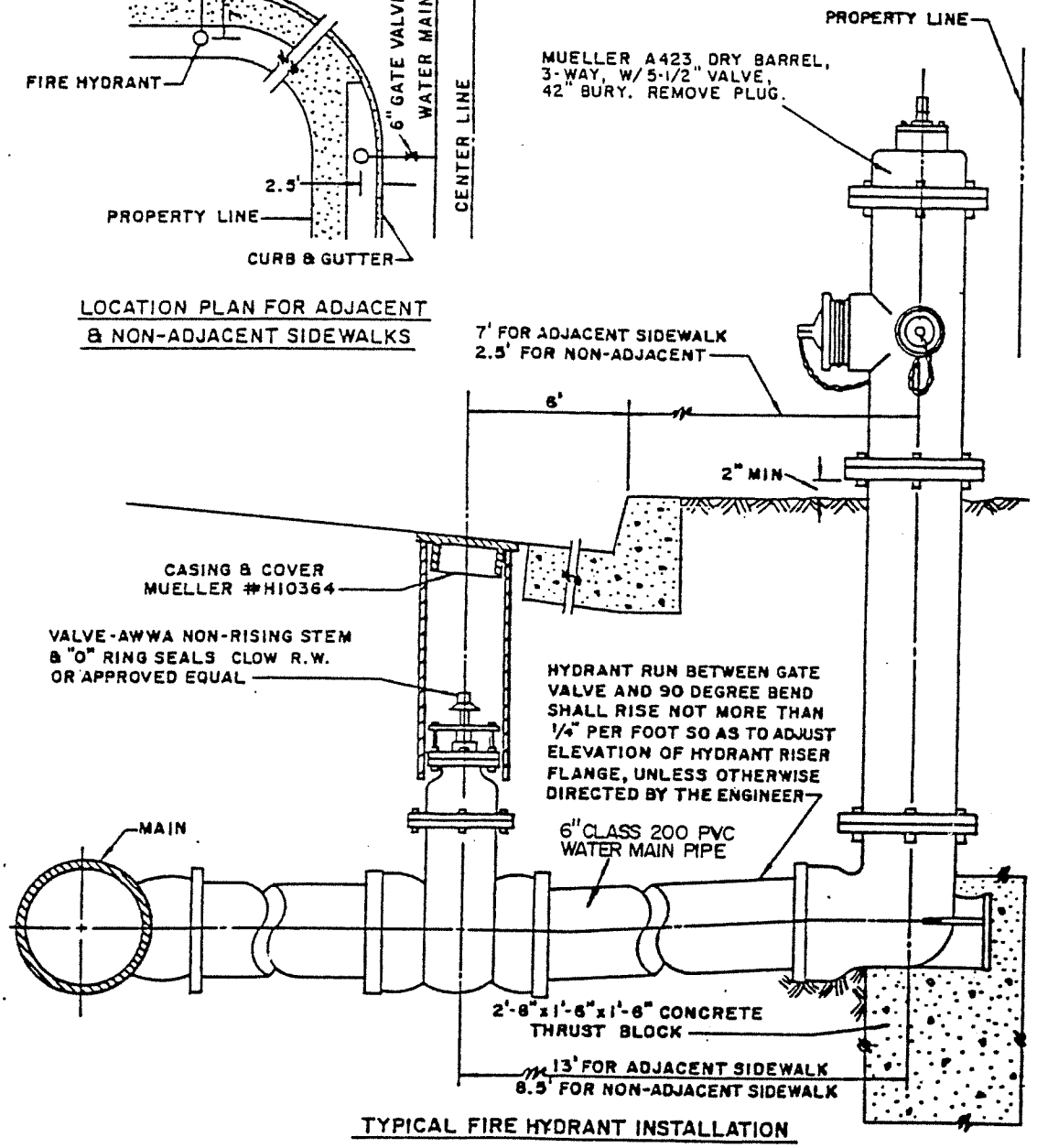
MALAGA COUNTY WATER DISTRICT

REF & REV.

STD. NO. W-1



LOCATION PLAN FOR ADJACENT & NON-ADJACENT SIDEWALKS



TYPICAL FIRE HYDRANT INSTALLATION

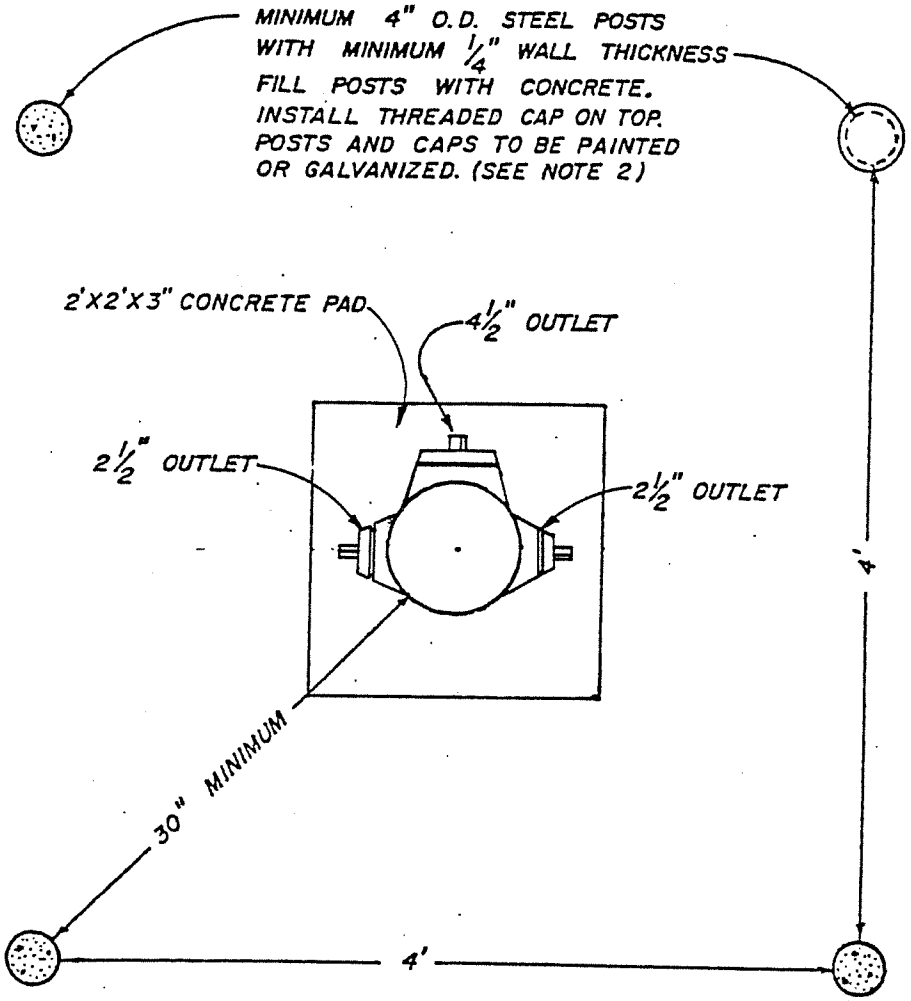
DESCRIPTION

FIRE HYDRANT ASSEMBLIES

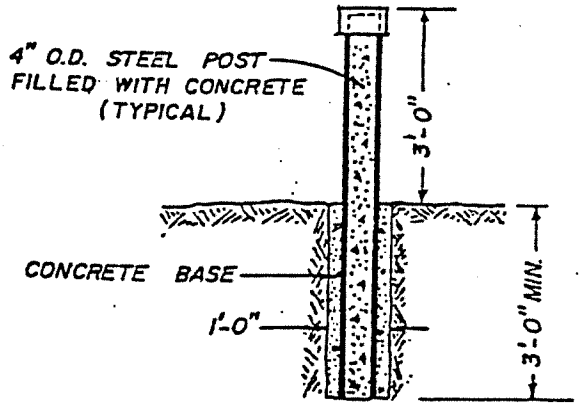
MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W-2



PLAN VIEW – FIRE HYDRANT



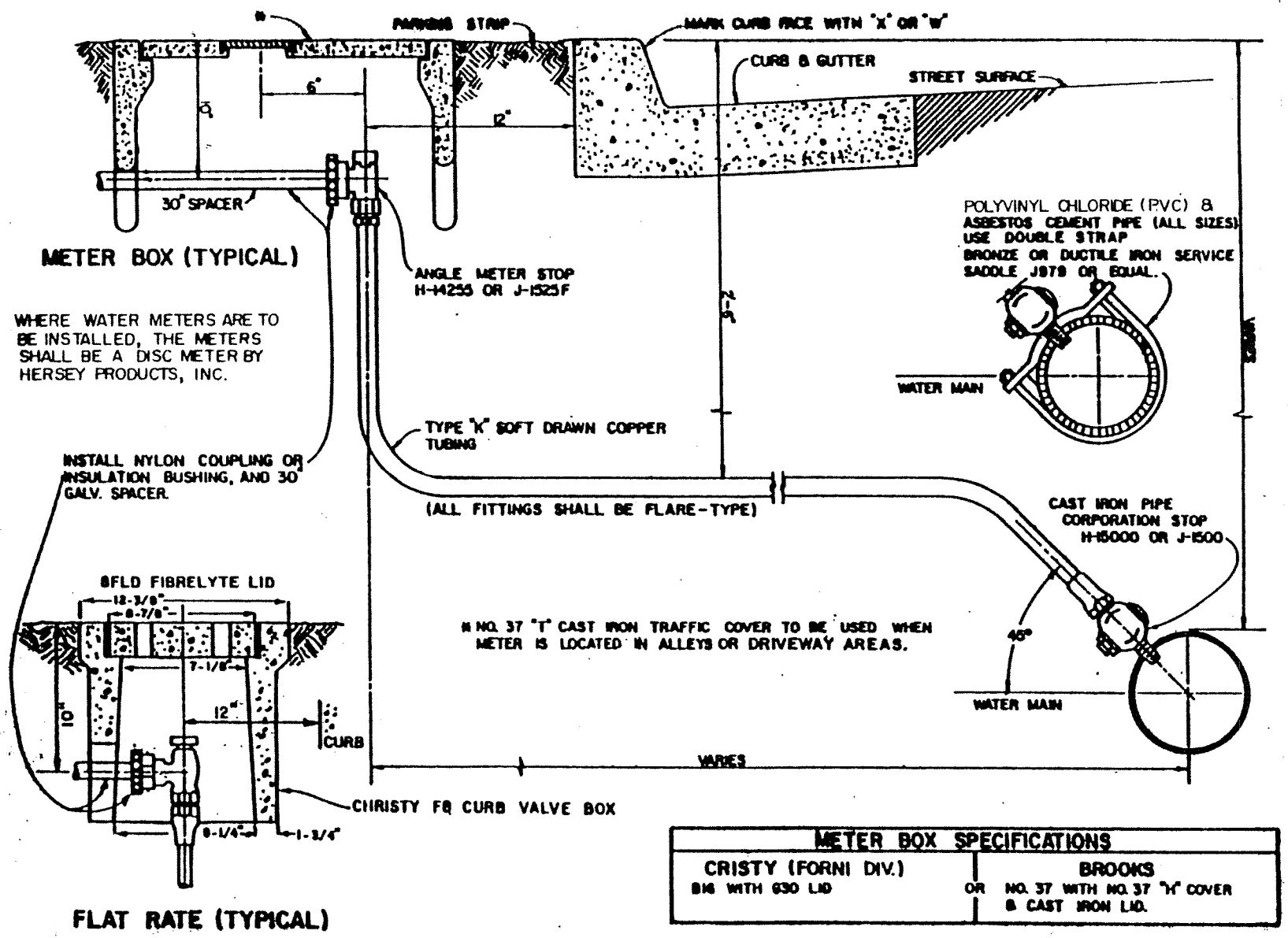
PROTECTION POSTS (typical)

NOTES:

1. PROTECTION POSTS SHALL BE REQUIRED ON ALL FIRE HYDRANTS THAT ARE LOCATED IN PUBLIC UTILITY EASEMENTS AND PARKING LOTS WHERE THERE IS NO CURB PROTECTION OR NATURAL PROTECTION. ALSO, WHERE DEEMED NECESSARY BY THE FIRE DEPARTMENT, WATER DISTRICT OR WHERE FIRE HYDRANTS ARE CONTINUOUSLY BEING DAMAGED BY VEHICLES.
2. IF GALVANIZED POST AND CAPS ARE NOT USED, THEY SHALL BE PAINTED WITH 2 COATS OF RUST PRIMER FOLLOWED BY 2 COATS OF RUSTOLEUM CATERPILLAR YELLOW PAINT.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
FIRE HYDRANT PROTECTION POSTS	REF. & REV.	STD. NO. W– 3

3/4" AND 1" SERVICE CONNECTION AND METER BOX INSTALLATION

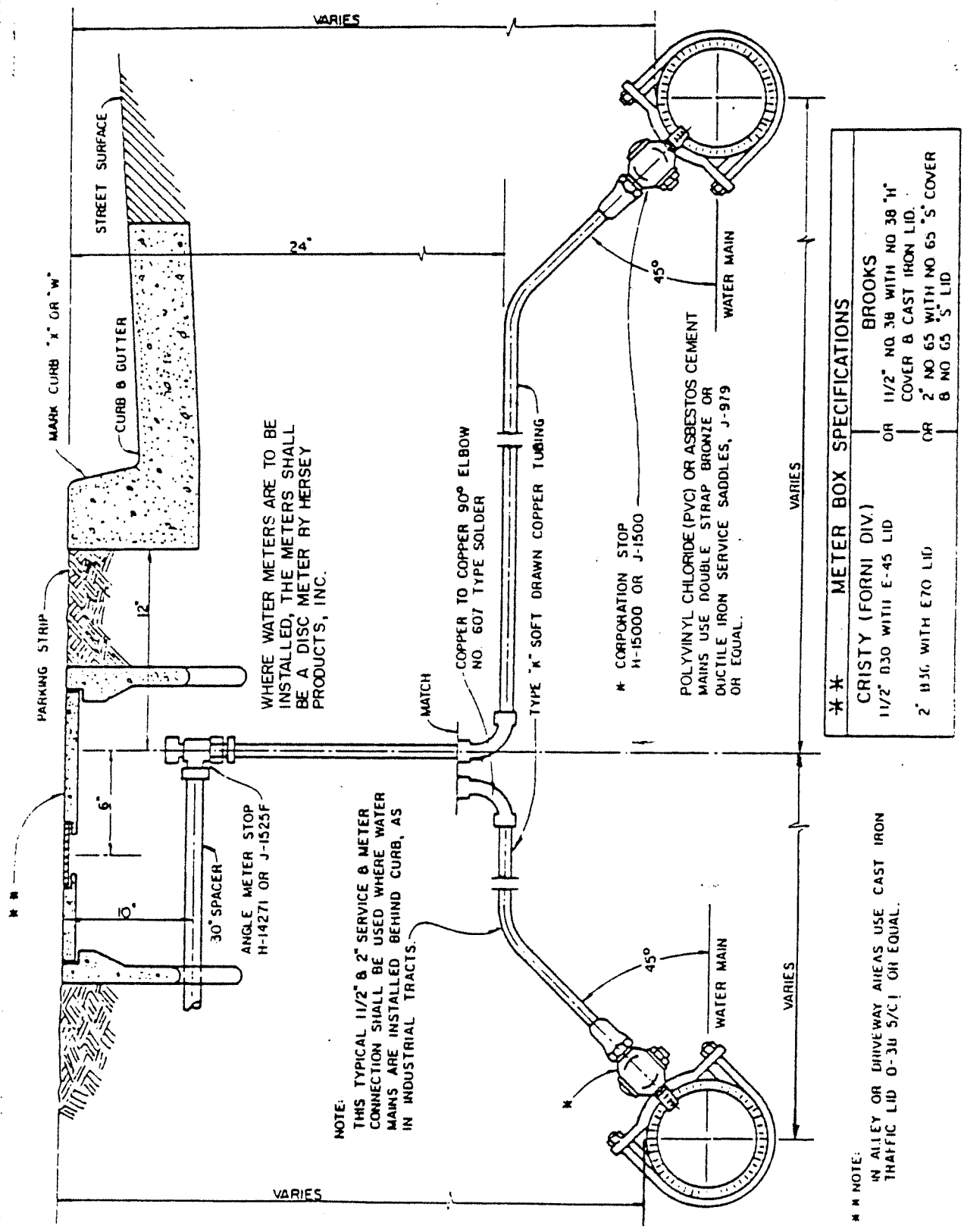


METER BOX SPECIFICATIONS		
CRISTY (FORNI DIV.)	OR	BROOKS
B16 WITH 630 LID		NO. 37 WITH NO. 37 "H" COVER & CAST IRON LID.

MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W—4



DESCRIPTION

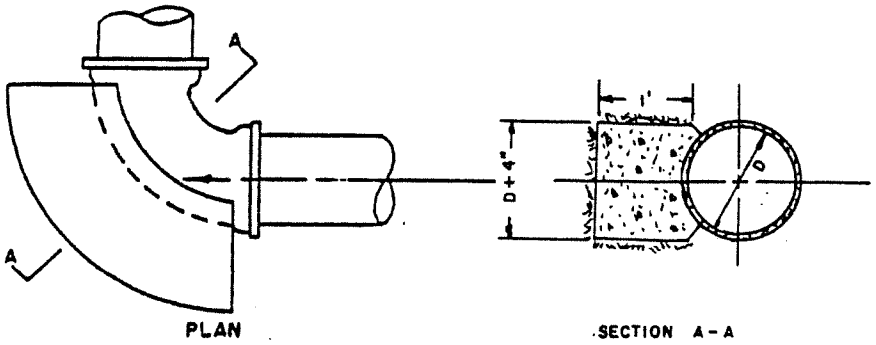
1-1/2" AND 2" SERVICE CONNECTION AND METER BOX INSTALLATION

MALAGA COUNTY WATER DISTRICT

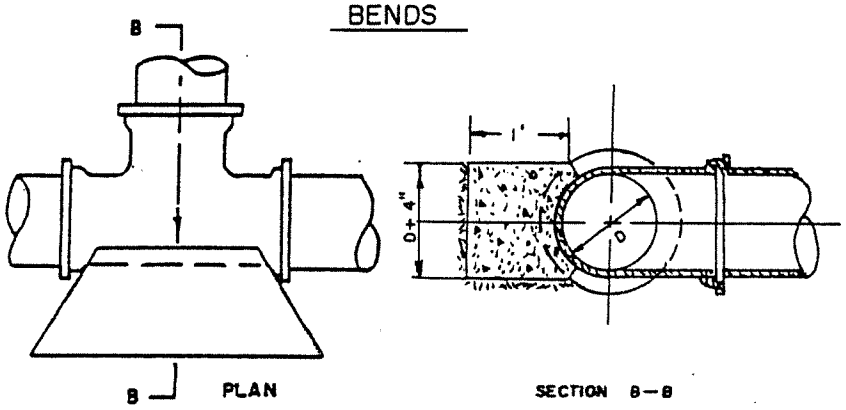
REF. & REV.

STD. NO.

W-5



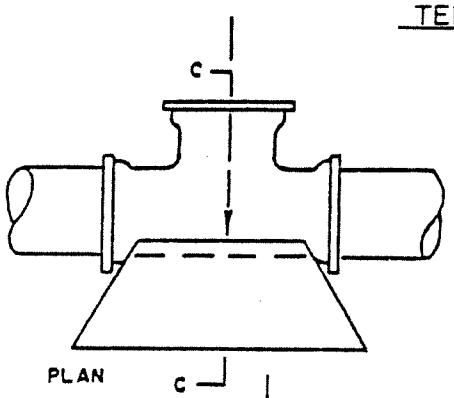
BENDS

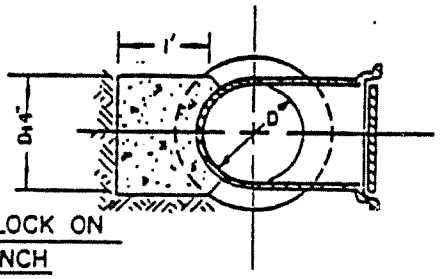


PIPE DIAMETER	CROSS, TEE, 90° BEND, PLUG, FIRE HYDRANT	45° BEND	22-1/2° BEND	11-1/4° BEND	VALVE
	BEARING AREA (FT²)				
6"	3	2	1	0	0
8"	5	3	2	1	0
10"	8	4	2	1	4
12"	11	6	3	2	9

TABLE OF BEARING AREAS REQUIRED

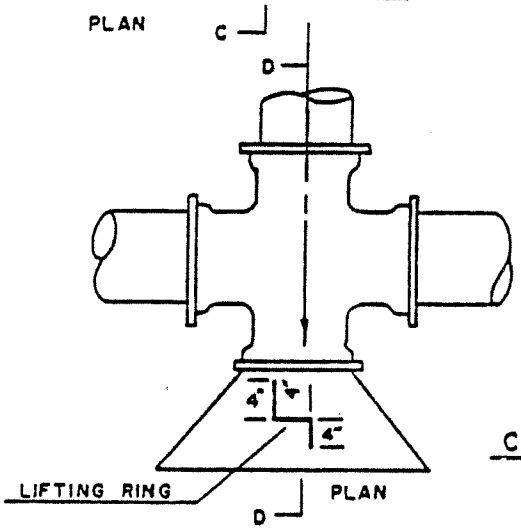
TEES



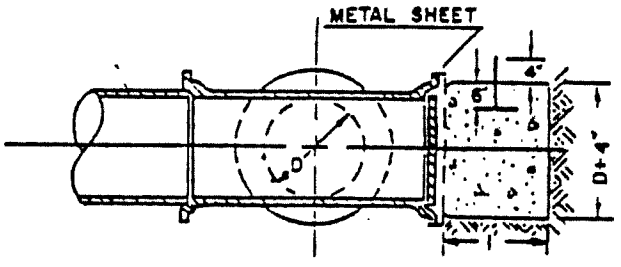


TEE BLOCK ON BRANCH

SECTION C-C



CROSS BLOCK ON BRANCH



SECTION D-D

NOTE:
POUR CONCRETE BLOCKS AGAINST UNDISTURBED EARTH EXCAVATION. BLOCKS ON ALL BRANCHES SHALL HAVE LIFTING RING. USE NO. 5 BAR REINF ROD TO FABRICATE RING AT CENTER OF BLOCK.

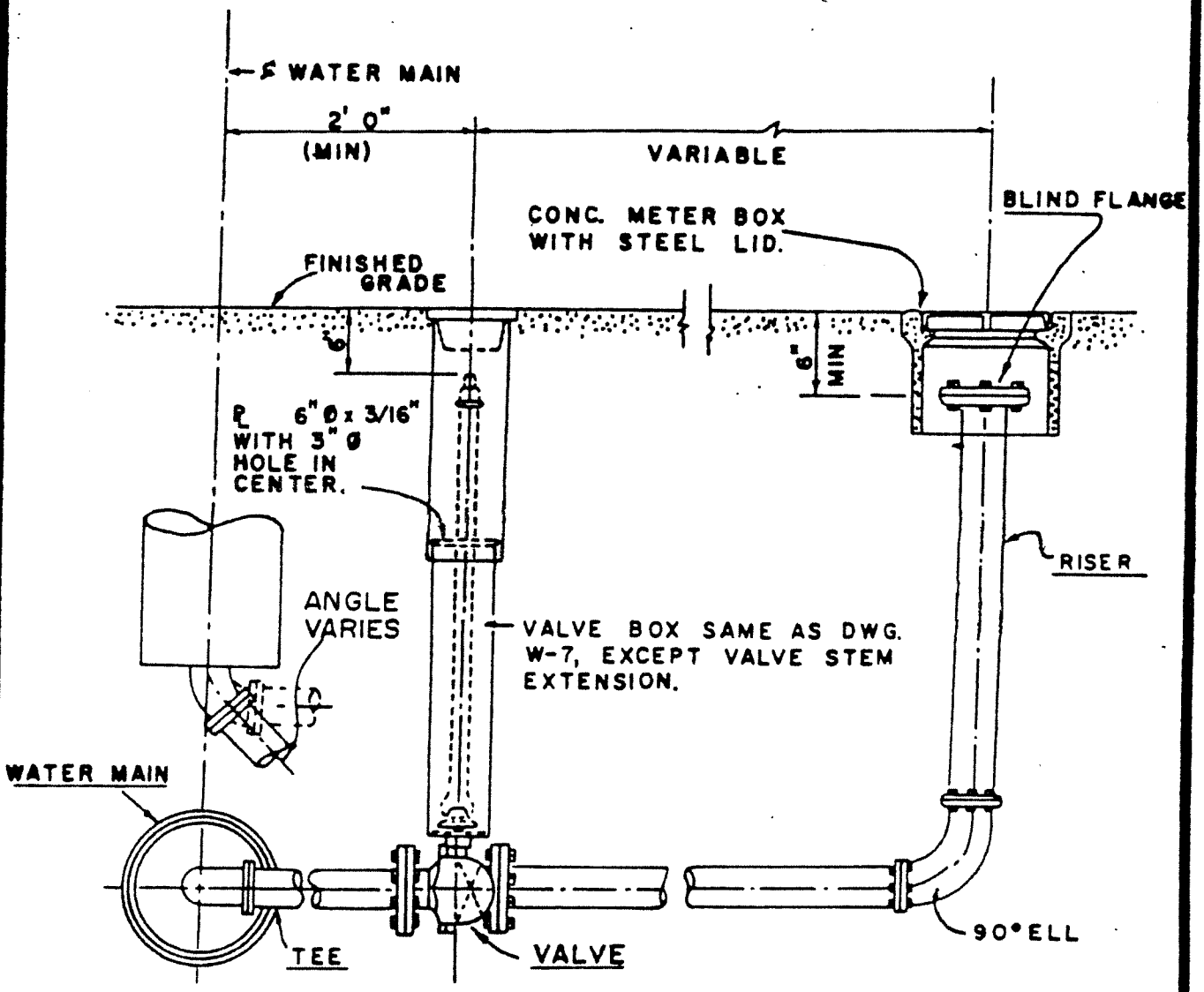
DESCRIPTION

WATER MAIN THRUST BLOCKING DETAIL 4" THROUGH 12" FITTINGS

MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W-6



NOTE:

- ALL FITTINGS SHALL BE SECURED WITH RETAINING GLANDS OR TIE-RODS WHERE APPLICABLE.
- PLACE VALVES AND BLOW-OFFS OUTSIDE SIDEWALK DRIVEWAY AREAS.

BLOW-OFF SCHEDULE

MAIN SIZE	BLOW-OFF SIZE
6"	4"
8"	4"
10"	4"
12"	6"
14"	6"
16"	8"

DESCRIPTION

PERMANENT BLOWOFF ASSEMBLY

MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W-7

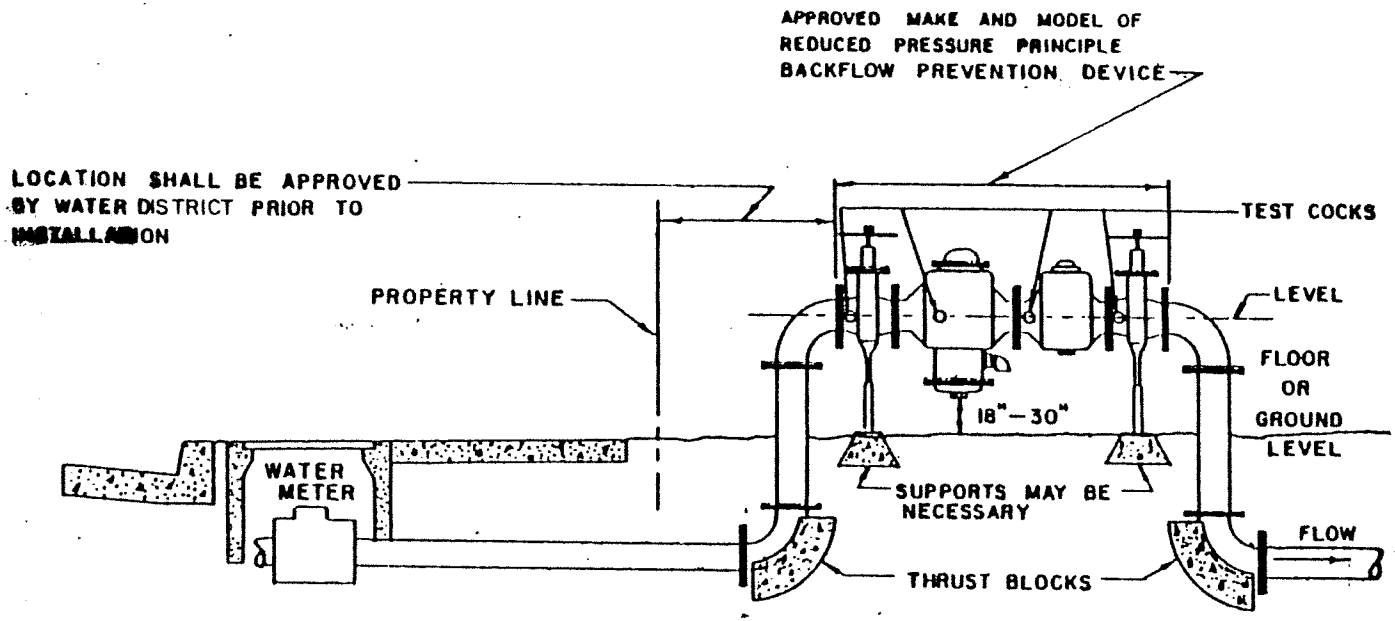
DESCRIPTION

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER INSTALLATION

REF. & REV.

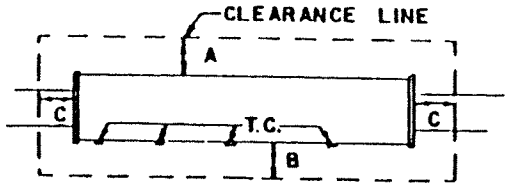
STD. NO. W-8

MALAGA COUNTY WATER DISTRICT



MIN. CLEARANCE

SIZE/DC	A	B	C
1"–3"	12"	18"	12"
4" & UP	24"	24"	12"



GENERAL NOTES

1. GATE VALVES AND TEST COCKS ARE REQUIRED.
2. DISTRICT WATER SUPPLY – NO CONNECTIONS OR TEES WILL BE ALLOWED BETWEEN METER AND DEVICE.
3. PROTECTION FROM FREEZE DAMAGE MAY BE REQUIRED IN EXPOSED AREAS.
4. DEVICE MUST BE ACCESSIBLE FOR TESTING AND MAINTENANCE.

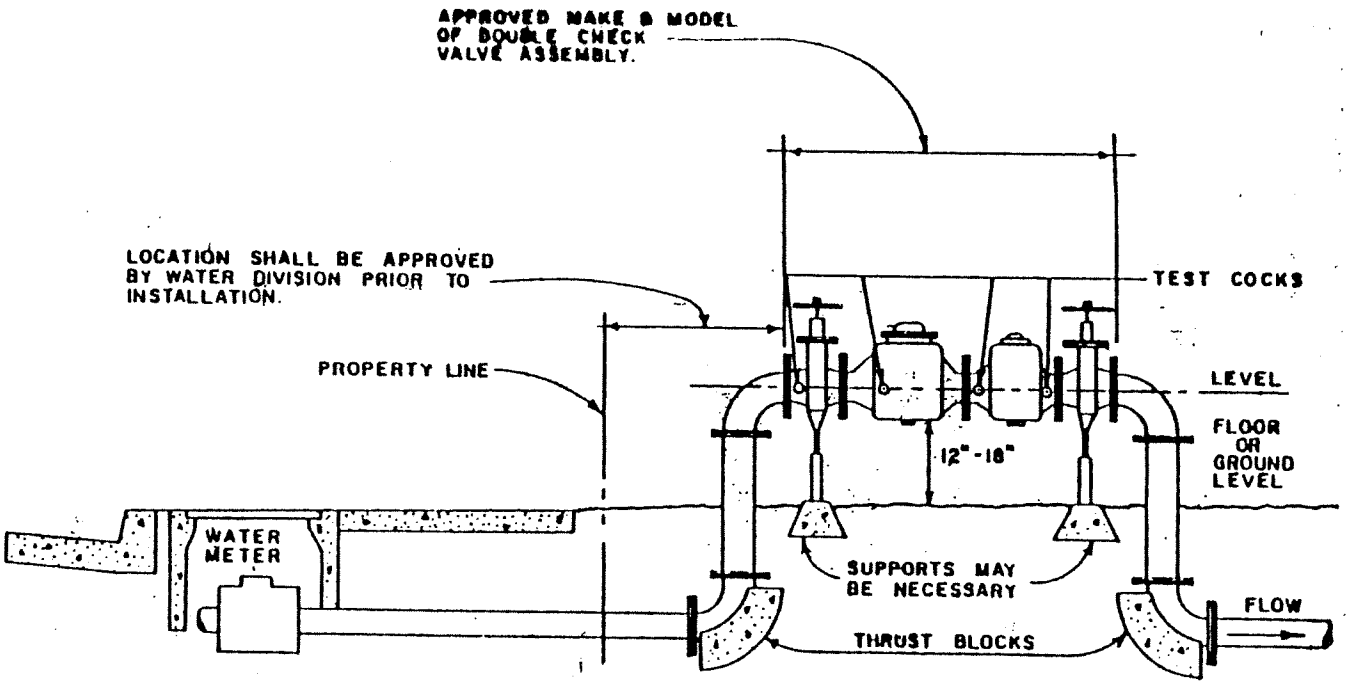
DESCRIPTION

DOUBLE CHECK VALVE INSTALLATION

REF. & REV

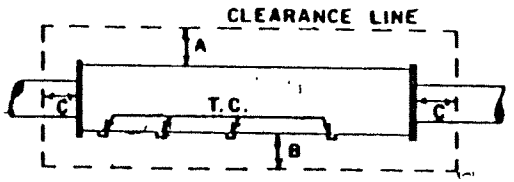
STD. NO. W-9

MALAGA COUNTY WATER DISTRICT



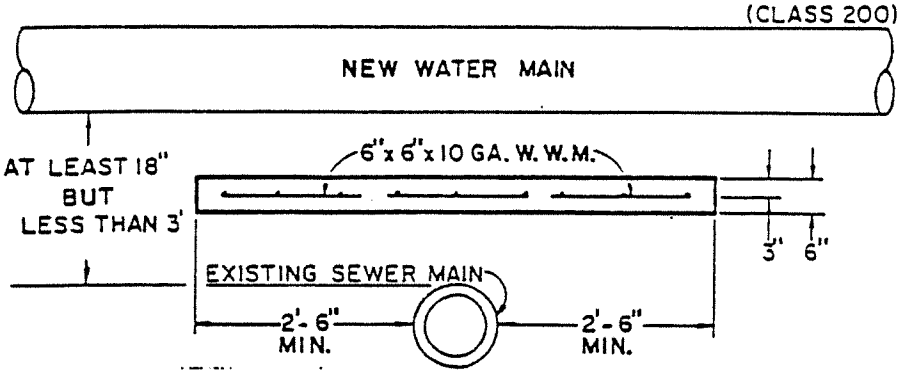
MIN CLEARANCE

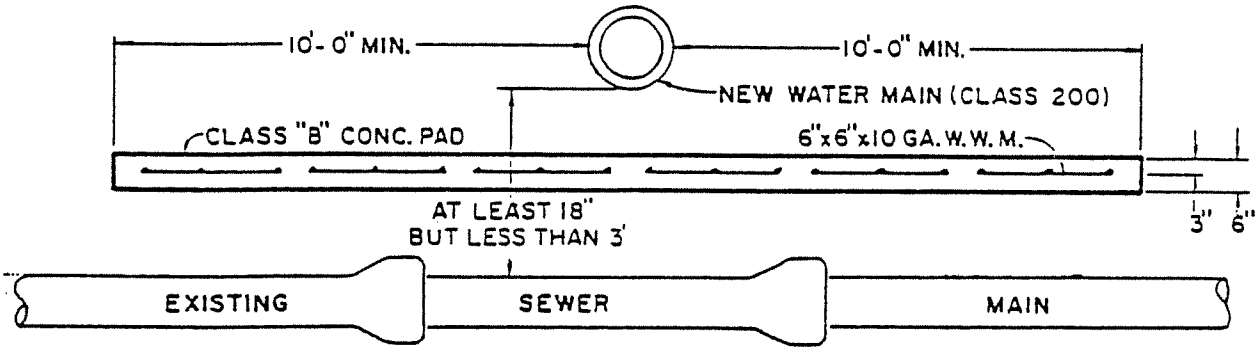
SIZE/DC	A	B	C
1"- 3"	12"	18"	12"
4" & UP	24"	24"	12"



GENERAL NOTES

1. GATE VALVES & TEST COCKS ARE REQUIRED.
2. DISTRICT WATER SUPPLY - NO CONNECTIONS OR TEES WILL BE ALLOWED BETWEEN METEH & DEVICE.
3. PROTECTION FROM FREEZE DAMAGE MAY BE REQUIRED IN EXPOSED AREAS.
4. DEVICE MUST BE ACCESSIBLE FOR TESTING & MAINTENANCE





DESCRIPTION

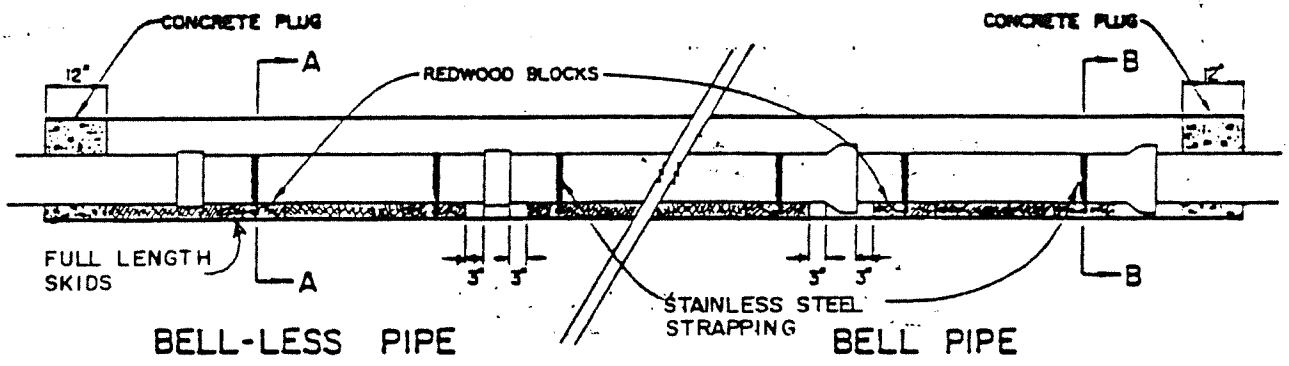
ALTERNATE TO FULL ENCASEMENT
NEW WATER MAIN OVER EXIST. SEWER

MALAGA COUNTY WATER DISTRICT

REF. & REV.

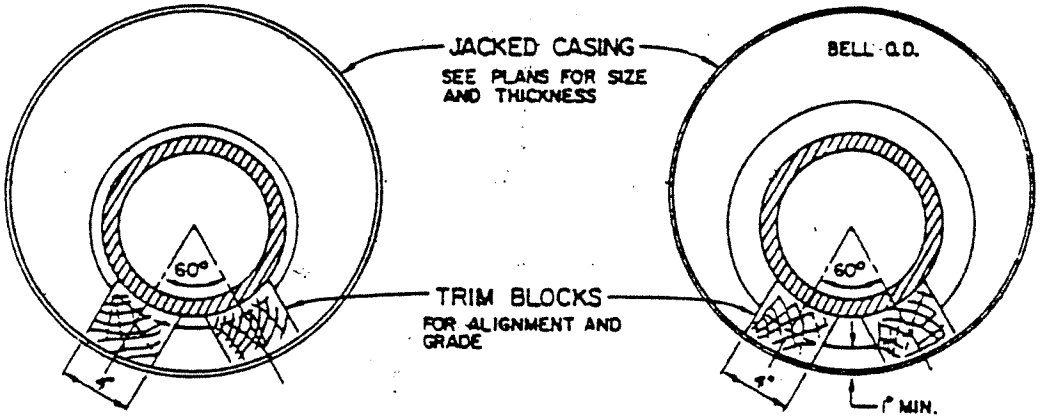
STD. NO.

W-10



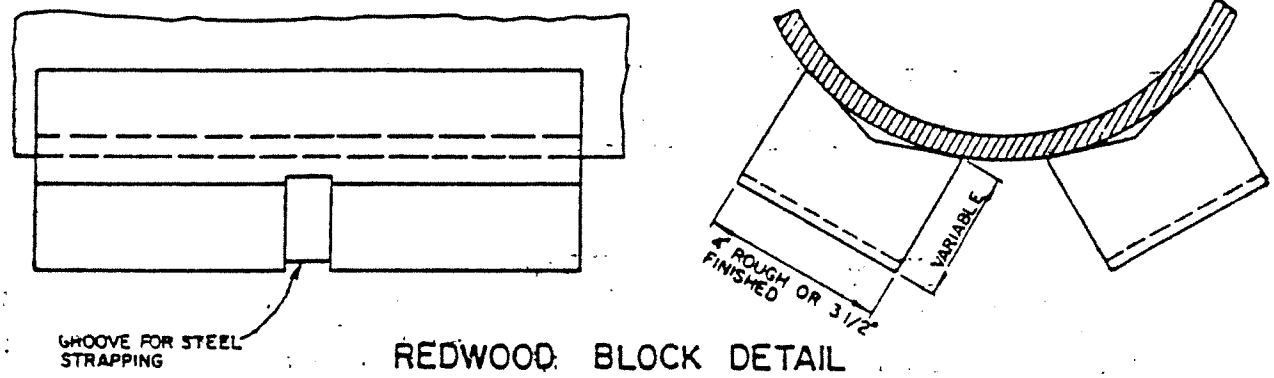
BELL-LESS PIPE

BELL PIPE



SECTION A-A

SECTION B-B



REDWOOD BLOCK DETAIL

NOTES

1. REDWOOD BLOCKS SHALL BE CONSTRUCTION GRADE.
2. REDWOOD BLOCKS SHALL BE VEED TO FIT CONTOUR OF PIPE.
3. WHEN JACKING CASING, GRADE SHALL BE SET SO CENTER LINE OF CASING SHALL COINCIDE WITH CENTER LINE OF WATER PIPE.
4. REDWOOD BLOCKS SHALL BE STRAPPED TO THE PIPE WITH STAINLESS STEEL STRAPPING OR APPROVED WIRE BANDS.
5. PLUG ENDS OF CASING WITH 12 INCHES MINIMUM OF CONCRETE.
6. CONCRETE SHALL BE CLASS B.

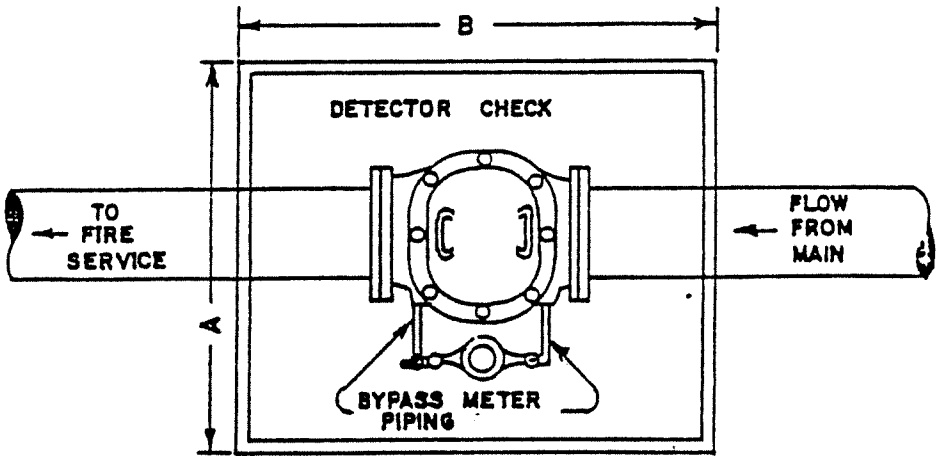
DESCRIPTION

INSTALLATION OF WATER PIPE IN JACKED STEEL CASING

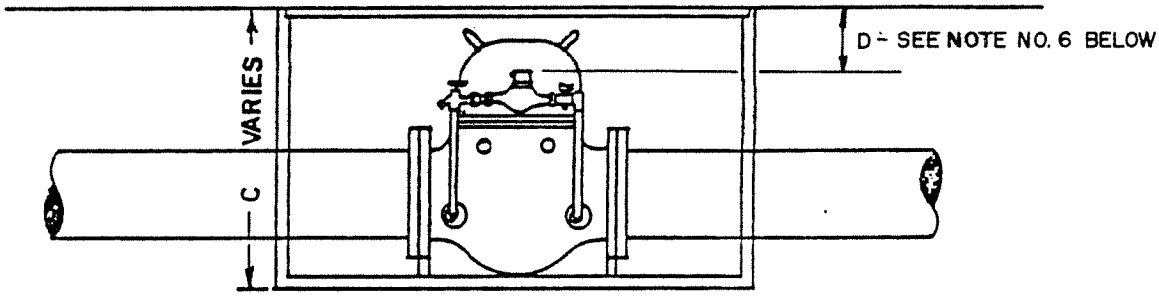
MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W-11



PLAN VIEW



ELEVATION

NOTES:

1. CHECK VALVE TO BE HERSEY PRODUCTS, INC. MODEL E.D.C. OR D.C., GRINNELL MODEL A-2 OR B-2 OR APPROVED EQUAL.
2. CHECK VALVE IS TO BE TAPPED FOR INSTALLATION OF BYPASS METER PIPING BY DEVELOPER'S CONTRACTOR.
3. VAULT TO BE CHRISTY, BROOKS, OR APPROVED EQUAL.
4. VAULT TO PROVIDE MINIMUM CLEARANCE OF 12" AROUND CHECK AND BYPASS METER.
5. VAULT, VAULT COVER, AND DETECTOR CHECK VALVE TO BE INSTALLED BY DEVELOPER'S CONTRACTOR.
6. BYPASS METER MUST BE WITHIN 6" OF THE GROUND SURFACE.

MINIMUM VAULT SIZE

	A	B	C*
4"	36"	36"	24"
6"	42"	48"	30"
8"	48"	48"	36"
10"	48"	60"	42"

* DEPTH VARIES

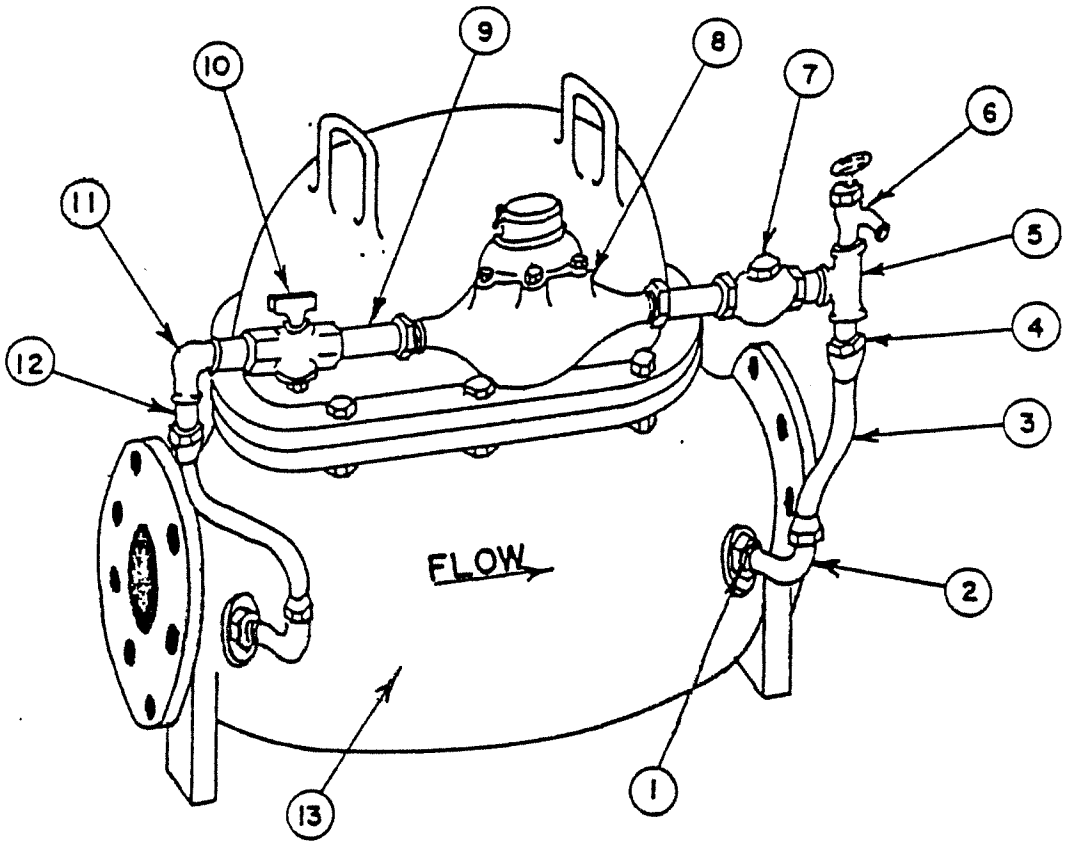
DESCRIPTION

FIRE SERVICE DETECTOR CHECK INSTALLATION

MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. W-12



MATERIALS LIST:

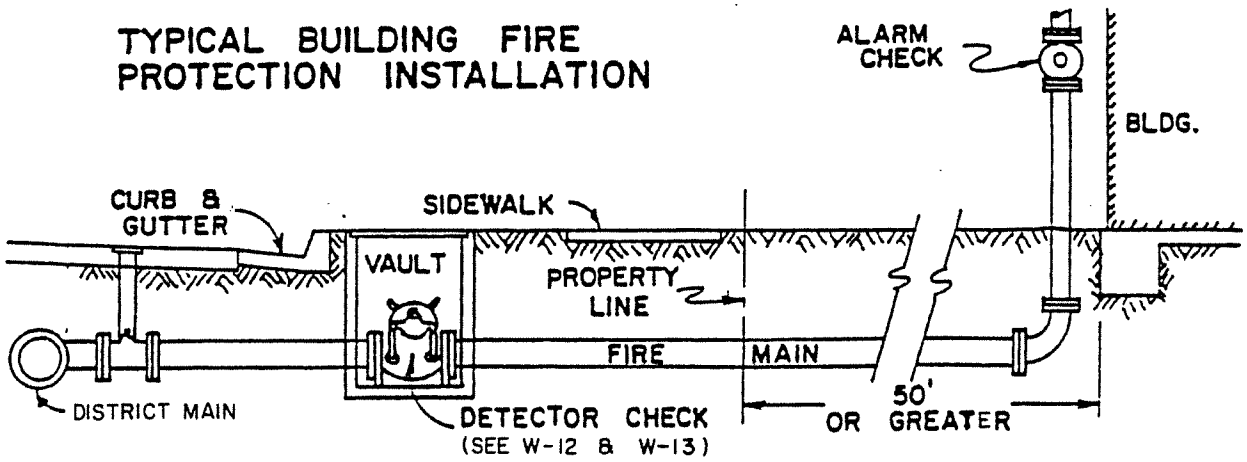
1. 1" X 3/4" BRASS BUSHING - 2 REQ'D.
2. 3/4" J-1550 BRASS COUPLING - 2 REQ'D.
3. 3/4" COPPER TUBING - 2 REQ'D.
4. 3/4" J-1531 BRASS COUPLING - 2 REQ'D.
5. 3/4" BRASS TEE - 1 REQ'D.
6. 3/4" BENT NOSE HOSE BIBB - 1 REQ'D.
7. 3/4" CHECK VALVE - 1 REQ'D.
8. 5/8" METER - 1 REQ'D.
9. 3/4" METER CONNECTION (TAIL PIECE) - 2 REQ'D.
10. 3/4" J-200 CURB STOP - 1 REQ'D.
11. 3/4" BRASS 90° ELL - 1 REQ'D.
12. 3/4" BRASS CLOSE NIPPLE - 4 REQ'D.
13. WEIGHTED DETECTOR CHECK VALVE - 1 REQ'D.
    A. TO BE INSTALLED BY DEVELOPER.
    B. TO BE TAPPED FOR DETECTOR METER PIPING.

NOTE:

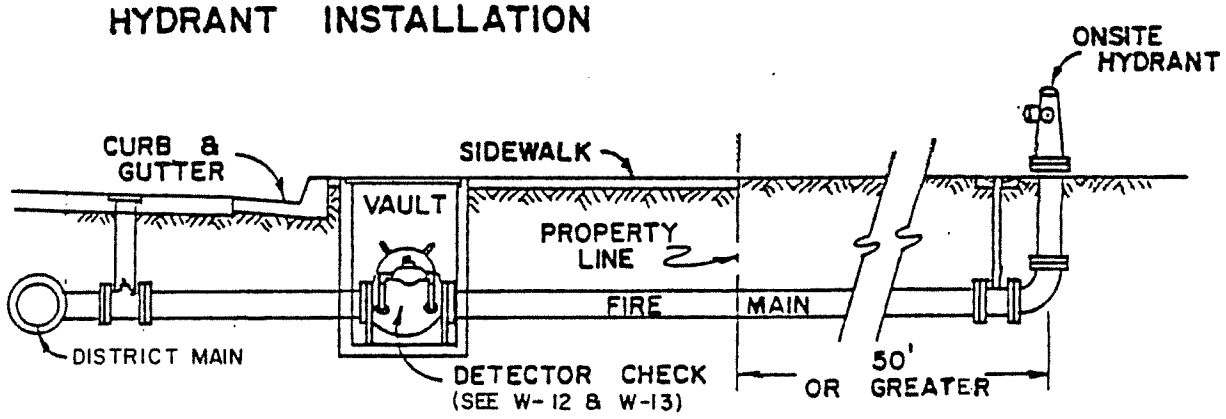
J NUMBERED MATERIALS TO BE JAMES JONES OR APPROVED EQUAL.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
DETECTOR BYPASS/ METER INSTALLATION	REF. & REV.	STD. NO. W-13

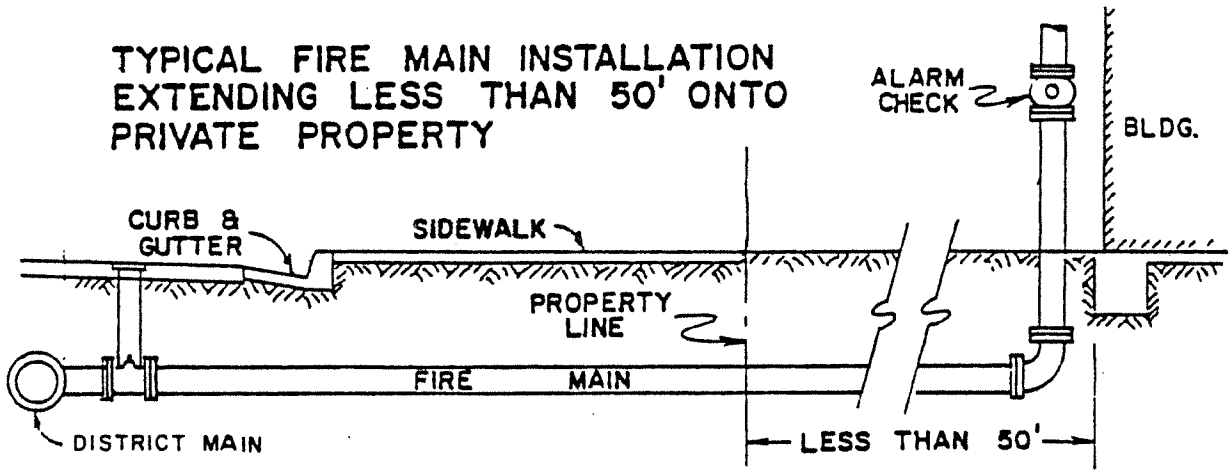
TYPICAL BUILDING FIRE PROTECTION INSTALLATION



TYPICAL ONSITE FIRE HYDRANT INSTALLATION



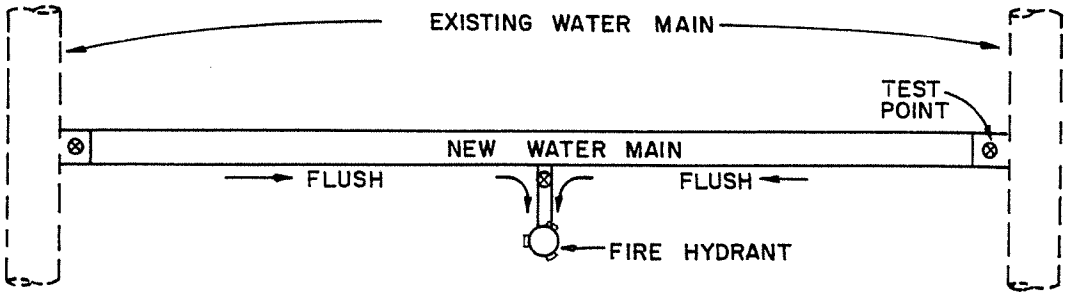
TYPICAL FIRE MAIN INSTALLATION EXTENDING LESS THAN 50' ONTO PRIVATE PROPERTY

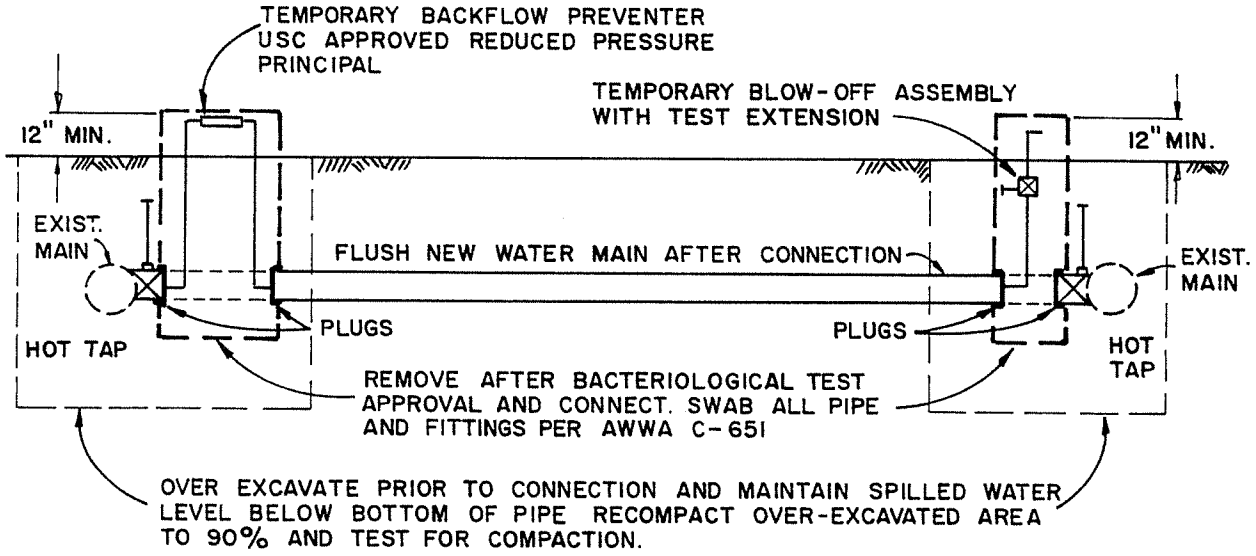


NOTES:

1. THE PERMANENT CONNECTION BETWEEN THE DISTRICT'S INSTALLATION AND THE DEVELOPERS CONSTRUCTION SHALL BE MADE BY THE DEVELOPERS CONTRACTOR.
2. CONTRACTOR SHALL INSTALL ALL NECESSARY PIPING, VALVES, DETECTOR CHECK, VAULT AND VAULT COVER.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
DETECTOR CHECK REQUIREMENTS RELATED TO FIRE SERVICE	REF. & REV.	STD. NO. W-14





WATER USED FOR FLUSHING SHALL BE METERED
AND BILLED TO METER APPLICANT.

DESCRIPTION

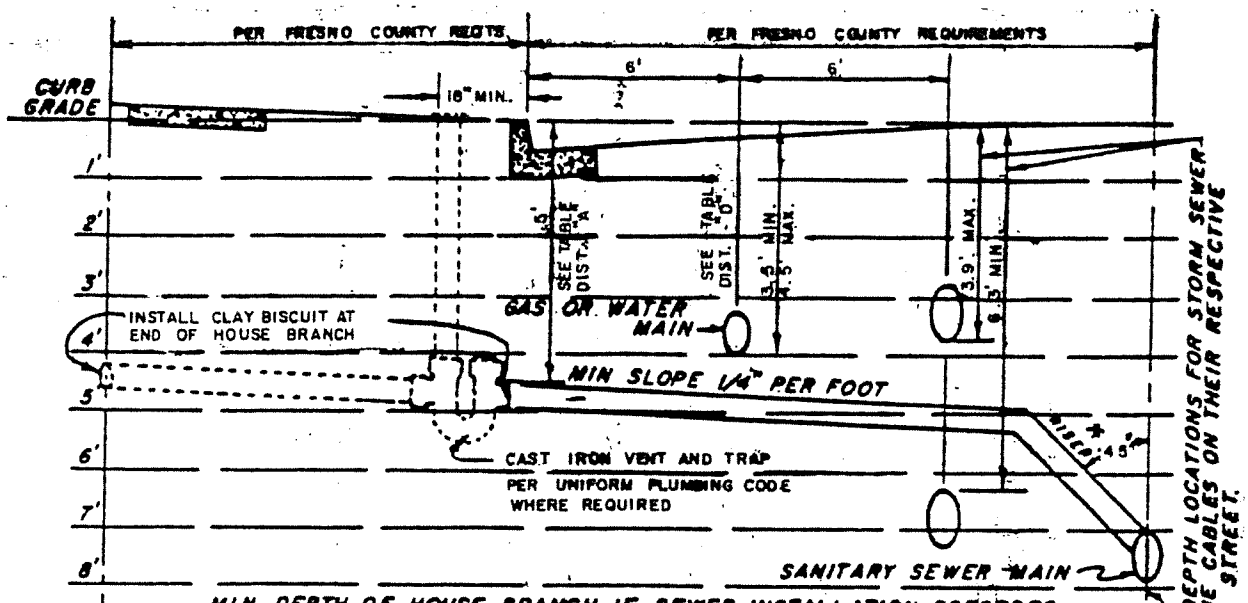
WATER MAIN CONNECTION PROCEDURE

MALAGA COUNTY WATER DISTRICT

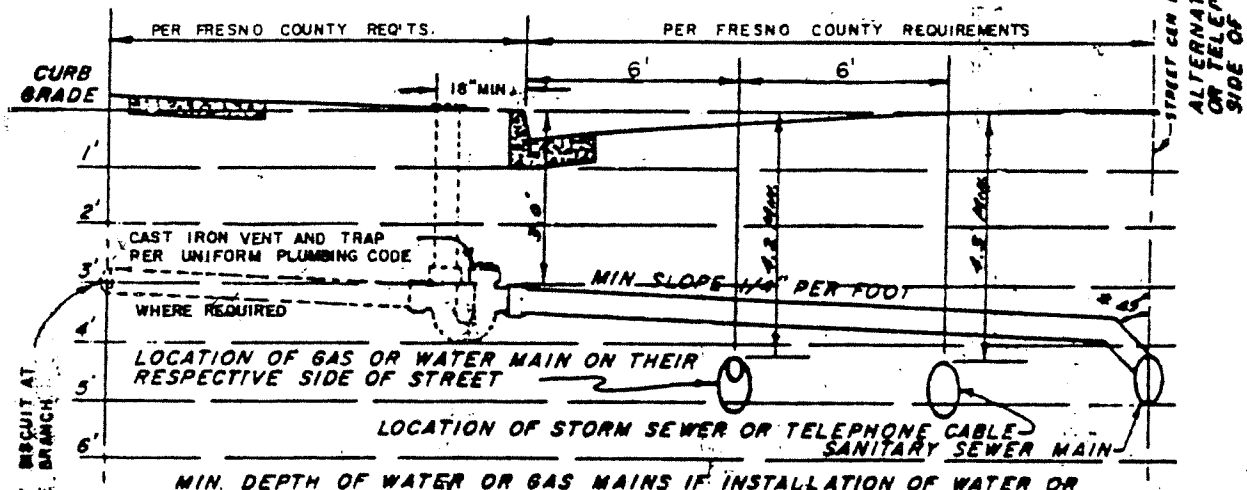
REF. & REV.

STD. NO.

W-15



MIN. DEPTH OF HOUSE BRANCH IF SEWER INSTALLATION PRECEDES INSTALLATIONS OF WATER AND GAS



MIN. DEPTH OF WATER OR GAS MAINS IF INSTALLATION OF WATER OR GAS MAINS PRECEDES INSTALLATION OF SEWERS ONLY IF APPROVED BY THE ENGINEER.

DEPTH SCHEDULE		
DISTANCE	"A"	"D"
6" WATER OR GAS MAIN	4.0'	3.5'
8" " " " "	4.3'	3.8'
10" " " " "	4.7'	4.2'
12" " " " "	5.0'	4.5'

"A" & "D" DIMENSIONS ARE SET TO ALLOW 0.6' CLEARANCE BETWEEN SEWER AND WATER LINES

EXTEND HOUSE BRANCHES 1'± BEYOND SIDEWALK IF TO BE UNDER COMBINATION CURB & WALK
EXTEND HOUSE BRANCHES IN STREETS TO 1'± INSIDE CURB
EXTEND HOUSE BRANCHES IN ALLEY TO PROPERTY LINE.

* SPECIAL APPROVAL REQUIRED FOR DEVIATION FROM 45 DEGREE STANDARD ANGLE.

NOTE:
WATER MAINS AND TELEPHONE DUCTS SHALL OCCUPY ONE SIDE OF STREET; GAS MAINS AND STORM SEWERS TO OCCUPY OTHER SIDE

DESCRIPTION

HOUSE BRANCH AND UTILITIES LOCATIONS IN THE STREET

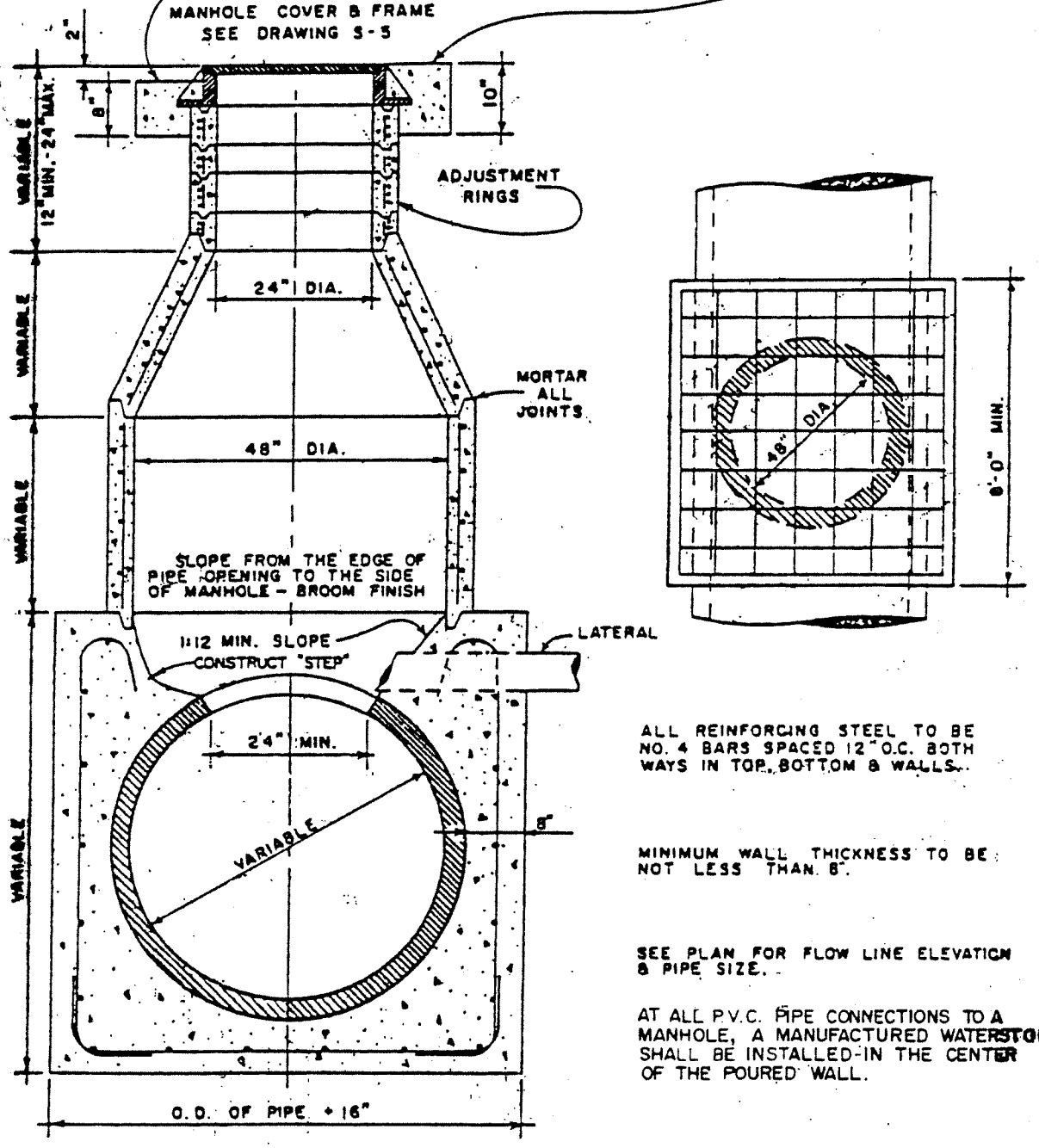
MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. S– 1

TO BE PAVED WITH A.C. (85-100 PENETRATION ASPHALT) TACK-COAT CONC. & METAL SURFACES PRIOR TO PAVING.

COLLAR AROUND C.I. FRAME - AS SHOWN. SET FRAME IN CONC. BED IN CONC. STREETS.



ALL REINFORCING STEEL TO BE NO. 4 BARS SPACED 12" O.C. BOTH WAYS IN TOP, BOTTOM & WALLS.

MINIMUM WALL THICKNESS TO BE NOT LESS THAN 8".

SEE PLAN FOR FLOW LINE ELEVATION & PIPE SIZE.

AT ALL P.V.C. PIPE CONNECTIONS TO A MANHOLE, A MANUFACTURED WATERSTOP SHALL BE INSTALLED IN THE CENTER OF THE POURED WALL.

NOTE: PRECAST PIPE, ADJUSTMENT RINGS & TAPERED SECTIONS SHALL BE CLASS 2 R.C.P. IN ACCORDANCE WITH ASTM C76-57T. ELLIPTICAL SINGLE LINE REINFORCEMENT WILL NOT BE PERMITTED.

DESCRIPTION

SPECIAL SEWER MANHOLE FOR LARGE DIAMETER MAIN

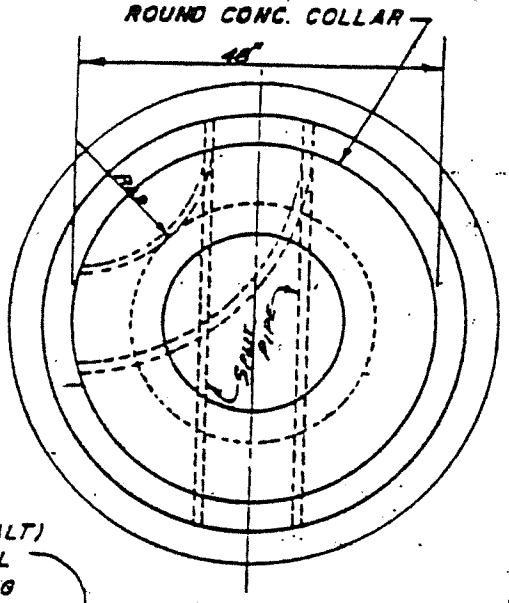
MALAGA COUNTY WATER DISTRICT

REF & REV

STD. NO. S-2

PLAN VIEW SHOWING QUARTER BEND TO BE USED WHEN MAKING A TURN.

QUARTER TURNS TO BE CONSTRUCTED TO FORM A SMOOTH FLOW LINE OF SAME SHAPE AND PATTERN AS BOTTOM WALL OF PIPE.



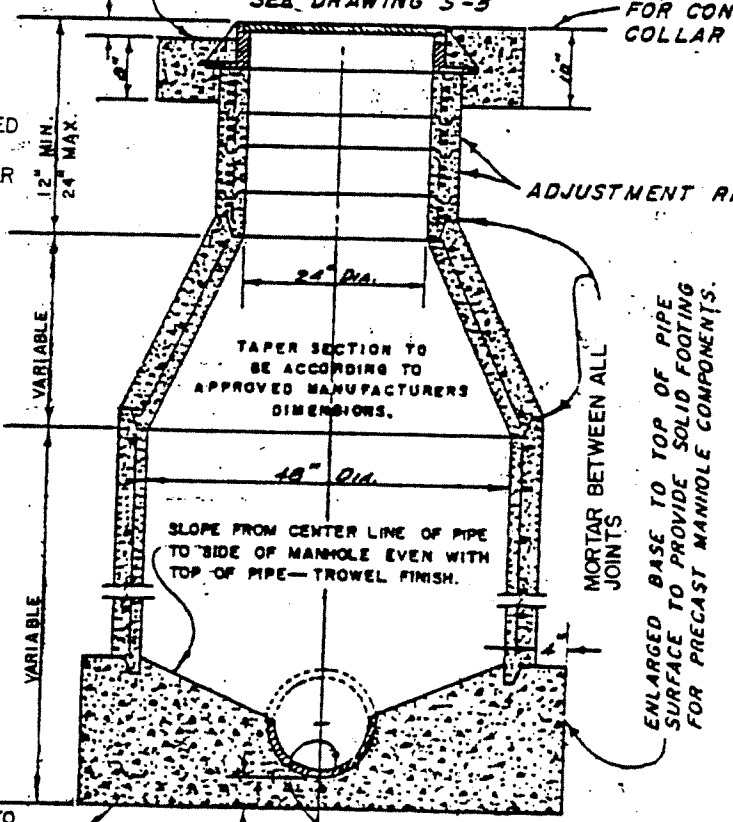
ALL STRAIGHT PIPE TO BE LAID THROUGH MANHOLES WITH TOP HALF REMOVED TO PROVIDE AT LEAST A 44" OPENING. ROUGH BROKEN EDGES SHALL BE MORTARED SMOOTH. THIS ALSO INCLUDES UPPER ENDS OF LINE MANHOLE.

TO BE PAVED WITH A.C. (85-100 PENETRATION ASPHALT) TACK-COAT CONC. & METAL SURFACES PRIOR TO PAVING

MANHOLE COVER & FRAME SEE DRAWING S-5

COLLAR AROUND C.I. FRAME — AS SHOWN. SET FRAME IN CONC. BED FOR CONC. STREETS ONLY — COLLAR TO BE FLUSH.

AT ALL P.V.C. PIPE CONNECTIONS TO A MANHOLE, A MANUFACTURED WATERSTOP SHALL BE INSTALLED IN THE CENTER OF THE POURED WALL.



PRECAST MANHOLE PIPE TO SET ON CLASS "A" CONCRETE POURED IN PLACE.

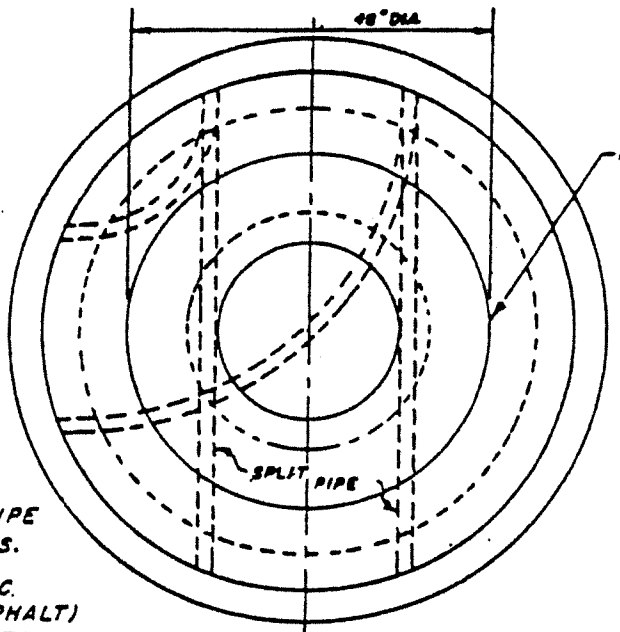
SEE PLAN FOR FLOW LINE ELEVATION AND SIZE OF PIPE.

MANHOLE DETAILS

SCALE: 1/2" = 1'-0"

NOTE: PRECAST PIPE, ADJUSTMENT RINGS AND TAPERED SECTIONS SHALL BE CLASS II R.C.P. IN ACCORDANCE WITH ASTM C76-57T. ELLIPTICAL SINGLE LINE REINFORCEMENT WILL NOT BE PERMITTED.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
48" SEWER MANHOLE	REF. & REV.	STD. NO. S-3



QUARTER TURNS TO BE CONSTRUCTED TO FORM A SMOOTH FLOW LINE OF SAME SHAPE AND PATTERN AS BOTTOM WALL OF PIPE.

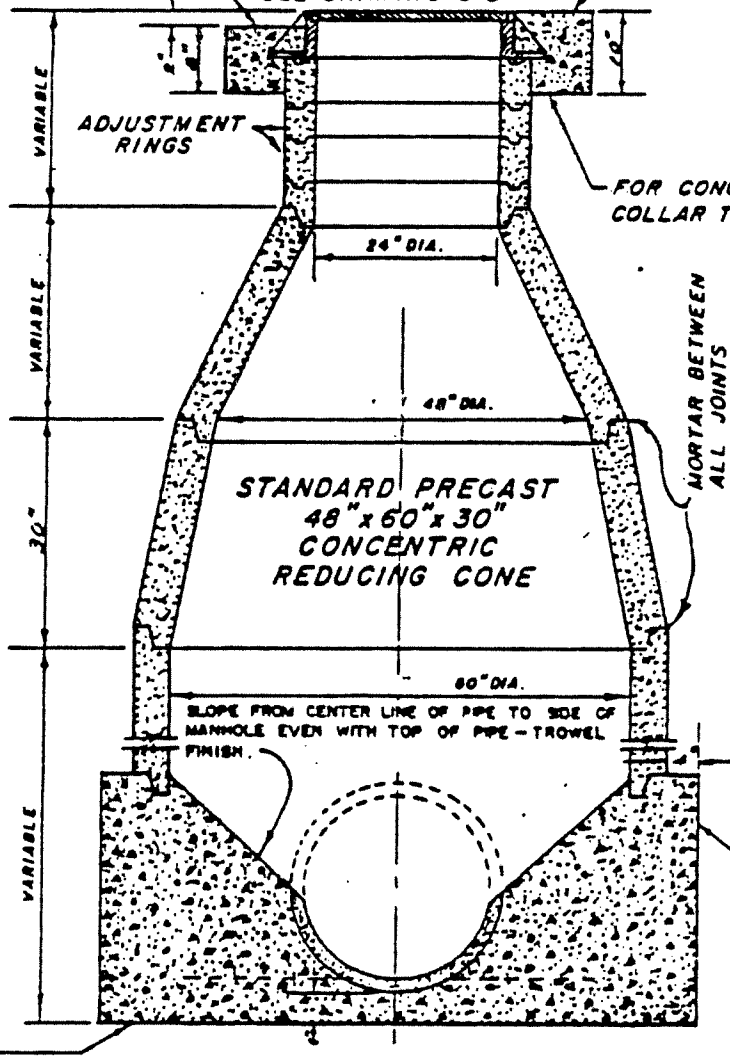
NOTE:
SECTIONS TO MEET ASTM SPECIFICATION C-76-57-CLASS II FOR CONCRETE PIPE FOR RESPECTIVE DIAMETERS.

NOTE:
WHEN PIPE IS CUT ALL EXPOSED REINFORCING STEEL TO BE COATED WITH 2" OF CONCRETE.

TO BE PAVED WITH A.C. (85-100 PENETRATION ASPHALT) TACK-COAT CONC. & METAL SURFACES PRIOR TO PAVING

MANHOLE COVER & FRAME SEE DRAWING S-5

SET FRAME IN CONCRETE BED



FOR CONCRETE STREETS ONLY COLLAR TO BE FLUSH

MORTAR BETWEEN ALL JOINTS

ENLARGED BASE TO TOP OF PIPE SURFACE TO PROVIDE SOLID FOOTING FOR PRECAST MANHOLE COMPONENTS.

PRECAST MANHOLE PIPE TO SET ON CLASS "A" CONCRETE POURED IN PLACE

SEE PLAN FOR FLOW LINE ELEVATION AND SIZE OF PIPE.

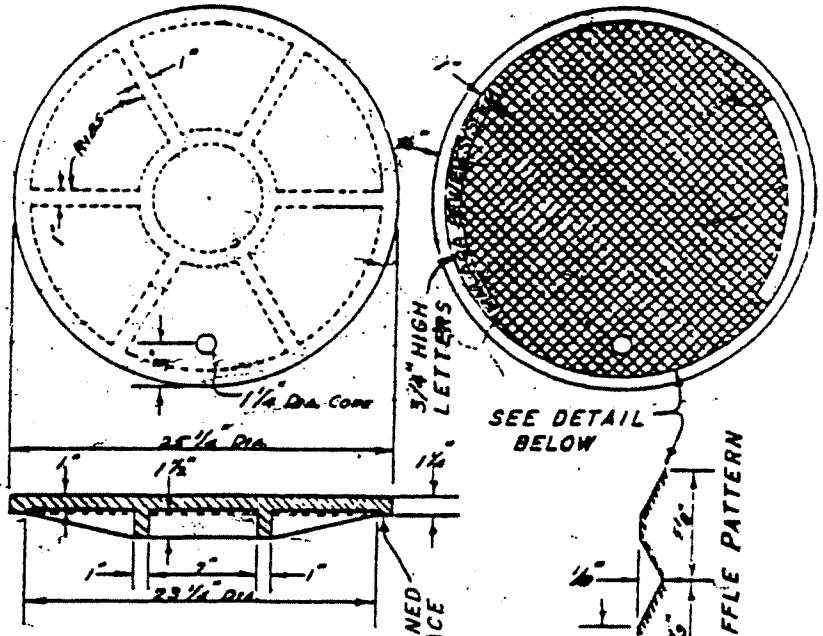
DESCRIPTION

60" SEWER MANHOLE

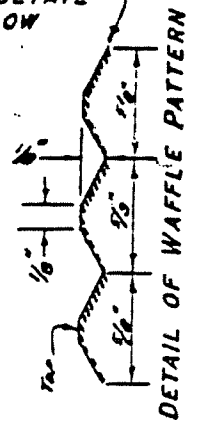
MALAGA COUNTY WATER DISTRICT

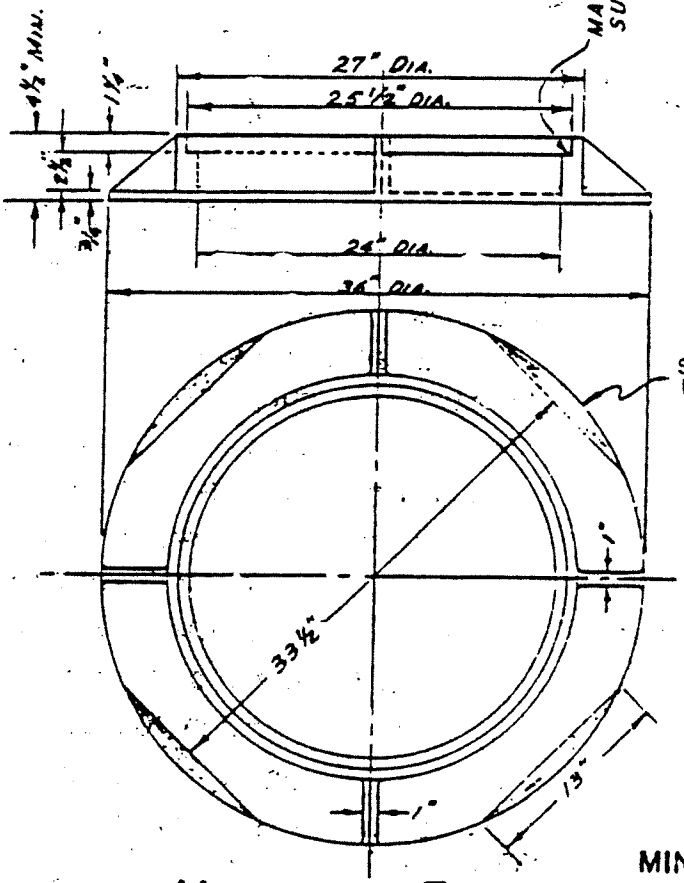
REF. & REV.

STD. NO. S- 4



MANHOLE COVER



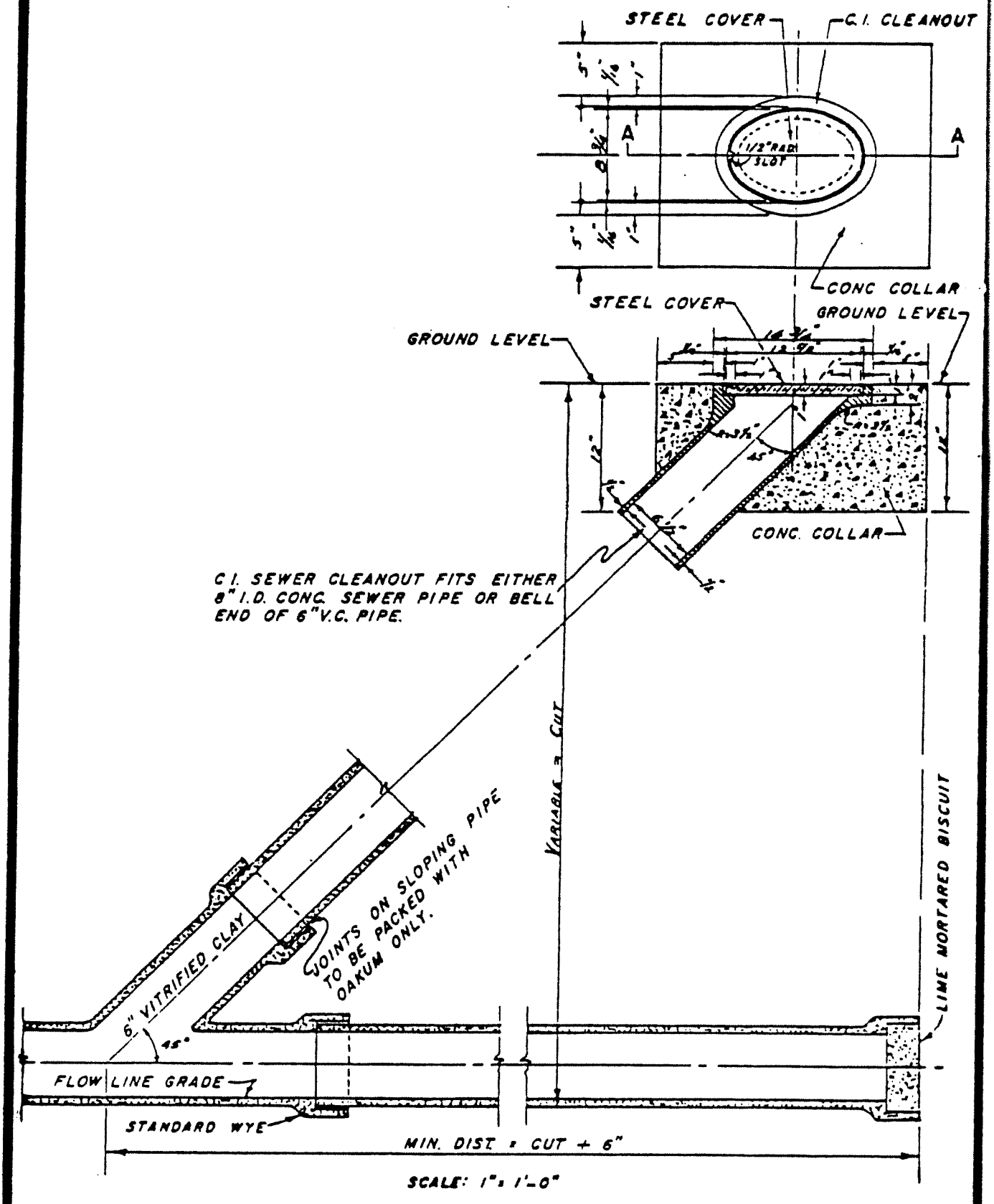


MANHOLE FRAME

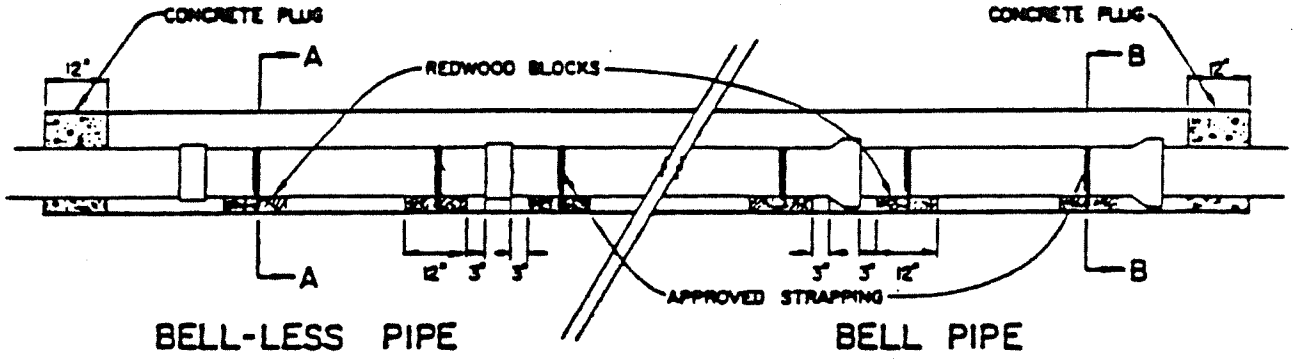
SCALE: 1" = 1'-0"

MINIMUM WEIGHTS
FRAME - 191 lbs.
COVER - 147 lbs.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
CAST IRON MANHOLE FRAME AND COVER	REF. & REV.	STD. NO. S-5

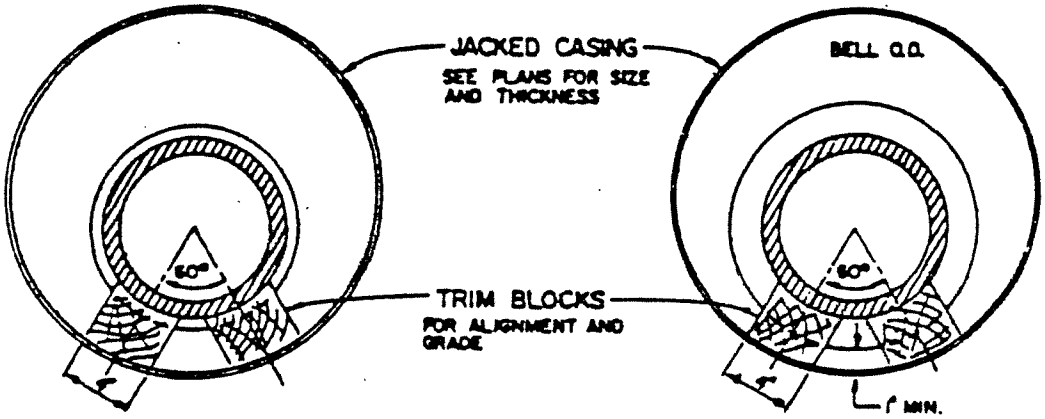


DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
SLOPING LAMPHOLE	REF. & REV.	STD. NO. S– 6



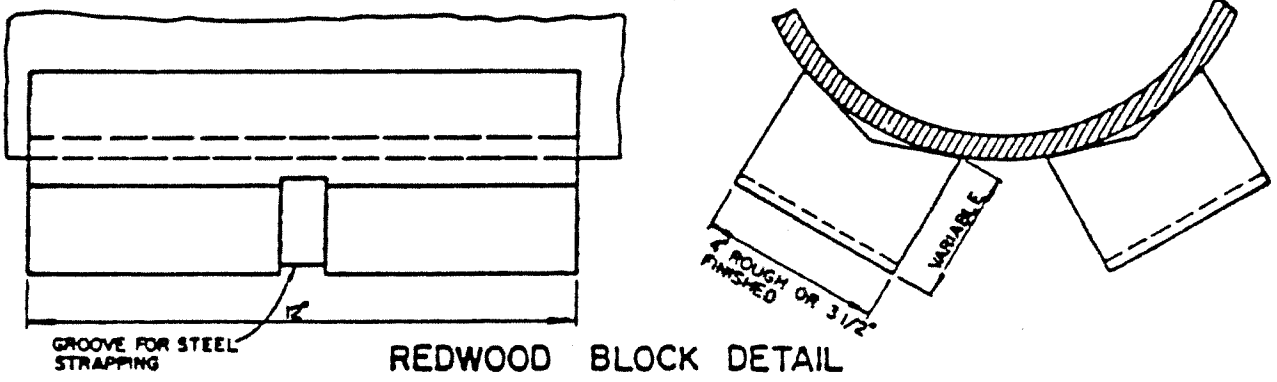
BELL-LESS PIPE

BELL PIPE



SECTION A-A

SECTION B-B

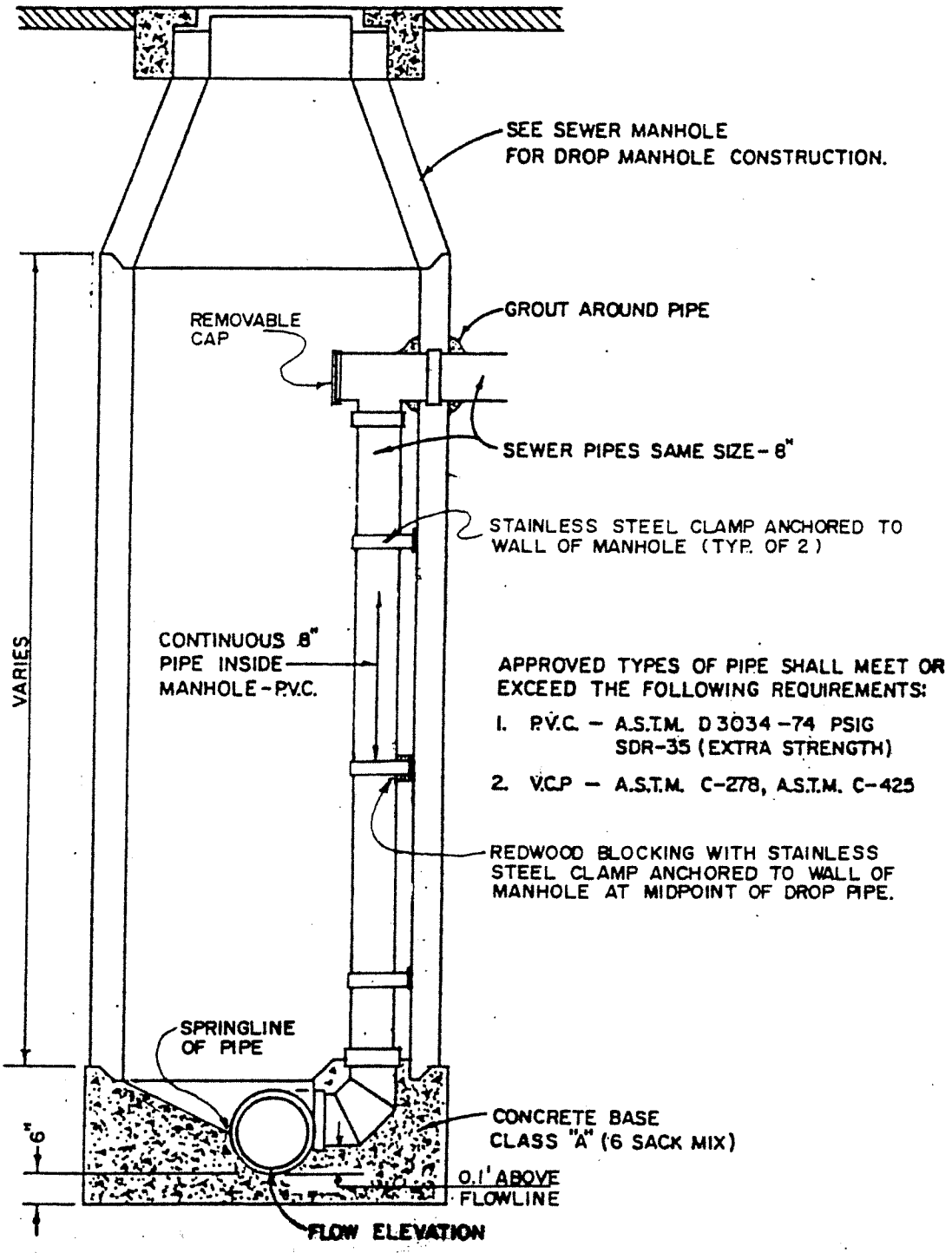


REDWOOD BLOCK DETAIL

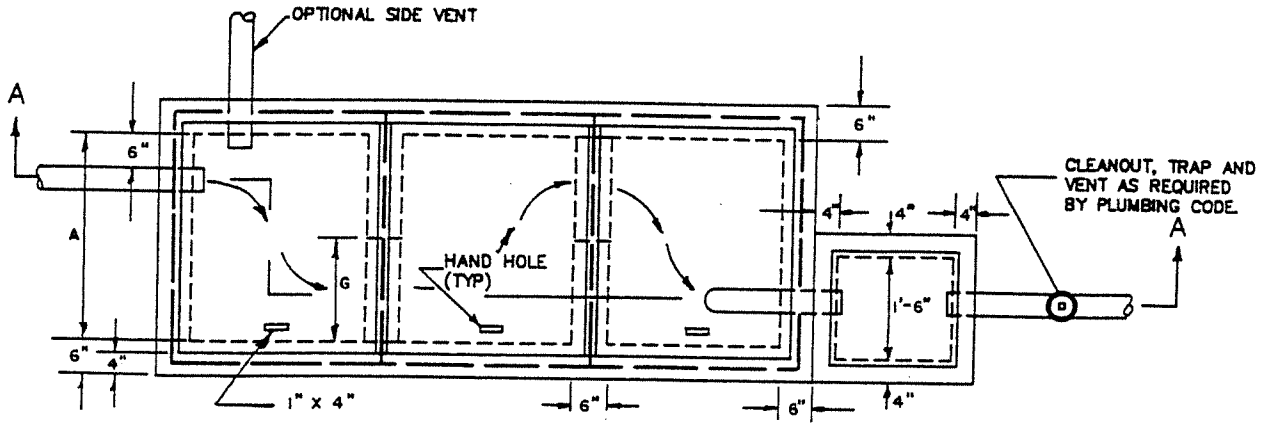
NOTES

1. REDWOOD BLOCKS SHALL BE CONSTRUCTION GRADE.
2. REDWOOD BLOCKS SHALL BE VEED TO FIT CONTOUR OF PIPE.
3. WHEN JACKING CASING GRADE SHALL BE SET SO CENTER LINE OF CASING SHALL COINCIDE WITH CENTER LINE OF SEWER PIPE.
4. REDWOOD BLOCKS SHALL BE STRAPPED TO THE PIPE WITH STEEL STRAPPING OR APPROVED WIRE BANDS.
5. PLUG ENDS OF CASING WITH 12 INCHES MINIMUM OF CONCRETE.
6. CONCRETE SHALL BE CLASS B.

DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
INSTALLATION OF SEWER PIPE IN JACKED STEEL CASING	REF. & REV.	STD NO. S- 7



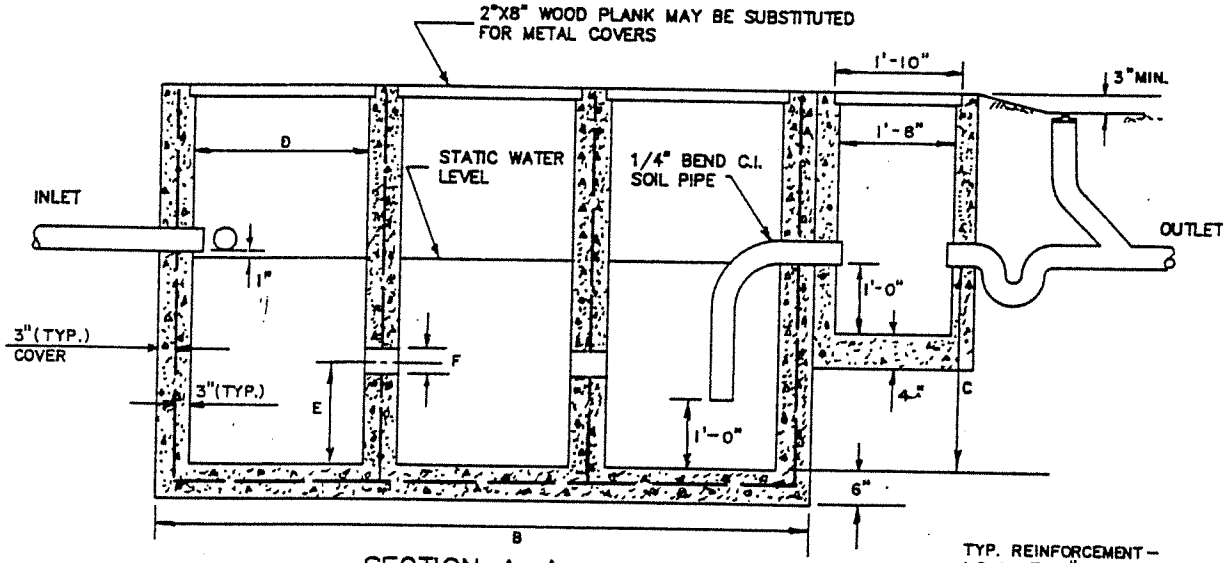
DESCRIPTION	MALAGA COUNTY WATER DISTRICT	
DROP MANHOLE	REF. & REV.	STD. NO. S- 8



PLAN

NOT TO SCALE

INTERCEPTOR AND SAMPLING BOX MAY BE MONOLITHIC OR CAST SEPARATELY AND JOINED TOGETHER WITH EPOXY RESIN.



SECTION A-A

NOT TO SCALE

TYP. REINFORCEMENT - NO. 4 AT 12" O.C. EACH WAY (WALLS AND SLABS)

NOTE: THE APPROVAL OF DISTRICT ENGINEER MUST BE OBTAINED BEFORE INSTALLATION. THE INTERCEPTOR TO BE CONSTRUCTED OF TYPE II PORTLAND CEMENT CONCRETE. INTERCEPTOR EXCEEDING 6'-6" IN DEPTH MUST BE CONSTRUCTED OF REINFORCED CONCRETE. IF INSTALLED INSIDE OF BUILDING, THE TOP OF THE INTERCEPTOR MAY BE LEVEL WITH FLOOR PROVIDED THAT WASTES ENTER THROUGH INLET PIPE ONLY. ALL SURFACE WATER MUST DRAIN AWAY FROM INTERCEPTOR TO EXCLUDE RAIN WATER FROM PUBLIC SEWERS.

CAPACITY GALLONS	DIMENSIONS							COVER SIZE	METAL COVERS	PIPE SIZE
	A	B	C	D	E	F	G			
510	3'-0"	9'-6"	3'-0"	2'-6"	1'-6"	0'-4 1/2"	1'-6"	2'-10"X3'-4"	1/4" STEEL	4"MIN
866	3'-6"	10'-3"	4'-0"	2'-9"	2'-0"	0'-6"	1'-9"	3'-1"X3'-10"	3/8" ALUM.	4"MIN
1260	4'-0"	12'-6"	4'-0"	3'-6"	2'-0"	0'-6"	2'-0"	3'-10"X4'-4"	3/8" ALUM.	4"MIN

DESCRIPTION

SAND AND GREASE INTERCEPTOR

MALAGA COUNTY WATER DISTRICT

REF. & REV.

STD. NO. S- 9

List of Approved Backflow Prevention Assemblies

FOUNDATION FOR CROSS-CONNECTION CONTROL
AND HYDRAULIC RESEARCH
UNIVERSITY OF SOUTHERN CALIFORNIA
BHE-315 University Park MC-0231
Los Angeles, California 90089-0231
(213) 743-2032

20 October 1988
Supersedes All Prior Lists

This *List of Approved Backflow Prevention Assemblies*, dated 20 October 1988, contains the following modifications:

ADDITIONS

Double Check Valve Assemblies

Hersey/Grinnell

Model HDC - 1 1/2", 2"

Watts

Model 007QT - 1 1/2", 2"
Model 007SSQT - 1 1/2", 2"
Model U007QT - 1 1/2", 2"
Model U007SSQT - 1 1/2", 2"

Double Check Detector Assemblies

Febco

Model 806 Type YD - 3"

Wilkins

Model DCDA - 4", 6"

Reduced Pressure Principle Detector Assemblies

Febco

Model 826 Type YD - 4"

Watts

Model 909DDC-M2 - 3"
Model 909DDC - 6"

ADDITIONS, continued

Reduced Pressure Principle Assemblies

Watts

Model 009QT - 1 1/4", 1 1/2", 2"
Model 009SSQT - 1 1/4", 1 1/2", 2"
Model U009QT - 1 1/4", 1 1/2", 2"
Model U009SSQT - 1 1/4", 1 1/2", 2"

MODIFICATIONS

The Grinnell Corporation has reqested that the assemblies previously shown under the separate names of Beeco ahd Hersey be listed as Hersey/Grinnell. This affects those listings for double check valve assemblies, reduced pressure principle assemblies and double check detector assemblies.

Listed below are modifications to the model numbers which the respective manufacturer requested. No change in design has been made.

Double Check Valve Assemblies

Ames

Model 2000 DCA - 4", 6", 8"
(Formerly listed as Model DCA)
Model 2000 DC - 10"
(Formerly listed as Model DC)

Wilkins

550 - M10" 6"x8"x10" Manifold
(Formerly listed as Model MBD)

Watts

Model 007QT - 3/4", 1"
(Formerly listed as Model 007)
Model 007SSQT - 3/4", 1"
(Formerly listed as Model 007)
Model U007QT - 3/4", 1"
(Formerly listed as Model 007U)
Model U007SSQT - 3/4", 1"
(Formerly listed as Model 007U)

MODIFICATIONS, continued

Double Check Detector Assemblies

Ames

Model 3000 DCDA - 4", 8"
(Formerly listed as Model DCDA)
Model 3000 DCDA - 6"
(Formerly listed as Model DCDA-I)
Model 3000 DCDC - 10"
(Formerly listed as Model DCDC)

Reduced Pressure Principle Assemblies

Ames

Model 4000 RP - 4", 6", 8", 10"
(Formerly listed as Model RP)

Wilkins

575 - M8" 4"x4"x8" Manifold
(Formerly listed as Model MBC)
575 - M10" 6"x6"x10" Manifold
(Formerly listed as Model MBC)

Watts

Model 009QT - 3/4", 1"
(Formerly listed as Model 009)
Model 009SSQT - 3/4", 1"
(Formerly listed as Model 009)
Model U009QT - 3/4", 1"
(Formerly listed as Model 009U)
Model U009SSQT - 3/4", 1"
(Formerly listed as Model 009U)

Atmospheric (non-pressure) Vacuum Breakers

Watts

288A-M3 - 1/4", 3/8", 1/2", 3/4",1", 1 1/4", 1 1/2", 2", 2 1/2", 3"
(Formerly listed as Model 288A)

DELETIONS

Atmospheric (non-pressure) Vacuum Breakers

Conbraco

Model 38-103 - 1/2" (Removed from L.A. City Mechanical Testing Laboratory List)
Model 38-104 - 3/4" (Removed from L.A. City Mechanical Testing Laboratory List)
Model 38-105 - 1" (Removed from L.A. City Mechanical Testing Laboratory List)

SPARE PARTS ONLY

The assemblies listed below are no longer manufactured as complete units, however, spare parts from the original manufacturer are still available.

Double Check Valve Assemblies

Ames

Model DC - 4", 6", 8"

Double Check Detector Assemblies

Ames

Model DCDC 4", 6", 8"

Should you have any questions, please contact the Foundation office at the number listed on the cover of this list.

List of Approved Backflow Prevention Assemblies

Notice:

The original Certificate of Approval - identified by the Edition of the Manual and the Approved date shown below - is valid only if the original or renewal date shown hereon is within three (3) years of the current date. The responsibility to request a renewal of an Approval is that of each manufacturer. The Foundation retains the right of determining the extent of re-evaluation required before renewal is granted. Certificiates of Approval are not recalled for the purpose of updating the effective date. This revision of date is only published via the current "List of Approved Backflow Prevention Assemblies."

Unless otherwise specified by the manufacturer all assemblies are to be installed on cold water applications - below 110°F.

Use of spare parts other than those of the original manufacturer invalidates the Approval.

Double Check Valve Assemblies

COMPANY	MODEL-SIZE	STATUS OF APPROVAL
Ames	ψ DC - 4", 6"	Approved 6th Ed. of Manual (14 June 1985) Renewed 14 June 1988
	ψ DC - 8"	Approved 7th Ed. of Manual (4 Aug 1987)
	2000-DC - 10" (formerly DC)	Approved 7th Ed. of Manual (4 Aug 1987)
	2000-DCA - 4", 6", 8" (formerly DCA)	Approved 7th Ed. of Manual (11 Jan 1988)
Beeco - See Hersey/Grinnell		
Cla-Val	D - 2", 4", 6"	Full Approval 3rd Ed. of Manual
	D - 2 1/2"	Approved 4th Ed. of Manual (1 Oct 1972) Renewed 1 October 1987
	D - 3"	Approved 4th Ed. of Manual (18 May 1970) Renewed 7 January 1986
	D - 8"	Approved 4th Ed. of Manual (27 June 1973) Renewed 7 January 1986
	D - 10"	Approved 5th Ed. of Manual (10 Oct 1975) Renewed 10 October 1987
	D2 - 1 1/4", 1 1/2"	Approved 5th Ed. of Manual (6 Nov 1976) Renewed 6 November 1985
	D2 - 3/4", 1"	Approved 5th Ed. of Manual (19 April 1977) Renewed 19 April 1986
Febco	805 - 3/4", 1", 1 1/2", 2"	Approved 4th Ed. of Manual (29 April 1974) Renewed 29 April 1986
	805 - 3", 4"	Approved 4th Ed. of Manual (26 Oct 1973) Renewed 7 January 1986

ψ - Only spare parts available

Double Check Valve Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Febco	805Y - 3/4", 1"	Approved 6th Ed. of Manual (13 May 1982) Renewed 13 May 1988
	805Y - 1 1/2", 2"	Approved 6th Ed. of Manual (5 Jan. 1983) Renewed 5 January 1986
	ψ 805Y - 2 1/2"	Approved 6th Ed. of Manual (7 March 1983) Renewed 7 March 1986
	ψ 805Y - 3", 4"	Approved 6th Ed. of Manual (4 August 1982) Renewed 4 August 1988
	ψ 805Y - 6", 8"	Approved 5th Ed. of Manual (26 Aug 1977) Renewed 26 August 1986
	ψ 805Y - 10"	Approved 5th Ed. of Manual (31 May 1978) Renewed 31 May 1987
	805 Type YD - 2 1/2",3",4", 6",8",10"	Approved 7th Ed. of Manual (19 June 1987)
Grinnell Model B2 - see Kennedy 1373		
Hersey/Grinnell		
	VC - 2", 3", 4"	Full Approval Paper No. 5
	FDC - 3/4"	Approved 5th Ed. of Manual (21 Oct 1976) Renewed 5 October 1988
	FDC - 1 1/2"	Approved 5th Ed. of Manual (1 Aug 1979) Renewed 1 Aug 1988
	FDC - 2"	Approved 5th Ed. of Manual (20 Dec 1978) Renewed 20 December 1987
	HDC - 3/4"	Approved 7th Ed. of Manual (22 July 1986)
	HDC - 1 1/2"	Approved 7th Ed. of Manual (19 August 1988)
	ψ #1 - 2", 3", 4", 6", 8", 10"	Full Approval 2nd Ed. of Manual
	#2 - 3", 4"	Approved 5th Ed. of Manual (27 Dec 1978) Renewed 27 December 1987
	#2 - 6"	Approved 5th Ed. of Manual (22 Dec 1978) Renewed 22 December 1987
	#2 - 8"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	#2 - 10"	Approved 6th Ed. of Manual (19 Feb. 1982) Renewed 19 February 1988
	E-1 -4"	Approved 5th Ed. of Manual (24 July 1979) Renewed 24 July 1988
	E-1 -6"	Approved 5th Ed. of Manual (30 Dec 1979) Renewed 30 December 1988
Kennedy	1373 - 4", 6", 8"	Full Approval Paper No. 5
	1373 - 10"	Approved 5th Ed. of Manual (21 Oct 1975) Renewed 21 October 1984
Mueller	H-9505 - 4"	Approved 6th Ed. of Manual (10 May 1985) Renewed 10 May 1988

ψ - Only spare parts available

Double Check Valve Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Mueller	H-9505 - 6"	Approved 6th Ed. of Manual (10 June 1985) Renewed 10 June 1988
	H-9505 - 8"	Approved 7th Ed. of Manual (17 March 1986)
	H-9505 - 10"	Approved 7th Ed. of Manual (1 March 1986)
Neptune - see Wilkins		
Orion	80-0070 - 1 1/2"	Approved 5th Ed. of Manual (16 May 1975) Renewed 16 May 1981
	9-2930 - 2"	Approved 5th Ed. of Manual (16 May 1975) Renewed 16 May 1981
	BDC - 3/4", 1"	Approved 5th Ed. of Manual (7 Dec 1976) Renewed 7 December 1982
	BDC - 4"	Approved 5th Ed. of Manual (18 Jan 1979) Renewed 18 January 1982
	BDC - 3"	Approved 6th Ed. of Manual (9 Sept 1982) Renewed 18 January 1985
Rain Bird	ψ DC-250L - 2 1/2"	Approved 5th Ed. of Manual (10 Jan 1981) Renewed 10 January 1987
	ψ DC-300L - 3"	Approved 5th Ed. of Manual (10 Jan 1981) Renewed 10 January 1987
	DCA-075-R - 3/4"	Approved 6th Ed. of Manual (4 August 1982) Renewed 4 August 1988
	DCA-100-R - 1"	Approved 6th Ed. of Manual (4 August 1982) Renewed 4 August 1988
	DCA-150-R - 1 1/2"	Approved 6th Ed. of Manual (27 April 1982) Renewed 27 April 1988
	DCA-200-R - 2"	Approved 6th Ed. of Manual (27 April 1982) Renewed 27 April 1988
	DCA-250-R - 2 1/2"	Approved 6th Ed. of Manual (20 July 1982) Renewed 20 July 1988
	DCA-300-R - 3"	Approved 6th Ed. of Manual (20 July 1982) Renewed 20 July 1988
	DCA-400-R - 4"	Approved 6th Ed. of Manual (15 Jan 1982) Renewed 15 January 1988
	DCA-600-R - 6"	Approved 6th Ed. of Manual (18 May 1981) Renewed 18 May 1987
	DCA-800-R - 8"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	DCA-1000-R - 10"	Approved 6th Ed. of Manual (16 March 1983) Renewed 16 March 1986
Richwell - see Wilkins		
Rockwell	ψ 711 - 1 1/2", 2"	Approved 5th Ed.of Manual (19 Jan 1979) Renewed 19 January 1988

ψ - Only spare parts available

Double Check Valve Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Rockwell	ψ 711 - 2 1/2", 3"	Approved 5th Ed. of Manual (9 Aug 1977) Renewed 9 August 1986
	ψ 711 - 4"	Approved 5th Ed. of Manual (31 Aug 1977) Renewed 31 August 1986
	ψ 711 - 6"	Approved 5th Ed. of Manual (3 April 1980) Renewed 3 April 1986
SMR - see Wilkins		
Toro - see Orion		
Viking	A-1 -8"	Approved 5th Ed. of Manual (21 Oct 1976) Renewed 5 October 1985
	A-1 - 4", 6"	Approved 5th Ed. of Manual (22 June 1977) Renewed 20 June 1986
	A-1 - 10"	Approved 5th Ed. of Manual (28 Sept 1977) Renewed 28 September 1986
Watts	ψ 700 - 2 1/2", 3"	Approved 5th Ed. of Manual (10 Jan 1981) Renewed 10 January 1987
	709 QT - 3/4", 1"	Approved 5th Ed. of Manual (4 August 1982) Renewed 4 August 1988
	709 QT - 1 1/2", 2"	Approved 6th Ed. of Manual (27 April 1982) Renewed 27 April 1988
	709 RW Bronze - 2 1/2", 3"	Approved 6th Ed. of Manual (20 July 1982) Renewed 20 July 1988
	709 RW - 2 1/2", 3"	Approved 7th Ed. of Manual (12 June 1986)
	709 RW - 4"	Approved 6th Ed. of Manual (15 Jan. 1982) Renewed 15 January 1988
	709 RW - 6"	Approved 6th Ed. of Manual (18 May 1982) Renewed 18 May 1988
	709 RW - 8"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	709 RW - 10"	Approved 6th Ed. of Manual (16 March 1983) Renewed 16 March 1986
	007QT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	007SSQT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	U007QT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	U007SSQT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	007QT - 1 1/2", 2"	Approved 7th Ed. of Manual (21 July 1988)
	007SSQT - 1 1/2", 2"	Approved 7th Ed. of Manual (21 July 1988)
	U007QT - 1 1/2", 2"	Approved 7th Ed. of Manual (21 July 1988)
	U007SSQT - 1 1/2", 2"	Approved 7th Ed. of Manual (21 July 1988)

ψ - Only spare parts available

Double Check Valve Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Wilkins	ψ 550 - 3/4", 1"	Approved 5th Ed. of Manual (11 Oct 1976) Renewed 5 October 1988
	550A - 3/4", 1"	Approved 7th Ed. of Manual (17 April 1987)
	550 - 1 1/4", 1 1/2", 2"	Approved 5th Ed. of Manual (11 Oct 1976) Renewed 5 October 1988
	550 - 2 1/2"	Approved 7th Ed. of Manual (25 Sept 1986)
	550 - 3"	Approved 5th Ed. of Manual (20 Aug 1979) Renewed 20 August 1988
	550 - 4"	Approved 5th Ed. of Manual (20 June 1980) Renewed 20 June 1986
	550 - 6"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	550 - M10" (6"x6"x10"Manifold) (formerly MBD)	Approved 6th Ed. of Manual (11 April 1983) Renewed 11 April 1986

Detector Backflow Prevention Assemblies

WARNING

The Double Check Detector Assemblies (DCDA) and Reduced Pressure Principle Detector Assemblies (RPDA) shown below have been evaluated with a specific meter as the detector element of the assembly. That specific meter is coded by a parenthetic letter shown immediately after the size designation. This coding of meters is shown in this Section. Other meters having similar performance characteristics to permit the assembly to meet the Specifications are shown immediately after the original evaluation meter. The use of any other meter or modified bypass piping invalidates the Approval.

Most of the Approved Assemblies below utilize a line-size assembly which is not a standard or stock Approved Assembly. Increased loads are required in these line-size units to allow the assembly to accurately record low flow rates in the bypass meter. Therefore, various 'off the shelf' components cannot be assembled and expected to perform satisfactorily.

Identification of meters:

(A) Hersey Model F-F 5/8"x3/4"
(B) Hays Acumeter 5/8"x3/4"
(C) Master Meter 5/8"
(D) Carlon 5/8"
(E) Dande' Model D-3 5/8"x3/4"
(F) Gamon-Calmet 5/8"
(G) Precision 5/8"
(H) Rockwell 5/8"
(I) Hersey Model 430 - 5/8"
(J) Neptune Trident 8 5/8"
(K) Neptune 5/8"
(L) Arad 5/8"x3/4"
(M) Neptune T-10 5/8"
(N) Badger Model 25 3/4"
(O) Kent Model C700 5/8"x3/4"
(P) Rockwell Model SR 3/4" Short
(Q) Hersey Model MVR-30 3/4"

ψ - Only spare parts available

Double Check Detector Assemblies

COMPANY	MODEL-SIZE	STATUS OF APPROVAL
Ames	ψ DCDC - 4", 6" (G),A,B,C,D,E, F,H,I,J,K,L,M,N,O,P,Q	Approved 6th Ed. of Manual (14 June 1985) Renewed 14 June 1988
	ψ DCDC - 8" (G),A,B,C,D,E, F,H,I,J,K,L,M,N,O,P,Q	Approved 7th Ed. of Manual (4 Aug 1987)
	3000-DCDC - 10" (M),B,C,D,E,F G,H,I,J,K,L,N,O,P,Q (Formerly DCDC)	Approved 7th Ed. of Manual (4 Aug 1987)
	3000 DCDA - 4" (M),B,C,D,E,F G,H,I,J,K,L,N,O,P,Q (Formerly DCDA)	Approved 7th Ed. of Manual (11 Jan 1988)
	3000 DCDA - 8" (M),B,C,D,E,F G,H,I,J,K,L,N,O,P,Q (Formerly DCDA)	Approved 7th Ed. of Manual (11 Jan 1988)
	3000 DCDA - 6" (M),B,C,D,E,F G,H,I,J,K,L,N,O,P,Q (Formerly DCDA-I)	Approved 7th Ed. of Manual (11 Jan 1988)
Cla-Val	Model 16 - 4",6",8",10" (D),E,F,G,H,I,J,K,L,M,N,O,P,Q	Approved 6th Ed. of Manual (14 Dec 1979) Renewed 14 December 1985
Febco	ψ Model 806 - 4" (L),A,B,C, D,E,F,G,H,I,J,K,M,N,O,P,Q	Approved 6th Ed. of Manual (4 Aug 1983) Renewed 4 August 1985
	ψ Model 806 - 6",8",10" (L),A, B,C,D,E,F,G,H,I,J,K,M,N,O,P,Q	Approved 6th Ed. of Manual (13 May 1982) Renewed 13 May 1988
	Model 806 TYPE YD - 4",6",8",10" (L),A,B,C,D,E,F,G,H,I,J,K,M,N,O,P,Q	Approved 7th Ed. of Manual (10 July 1987)
	Model 806 Type YD - 3" (M),B,C,D, E,F,G,H,I,J,K,L,N,O,P,Q	Approved 8th Ed. of Manual (26 Sept. 1988)
Hersey/Grinnell		
	Model DDC-II - 3" (Q),A,B,C,D, E,F,G,H,I,J,K,L,M,N,O,P	Approved 6th Ed. of Manual (31 Jan 1985) Renewed 31 Jan 1988
	Model DDC-II - 4",8" (I),J,K,L, M,N,O,P,Q	Approved 6th Ed. of Manual (10 Apr 1980) Renewed 18 March 1986
	Model DDC-II - 8" (I),J,K,L,M,N, O,P,Q	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	Model DDC-II - 10" (Q),B,C,D,E,F, G,H,I,J,K,L,M,N,O,P	Approved 7th Ed. of Manual (14 Mar 1986)
Watts	Model 709DDC - 3" (N),B,C,D,E,F, G,H,I,J,K,L,M,O,P,Q	Approved 6th Ed. of Manual (19 Apr 1987)
	Model 709DDC - 4", 6" (N),A,B, C,D,E,F,G,H,I,J,K,L,M,O,P,Q	Approved 6th Ed. of Manual (27 July 1987)
	Model 709DDC - 8" (N),A,B,C,D,E, F,G,H,I,J,K,L,M,O,P,Q	Approved 6th Ed. of Manual (19 Apr 1987)
	Model 709DDC - 10" (N),E,F,G,H,I J,K,L,M,O,P,Q	Approved 6th Ed. of Manual (27 July 1987)

ψ - Only spare parts available

Double Check Detector Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Wilkins	Model DCDA - 2 1/2", 3" (P) B,C, D,E,F,G,H,I,J,K,L,M,N,O,Q	Approved 7th Ed. of Manual (5 March 1987)
	Model DCDA - 4" (M),A,B,C,D,E, F,G,H,I,J,K,L,N,O,P,Q	Approved 7th Ed. of Manual (18 May 1988)
	Model DCDA - 6" (M),A,B,C,D,E, F,G,H,I,J,K,L,N,O,P,Q	Approved 7th Ed. of Manual (2 June 1988)

Reduced Pressure Principle Detector Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Febco	Model 826 Type D - 4" (M),B,C,D,E, F,G,H,I,J,K,L,N,O,P,Q	Approved 8th Ed. of Manual (14 Oct 1988)
Watts	Model 909DDC-M2 - 3" (N),B,C,D, E,F,G,H,I,J,K,L,M,O,P,Q	Approved 8th Ed. of Manual (5 Oct 1988)
	Model 909DDC - 6" (N),B,C,D,E,F, G,H,I,J,K,L,M,O,P,Q	Approved 8th Ed. of Manual (5 Oct 1988)

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Ames	Model 4000 RP - 4", 6", 8", 10" (formerly Model RP)	Approved 7th Ed. of Manual (13 Oct 1987)
Beeco - See Hersey/Grinnell		
Cla-Val	ψ RP-1 - 2", 2 1/2"	Approved 5th Ed. of Manual (3 May 1974) Renewed 3 May 1986
	ψ RP-1 - 4", 6", 8", 10"	Approved 5th Ed.of Manual (3 July 1975) Renewed 3 July 1987
	ψ RP-1 - 3"	Approved 5th Ed. of Manual (3l Oct 1975) Renewed 31 October 1987
	RP-1 EX - 2", 2 1/2"	Approved 5th Ed. of Manual (3 May 1974) Renewed 3 May 1986
	RP-1 EX - 4", 6", 8", 10"	Approved 5th Ed.of Manual (3 July 1975) Renewed 3 July 1987
	RP-1 EX - 3"	Approved 5th Ed. of Manual (3l Oct 1975) Renewed 31 October 1987
	RP-2 - 3/4", 1"	Approved 4th Ed. of Manual (6 Feb 1974) Renewed 18 March 1986
	RP-2 - 1 1/4", 1 1/2"	Approved 5th Ed. of Manual (13 Aug 1976) Renewed 5 October 1988
	RP-4 - 6"	Approved 7th Ed. of Manual (7 August 1987)

ψ - Only spare parts available

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Craneline	ψ A - see Hersey/Grinnell 6C	
Febco	825 - 1 1/2", 2", 2 1/2"	Approved 5th Ed. of Manual (17 Mar 1975) Renewed 17 March 1987
	ψ 825 - 3"	Approved 5th Ed. of Manual (16 June 1975) Renewed 16 June 1987
	ψ 825 - 4"	Approved 5th Ed. of Manual (12 June 1975) Renewed 12 June 1987
	ψ 825 - 6"	Approved 5th Ed. of Manual (6 June 1975) Renewed 6 June 1987
	ψ 825 - 8"	Approved 5th Ed. of Manual (11 Nov 1975) Renewed 11 November 1987
	ψ 825 - 10"	Approved 5th Ed. of Manual (23 March 1979) Renewed 23 March 1988
	ψ 835B- 3/4", 1", 1 1/2", 2"	Approved 5th Ed. of Manual (6 March 1979) Renewed 6 March 1988
	825 Type D - 2 1/2",3",4", 6",8",10"	Approved 7th Ed. of Manual (13 Sept 1987)
	825Y - 3/4", 1"	Approved 6th Ed. of Manual (19 March 1982) Renewed 19 March 1988
	825Y - 1 1/4"	Approved 6th Ed. of Manual (3 June 1982) Renewed 3 June 1988
	825Y - 1 1/2", 2"	Approved 6th Ed. of Manual (6 August 1982) Renewed 6 August 1988
	845 - 3/4", 1"	Approved 7th Ed. of Manual (27 March 1986)
Hersey/Grinnell		
	ψ #6C- 1", 1 1/2", 2", 2 1/2", 3", 4", 6", 8", 10"	Full Approval - Paper No. 5
	ψ #10- 1 1/4"	Full Approval - Paper No. 5
	ψ #12- 3/4"	Full Approval - Paper No. 5
	ψ Model 14 - 1"	Approved 4th Ed. of Manual (30 July 1971) Renewed 30 July 1987
	ψ Model 14 - 3/4"	Approved 4th Ed. of Manual (22 Dec 1971) Renewed 22 December 1986
	ψ Model 14 - 1 1/2"	Approved 4th Ed. of Manual (11 Mar 1974) Renewed 21 March 1986
	ψ Model 14 - 2"	Approved 5th Ed. of Manual (14 May 1973) Renewed 21 March 1986
	ψ Model 14 - 2 1/2"	Approved 5th Ed. of Manual (25 Nov 1974) Renewed 25 November 1986
	ψ Model 14 - 3"	Approved 4th Ed. of Manual (23 Jan 1974) Renewed 21 March 1986

ψ - Only spare parts available

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Hersey/Grinnell		
	ψ Model 14 - 4"	Approved 5th Ed. of Manual (19 Dec 1975) Renewed 19 December 1987
	ψ Model 14 - 6"	Approved 5th Ed. of Manual (18 Aug 1976) Renewed 5 October 1987
	Model 6CM - 2 1/2"	Approved 6th Ed. of Manual (12 Aug 1983) Renewed 12 Aug 1986
	Model 6CM - 3"	Approved 5th Ed. of Manual (1 Dec 1978) Renewed 1 December 1987
	Model 6CM - 4"	Approved 5th Ed. of Manual (21 Dec 1978) Renewed 21 December 1987
	Model 6CM - 6"	Approved 5th Ed. of Manual (27 Dec 1978) Renewed 27 December 1987
	Model 6CM - 8"	Approved 5th Ed. of Manual (10 Feb 1981) Renewed 10 February 1987
	Model 6CM - 10"	Approved 6th Ed. of Manual (19 Feb 1982) Renewed 19 February 1988
	ψ Model FRP - 3/4", 1"	*Approved 5th Ed. of Manual (11 Oct 1976) Renewed 5 October 1987
	*See Installation Instruction Tag on assembly - must be installed with assembly rotated 45° about the pipeline axis with the No. 2 test cock downward.	
	Model FRP-2 - 3/4", 1"	Approved 5th Ed. of Manual (15 Dec 1978) Renewed 15 December 1987
	Model FRP-2 - 1 1/2"	Approved 5th Ed. of Manual (10 April 1980) Renewed 18 March 1986
	M[illegible] 2"	Approved 5th Ed. of Manual (5 May 1980) Renewed 5 May 1986
	Model FRP-2 - 1 1/4"	Approved 6th Ed. of Manual (21 Jan 1981) Renewed 21 Jan 1987
	Model 6CM-Bronze - 2 1/2"	Approved 5th Ed. of Manual (30 Nov 1978) Renewed 30 November 1987
	Model 6CM-Bronze - 3", 4"	Approved 6th Ed. of Manual (6 Aug 1980) Renewed 6 August 1986
	Model 6CM-Bronze - 6"	Approved 6th Ed. of Manual (23 Dec 1980) Renewed 23 December 1986
ITT Lawler	ψ RZ-12 - 3"	Approved 5th Ed. of Manual (27 Sept 1979) Renewed 27 September 1982
	ψ RZ-24 - 6"	Approved 5th Ed. of Manual (25 Sept 1979) Renewed 25 September 1982
	ψ RZ-16 - 4"	Approved 5th Ed. of Manual (7 Feb 1980) Renewed 7 February 1983
	ψ RZ-32 - 8"	Approved 5th Ed. of Manual (21 Jan 1981) Renewed 21 Jan 1984

ψ - Only spare parts available

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
ITT Lawler	ψ RZ-40 - 10"	Approved 5th Ed. of Manual (21 Jan 1981) Renewed 21 Jan 1984
Mueller	H-9506 - 4"	Approved 6th Ed. of Manual (10 May 1985) Renewed 10 May 1988
	H-9506 - 6", 8"	Approved 6th Ed. of Manual (10 June 1985) Renewed 10 May 1988
	H-9506 - 10"	Approved 7th Ed. of Manual (1 March 1986)
Orion	80-0069 - 1 1/2"	Approved 5th Ed. of Manual (20 Nov 1975) Renewed 20 November 1981
	BRP - 3/4", 1"	Approved 5th Ed. of Manual (15 Dec 1977) Renewed 15 December 1983
	9-2929 - 2"	Approved 5th Ed.of Manual (20 Nov 1975) Renewed 20 November 1981
	BRP - 3"	Approved 5th Ed. of Manual (16 June 1980) Renewed 16 June 1983
	BRP - 4"	Approved 5th Ed. of Manual (19 April 1979) Renewed 19 April 1982
Rain Bird	Model RPA - 075-R - 3/4"	Approved 5th Ed. of Manual (29 Sept 1979) Renewed 29 September 1988
	Model RPA - 100-R - 1"	Approved 5th Ed.of Manual (29 Sept 1979) Renewed 29 September 1988
	Model RPA - 125-R - 1 1/4"	Approved 5th Ed. of Manual (7 Febr 1980) Renewed 7 February 1986
	Model RPA - 150-R - 1 1/2"	Approved 5th Ed.of Manual (7 Feb. 1980) Renewed 7 February 1986
	Model RPA - 200-R - 2"	Approved 5th Ed. of Manual (7 Feb 1980) Renewed 7 February 1986
	Model RPA - 250-R - 2 1/2"	Approved 6th Ed. of Manual (4 Feb 1983) Renewed 4 February 1986
	Model RPA - 300-R - 3"	Approved 6th Ed. of Manual (4 Feb 1983) Renewed 4 February 1986
	Model RPA - 400-R - 4"	Approved 6th Ed. of Manual (15 Jan 1982) Renewed 15 January 1988
	Model RPA - 600-R - 6"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	Model RPA - 800-R - 8"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	Model RPA - 1000-R - 10"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
Richwell - see Wilkins		

ψ - Only spare parts available

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Rockwell	ψ 701 - 1 1/2", 2"	Approved 5th Ed. of Manual (18 Jan 1979) Renewed 18 January 1988
	ψ 701 - 2 1/2", 3"	Approved 5th Ed. of Manual (1 March 1981) Renewed 1 March 1986
	ψ 701 - 4"	Approved 5th Ed. of Manual (12 Aug 1976) Renewed 5 October 1988
	ψ 701 - 6"	Approved 5th Ed. of Manual (3 Apr 1980) Renewed 3 April 1986
Toro - see Orion		
Watts	909HW QT- 3/4", 1"	Approved 5th Ed. of Manual (29 Sept 1979) Renewed 29 September 1988
	909HW QT- 1 1/4", 1 1/2", 2"	Approved 5th Ed.of Manual (7 Feb 1980) Renewed 7 February 1986
	909 QT- 3/4", 1", 1 1/4", 1 1/2", 2"	Approved 6th Ed. of Manual (15 Jan 1982) Renewed 15 January 1988
	909 RW Bronze - 2 1/2", 3"	Approved 6th Ed. of Manual (4 Feb 1983) Renewed 4 February 1986
	909 RW - 2 1/2", 3"	Approved 7th Ed. of Manual (12 June 1986)
	909 RW - 4"	Approved 6th Ed. of Manual (15 Jan. 1982) Renewed 15 January 1988
	909 RW - 6", 8", 10"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	009QT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	009SSQT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	U009QT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	U009SSQT - 3/4", 1"	Approved 7th Ed. of Manual (11 Jan 1988)
	009QT - 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (9 Aug 1988)
	009SSQT - 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (9 Aug 1988)
	U009QT - 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (9 Aug 1988)
	U009SSQT - 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (9 Aug 1988)
Wilkins	ψ 575 - 3/4", 1"	Approved 5th Ed. of Manual (28 April 1976) Renewed 30 April 1988
	575A - 3/4", 1"	Approved 7th Ed. of Manual (17 Apr 1987)
	575 - 1 1/4", 1 1/2", 2" (MOD-III)	Approved 5th Ed. of Manual (11 Oct 1976) Renewed 5 October 1988
	575 - 2 1/2"	Approved 7th Ed. of Manual (25 Sept 1986)
	575 - 3"	Approved 5th Ed. of Manual (20 Aug 1979) Renewed 20 August 1988
	575 - 4"	Approved 5th Ed. of Manual (8 June 1980) Renewed 8 June 1986
	575 - 6"	Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 1987
	575 -M8" (4"x4"x8" Manifold) (formerly MBC - 8")	Approved 6th Ed.of Manual (11 April 1983) Renewed 11 April 1986

ψ - Only spare parts available

Reduced Pressure Principle Assemblies

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
Wilkins	575 - M10" (6"x6"x10" Manifold) (formerly MBC -10")	Approved 6th Ed. of Manual (1 June 1983) Renewed 1 June 1986

Atmospheric (Non-Pressure) Type Vacuum Breakers

COMPANY	MODEL-SIZE	STATUS OF APPROVAL
Arrowhead Brass	58 - 1/2"	Approved 6th Ed. oF Manual (18 March 1983) Renewed 18 March 1986
American Standard	VB-4 - 1/2"	L.A. CITY MECHANICAL TESTING LABORATORY
Belvedere	403 and 404 - 1/4", 3/8"	L.A. CITY MECHANICAL TESTING LABORATORY
Cash	VB - 111 3/4"	L.A. CITY MECHANICAL TESTING LABORATORY
Champion Brass	162 (straight) 3/4", 1", 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (13 Jan 1986)
	262 (angle) - 3/4", 1", 1 1/4", 1 1/2", 2"	Approved 7th Ed. of Manual (13 Jan 1986)
	362 (angles with union) 3/4", 1"	Approved 7th Ed. of Manual (13 Jan 1986)
	466 (w/ union) 3/4",1"	Approved 7th Ed. of Manual (13 Jan 1986)
	466P 3/4", 1"	Approved 7th Ed. of Manual (13 Jan 1986)
	566P (w/ integral solenoid shutoff valve) 3/4"	Approved 7th Ed. of Manual (13 Jan 1986)
Chicago Faucet	892 - 1/2"	L.A. CITY MECHANICAL TESTING LABORATORY
	898 - 3/4"	L.A. CITY MECHANICAL TESTING LABORATORY
Febco	710A - 1", 1 1/4", 1 1/2", 2"	L.A. CITY MECHANICAL TESTING LABORATORY
	715A - 1/2", 3/4"	L.A. CITY MECHANICAL TESTING LABORATORY
GardenAmerica	Model 711BLG - 3/4" (Lawn Genie)	Approved 7th Ed. of Manual (27 July 1987)
	Model 711BPR - 3/4" (Richdel)	Approved 7th Ed. of Manual (27 July 1987)
ITT Lawler	Model VB-1 - 1/4"	Approved 6th Ed. of Manual (20 April 1981) Renewed 20 April 1987
	Model VB-1.5 - 3/8"	Approved 6th Ed. of Manual (20 April 1981) Renewed 20 April 1987

ψ - Only spare parts Available

Atmospheric (non-pressure) Vacuum Breakers

COMPANY	MODEL - SIZE	STATUS OF APPROVAL
ITT Lawler	Model VB-2 - 1/2"	Approved 6th Ed. of Manual (21 April 1981) Renewed 21 April 1987
	Model VB-3 - 3/4"	Approved 6th Ed. of Manual (21 April 1981) Renewed 21 April 1987
	Model VB-4 - 1"	Approved 6th Ed. of Manual (21 April 1981) Renewed 21 April 1987
	Model VB-5 - 1 1/4"	Approved 6th Ed. of Manual (March 30 1981) Renewed 30 March 1987
	Model VB-6 - 1 1/2"	Approved 6th Ed. of Manual (March 17 1981) Renewed 30 March 1987
	Model VB-8 - 2"	Approved 6th Ed. of Manual (March 19 1981) Renewed 19 March 1987
	Model VB-10 - 2 1/2"	Approved 6th Ed. of Manual (March 25 1981) Renewed 25 March 1987
	Model VB-12 - 3"	Approved 6th Ed. of Manual (March 31 1981) Renewed 31 March 1987
Rain Bird	AVB - 3/4", 1", 1 1/4", 1 1/2", 2"	L.A. CITY MECHANICAL TESTING LABORATORY
	ψ AVB - 2 1/2", 3"	L.A. CITY MECHANICAL TESTING LABORATORY
	APAS - 075 - 3/4"	Approved 6th Ed. of Manual (22 April 1982) Renewed 22 April 1988
	PAS - 075 - 3/4"	Approved 6th Ed. of Manual (22 April 1982) Renewed 22 April 1988
	PAS - 075U - 3/4"	Approved 6th Ed. of Manual (4 June 1982) Renewed 4 June 1988
Strahman	HS - Vertical - 3/4"	Approved 6th Ed. of Manual (5 June 1981) Renewed 5 June 1987
	HS - Horizontal - 3/4"	Approved 6th Ed. of Manual (15 Sept. 1981) Renewed 5 Sept 1987
Toro	800-VB w/ Manual Control Valve - 3/4"	Approved 6th Ed. of Manual (15 Aug 1984) Renewed 15 Aug. 1987
Watts	8 - 3/4 hose	L.A. CITY MECHANICAL TESTING LABORATORY
	8A-C 3/4 hose	L.A. CITY MECHANICAL TESTING LABORATORY
	8B - 3/4 hose	L.A. CITY MECHANICAL TESTING LABORATORY
	8C - 3/4 hose	L.A. CITY MECHANICAL TESTING LABORATORY
	NLF- 9 3/8"	L.A. CITY MECHANICAL TESTING LABORATORY
	288A-M3 - 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3"	L.A. CITY MECHANICAL TESTING LABORATORY

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Pressure Type Vacuum Breakers

COMPANY	MODEL-SIZE	STATUS OF APPROVAL
Febco	Model 765 - 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"	Approved 5th Ed. of Manual (26 March 1974) Renewed 1 July 1986
	Model 745 - 3/4", 1"	Approved 6th Ed. of Manual (10 May 1983) Renewed 10 May 1986
Neptune - See Wilkins		
Rain Bird	Model PVB-075-R - 3/4"	Approved 5th Ed. of Manual (14 Feb 1978) Renewed 14 Feb 1987
	Model PVB-100-R - 1"	Approved 5th Ed. of Manual (14 Feb 1978) Renewed 14 Feb 1987
	Model PVB-125-R - 1 1/4"	Approved 5th Ed. of Manual (14 Aug 1978) Renewed 14 August 1987
	Model PVB-150-R - 1 1/2"	Approved 5th Ed. of Manual (14 Aug 1978) Renewed 14 August 1987
	Model PVB-200-R - 2"	Approved 5th Ed. of Manual (14 Aug 1978) Renewed 14 August 1987
SMR-see Wilkins		
Toro	Model PVB - 3/4", 1"	Approved 6th Ed. of Manual (20 June 1983) Renewed 20 June 1986
Watts	Model 800 QT- 3/4", 1"	Approved 5th Ed. of Manual (14 Feb 1978) Renewed 14 February 1987
	Model 800 QT- 1 1/4", 1 1/2", 2"	Approved 5th Ed. of Manual (14 Aug 1978) Renewed 14 August 1987
Wilkins	Model 720A - 1/2", 3/4", 1"	Approved 5th Ed. of Manual (28 Aug 1978) Renewed 28 August 1984
	Model 720A - 1 1/4", 1 1/2", 2"	Approved 5th Ed. of Manual (28 Aug 1978) Renewed 28 August 1987

NOTE: All assemblies are listed in alphabetical order. There is no implication of preference of assemblies.

Eighteen (18) pages

Paul H. Schwartz, P.E.
Chief Engineer

REGISTERED PROFESSIONAL ENGINEER PAUL H. SCHWARTZ NO. 16550 MECHANICAL STATE OF CALIFORNIA

ψ - Only spare parts available

Manufacturers of Approved Assemblies

Ames Company
1485 Tanforan Ave.
Woodland, CA 95695
(916) 666-2493

Arrowhead Brass
5142 Alhambra Ave.
Los Angeles, CA 90032
(213) 221-9137

Champion Brass Manufacturing Co.
1460 N. Nuad Street
Los Angeles, CA 90012
(213) 221-2108

Cla-Val Company
P. O. Box 1325
Newport Beach, CA 92663
(714) 548-2201

Febco Sales, Inc.
P. O. Box 8070
Fresno, CA 93747
(209) 252-0791

GardenAmerica
1851 Roup Street
Carson City, NV 89701
(702) 882-6786

Hersey/Grinnell
Grinnell Corporation
Research and Development Center
1467 Elmwood Ave.
Cranston, RI 02910
(401) 456-5770

ITT Lawler

Hoffman Specialties (AVB)
1700 West Tenth Street
Indianapolis, IN 46222
(317) 632-7546

Bell and Gosset (RP)
8200 N. Austin Ave.
Morton Grove, IL 60053
(312) 966-3700

Kennedy Valve
P. O. Box 931
Elmira, NY 14902-0931
(607) 734-2211

Mueller Company
500 Eldorado Street
Decatur, IL 62525
(217) 423-4471

Orion Industries
613 N. 5th Street
Kansas City, KS 66110
(913) 342-1653

Rain Bird Sales, Inc.
145 North Grand Ave.
Glendora, CA 91740
(818) 963-9311

Rockwell International
6363 Knott Ave.
Buena Park, CA 90620
(714) 523-4000

Strahman Valves, Inc.
3 Vreeland Road
Florham Park, NJ 07932
(201) 377-4900

Toro Company
5825 Jasmine Street
Riverside, CA 92504
(714) 688-9221

Viking Corporation
210 North Industrial Park Road
Hastings, MI 49058
(616) 945-9501

Watts Regulator Company
815 Chestnut Street
North Andover, MA 01845
(508) 688-1811

Wilkins Regulator Company
1747 Commerce Way
Paso Robles, CA 93446
(805) 238-7100