

**LAKE HEMET
MUNICIPAL WATER DISTRICT**

**Technical Specifications
And Standards**

For Water Lines and Appurtenances

November 2010

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TECHNICAL SPECIFICATIONS AND STANDARDS FOR WATER LINES AND APPURTENANCES

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LAKE HEMET MUNICIPAL WATER DISTRICT

PREFACE TO THE TECHNICAL SPECIFICATIONS – WATER

1. Supplemental Definitions to the Technical Specifications

In these Technical Specifications, whenever the following terms, or pronouns are used, the intent and meaning shall be interpreted as defined in the Ordinance and Rules and Regulations of the District which regulates the use and construction of water facilities. These supplemental definitions shall apply only to the interpretation of these Technical Specifications.

Contract – The written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The contract shall include the Notice to Contractors, Proposal, Plans, Specifications and Contract Bonds; also, any and all written supplemental agreements amending or extending the work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the contract and include contract change orders.

Contractor – The individual, partnership, corporation, joint venture or other legal entity entering into a contract with the District to perform the work. In case of the work being done under a permit issued by the District, the Permitted shall be construed to be the Contractor.

District – The Political Subdivision within which “The Work” is to be accomplished and in all cases refers to the Lake Hemet Municipal Water District.

Engineer – That person (or firm) that represents the District on engineering matters related to “The Work”.

Guarantee – Giving security for the carrying out of assurance.

Inspector – Personnel appointed by the Engineer or District to inspect construction of “The Work” for engineering and technical completeness. An inspector shall be limited to the particular duties entrusted to him.

Or Equal – Where used with brand names or specific manufactured products, shall mean the named commodity is a standard or quality. Items of equal quality may be substituted. However, the decision as to what constitutes “or equal” is the responsibility of the Engineer. Approval in writing from the Engineer must be obtained prior to making any substitutions.

Pipe Zone – Is considered to extend to twelve inches (12”) above the top of the water pipe.

Plans – The official project plans, profiles, typical cross sections, general cross sections, working drawings and supplemental drawings, or reproductions thereof, submittals, approved by the Engineer, which show the locations, character, dimensions and details of the work to be performed, and which are to be considered as part of the Contract.

Project Area – The real extent within which “The Work” will be accomplished.

Specifications – Portions of the contractual documents delineating descriptions, particulars and terms of the Contract as well as details for completeness of “The Work” now shown on the plans.

“The Work” – That which is to be accomplished by the Contractor to make the contents of the plans a reality.

2. Work Schedule

One week prior to starting construction, the Contractor shall submit to the District, Engineer, and Inspector, a work schedule which shall describe the sequence, time and method of operations he plans to use on the job. The Engineer may recommend alteration of this schedule where he feels the intent of the contract cannot be carried out.

It shall be the Contractor’s responsibility to update this schedule once a month showing work completed and work in progress. The Contractor shall provide the District, Engineer and Inspector copies of this updated schedule.

3. Notification

The Contractor shall notify the District, Engineer and Inspector one week in advance of when he plans to start construction.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 1.0
WATER

EARTHWORK

1.1 General

Earthwork includes all labor, materials, tools, equipment, and incidentals as required or necessary to clear, grub, remove and replace unsuitable materials, excavate, trench, fill, backfill, compact and grade for the construction of all structures, pipelines, ditches, embankments and graded areas as shown and specified.

1.2 Obstructions

The Contractor shall remove, or cause to be removed, at his expense, all trees, shrubs and brush, including stumps and roots, fences and all structures as and when required by the plans or where the proper construction and completion of the work require their removal. The Contractor shall also remove, at his expense, all rock, stones, debris, deleterious material and all obstructions of whatsoever kind or character, whether natural or artificial, encountered in the construction of the work.

In the installation of pipelines outside of public rights-of-way or in easements, trees shall not be removed unless otherwise authorized in writing by the Engineer, and all fences, structures and landscaping which are removed or damaged by the Contractor shall be restored to their original condition at the Contractor's expense without any compensation therefore. Any damage done to private property by reason of work on easements shall be the responsibility of the Contractor for restoration of their preconstruction condition at Contractor's expense.

Material that is removed as hereinabove specified, and is not to be incorporated in the improvement being constructed, shall be disposed of at a legal disposal site, away from the construction site at the Contractor's expense.

The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the plans. All reasonable precautions shall be taken to preserve and protect any such improvements whether shown on the plans or not. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute the work, they shall be removed, maintained and permanently replaced by the Contractor. Unless otherwise provided, the cost for said removal and replacement, or relocation, shall be considered included in the prices names for the various items of work on the bid sheets.

1.3 Earthwork in City, County, State and Railroad Rights-of-Way

Earthwork within the rights-of-way of the State Division of Highways, the County Road Department, Railroads and any City having jurisdiction, shall be done in accordance with the requirements and the provisions of the permit issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these specifications. The requirements of these Technical Specifications shall be the minimum requirements.

1.4 Safety Precautions

All excavations shall be performed, protected and supported as required for safety and in the manner set forth in the operating rules, orders and regulations prescribed by the Division of Industrial Safety of the Department of Industrial Relations of the State of California. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to prevent accidents. Blinking barricades shall also be placed along excavations at intervals not exceeding 100 feet from sunset each day to sunrise of the next day until such excavation is entirely smooth and made safe for the traveling public. The Contractor shall furnish such watchman, guards, fences, warning signs, walks, and lights as shall be necessary and shall take all other necessary precautions to prevent damage or injury to persons and property. All provisions for excavation safety are to be made at the Contractor's expense.

In advance of any excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall submit for acceptance of the District, or by a registered civil or structural engineer, employed by the District, to whom the authority to accept has been delegated, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer. Nothing herein contained shall be deemed to allow the use of shoring, sloping or protective system less effective than that required by the Construction Safety Orders of the State Division of Industrial Safety. Shoring shall be in compliance with Section 6707 of Chapter 9, Part 1, Division 5, of the Labor code of the State of California.

Nothing contained in this Specification shall be construed to impose tort liability on the District, Engineer or any of their employees.

Section 6424 of the Labor Code requires a permit for trenches five (5) feet or more in depth. The District will not issue a permit for trenching operations. The Contractor, prior to beginning construction, shall obtain from the State Division of Industrial Safety a permit authorizing said construction.

Safety rules and regulations required by CAL-OSHA standards will be practiced and enforced by the Contractor and those working for the Contractor. Failure of Contractors or persons working for Contractors to comply with CAL-OSHA standards required by State law may lead to termination of the contract by Lake Hemet Municipal Water District.

The District will see that OSHA standards are practiced by the Contractor and those working for the Contractor and will determine if OSHA standards are being followed. Inspector should be what CAL-OSHA defines as a “competent person”. Contractor should have person(s) that meet CAL-OSHA competent person definition. A “competent person” is one who has specific training in, and is knowledgeable about soils analysis, the use of protective systems, and the requirements of this standard. One who does not have such training or knowledge cannot possibly be capable of identifying existing and predictable hazards in excavation work or taking prompt corrective measures. Contractor shall sign a release form relieving the District of all liability for Contractor or those working for Contractor for property damage or personal injury caused by failure to enforce safety standards set by CAL-OSHA and required by the District.

1.5 Excavated Material

Arrangements for disposing of excess excavated material at a legal disposal site shall be made by the Contractor. Excavated material suitable for backfill shall be stored temporarily in such a manner as will facilitate work under the Contract. Contractor shall provide written acceptance by private property owner when their property is restored to its pre-storage condition.

1.6 Shoring, Sheet piling and Bracing

Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained and removed by the Contractor. Sheet piling and other supports shall be withdrawn in such a manner as to prevent additional backfill on pipelines which might cause overloading. At all times the rules of the Division of Industrial Safety of the Department of Industrial Relations of the State of California with respect to excavation and construction shall be strictly observed.

1.7 Clearing and Grubbing

Areas, where construction is to be performed, shall be cleared of all trees, shrubs, brush, rubbish, and other objectionable material of any kind which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or form obstructions therein. Trees and other natural growths outside the actual lines of construction operations shall not be destroyed and such measures as are necessary shall be taken by the Contractor for the protection thereof.

Organic material from clearing and grubbing operations will not be permitted for use as excavation backfill.

It shall be the Contractor's responsibility to remove and dispose of all excess material resulting from clearing and grubbing operations at his own expense. The Contractor shall make his own arrangements for disposal sites at his own expense, at which said material may be wasted.

If said material is to be wasted on private property, evidence of the appropriate permits and written consent of the property owner shall be submitted to the District prior to the start of construction.

1.8 Control of Water

The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and dispose of all water entering the excavations or other parts of the work. No concrete footings or floors shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set at least eight hours. Water shall not be allowed to rise unequally against walls for a period of twenty-eight (28) days. Ground water shall not be allowed to rise around pipe installations until jointing compound in the joints has set.

The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be disposed of in such a manner as not to be a menace to the public health.

Dewatering for structures and pipelines shall commence when ground water is first encountered, and shall be continuous until such time as water may be allowed to rise in accordance with the provisions of this section. Dewatering shall be accomplished by well points or some other method which will ensure a dry hole and preservation of final lines and grade of the bottoms of the excavations, all subject to the approval of the Engineer.

At all times the trenches shall be braced and drained so that workmen may work therein safely and efficiently.

1.9 Pipeline Excavation

1.9.01 Excavation

Excavation for pipelines, fittings, valves, and appurtenances shall be open trench to the depth and in the direction necessary for the proper installation of the same, as shown on the plans, or as otherwise directed by the Engineer, except where another method is specifically called for on the plans or in these Specifications.

1.9.02 Limit of Excavation

Except with specific approval of the Engineer in writing, no more than four hundred (400) feet of open trench, or the permit whichever is more restrictive, shall be excavated in advance of laying of pipe. All operations shall be carried out in an orderly fashion. Backfilling and clean-up work shall be accomplished as sections of the pipe installations are approved. Public travel through the work area shall be impeded or obstructed as little as possible. At the end of each working day, there shall be a maximum of fifty (50) feet of open trench or the permit whichever is more restrictive for each operation. The remainder of the trench excavated that day shall be backfilled, compacted and the roadway opened to the public.

At the end of each week all trenches, shall be backfilled, compacted and the roadway opened to the public on Saturday and Sunday.

With prior written approval of the District, substantial steel plates may be used to bridge across trenches where trench backfill has not been completed at the end of the working day. Prior to the approval of the use of steel plating, Contractor shall submit structural calculations, signed and sealed by a registered engineer. These calculations shall substantiate that given the span, the steel plate is of adequate strength and thickness to support all vehicular loads and that the bearing capacity of the trench walls in relation to the required bracing will provide adequate support.

1.9.03 Tunneling

Tunneling will be permitted only where native earth is of such firmness that it will remain in its original position, without sloughing off. Throughout the work of excavation and backfilling, if sloughing occurs, the roof of the tunnel shall be broken down and the trench excavated as an open trench as herein specified.

1.9.04 Trench Width

Bank of open cut trenches shall be kept as nearly vertical as possible. Where necessary in order to maintain the banks nearly vertical and/or provide workman safety, the trench shall be properly sheeted and braced. The overall trench width shall not be more than sixteen inches (16") or less than twelve inches (12") wider than the largest outside diameter if the pipe to be laid therein, measured at a point twelve inches (12") above the top of the pipe to be laid therein, measured at a point twelve inches (12") above the top of the pipe exclusive of branches. Excavation and trenching shall be true to line so that a clear space of not more than eight inches (8") or less than six inches (6") in width is provided on each side of the largest outside diameter of the pipe in place. For the purpose of this article, the largest outside diameter shall be the outside diameter of the coupling.

1.9.05 Correction of Faulty Grades

Should the excavation for the pipeline be carried below grade without instruction from the Engineer, it shall be refilled to proper grade with pipe zone material or class two aggregate base and shall be compacted to ninety percent (90%) relative compaction, at the expense of the Contractor. If compaction tests are required, they shall be at the expense of the Contractor.

1.10 Pipe Foundation and/or Subgrade

1.10.01 Foundations in Good Soil

The trench shall have a flat or semi-circular bottom conforming to the grade to which the pipe is to be laid.

With bell and spigot pipe, bell holes shall be excavated in the firm foundation to insure the pipe barrel resting for its entire length upon the firm foundation.

1.10.02 Foundations in Poor Soil

All soft, spongy or unstable material in the bottom of the trench shall be removed and replaced with approved material to a depth as determined in the field by the Engineer. The approved material shall be compacted to ninety percent (90%) relative compaction to provide an unyielding foundation for the pipe. The removal and replacement of material from depths greater than two feet (2') below the grade shown on the plans will be considered as extra work.

1.10.03 Foundations in Rock

Where rock is encountered, it shall be removed below grade and the trench shall be backfilled and compacted to 90% relative compaction with suitable material to provide a compacted thickness under the pipe of not less than one-half inch (1/2") per inch of nominal diameter of the pipe to be installed with a minimum allowable thickness of six inches (6").

1.11 Trench Backfill

1.11.01 General

All trenches shall be backfilled after pipe, fillings, valves, and appurtenances have been installed. Whenever a relative compaction requirement value is specified hereunder, the optimum moisture content and density shall be determined in accordance with the California Test Method 216, or ASTM Designations D 1557 and D 1556.

All wood and waste material shall be removed from excavation preparatory to backfilling. Backfill material shall be approved in all cases by the Engineer and shall be free of trash, wood, rock, and other objectionable debris. Backfilling shall include the refilling and compacting of the fill in trenches or excavations up to the subgrade of the street or to the existing ground surface in unpaved areas.

1.11.02 Procedure in Pipe Zone

The pipe zone shall be considered to extend twelve inches (12") above the top of the water pipe. Selected backfill material consisting of granular material free from stone, clods, clay, or other deleterious material shall be placed in the trench simultaneously on each side of the pipe for the full width of the trench in maximum lifts of six inches (6"). Each layer shall be thoroughly compacted to a relative density of ninety percent (90%) by tamping, or where the material is sufficiently granular in nature as determined by the Engineer, by water settling. Where water settling is allowed by the Engineer, each lift shall be thoroughly wetted layer by layer. Granular backfill with a minimum sand equivalent of 20 for steel or DIP pipe and a sand equivalent of 30 for PVC pipe, when tested in accordance with the California Test Method 217 or ASTM D-2419, shall be required in the pipe zone and the water densification method shall be used to densify the material in the pipe zone. When the excavated material is not granular as specified above, the Contractor shall import at his own expense, and place a suitable granular backfill material. Particular attention is to be given to the underside of the pipe and fittings to provide a firm bedding support along the full length of the pipe. Care shall be exercised in backfilling to avoid damage to the pipe.

1.11.03 Procedure Above Pipe Zone

From the top of the selected backfill to the subgrade of the street or to the existing ground surface, the material for backfill shall be clean and free of rock and other materials that may cause damage to the pipeline. In the absence of clean backfill, Class II aggregate base may be substituted.

1.11.04 Compaction Above Pipe Zone

Where it is important that the backfill be made safe for vehicular traffic or for the support of structures, the backfill above the "Pipe Zone" shall be thoroughly compacted by approved methods to obtain a minimum relative density of ninety percent (90%), except that in the State Highway or where pavement is to be placed directly on the subgrade or backfill material, ninety-five percent (95%) shall be required.

1.11.05 Compaction in Easements

In easements and open terrain where the degree of compaction is less important, the backfill, if sufficiently granular in nature (sand equivalent of 20 or greater for steel or DIP and SE of 30 or greater for PVC), shall be consolidated by a water settling method as described in Section 1.11.08 of these specifications. If the backfill is not sufficiently granular in nature, the backfill shall be consolidated by a method approved by the Engineer. Backfill in easements and open terrain shall be compacted to a minimum 85 percent (85%) relative compaction.

1.11.06 Mechanically Compacted Backfill

Mechanically compacted backfill shall be placed in horizontal layers (lifts) of such depth (not exceeding those specified herein) compatible to the material being placed and the type of equipment being used. All such equipment shall be of a size and type approved by the Engineer. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped or rolled until the specified relative compaction has been attained. Permission to use specific compaction equipment shall not be construed as a guarantee or an implication that the use of such equipment will not result in damage to adjacent ground, existing improvements, or improvements installed under the contract. The Contractor shall make his own determination in this regard. Any damage which results shall be the responsibility of the Contractor and shall be repaired or replaced at the Contractor's expense.

Material for mechanically compacted backfill shall be placed in lifts which, prior to compaction, shall not exceed the depths specified below for the various types of equipment.

- A. Impact, free-fall, or “stomping” equipment – maximum lift depth of three (3’) feet.
- B. Vibratory smooth-wheel rollers, and vibratory pneumatic-tired roller – maximum lift depth of two (2’) feet.
- C. Rolling equipment, including sheep foot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels – maximum lift depth of one (1) foot.
- D. Hand directed mechanical tampers – maximum lift depth of six (6”) inches.

1.11.07 Water Densified Backfill

As used in these Specifications, flooding shall mean the inundation of backfill with water, puddled with poles or bars to insure saturation of each lift of the backfill material for its full depth. Jetting will not be allowed.

1.11.08 Requirements for Densification by flooding

Densification by flooding shall be subject to all of the following requirements:

A. Application of Water

The Contractor shall apply water in a quantity and at a rate sufficient to thoroughly saturate the entire thickness of the lift being densified. Water shall also be applied while the backfill material is being placed in the trench.

B. Use of Vibration

Where densities are required which cannot be attained by flooding alone, the Engineer may direct the Contractor to supplement the flooding process with the application of vibrating compacting equipment to the backfill.

C. Lift Thickness

The lift of backfill shall not exceed that which can be readily densified by the flooding procedure, but in no case shall the undensified lift exceed six inches (6") for flooding.

D. Character of Material

The material being used with the water settling methods to backfill the trenches in street rights-of-way shall have a sand equivalent of at least 20 for steel and DIP and an SE of 30 for PVC when tested in accordance with the California Test Method 217 or ASTM D 2419 and having a maximum of ten percent (10%) passing a two hundred (200) mesh standard sieve. Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the District, import suitable material for flooding, or densify the excavated material by other methods. If water densification methods are employed in such cases, the Contractor shall, at his expense, provide free-draining bedding material under the pipe and all structures to permit the unimpeded movement of excess water to the downstream end of the construction where the Engineer may require the Contractor to provide a sump and pump to remove the accumulated water.

E. Damage to Adjacent Improvements

The Contractor shall make his own determination that the use of flooding methods will not result in damage to existing improvements. Permission to employ such methods in densifying backfill shall not be construed as guaranteeing or implying that adjacent ground and improvements will be unaffected.

1.11.09 Compaction Testing

The Contractor when providing water or sewer facilities within a development shall engage the services of a testing laboratory (approved by the District) to test the degree of compaction attained in the backfill as required by these Specifications. All compaction tests shall be at the Contractor's expense without any compensation therefore.

The compaction tests of the backfill for a District project which meet the specified requirements shall be at the Owner's expense. All compaction tests which do not meet the specified requirements shall be at the Contractor's expense without any

compensation therefore. These latter costs will be paid by the Owner and deducted from the progress payments to the contractor.

Compaction shall be tested in accordance with the methods specified by the California Test Method 216, or ASTM Designations D 1556 and D 1557.

A compaction test of the backfill will be required as directed by the Engineer or approximately every two hundred fifty to three hundred feet (250' to 300') or more often if tests indicate the need, along the alignment on the main pipeline and, in addition, a minimum of twenty percent (20%) of all laterals within the street rights-of-way. It is possible that the Engineer will require up to every other lateral to be tested. The tests shall be made at varying depths and locations as directed by the Engineer or the agency having jurisdiction.

The Contractor, at his expense, shall excavate the holes for all of the tests, backfill the holes and compact this backfill, and pave the surface, if required, after the test.

1.11.10 Excess Excavated Material

The Contractor shall make the necessary arrangements for and shall remove and dispose of all excess or waste material at a legal disposal site. All costs for the disposal of excess or waste material shall be borne by the Contractor.

It is the intent of these Specifications that all surplus material not required for backfill be disposed of by the Contractor outside the limits of the public rights-of-way, and in accordance with the requirements of the County Grading Ordinance or ordinance of any other agencies having jurisdiction at no cost to the District.

Excavated material shall not be deposited on private property unless written permission from the owner thereof is secured by the Contractor. Copies of said written permission, duly signed by the owner of the private property involved, shall be furnished to the Engineer by the Contractor before such material is placed on private property. A post construction letter of acceptance from the owner shall be required before Final Release.

In open terrain, surplus material may be disposed of within the rights-of-way by spreading and rolling, provided that such surplus material does not contain any rocks or lumps which cannot be readily covered by spreading.

1.11.11 Imported Backfill Material

Whenever the excavated material is unsuitable for backfill, the Contractor shall arrange for and furnish imported backfill material per sections 1.11.02, 1.11.03 and 1.11.08 at his own expense. He shall dispose of the excess trench excavation

as specified in Section 1.11.10. Backfilling with imported material shall be done in accordance with the methods described herein.

1.12 Structural Earthwork

1.12.01 Structural Excavation

The site shall be cleared of all natural obstructions, pavements, utilities and other items which will interfere with construction. Any method of excavation may be employed which, in the opinion of the Contractor, is considered best. Ground shall not be dug by machinery nearer than three inches (3") from any finished subgrade without the express approval of the Engineer. The last three inches (3") shall be removed without disturbing the subgrade. Should the excavation be carried below the lines and grades indicated on the plans, the Contractor shall, at his own expense, refill such excavated space to the proper elevation in accordance with the procedures specified for backfill, or, if under footings, the space shall be filled with concrete, as directed by the Engineer.

Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is authorized to be deposited directly against excavated surfaces.

1.12.02 Structural Backfilling

After completion of foundation footings and walls, and of other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all debris. Unless otherwise shown, material for backfilling shall consist of excavated material, or imported sand, gravel or other material approved by the Engineer and shall be free of trash, lumber or other debris. Backfill shall be placed in horizontal layers not exceeding nine inches (9") in thickness, and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by hand or machine tampers, or by other suitable equipment or means, to a relative compaction of at least ninety percent (90%) of maximum. Dewatering shall be maintained during the placement of compacted clay backfill.

1.12.03 Stripping

All vegetation, such as roots, brush, heavy sods, heavy growths of grass and all decayed vegetable matter, rubbish, and other unsuitable material within the area of the work, shall be stripped or otherwise removed before fill is started. Surfaces under paved areas, dikes, and elsewhere as directed by the Engineer shall be wetted and compacted prior to placing fill.

1.12.04 Grading

After stripping has been done, excavation of every description and of whatever substance encountered within the grading limits of the work shall be performed to the lines and grades indicated on the plans. All suitable excavated material shall be transported to and placed in the fill area within the limits of the work. All excavated materials which are considered unsuitable by the Engineer, and any surplus of excavated material which is not required for fill shall be known as waste and shall be disposed of as directed in Section 1.11.10 above. During construction, excavation and filling shall be performed in a manner and sequence that will provide drainage at all times.

Ditches shall be cut accurately to the cross-sections and grades indicated. Any excessive ditch excavation shall be backfilled to grade either with suitable, thoroughly compacted material, or with Class II Aggregate Base to form an adequate paving subgrade.

1.12.05 Fill

Fills or embankments shall be constructed at the locations and to the lines and grades indicated on the plans. Suitable material from excavations may be used for fill. Material shall be placed in horizontal layers of from eight to twelve inches (8" to 12") in loose depth for the full width of the cross section and compacted as specified.

For general fill areas, the fill shall be compacted to ninety percent (90%) relative compaction.

For roadways and all areas to be paved, the fill shall be compacted, by means of tamping roller or three-wheel power roller, to at least ninety percent (90%) relative compaction at optimum moisture content. In the State Highway, or where pavement is to be placed directly on the subgrade or backfill materials, ninety-five percent (95%) relative compaction shall be required.

Dikes and embankments shall be compacted by the use of compaction rollers or three-wheel power rollers to ninety percent (90%) relative compaction so that subsequent settlement shall be negligible.

Relative compaction shall be as determined in accordance with the California Test Method 216, or ASTM Designations D 1556 and D 1557.

1.12.06 Finish Grading

All areas covered by the work, including excavated and filled sections and transition areas, shall be graded uniformly to the elevations shown on the plans. The finished surface shall be reasonably smooth, compacted, and free from any irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations. The finished surface shall be not more than two tenths foot (0.2') above or below the established grade. Ditches shall be paved to drain readily. The surface of areas to be paved, on which a surface course is to be placed, shall not vary more than five hundredths foot (0.05') from established grade and approved cross-section.

1.12.07 County and City Grading Ordinances

In addition to the requirements herein set forth for structural earthwork, all work shall be in accordance with the requirements of the County Grading Ordinance of ordinance of any other agencies having jurisdiction.

1.13 Drilling and Blasting

1.13.01 Use of Explosives

All operations, storage and handling of explosives shall be according to provisions of Division II, Part I, of the Health and Safety Code, State of California, and shall comply with all State, County and local laws.

1.13.02 Skilled Workmen

Drilling and blasting are to be done only by personnel skilled in rock techniques.

1.13.03 Safety

All necessary precautions shall be taken for protection of life and property. Warnings shall be given to nearby property owners that blasting is in progress. Safety mats shall be used to restrict flying particles. The Contractor shall size each "shot" to minimize nuisance and reduce the possibility of damage to local structures.

1.13.04 Site Documentation

Prior to commencing any activity associated with the drilling and blasting operation, photographs and a video tape will be made of structures in the immediate blasting area.

1.14 Final Cleanup

After all earthwork operations have been completed, the rights-of-way and all other areas shall be dressed smooth and left in a neat and presentable condition to the satisfaction of the Engineer and District.

1.15 Traffic Plan

The Contractor or Developer's Engineer shall provide a traffic plan approved by the Agency issuing the Encroachment Permit to the District for review.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 2.0
WATER

CONCRETE CONSTRUCTION

2.1 Scope

The Contractor shall furnish all labor, materials, tools, equipment and incidentals necessary to complete construction of Portland cement concrete as shown on the plans and as specified herein.

2.2 Composition

Concrete shall consist of Portland cement, sand, coarse aggregate, water and admixtures as specified or approved, all well mixed and brought to the proper consistency suitable for the specified conditions of placement and in accordance with the requirements of this specification.

2.3 Classes of Concrete

All Portland cement used on the work shall be one of the classes described below. Unless otherwise stated, each class shall be used in the locations as listed:

2.3.01 Class I

Compressive Strength – 3000 psi min.
Mix - 6 sack minimum, test required
7 sack, test not required
Use - Walls, beams, slabs, footings
Equivalent California State Highway Designation
(1969) - Class D (for 7 sack min.)

2.3.02 Class IV

Compressive Strength – 2500 psi min.
Mix - 5 sack, test not required
Use - Paving, cradles, curbs, gutters, sidewalks, thrust blocks,
manhole bases, pipe encasement, or where specified
Equivalent California State Highway Designation (1969) Class B

2.4 Portland Cement

Unless otherwise specific, Portland cement shall be Type I or Type II complying with ASTM Designation C-150, and shall have a total alkali content not exceeding 0.6 percent (0.6%) when calculated as sodium oxide as determined by methods given in ASTM Designation C-114.

2.5 Sand

Sand shall be washed, natural sand having hard, strong and durable particles and which does not contain more than 2 percent (2%) by weight of such deleterious substances as clay lumps, shale, schist, alkali, mica, coated grains, or soft and flaky particles. Sand shall be graded uniformly from fine to coarse such that the combined grading of coarse aggregate and sand set forth in paragraph 2.6 will be met. Nor more than 3 percent (3%) shall pass the No. 200 screen as determined by ASTM Designation C-117.

2.6 Coarse Aggregate

Coarse aggregate shall be a clean, hard, fine grained, uncoated sound crushed rock, or washed gravel or combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than 2 percent (2%) by weight of shale or cherty materials; and shall show a loss of not more than 10 percent (10%) when tested for soundness in sodium sulfate solution in accordance with ASTM Designation C-88. Coarse aggregate shall be graded uniformly from one-quarter inch size to maximum size. The combined grading of coarse and fine aggregate shall fall within the following percentages by weight.

<u>Percentage Passing Sieves</u>			
<u>Sieve Size</u>	<u>1-1/2" Max.</u>	<u>1" Max.</u>	<u>3/4" Max.</u>
2"	100		
1-1/2"	90 - 100	100	
1"	50 - 86	90 - 100	100
3/4"	45 - 75	89 - 90	90 - 100
3/8"	38 - 55	65 - 85	60 - 80
No 4	30 - 45	35 - 50	40 - 60
No 8	23 - 35	25 - 40	30 - 45
No 16	12 - 27	19 - 30	20 - 35
No 30	10 - 17	12 - 20	13 - 23
No 50	4 - 9	5 - 10	5 - 15
No 100	1 - 3	1 - 4	1 - 5
No 200	0 - 2	0 - 2	0 - 2

2.7 Mixing Water

Mixing water shall be clean and free from deleterious amounts of acids, alkalis, salts or organic materials.

2.8 Air Entrainment

Unless otherwise specified or directed by the Engineer, water reducing and plasticizing admixtures shall be used to reduce the required mixing water, for equivalent slump in plain concrete, at least 10 percent (10%) without entraining air in excess of 2 percent (2%) by volume. If the admixture used entrains more than 2 percent (2%) air, the water reduction shall be an additional 2 percent (2%) of air entrained over 2 percent (2%), but in no case shall air entrained exceed 5 percent (5%). Admixtures containing more than 25 percent (25%) by weight of calcium chloride will not be approved. Acceptable water-reducing and plasticizing admixtures are Maracon and Pozzolith or approved equal. All admixtures shall be used in strict accordance with manufacturer's recommendations.

2.9 Pozzolan

Pozzolan shall conform to ASTM Designation C-618, except that minimum compressive strength for the lime-reactivity test shall be one thousand (1000) psi at seven (7) days. Acceptable pozzolans are Airox, Colton or approved equal.

2.10 Other Admixtures

No other admixtures shall be used without the Engineer's approval.

2.11 Reinforcing Steel

Reinforcing steel shall consist of deformed bars of the size called for on the plans. Reinforcing steel shall conform to ASTM A-615; longitudinal reinforcing steel for columns shall be hard grade; all other reinforcing steel shall be either intermediate or hard grade. Deformations shall conform to ASTM A-615, A-616, A-617, and A-305. Mill certificates showing conformity with these requirements shall be furnished to the Engineer for each melt if so requested. Wire reinforcement shall conform to ASTM A-82.

2.12 Test on Concrete

From each day's placing of each class of concrete, at least one set of three standard test cylinders shall be made and cured in accordance with ASTM Designation C-31. The cylinders shall be dated, numbered, and marked to indicate the location from which the sample was taken. The result of the slump test shall be noted on the cylinder. Not more than two cylinders shall be made from any one point or batch of concrete. The average of three cylinders crushed at the required age shall constitute one standard test, except that

occasional additional cylinders may be made for crushing at early ages to determine the approximate strength of the concrete for form stripping or other purposes.

Specimens shall be tested in accordance with ASTM Designation C-39.

The standard age of test shall be 28 days.

Should more than one in ten laboratory control strength test cylinders for any structure falls below the specified compression strength, the Engineer shall have the right to order a change in proportions or the water content of the concrete for the remaining structures. If the strength of any job cured cylinders falls below the specified compressive strength, the Engineer shall have the right to require the necessary changes in temperature and moisture content to secure the required strength and may require additional tests in accordance with ASTM Designation C-42, or order load tests to be made on the structures so affected if preliminary testing with the Schmidt Impact Hammer indicates the concrete to be defective.

2.13 Mix Design

Before beginning concrete work, the proper proportions of materials for each class of concrete shall be determined by the Contractor and/or his supplier. The mix design shall be prepared at the Contractor's expense, by a recognized inspection and testing laboratory, approved by the Engineer, and shall show the expected strengths and corresponding slumps, and all ingredient weights and other physical properties necessary to check the design mix. A trial batch shall be made for each class of concrete to be used on the job and from each batch four standard test cylinders shall be cast, cured and tested, as specified for the job concrete. Certified copies of all laboratory reports shall be sent promptly to the Engineer directly from the testing laboratory stating whether the items reported meet the Specifications. A final report shall be submitted at the completion of all concreting summarizing all findings concerned with concrete used in the project.

If more than one supplier of concrete is used by the Contractor, each supplier shall submit their design mix as directed above.

2.14 Mixing

Job mixing of structural concrete will not be permitted unless otherwise specified. When allowed, concrete shall be mixed in a batch mixer of approved type which will insure a uniform distribution of the materials throughout the mass, so that the mixture is uniform in color and homogenous. All concrete shall be placed within one (1) hour after water is first added to the batch. The mixer shall be equipped with a suitable charging hopper, a water storage and water measuring device controlled from a case which may be kept locked and so constructed that the way may be discharged only while the mixer is being charged. The entire contents of the mixing drum shall be discharged before recharging.

The mixer shall be cleaned at frequent intervals while in use. The volume of mixed materials per batch shall not exceed the rated capacity of the mixer. Transit mixed concrete shall be batched, mixed and delivered in accordance with ATM Designation C-94, except that truck agitators may not be used. All concrete shall be deposited in place not more than forty-five (45) minutes after water is added when the temperature of the concrete exceeds 85° F and not more than one and one-half (1-1/2) hours after water is added when the temperature of the concrete is less than 85° F. Certified public weigh master tickets shall be delivered to the Engineer or his representative in the field prior to placing the concrete to which the ticket applies.

2.15 Consistency

The quantity of water required for the proper consistency of the concrete shall be determined by the slump test, in accordance with ASTM Designation C-143. Unless otherwise stated, slump allowances shall be as follows:

Vertical Wall Sections, Columns – Maximum four-inch (4”) plus or minus one-inch (1”).

Floor Slabs, Beams, Footings – Maximum three-inch (3”) plus or minus one-half inch (1/2”).

2.16 Retempering

Retempering of concrete which has partially hardened, that is, mixing with or without additional cement, aggregate, or water, will not be permitted.

2.17 Joint Filler

Pre-formed fillers shall be of the type indicated on the plans and shall be installed as indicated on the plans.

2.18 Shop Drawings

Placing sheets and bending schedules shall be submitted to the Engineer for approval.

2.19 Waterstops

Waterstops shall be installed where so indicated on the plans. Waterstops shall be of polyvinyl chloride plastic, “Burke Vinylok type RB”, medium duty or approved equal. Proper care in placing of waterstops in forms shall be exercised so that the center bulb coincides with the construction joint. When concrete is being placed, it shall be properly vibrated to insure density at waterstop location. Waterstops shall be made continuous at splices and intersections (horizontal and/or vertical) by “welding” with a polyvinyl chloride splicing iron.

2.20 Depositing

Concrete shall not be placed until the forms and reinforcement have been approved by the Engineer. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as possible by methods which will prevent the separation or loss of ingredients. It shall be deposited in the forms as nearly as practicable in its final position with lifts not over one and one-half (1-1/2) feet high, so as to maintain a plastic surface approximately horizontal. Concrete shall not be dropped more than eight feet (8') unless a suitable chute or tube is used. Forms for walls, or other sections of considerable height, shall be provided with openings, or other devices shall be used which will permit the concrete to be placed in a manner which will avoid accumulations of hardened concrete on the forms or metal reinforcement. Under no circumstances shall concrete that has partially hardened be deposited in the work. Temporary joints shall not remain exposed for more than forty-five (45) minutes before adjacent concrete is placed. Concrete shall be continuously inspected by the inspector who shall be afforded an opportunity to check the forms for accuracy, cleanliness and position of reinforcing before the pour is started.

2.21 Subgrade Preparation

Subgrade for slabs over native earth or fill shall be finished to the exact location and section of the bottom of the slab and shall be maintained in a smooth, compacted condition, until concrete is placed. Sub-grade shall be thoroughly moistened but not muddy, at the time concrete is placed.

2.22 Compacting

Concrete during and immediately after depositing shall be thoroughly worked around the reinforcement and embedded fixtures and into corners of the forms. Internal vibrators shall be used for all walls, and self-supporting beams or slabs. Vibrators shall be handled by experienced workmen and care shall be taken to avoid separation of aggregate due to over vibration. At least one vibrator shall be used for each fifteen (15) cubic yard per hour of concrete placed. Standby vibrators shall be kept on hand.

2.23 Construction Joints

Concrete in each unit of construction shall be placed continuously, and the Contractor shall not be permitted to begin work on any part unless his facilities and forces are sufficient to complete the unit without interruption. All joints in concrete shall be located as indicated on the drawings and as approved by the Engineer.

The Contractor shall submit to the Engineer for approval, drawings marked to show the location and sequence for pours.

All construction joints shall be made as watertight as possible. Waterstops shall be provided where called for on the plans or where deemed necessary by the Engineer. Where these methods fail, joints shall be grouted under pressure after the concrete has set and forms have been removed.

The surfaces of construction joints in any location shall be thoroughly cleaned and roughened by dry method sandblasting to remove all laitance and expose aggregate solidly embedded in the mortar matrix.

2.24 Bonding

Before new concrete is deposited on or against concrete which has set, the form shall be retightened, the surface of the set concrete shall be roughened, thoroughly cleaned of foreign matter and laitance, as specified under Section 2.23 "Construction Joints", and sprayed with water so that the concrete is saturated but no free water is left on the surface. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond. To insure this excess mortar at the juncture of the hardened and newly deposited concrete on vertical and inclined surfaces, the cleaned and saturated surfaces of the hardened concrete shall first be slushed with a coating of neat cement grout against which the new concrete shall be placed before the grout has attained its initial set. For horizontal surfaces, a layer at least one inch (1") thick of cement mortar composed of one (1) part cement and two (2) parts sand shall be placed before depositing the concrete.

2.25 Curing

2.25.01 Water Curing

Uniformed concrete surfaces shall be covered with wet burlap mats as soon as the concrete has sufficiently set, and shall thereafter be kept wet under burlap until backfilled or for fourteen (14) days after the concrete is placed. Where drying conditions are severe, as determined by the Engineer; fog sprays shall be employed to prevent checking of the fresh concrete surface. Immediately following the first leveling, the fog spray shall be applied whenever the concrete surface will absorb moisture and shall be discontinued when the applied moisture is rejected. Fog spraying shall be continued as specified until the finished surface has attained sufficient strength to permit flooding or covering with burlap mats.

Formed surfaces, both interior and exterior, shall be water cured under burlap mats or by water sprays beginning as soon as the forms are stripped. Prior to stripping of forms, the concrete shall be kept moist by the water sprays.

2.25.02 Curing Compounds

With the written approval of the Engineer, concrete surfaces may be cured by curing compounds as defined below. Any concrete curing compound shall be of a nature and composition not deleterious to concrete, and thinned to a working consistency either with a volatile solvent or by emulsification with water. The curing compound shall be of a standard and uniform quality ready for use as shipped by the manufacturer. Curing compound shall form a continuous, unbroken membrane which shall adhere to moist concrete and which will not disintegrate, check, peel from the surface, nor show signs of such deterioration within thirty (30) days after application under actual working conditions. The compound shall be sufficiently transparent and free from color that there will be no permanent change in the color of the concrete. The compound shall contain, however, a temporary dye of sufficient color to make the membrane clearly visible for a period of at least four (4) hours after application. If the contractor applied a deleterious compound to paint, plaster, gunite, or other surface treatment, he shall thoroughly sandblast the surface to remove all vestiges of the compound.

2.26 Protection of Concrete Construction

All surfaces shall be protected against injury. During the first seventy-two (72) hours after placing, wheeling, working, or walking on the concrete shall not be permitted. All slabs subject to wear shall be covered with a layer of sand or other suitable material as soon as the concrete has set, and either shall be cured by the use of a curing compound or shall be kept wet for not less than fourteen (14) days or they shall be kept covered for the same period with Sisalcraft paper or other similar tough waterproof paper. All joints between adjacent strips of paper shall be sealed.

No concrete shall be placed during rain and during such weather; all concrete placed within the preceding twelve (12) hours shall be protected with waterproof canvas or other suitable coverings. These shall be provided and kept ready at hand.

All concrete construction shall be protected from excessive loadings.

2.27 Repair and Patching

After removing forms and before the concrete is thoroughly dry, any pour joints, voids, stone pockets, or other defective areas and all tie holes shall be patched. Defective areas shall be saw cut to a depth of not less than one inch (1") with the edges perpendicular to the surface. The area to be patched and a space at least six inches (6") wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.

The patch shall be made of the same materials and proportions as used for the concrete, except that the coarse aggregate shall be omitted. The amount of mixing water shall be as little as consistent with the requirements of handling and placing.

The mortar shall be thoroughly compacted into placed and screened, leaving the patch slightly higher than the surrounding surface. After being undisturbed for one or two hours to permit initial shrinkage, the patch shall be finished to match the adjoining surface.

Tie holes left by the withdrawal of form clamp rods or holes left by removal of snap ties shall be filled solid with mortar. For holes passing entirely through the wall, a plunger-type grease gun or other device shall be used to force mortar through the wall, starting at the back face. When the hole is completely filled, the excess mortar shall be struck off with a cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar, with any excess mortar being struck off flush with the surface.

2.28 Placing Reinforcing Steel

Reinforcing steel, before being positioned, shall be cleaned thoroughly of mill and rust scale or other coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing the concrete, reinforcement shall be reinspected and, when necessary, cleaned.

Reinforcement shall be carefully formed as indicated on the plans. Stirrups and tie bars shall be bent around a pin having a diameter of not less than three times the diameter of the bar. Except where specifically indicated otherwise on the plans, bends for other bars shall be made around a pin having a diameter of not less than six (6) bar diameters. All bars shall be bent cold. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars will be permitted only when the entire operation is approved by the Engineer.

Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire or suitable clips at intersections and shall be supported by concrete chairs or spacers, or metal hangers.

In slabs, beams and girders, and walls subject to lateral pressure, splices of reinforcement shall not be made at points of maximum stress without the express approval of the Engineer. Splices, where permitted, shall provide sufficient lap to transfer the stress between bars (bond and shear).

Adjacent bars shall not be spliced at the same point. The minimum allowable lap at points of maximum stress shall be thirty (30) times the diameter of the larger bar of the

splice, but in no case shall the lap be less than eighteen inches (18"). Minimum allowable lap distances for masonry wall reinforcement shall be forty (40) times the diameter of the larger bar of the splice, but in no case less than eighteen inches (18").

2.29 Form Material

2.29.01 Class I

For permanently exposed concrete surfaces where architectural appearance is important, Class I forms shall be constructed with particular care to assure a high type of architectural finish of uniform texture, free from visible irregular ties, patch marks and discolorations. Forms shall be of synthetic resin bonded plywood specially made for concrete work or nonwarping hardboard. The entire surface shall be lightly sanded if necessary.

2.29.02 Class II

This class shall be used for unplastered interior of all rooms and for all surfaces in contact with water, such as interior walls of channels and tanks. These forms shall be of hardboard, steel or waterproof synthetic resin bonded plywood specially made for concrete work.

The Contractor shall be permitted to use the most advantageous panel sizes and panel joint location. Class II forms for painted concrete surfaces shall be free of all surface imperfections. Neat patches and minor surface imperfections will be permitted in forms for unpainted concrete provided the finished surface conforms to the requirements specified hereunder.

2.29.03 Class III

This class shall be used for formed surfaces not exposed to view such as footings, backfilled walls and pipe trenches. These forms shall be of metal or of smooth placed boards in good condition free from large or loose knots.

2.30 Form Construction

Exposed edges of concrete on the outside and inside of structures shall be chamfered or beveled at an angle of forty-five (45 °) degrees, such bevel being one inch (1") on a side. If so directed by the Engineer, however, the Contractor shall provide square edges for any portions of the work.

All dirt, chips, sawdust and other foreign matter shall be removed from within the forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used. Before concrete is

deposited within the forms all inside surfaces of the forms shall be thoroughly coated with an approved oil.

Bolts, rods or single wires shall preferably be used for internal ties and if so used shall be so arranged that when the forms are removed, no metal shall be within one inch (1") of any surface. Twisted wire ties will not be permitted in the forms for any wall later to be subjected to water pressure. The Contractor shall take due precaution to prevent future leakage or seepage along ties used in all walls which will be subjected to water pressure. Ties used in all such walls must be cut back into the face of the wall at least one inch (1") and the resulting holes pointed up with 1:3 mortar.

Temporary openings shall be provided at the base of column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Forms, bracing and shoring shall be kept in place until their removal is approved by the Engineer, and in no case shall removal commence earlier than the following schedule:

Sides of footing	1 Day
Walls above ground	3 Days
Walls below ground	7 Days
Columns	10 Days
Slabs	14 Days
Beams	21 Days

Members subject to additional loads during construction shall be adequately reshored to support both member and construction loads in a manner that will protect the member from damage.

2.31 Finish of Formed Surfaces

All finished or formed surfaces shall conform accurately to the shape, alignment, grades and sections as shown on the plans or prescribed by the Engineer. Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind, and shall present a finished, smooth, continuous hard surface. All sharp angels, where required, shall be rounded or beveled.

Where Class I forms are required, the surface of the concrete shall be given the following finish: After wetting the surface, a grout shall be rubbed in using a rubber float or burlap.

The grout shall be made by mixing one part of cement and one and one-half (1-1/2) parts of fine sand with sufficient water to give it the consistency of thick paint. After the grout hardens sufficiently, it shall be scraped from the surface with the edges of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a uniform texture.

2.32 Finish of Slabs

Floors and flat roof surfaces, all exterior concrete floors, sidewalks and flat surfaces where drains are to be provided, the Contractor shall be particularly careful to provide an adequate slope to the drains or to suitable points of disposal. The direction of slope and the amount of crowing generally are shown on the Plans; otherwise they shall be subject to the approval of the Engineer.

2.32.01 Float Finish

The forms shall be completely filled with concrete with as little working as possible. All high or low spots exceeding one-quarter inch (1/4") in ten feet (10') shall be eliminated. The surface shall then be floated until it is smooth and free from blemishes. Only clean floats will be permitted.

2.32.02 Broomed Finish

Surfaces to receive a broomed finish shall be wood floated as specified above, followed by steel troweling. After steel troweling and before initial set, the surface shall then be slightly roughened by means of a broom or a burlap mat to produce an even textured surface finish.

2.33 Inserts

Where pipes, castings, or conduits are to pass through the walls, the Contractor shall place such pipes or castings in the forms before pouring the concrete, or in special cases, with the express consent and approval of the Engineer or as specified herein, he shall build approved boxes in the forms to make openings for subsequent insertion of such pipes, casting, or conduits. To withstand water pressure and to insure water-tightness around the openings so formed, the boxes or cores shall be provided with continuous keyways all the way around and shall have a slight flare to facilitate grouting and the escape of entrained air during grouting. The grout shall contain Embecco or similar material and shall be mixed and placed in accordance with the manufacturer's instructions.

Additional reinforcement shall be provided around openings to meet the approval of the Engineer. The space around pipes, castings, or conduits, as specified, shall be filled by

pouring grout under a head of at least four inches (4"). The grout shall be poured, rammed or joggled into place to fill completely the space between the pipes, castings, or conduits, and the sides of the openings so as to obtain the same water tightness as through the wall itself. The grouted castings shall then be water cured. The grouting material so placed shall be surfaced when the forms are removed to give a uniform appearance to the wall if such wall will be exposed to view.

The Contractor shall set accurately and hold in exact position in the forms until the concrete is poured and set, all gate frames, gate thimbles, special castings, channels, or other metal parts that are to be embedded in concrete, and he shall furnish and set accurately all inserts and anchor or other bolts necessary for the attaching of piping, valves, metal sash, and equipment. All nailing blocks, plugs, strips, and the like, necessary for the attachment of trim, finish and similar work and all wires for suspending ceilings will be furnished and placed by the Contractor.

2.34 Guniting

When the use of guniting is proposed, the Contractor's design engineer shall submit his guniting design and the specification proposal to the Engineer for approval.

2.35 Prestressed Concrete

When the use of prestressed concrete is proposed, the Contractor's design engineer shall submit his prestressed concrete design and specification proposal to the Engineer for approval.

2.36 Miscellaneous Concrete Mixes

Miscellaneous concrete mixes shall be as listed below:

<u>Use</u>	<u>28-Day Strength</u>	<u>Mix</u>
Grout	-----	7 sacks with pea gravel
Mortar	1800 psi	1 part cement, ¼ part lime putty, 3 parts sand
Grout for filling masonry blocks and for bond beams	2000 psi	1 part cement, 3 parts sand, 2 parts pea gravel

2.37 Cold Weather Requirements

Adequate equipment shall be provided for heating the concrete during freezing or near freezing weather. No frozen materials or materials containing ice shall be used.

All concrete materials and all reinforcement, forms, fillers and ground which the concrete is to come in contact with shall be free from ice and frost. Whenever the temperature of the surrounding air is below forty degrees (40°F), all concrete placed in the forms shall have a temperature of between seventy degrees (70°F) and eighty degrees (80°F) and adequate means shall be provided to maintain a temperature of between fifty degrees (50°F) and eighty degrees (80°F) during the curing period.

The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is disconnected. The use of salt or chemicals for the prevention of freezing is prohibited.

When heating of concrete materials is required, the mixing of water and aggregate shall be heated to not more than 90°F prior to being placed in the mixer so that the temperature of the mixed concrete shall be not less than 70°F nor more than 80°F. Aggregates shall be heated either by steam or by dry heat, and the heating apparatus shall be of a type which will heat the mass uniformly and in such a manner as to preclude the possible occurrence of over-heated areas, or hot spots, which will burn the materials. Flame throwers, or other similar direct heating devices will not be allowed.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 3.0
WATER

PIPELINE MATERIALS AND INSTALLATION

3.1 General

This portion of the work shall include the furnishing and installation of all materials necessary to result in a first-class water installation true to line and grade and free from leaks, cracks, and obstructions, in conformance with the Plans and Specifications.

Where choices are allowed, the Contractor shall select such materials and construction methods as will result in a satisfactory completed project. Materials and equipment used in the work shall be new and unused unless otherwise specified. In case a reference is not clear as to which of several grades is desired, the highest quality material shall be used. Materials and strength of pipe shall be as shown on the plans. Unless two or more materials are mentioned as equals, the Contractor shall not substitute another material for the one specified.

3.2 Excavation and Backfill

The Contractor is referred to Section 1.0, Earthwork, of the Technical Specifications of these Specifications.

3.3 Materials (Steel Pipe)

3.3.01 Steel Water Pipe Cement Mortar Lined and Wrapped (CML & W)

Steel pipe shall consist of furnace-welded, electrically welded, or seamless pipe produced to meet finished pipe specifications in accordance with AWWA Standard Specification C-200.

The thickness of steel plate shall be as determined by the formula specified in AWWA Standard Specifications C-200 but not less than twelve (12) gauge for all steel pipe. All pipe shall be cement mortar lined, dipped and wrapped in accordance with AWWA Standard Specifications C-205 & C-203. Steel used in the manufacture of the pipe shall comply with the physical and chemical requirements for AWWA Standard Specification C-200. All welded steel pipe, cement lined and wrapped shall be the class noted on the plans.

3.3.02 Steel Water Pipe Cement Mortar Lined and Reinforced Mortar Coated (CML & C)

Welded steel pipe shall conform to paragraph 3.3.01 above and the cement lining and reinforced mortar coating shall conform to AWWA Standard Specification C-205. All welded steel pipe cement lined and reinforced mortar coated shall be the class noted on the plans.

3.3.03 Pipe Dimensions & Weights - Fabrication

The inside and outside diameters, wall thickness, weight, and dimension tolerances for the steel pipe shall conform to ASA B36.10 and AWWA C-200.

The diameter of pipe shown on the plans refers to the net actual inside diameter, after lining. The pipe shall be manufactured in sections not less than eighteen feet (18') nor more than forty feet (40') in length and having not more than one longitudinal welded seam per section, except where shorter lengths or more than one longitudinal welded seam are required by special conditions.

Pipe manufacturing in sections of twenty feet (20') or less, in length shall have not more than one circumferential seam. Sections more than twenty feet (20') in length but less than thirty feet (30') in length shall have not more than two (2) circumferential seams. Sections thirty feet (30') or more in length shall have not more than three circumferential seams, except where it is necessary to increase the number of such seams because of special conditions.

3.3.04 Joints

All field joints shall be O-ring, rubber-gasketed slip-joints; except where welded or flanged joints are shown on the plans. The pipe fabricator shall furnish a written certification and guarantee stating the O-ring, rubber gasketed slip-joints, when properly jointed in the field, have a safe working pressure equal to the safe working pressure for steel pipe of corresponding size and gauge. One end of each section shall be swaged approximately five inches (5") deep with a flared lip to form the bell. The spigot end shall be formed in such a manner as to assure perfect roundness of the ends with a groove of uniform dimensions.

Joints for steep pipe shall be one of the following types:

- A. Mechanical Couplings. Pipe ends for mechanical couplings shall be square cut or beveled with all burrs removed. All outside surfaces of the pipe ends, where the mechanical coupling will be seated, shall be free of all indentations, projections or roll marks to assure a water tight joint. Pipe ends for mechanical couplings shall

have tolerances within the limits required by the manufacturer of the mechanical coupling specified.

- B. Field Butt Welded Joints. Pipe with a wall thickness fifteen sixty-fourths inch (15/64") or greater, intended for field butt welding, shall have the pipe ends beveled on the outside or inside, or both sides, as specified on the plans or in the Special Provisions. Bevels shall have an angle of thirty degrees (30°), with a maximum plus tolerance of five degrees (5°) and no minus tolerance, measured from a line drawn perpendicularly to the axis of the pipe. The width of the root face at the end of the pipe shall be one-sixteenth inch (1/16") +/- to one-thirty second inch (1/32").
- C. Flanged Joints. Flanges shall conform to Standard Specifications for Steel Pipe Flanges, AWWA C-207.

Welding flanges shall be forged steel conforming to ASTM A-181 and faced and dimensioned in accordance with ASA B16.5 for the pressure class specified on the plans or in the Special Provisions. Class ASA-125 shall be the minimum class flange permitted for water distribution purposes. Threads for screwed flanges and companion pipe ends shall be dimensioned in accordance with ASA B2.1.

Pipe ends for welding neck flanges shall be beveled.

- D. Plain Ends for Flexible Couplings. Both ends at coupling shall be square sheared before rolling or shall be cut square after fabrication.

3.3.05 Protective Lining and Coating for Steel Pipe

The interior and exterior surfaces of all steel water pipe shall be protected from corrosion by the following methods:

- A. Cement-Mortar Lining (Interior Surfaces). Cement-mortar lining shall comply with the requirements of AWWA C-205.

Unless otherwise specified on the plans or in the Special Provisions, cement-mortar lining for fabricated steel pipe shall be of the following uniform thickness, except as joints, for the pipe sized indicated:

<u>Pipe Diameter (in.)</u>	<u>Lining Thickness (in.)</u>	<u>Tolerance (in.)</u>
4 through 10	1/4	+/- 1/32
11 through 23	5/16	-1/16 + 1/8
24 through 36	3/8	-1/16 + 1/8
Over 36	1/2	-1/16 + 1/8

The interior surfaces of all pipe to which cement-mortar will be applied shall be thoroughly cleaned prior to the application of the cement-mortar. Scale, rust and all accumulations of dirt or debris shall be removed to the satisfaction of the Engineer. Oil and grease shall be removed by a volatile solvent. The interior surfaces of the pipe shall be cleaned by grit blasting if, in the opinion of the Engineer, it is deemed necessary to assure the proper bond of the cement mortar to the pipe cylinder.

When curing compound is used to facilitate curing of the cement-mortar lining, it shall be applied to the cement-mortar within one hour after placing the mortar. The curing time of cement-mortar so cured shall be seven (7) days. Curing compound used shall be in conformance with Section 2.5 of AWWA C-205.

The cement-mortar lining shall reach a compressive strength of at least three thousand (3,000) psi at twenty-eight (28) days.

One test sample of the lining material shall be taken by the contractor for each fifty (50) lengths of pipe. The test samples shall be cured with and under curing conditions identical to the pipe lining and coating from which they were taken. Certified test results shall be submitted to the Engineer prior to delivery of the pipe.

The results of cleaning and lining of special sections shall be equivalent to the results of similar work on straight pipe sections and shall conform to the requirements of Section 4.5 and 5.7 of AWWA C-205.

- B. Reinforced Cement-Mortar Coating (Exterior Surfacing). The cement-mortar coating shall comply with the requirements of AWWA Standard Specification C-205. Unless otherwise specified on the plans or in the Special Provisions, cement-mortar and coating for fabricated steel pipe shall be of the following uniform thickness, except at joints, for the pipe sizes indicated:

<u>Pipe Diameter (in.)</u>	<u>Lining Thickness (in.)</u>	<u>Tolerance (in.)</u>
4 through 12	1/2	+ 1/8*
14 through 18	5/8	+ 1/8*
Over 20	3/4	+ 1/8*

* No minus tolerance allowed.

The exterior surfaces of all pipe to which cement-mortar will be applied shall be thoroughly cleaned per paragraph one [(1) Cement Mortar Lining]. The use of curing compound, the prescribed compressive strength, and the requirements for testing for cement-mortar coated surfaces are provided for in paragraph one [(1) Cement Mortar Lining].

- C. Asphalt Coating and Wrapping (Exterior Surfacing). Asphalt coating and wrapping shall comply with the requirements of AWWA Standard Specification C-203.

The exterior surfaces of the pipe shall be thoroughly cleaned by grit blasting followed immediately by a coat of hot asphalt primer. The pipe shall then be coated with one or more coats of hot asphalt. A single layer of 23 ½-pound asbestos felt or 40-pound rag felt or fiberglass wrap shall be machine-wrapped into each coat of hot asphalt. The coating system shall be finished with a single wrap of heavy paper followed by a coat of water resistant whitewash or kraft paper.

The thickness of each exterior asphalt coating shall be three-thirty seconds inch (3/32") with an allowable variation in thickness not to exceed +/- one-thirty second inch (1/32") (excluding the wrapping).

The number of exterior hot asphalt coats and the type of exterior wrap shall be as specified on the plans or in the Special Provisions.

The results of coating special sections shall be equivalent to the results of similar work on straight pipe sections. If the shape precludes machine application, the coating of specials shall be applied by hand daubing and wrapping.

- D. Preparation of Pipe Ends (Lined and Coated Pipe). The pipe protective lining and coating shall be held back from the bell and spigot ends respectively, for all bell-an-spigot rubber gasket, welded lap, and driven field joint pipe in accordance with the

manufacturers' standard practices. The pipe protective coating shall be held back from the ends of all butt strap, mechanical coupling, and flanged joint pipe for a sufficient distance to permit field assembly of the particular joint.

The protective lining shall terminate at the pipe ends of all pipe except where otherwise specified herein.

All non-coated surfaces shall be cleaned and given an application of prime coat then wrapped with "Protector Wrap" or approved equal.

3.3.06 Special Sections

Special Sections, including elbows, returns, wyes, reducers and crosses shall be manufactured from mill-type steel pipe in accordance with ASA B16.9, and the AWWA Standard Specification C-200, and fabricated in accordance with AWWA Standard Specification C-208.

Special sections manufactured from previously tested pipe shall be tested hydrostatically.

3.3.07 Marking of Pipe and Special Sections

Each length of pipe and each special section shall be legibly marked by paint stenciling, die stamping, or hot-roll marking to show the manufacturer's name or mark, size and weight of the pipe or special section, and the type of steel from which the pipe or special section was made.

3.4 Materials (Ductile Iron Pipe)

3.4.01 Ductile Pipe and Fitting (DIP)

All ductile iron pipe shall be manufactured in accordance with ANSI A 21.51 and AWWA C151. Ductile iron pipe for 12-inch and smaller shall be Class 51 thickness; 14-inch and larger shall be class 52 thickness minimum.

All cast iron or ductile iron pipe and fittings shall be manufactured in accordance with ANSI A21.10 and AWWA C110.

All cast iron or ductile iron pipe and fittings shall have cement mortar lining per ANSI A21.4 and AWWA C104.

Bolts, nuts and washers for flanged joints shall conform to the recommendations of the pipe manufacturer and shall be uniformly tightened. Ring gaskets shall be uniformly tightened. Ring gaskets shall be lubricated and installed in accordance with the manufacturer's recommendation.

Ductile iron pipe may, at the Contractor's option (if not noted in plans), have push-on, mechanical or flange joints. Where flexibility of joints is a factor, such as where piping enters or exits a structure a flexible coupling shall be used.

Mechanical joints shall consist of a stuffing box into which an endless rubber ring is compressed by a follower gland. The gasket must be fully confined and under constant compression. Mechanical joint pipe shall be installed in accordance with manufacturer's recommendations.

All ductile iron pipe and fittings installed underground shall be protected with an 8 mil polyethylene tube encasement.

3.5 Materials (Plastic Pipe)

3.5.01 Polyvinyl Chloride Pipe (PVC) 4" and Larger

Pipe – Polyvinyl Chloride (PVC) shall meet the requirements of AWWA C900, "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for Water" and shall be furnished in cast-iron pipe equivalent outside diameters with rubber-gasketed separate couplings as listed in the Standard. Pressure class shall be 150 psi or 200 psi for C900 pipe as shown on the plans. Pipe shall be furnished in 20 foot laying lengths except for curves where short joints will be required due to deflection.

Pipe – Polyvinyl Chloride (PVS) shall meet the requirements of AWWA C905, "Standards for Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch through 24-inch for water and approved by LHMWD, shall be furnished in cast-iron pipe equivalent outside diameters with rubber-gasketed separate couplings as listed in the Standard. Pressure class shall be 165 psi for C-905 pipe unless otherwise shown on the plans. Pipe shall be furnished in 20 foot laying lengths except for where short joints will be required due to deflection.

Special Fittings – All special fittings, such as elbows, 45° bends, saddles and tees shall be CIP or ductile iron and shall be lined with cement mortar lining.

Delivery – Polyvinyl chloride pipe shall be delivered to the job site from the factory and stored at the job site in palletized units or bundles to prevent unnecessary deflection prior to installation. If pallet units are stored more than 90 days, they shall be covered with opaque material to protect it from the sun's rays.

Manufacturer – Plastic pipe shall be Pacific Western or Johns-Mannville, or equal.

3.6 Flanges, Gaskets, and Bolts

Flanges shall conform to dimensions and drilling for ANSI B16.1, Class 125, or as called for on the Drawings. Flange gaskets shall be ring type, Johns-Manville Style 60S, Granite, or equal. Thickness shall be 1/16-inch for pipe 18-inches and smaller, and 1/8-inch for larger pipe. Flange assembly bolts shall be standard hexagon head machine bolts with heavy hot pressed hexagon nuts. Threads shall conform to ANSI B1.1, coarse thread series, Class 2 fit. Bolt length shall be such that after the joints are made up, the bolts shall protrude through the nut, but not more than ½-inch. Flanges on steel pipe shall be welded to the pipe in accordance with AWWA C207.

3.7 Flexible Couplings

Flexible couplings shall be as designated on the Drawings and shall be Dresser Style 38, Smith Blair Type 411, minimum 12-inch in length or equal. Flanged coupling adapters shall be Smith Blair Type 912, Dresser Style 127, or equal. Flexible coupling for underground use shall be epoxy coated, including flanges and fittings.

3.8 Flexible Expansion Joints

Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA A21.53/C153. All flexible expansion joints shall be capable of deflecting and expanding simultaneously of no less than 15° deflection and 8” expansion. All flexible expansion joints shall have the expansion capability designed as an integral part of the ductile-iron ball castings. All pressure containing parts shall be lined with a minimum of 15 mils of Fusion Bonded Epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. All flexible expansion joints shall be Flex-Tend as manufactured by EBAS Iron Inc. or approved equal.

3.9 Temporary Bulkheads

The Contractor shall furnish and install complete all the necessary temporary bulkheads of steel boilerheads and appurtenances thereto in the pipeline used for backfilling or testing purposes and shall remove such bulkheads upon completion of the line.

3.10 Thrust Restraint

Thrust restraint shall be provided at dead ends, tees, valves, fittings, appurtenances, bends and where changes in pipe diameter occur.

- A. Polyvinyl Chloride (PVC) or Ductile Iron Pipe (DIP) – At all vertical bends where the thrust is upward, collars and tie rods, designed to take the full theoretical tension developed under the test pressure, shall be used. Retainer glands for PVC or DIP pipe per EBBA IRON Series 2000 PV or approved equal.
- B. Steel Pipe – Thrust restraint for steel pipe shall be made by field welding which shall be full field circumferential welding of all joints within the distances determined by the Engineer.

3.11 Pipe Installation – Above Ground or Exposed Pipe

The types and sizes of pipes and fittings to be used shall be as specified herein and as shown on the Drawings, they shall be the same size as the piping. Plumbing piping, in all cases, shall conform to the plumbing code requirements.

All pipe shall be carefully placed and supported at the proper lines and grades and where practicable shall be sloped to permit complete drainage. Piping runs shown on the Drawing shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features. If major relocations are required, they shall be subject to the approval of the Owner.

In erecting the pipe, a sufficient number of screw unions or flanged joints shall be used to allow any section or run of pipe to be disconnected without taking down adjacent runs. Screw unions may be employed on pipelines 2-1/2 inches in diameter and under. Flanged joints shall be employed on pipe 3-inches in diameter or larger unless shown otherwise on the Drawings. Flexible couplings or grooved end couplings shall be used where shown. Dielectric unions are to be installed at the junction of dissimilar metals.

Piping shall be properly supported by anchors, brackets, or hangers.

Anchorage lugs shall be provided where there is a possibility of pulling the joint under pressure.

Where pipes pass through walls, care shall be exercised to insure joints are watertight. Wall flanges, sleeves or block-outs shall be used. The pipe shall be free of all dirt and grease to secure a tight bond with the concrete. Where invert elevations only are shown on the Drawings the Contractor shall lay the pipe at a straight grade between these points.

Provisions shall be made for thermal expansion in all exposed pipelines, pipeline layout showing details of expansion joints and anchors shall be submitted for approval 30 days in advance of ordering.

A flexible connection shall be provided whenever piping is leaving a structure to prevent under stress due to never setting. The flexible connection shall be completely fabricated of materials not subject to deterioration when buried in the earth.

3.12 Installation – Underground Pipe

The Contractor shall, after excavating the trench and preparing the proper bedding for the pipe, furnish all necessary facilities for properly lowering and placing sections of the pipe in the trench without damage and shall properly install the pipe. The section of pipe shall be fitted together correctly and shall be laid true to line and grade in accordance with the drawings. The full length of the barrel of the pipe has a uniform bearing upon the bedding material, but if the pipe has a projecting bell, suitable excavation shall be made to receive the bell which shall not bear on the subgrade. The bottom of the pipe shall be closely fit to the bedding material for the specified width.

Pipe shall be laid upgrade. Any pipe which is not in true alignment, both vertical and horizontal, or shows any undue settlement after laying, shall be taken up and relaid correctly by the Contractor at his own expense, when so ordered by the Owner. No pipe shall be laid which is damaged, cracked, checked, or spalled or has any other defect deemed by the Owner to make it unacceptable, and all such sections shall be permanently removed from the work.

3.13 Installation Procedures (CML & W or CML & C)

3.13.01 General

All electric welded steel pipe shall be installed in accordance with installation instructions furnished by the pipe manufacturer, and these instructions shall be closely and carefully followed by the Contractor. The pipe shall be laid true to line and grade at the locations as indicated on the plans, and as herein specified.

3.13.02 Lowering

Pipe shall be carefully lowered into the trench using suitable means that will prevent injury to the pipe and disturbing the prepared foundation or getting dirt inside the pipe or couplings. All pipe ends and coupling parts shall be thoroughly cleaned before final assembly of the joint. Rubber rings and couplings sleeves shall be installed in an approved and workmanlike manner. Holes shall be dug at each joint to permit the jointing to be made properly.

3.13.03 Lubricating

A specially prepared non-toxic and water-soluble lubricant shall be applied to machined pipe ends just prior to installation of the couplings. Proper locations of all rubber rings shall be checked by use of a suitable feeler gage at all points around the circumference of coupling ends.

3.13.04 Capping

At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials. The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause, and shall, at his own expense, restore and replace the pipe to its specified condition and grade if it is displaced due to floating. The Contractor shall maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition until its acceptance by the District.

3.13.05 Inside Joint Recess

The inside joint recess shall be buttered with cement mortar in such a manner and in sufficient quantity to completely fill the space between the respective mortar linings. After the jointing is completed, the pipe interior shall be swabbed to remove all excess mortar by drawing an approved type swab squeegee through the pipe.

This procedure also applies to the inside joint recesses of all flexible couplings.

3.13.06 Outside Joints

Outside field joints shall be coated with cement mortar or approved tape type wrap (Protecto-Wrap) applied as directed by Engineer.

The pipe manufacturer's recommendations shall be followed in the fabrication of this joint.

All flexible couplings shall be coated in their entirety as outlined above.

3.13.07 Welded Joints

All welded joints shall be done by welders certified in accordance with Appendix II of the American Standard Code for Pressure Piping (ASA Designation:

B31.1), Standard Specifications for Field Welding of Steel Water Pipe Joints (AWWA Designation: 7A.7-T), of the American Water Works Association.

3.13.08 Flange Joints

The Contractor shall furnish all necessary bolts and gaskets for flange joints and all other material for jointing, special fittings and valves to pipe.

3.13.09 Large Radius Curves

When horizontal and vertical, large radius curves are specified, slight deflections may be made with straight pipe, provided that the maximum joint opening closure caused by such deflection shall not exceed five-eighths inch (5/8") for pipe of diameters twelve inches (12") through twenty-one inches (21") and three-quarters inch (3/4") for pipe of diameter twenty-four inches (24") and larger. Short radius curves and closures shall be formed by special fittings.

3.14 Installation for Ductile and Cast Iron Pipe

Unless otherwise indicated or shown on the drawings, all underground pipe may have push-on bell spigot joint, mechanical joint or couplings.

All pipelines adjoined concrete structures (including manholes) shall have a joint (flexible) within or at 18-inches from the face of such concrete structures.

All trench backfill shall be in accordance with section 1.0 "Earthwork" of these specifications.

Pipe Laying – All pipe shall be carefully inspected for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No pipe or fitting which is cracked or which shows defects excluded by the Specifications for such fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor with coal tar pitch varnish. The pipes, valves, and fittings shall be carefully cleaned immediately before installation. Every open end of a pipe shall be carefully plugged or capped before leaving the work. For bell and spigot pipe, the position or direction of bells, which shall normally face the direction of flow, may be altered from the positions shown on the plans with the permission of the Owner. Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, or excess coating before spigots are inserted into bells. The spigot end of the pipe shall be brought to true line and grade and be inserted to the full depth of the socket before the joints are made. The inner surface of the pipe shall conform at the joints, and the annular space for the jointing materials shall be uniform width and depth. If any pipe does not allow sufficient space for jointing material, it shall be replaced by one of proper dimensions. The maximum deflection angle in bell and spigot cast iron

pipe joints shall be no more than three (3) degrees. Laying of cast iron pipe shall conform to line and grade as shown on the Drawings.

Piping Through Walls – Piping through walls shall be installed in accordance with the drawings and shall be accomplished by the installation of a wall insert of the same size as the pipe penetrating the wall. Care shall be exercised to insure a watertight installation.

Neoprene-Ring Joints – Between lengths of cast iron pipe, neoprene gasket joints can be used. Joints shall be “Tyton” or approved equal. Installation shall be in accordance with the manufacturers recommendations. Gasket seats and neoprene gaskets shall be thoroughly cleaned before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.

Flanged Joints – Flanged pipe shall be cut true to length. Joints shall be perfectly watertight. Gaskets shall be full faced and shall fit the inside dimension of the pipe accurately, so that no surplus material projects out into the flow area. The completed joint shall be smooth and properly aligned.

All iron pipe shall be installed with a 8 mil polyethylene tube per ANSI/AWWA C-105.

3.15 Installation of Polyvinyl Chloride Pipe (PVC)

PVC shall be installed in accordance with AWWA C-900, ASTM D-2774 and the manufacturer’s recommendations.

For PVC pipe with mechanical joints, the gasket shall be placed in the groove of the bell. Lubricate the spigot lead of the pipe, keeping it clean and free of dirt or sand and then insert the spigot end into the bell and force into position per manufacturer’s recommendation.

The pipe shall be accurately laid to alignment and grade shown on the drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid to grade within a tolerance of 0.1’, or 0.2’ cumulative deviation from elevations set adjacent grade stakes. As ordered by the Engineer, the allowed tolerance may be greater than herein indicated for lines on steep grades, or less than herein indicated for the larger lines or lines on flat grades, where necessary to avoid air pockets.

3.16 Testing – Pressure Line

Upon the completion of the laying, jointing, and backfilling, and the proper curing of the joints, the pipeline or portions thereof shall be hydrostatically tested. For convenience of testing, the pipeline may be divided into sections and each section tested separately. The maximum length of each test section shall not exceed 4,000 feet. The maximum

elevation difference for each test section shall not exceed 50 feet. Bulkheads shall be constructed to safely withstand the hydraulic pressures imposed upon them. No payment will be made expressly for the work and materials required for the bulkheads and any compensation desired by the Contractor for this work shall be included in the price quoted for the installation of the pipe. The contractor shall have no claim against the Owner by reason of required construction due to omission of the installation of any or all main line valves.

- A. Preparation – After the section of pipeline has been bulkheaded and completely filled with water, it shall be allowed to stand under a light pressure a minimum of 24 hours to allow the concrete to obtain a maximum absorption of water and to allow the escape of air from any pockets.
- B. Test Pressure and Leakage – All pipe shall be tested per Section 9.0. The Contractor shall determine the points of leakage, make the necessary repairs including trench back fill, and make another test. This procedure shall be continued until the leakage falls below the allowable maximum. Leakage shall be determined by metering the water injected into the pipeline while under the required pressure.

The Contractor shall submit to the Owner before and after the test gauge, the meter used so that these devices may be tested by the Owner.

- C. Test Equipment – The Contractor shall provide all calibrated meters for measurement of leakage, all bulkheads or boilerheads, piping, calibrated gauges, pumps and other equipment, and all power and labor necessary for the performance of pressure tests satisfactory to the Owner. The Contractor shall furnish all necessary equipment and labor to fill each section of pipeline tested and for pumping the water from one test section to another as may be necessary for obtaining and maintaining the required water pressure and for filling the entire pipeline with water after the conclusion of the testing, as hereinafter provided.
- D. Corrections – The Contractor at his own expense, shall do any excavation necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed, shall replace such excavated material, and shall make all repairs necessary to meet the required water tightness after which the test shall be repeated until the pipe meets the test requirements. All tests shall be made in the presence of the Owner. After the pipe has met successfully with the test requirements specified herein, the entire pipeline shall be filled with water and so maintained under the completion of the contract unless otherwise ordered by the Owner.

- E. Special Testing Requirement for Piping Under Building Slab – After installation of under slab influent and effluent, suction and discharge piping, pump barrels, filter effluent and filter, waste piping and valving and prior to the construction of building foundation and slab, all underground piping shall be tested for water tightness in accordance with the procedures outlined in paragraph a, b, c and d.

The Contractor may divide the underground piping into sections at his own convenience and test each section separately. It shall be Contractor's responsibility to provide, install and remove temporary bulkheads as necessary.

3.17 Connections to the Existing Water System

- A. General – Connections to the existing water distribution system shall be constructed at the locations and to the lines and grades indicated on the plans and as herein specified.
- B. Installation – The Contractor shall be required to connect the existing distribution lines to the newly installed mains. The Contractor shall furnish all materials and perform all work necessary to complete the connections including saddles, taps, fittings, thrust blocks, adapters, etc. Unless otherwise directed by the Engineer, all existing water mains shall be kept in service during construction.

The Contractor shall collaborate closely with the operation employees of the District in making connections. At no time shall the Contractor operate any District valve.

3.18 Shop Drawings

When called for in the Special Provisions show drawings of all pipe and fittings shall be submitted to the Engineer and shall be approved by him prior to fabrication of the pipe and fittings.

3.19 Hauling and Handling Pipe

The Contractor shall protect all pipe from damage during hauling and handling per the manufacturer's recommendation. Dropping or bumping of pipe will not be permitted. Pipe will be handled with a two point pick-up with a six foot minimum spread. Slings or padded cable will be used so as not to damage exterior coating.

Pipe shall not be strung prior to blasting in those areas where blasting is required. Damaged pipe shall be replaced or repaired by the Contractor at his expense, and subject to approval by the Engineer.

3.20 Testing and Disinfection of Water Lines

For testing and disinfection of water lines see Section 9.0 of these Specifications.

3.21 Concrete Thrust Blocks, Blankets and Pipe Encasements

For installation of concrete thrust blocks, blankets, and pipe encasements see Section 10.0 of these Specifications. Concrete Thrust Blocks shall only be used as shown on the construction drawings or as approved by LHMWD. Pipe joint restraints to account for imbalanced forces shall be delineated on the construction drawings and are the method of choice to account for thrust restraint.

3.22 Water Service Connections

For installation of water service see Section 7.0 of these Specifications.

3.23 Locator Wire

Locator wire shall be installed over all waterlines, reclaimed waterlines and force mains whether or not telemetry wire is buried with the pipe. Locator wire per District's Standard Drawing No. H-9 shall be 14-1 solid insulated copper wire (UF), in a continuous strand placed on top of pipe and secured with tape. Locator wire shall be brought to the surface at the edge of the right of way at 660 feet maximum oncenters in Brooks No. 1-SP, or equal, valve boxes. The valve boxes shall be placed within two feet of fire hydrants when fire hydrants are available 660 feet or less on center. Where no fire hydrants are available LHMWD market posts shall be installed within two feet of the valve boxes. For subdivision construction, instead of the marker post, mark the face of the curb in front of the box with the letters "LW". Loop 2 feet of wire in the valve box. Provide the inspector survey stations at each valve box for as-built drawings.

3.24 Inspection

The Engineer or his authorized representative shall at all times have the right to inspect the work and materials in the course of manufacture. The manufacturer shall furnish the Engineer reasonable facilities for obtaining such information as he may desire regarding the progress and manner of the work and the character and quality of materials used.

3.25 Warranty

The manufacturer shall guarantee that if the pipe is assembled in accordance with his instruction, the joint shall be water tight. If any joint is seen to leak, it will be repaired by the Contractor at the manufacturer's expense. The manner of repair shall be at the discretion of the Engineer. No deforming or mutilation of the pipe will be attempted. If possible, steel pipe will be welded. Otherwise, the sections will be cut out and a replacement piece shall be furnished by the pipeline Contractor and installed by the pipeline Contractor, using flexible couplings.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 4.0
WATER

FIRE HYDRANT ASSEMBLIES

4.1 General

The Contractor shall furnish and install fire hydrant assemblies, including heads, valves, pipes, valve box and lid, thrust blocks and other works and appurtenances as shown on the plans and called for in these Specifications.

Fire hydrant assemblies shall be as called for on the District's Standard Drawing No. H-2, (sheets one, two or three) and as specified in the other applicable sections of these Specifications. All fire hydrants require a "break-away" base.

Wet barrel fire hydrants shall be James Jones J-4040B (6" x 1-2 1/2" and 1/4") as indicated on the District's Standard Drawing No. H-2 (sheet 1) or approved equal, or James Jones J-4060B (6" x 2-2 1/2" and 1/4") as indicated on the District's Standard Drawing No. H-2 (sheet 2) or approved equal. James-Jones J-344 H.P. (4" x 1-2 1/2") as indicated on the District's Standard Drawing No. H-8 or approved equal. The unit called for shall have National Standard hose thread outlets.

Dry Barrel fire hydrants shall be Mueller A-423 (6" x 2-2 1/2" and 1/4") as shown on Standard Drawing No. H-2 (sheet 3) or approved equal.

Gate valves, valve boxes and lids, piping and fittings shall be as called for on the plans and as specified in the other applicable sections of these Specifications.

4.2 Paintings

All fire hydrants shall be surface prepared to receive paint by scraping and wire brushing and shall be painted with one (1) coat of 1069 Heavy Duty Rust Inhibitive Red Primer and two (2) coats of 7644 Safety Yellow as manufactured by Rust-Oleum, or approved equal paint system using compatible primer and finish supplied by one manufacturer. Caps and tops of fire hydrants shall be painted as follows:

Flows in excess of 1,500 Gallons per Minute (GPM), caps and tops shall be painted blue.

Flows from 1,000 to 1,499 GPM, caps and tops shall be painted green.

Flows from 500 to 999 GPM, caps and tops shall be painted orange.

Flows less than 500 GPM, caps and tops shall be painted red.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 5.0
WATER

FLUSH-OUT AND BLOW-OFF ASSEMBLIES

5.1 Flush-Out Assemblies

The Contractor shall furnish and install the flush-out assemblies as shown on the plans and on the District's Standard Drawing No. H-7 and as specified on the other applicable sections of these Specifications.

Flush-outs shall be constructed of 4-inch (4") size at the locations shown on the plans and the valves, piping, and fittings shall be as called for on the plans or approved equals.

5.2 Blow-Off's

The Contractor shall furnish and install the blow-off assemblies as called for on the plans, and as specified on the other applicable sections of these Specifications.

5.3 Excavation and Backfill

The Contractor is referred to Section 1.0, "Earthwork" of these Specifications.

5.4 Protective Coatings

All portions of flush-out and blow-off pipe and appurtenances extending above finished grade shall be surface prepared to receive paint by scraping and wire brushing, and shall be painted with one (1) coat of surface primer and two (2) coats of finish paint. The paint shall be 1069 Heavy Duty Rust Inhibitive Red Primer and 7644 Safety Yellow Finish coat, as manufactured by Rust-Oleum or Chex-Rust Primer and Safety Yellow Speed Tec 313-02 finish, as manufactured by Fuller Paint Company, or approved equal paint system using compatible primer and finish supplied by one manufacturer. All flush-out and blow-off pipe below grade shall be 4-inch CML&C pipe.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 6.0
WATER

GATE VALVES, BUTTERFLY VALVES, VALVE BOXES AND COVERS

6.1 General

The Contractor shall furnish and install valves and appurtenances, of the size and at the locations as shown on the plans and as herein specified.

6.1.01 Gate Valves

Gate valves shall be resilient seated and conform to the latest revision of the American Water Works Association (AWWA) Resilient Seated gate valve Standard C-509 for working pressures for 200 pounds per square inch. The wedge shall be cast iron completely encapsulated with resilient material. The resilient sealing material shall be permanently bonded to the cast iron wedge with a rubber tearing bond to meet ASTM D429. NRS stems shall be cast bronze with internal collars in compliance with AWWA. The NRS stuffing box shall have two "O"-Ring seals above the thrust collar. These rings shall be field replaceable without removing the valve from service. There shall be low friction thrust bearings above and below the stem collar. The stem nut shall be independent of the wedge and of solid bronze. The waterway in the seat area shall be smooth, unobstructed and free of cavities. Stuffing box shall be attached to the bonnet and bonnet to the body with bolts and nuts. The body and bonnet shall be coated both interior and exterior with fusion bonded heat cured thermo setting material meeting all the application and performance requirements of AWWA C-550. Each valve shall be hydrostatically tested at 400 psi to the requirements of AWWA. The gate valves shall be suitable for buried service with flanges conforming to the American Standard for Class 125 Cast Iron Pipe Flanges and Flanged Fittings B 16.1. The gate valves shall be of the inside screw type, non-rising stem with 2-inch operating nut manufactured by Kennedy Ken-Seal II, Clow RW Stockham G-700-0 or approved equal.

It is the intent of the plans and specifications to provide valve boxes and covers for all valve installations set in the ground.

6.1.02 Butterfly Valves

Butterfly valves shall conform to the latest specifications of the AWWA, Designation C-504. The valves shall be of the rubber seated, tight closing type, furnished with flanged ends, a cast iron body, a Ni-resist, and a molded rubber seat that is recess mounted, bonded, to the valve body. Valve body shall be cast

iron per ASTM A-126, Class B, with integrally cast hubs for shaft bearing housing, and shall have 125 pound flanged ends faced and drilled in accordance with ASA B16.1, Standard for Cast Iron Flanges. Valve disc shall be symmetrical about the shaft axis with no external ribs, cored or uncored, and cast of alloy cast iron. The disc shall rotate 90° from full open to tight shut position. Valve shaft shall be of a solid one piece design of centerless ground 18-8 stainless steel, and shall extend full size through the valve disc, valve bearings, shaft seal area and gland. Valve disc and shaft connection shall be by means of mechanically secured taper pins extending through the disc and shaft. Taper pins, lockwashers and nuts shall be 18-8 stainless steel. Sleeve type bearings of self-lubricating material shall be installed in the hubs of the valve body. A shaft seal shall be provided in the valve body hub where the shaft extends through the body. The one piece cast gland follower, studs and nuts shall be bronze. Packing shall be self-adjusting split “V” type.

Unless otherwise indicated on the Drawings, each Butterfly Valve shall be equipped with a manual operator of the traveling nut type and shall be self-locking to prevent the valve disc from creeping or fluttering when in any intermediate position between open and closed. The operator shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position to prevent the valve disc from over travel in either direction and except on units for buried or submerged service shall have a valve disc position indicator. The gear ratio and handwheel diameter shall be designed so that a pull of not more than 80 pounds on a handwheel or chainwheel (or 150-foot pound input on buried applications) will produce an output torque equivalent to the maximum valve shaft torque required to operate the valve under actual line pressures and velocities. Chainwheels with guides shall be furnished for all manually operated valves placed 6 feet 6 inches or more above the operating level. On buried installations the gear box shall be fixed to the valve and the stem with 2-inch square operating nut shall be extended through a slip-type valve box, to the surface.

Butterfly valves 4- thru 12-inch shall be Pratt Groundhog M & H Model 4500 or approved equal, valves 12-inch and above shall be Pratt Groundhog, M & H Model 4500, Mueller Lineseal III or approved equal.

6.2 Excavation and Backfill

The Contractor is referred to Section 1.0, “Earthwork”, of these Specifications.

6.3 Opening Direction

Wrench nut shall turn left (counter clockwise) to open the valve.

6.4 Valve Ends

The valve ends shall be of the type that is adaptable, insofar as possible, to the type of pipe that is used so that adapters are not required. However, valves with welding ends will not be permitted for use in welded steel lines.

6.5 Valve Boxes and Covers

Valve boxes shall be provided for all valves which are set in the ground and shall extend to a point flush with the finished or established ground or paved surface. Valve box covers shall be as supplied by Western Water Works or approved equal. The valve box shall be adjustable and shall consist of a six inch (6") outside diameter (o.d.) x eighteen inch (18") galvanized steel, ten (10) gauge valve box top with cast iron caps which extend six inches (6") into a six and five-eighths inches (6-5/8") o.d. ten (10) gauge pipe (valve box) which may be of varying length to meet field conditions. Where valve operating nuts are more than thirty-six inches (36") below finish surface, the contractor shall install a valve extension stem either of standard manufacturer or shop fabricated, which shall bring the operating unit within twelve inches (12") of the surface. The extension stem shall be made of solid round steel bar of diameter equal to the valve stem diameter with a minimum of one-inch (1") diameter or extra heavy steel pipe of diameter equal to one and one-quarter (1-1/4) times the valve stem diameter with a minimum of one and one-quarter inch (1-1/4") inside diameter. The stem extension shall have a round disc dirt shield guide made of one-quarter inch (1/4") minimum thickness solid steel plate having a diameter approximately one-half inch (1/2") less than the valve cover inside diameter which will allow smooth stem operation. The stem shall be pin or bolt affixed to the valve operating nut.

Installation of the Valve Box and Cover shall conform to the District's Standard Drawing No. H-10, and to other applicable drawings.

Nameplate

The nameplate on each and every valve box cover shall read as follows:
Top, "Lake Hemet"; Center "Water"; Bottom "M.W.D."

6.6 Double Check Detector Assembly (4" – 10")

Double check detector assembly shall consist of two independent mainline double check assemblies in parallel with a by-pass meter assembly. Mainline check assemblies shall be of the spring loaded, center stem guided type. All internal metal parts included in the mainline check assemblies shall be of Series 300 stainless steel, and shall not contain any dissimilar metals. Elastomeric seat discs must be reversible, seat rings shall be B-61 bronze, or Series 300 stainless steel, bolted to the valve bodies with an "O" ring seal.

Mainline check assemblies shall be guided at the seat ring and at the cover by replaceable non-corrosive bushings.

Mainline valve bodies and covers shall be manufactured of ductile iron ASTM A536, Grade 65-45-12 or fabricated steel body per ASTM A36 and shall be designed to withstand a 10:1 safety factor over rated maximum working water pressure.

Ductile iron bodies shall be flanged ANSI B16.1, Class 125, epoxy coated internally 10-20 mils and prime coated externally.

Head losses through the assembly shall not exceed 8 PSI (4" through 8") and 10 PSI (10") at velocities from zero to and including 7.5 FPS. Flow curves shall be documented by independent laboratory testing.

The by-pass meter assembly shall consist primarily of a bronze water meter in series with a bronze double check valve. The meter shall be the total registration type with accurate registration between 1 and 20 GPM flow rates. The by-pass double check assembly shall consist of independent modular center stem guided check assemblies with guiding surfaces located in the threaded-on-body bronze caps. The by-pass double check shut-off valves and testcocks shall be resilient seated ball valves with full flow characteristics. The static pressure drop across the by-pass double check assembly shall be approximately 2 PSI less than the mainline check valves to assure proper operation.

All flow up to approximately 5 GPM shall be diverted through the by-pass only. Flows above this level will open the mainline checks.

Mainline shut-off valves shall be resilient wedge, OS & Y, UL / FM for fireline service and are considered integral to the assembly along with full port ball valve testcocks. Assemblies must be factory assembled and backflow tested. Double check detector assemblies shall be rated 175 PSI MWWP (32° - 140° F), factory assembled and tested to assure proper mainline/by-pass balance and cross-over performance.

The assembly shall meet or exceed requirements of USC foundation for Cross Connection Control and Hydraulic Research, Latest Edition. Double check detector assemblies shall be Febco 856 (2-1/2 8-inch), Ames Model 3000 DCDA (4 – 8 inch) or Febco 806YD (10-inch), Ames Model 3000 DCDC (10-inch) or approved equal.

Installation of Double Check Detector Assembly shall conform to the District's Standard Drawing No. H-3.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 7.0
WATER

WATER SERVICES

7.1 General

The Contractor shall install services at the locations shown on the plans, at right angles to the centerline of the main and shall be spaced a minimum of five feet (5') from any sewer lateral. No services will be permitted in driveway areas.

All pipes, valves and fitting shall have a minimum working pressure rating of one hundred and sixty pounds (160) per square inch. All copper tubing service fittings are of pack joint type or flared fittings. All one inch (1") and two inch (2") water services shall be copper. All copper tubing shall be seamless copper water tubing, Type K, soft temper, or approved equal.

Water service connections shall be installed in conformance with the District's Standard Drawings No. H-4 and H-5, and other applicable Standard Drawings.

The area designated on District Standard Drawings No. H-4 and H-5 as Meter Box, Future, shall be backfilled after covering the angle meter stop with an inverted polyethylene bag securely tied or taped below said stop. The bag shall be of a size to adequately enclose the entire angle meter stop and shall be black, 4 to 6 mils in thickness as manufactured by Transparent Products Corp., or approved equal. Care shall be taken not to puncture or tear the bag during backfilling of the future meter box area.

The installation of water service connections such as Ameron Pipe Products "Snap Tap" or approved equal will be permitted when Electric Welded Steel Water Pipe, Cement Lined and Reinforced Mortar Coated is used. Special precautions shall be taken so that the portion of the mortar lining removed during the water service connection installation shall not be allowed to remain inside the pipe. The water service connection will be provided with a bronze coupling to fit the iron pipe thread corporation stop.

7.2 Earthwork

The Contractor is referred to Section 1.0 "Earthwork", of these Specifications.

7.3 Angle Meter Stops

All one-inch (1") angle meter cocks shall be Mueller H-14258, James Jones J-42015G, Ford KV-43-444, WG or approved equal.

All two inch (2") angle meter cocks shall be flanged Mueller H-14276, James Jones J-1975WSG or approved equal.

7.4 Corporation Stops

All corporation stops shall be Mueller H-15028 or James Jones J-34035G, or approved equal.

7.5 Service Saddles

All service saddles shall be one-inch (1") outlets - #311 Smith-Blair (single strap) two-inch (2") outlets - #313 Smith-Blair (double strap), Mueller, James Jones, or approved equal. All welded service connections shall be as shown on District Standard Number H-5 for 1-inch (1") and H-4 for 2-inch (2").

7.6 Water Service Surface Markers

The Contractor shall reference each water service connection in the field with a surface marker. The surface marker shall be a "W" one-inch (1") in height stamped into the face of the curb. The "W" shall be located on the perpendicular from the curb to the angle meter stop.

7.7 Meter Boxes

Meter boxes for five-eighths (5/8") and one-inch (1") meters – dimensions – 12" x 20" with concrete lid and cover – Brooks #37 Series or approved equal.

Meter boxes for one and one-half (1-1/2") and two-inch (2") inch meters – dimensions – 17" x 30" with concrete lid and cover – Brooks #66 Series or approved equal.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 8.0
WATER

AIR AND VACUUM AND AIR RELEASE ASSEMBLIES

8.1 General

The Contractor shall install the air and vacuum valve, air release valve, valves, unions, piping, vault, vault lid and other appurtenances at the locations shown on the plans and called for on the District's Standard Drawing No. H-6, "Air and Vacuum Valve Assembly", and other applicable Standard Drawings.

8.2 Earthwork

The Contractor is referred to Section 1.0, "Earthwork", of these Specifications.

8.3 Pavement Removal

All one-inch (1") copper tubing (minimum) shall be seamless copper water tubing, Type K, soft temper, or approved equal.

8.4 Replacement

All corporation stops shall be Mueller H-15028, James Jones J-42015G, or approved equal.

8.5 Curb Valves

All curb valves shall be Copper Tube Size (CTS), or approved equal.

8.6 Air and Vacuum Valves

All air and vacuum valves shall be Apco-Series 140, one-inch (1") 142, two-inch (2"), 144' Crispen Type S, Hendey two-inch (2"), or approved equal. For two-inch (2") services or two-inch (2") air vents, two-inch (2") galvanized and two-inch (2") brass fittings shall be used.

8.7 Air Release Valves

All air release valves (compound lever) shall be Crispen Type P, Apco Series 200, one-inch (1") 200A; two-inch (2") 200 or approved equal.

8.8 Air and Vacuum Combination Valves

All air and vacuum combination valves shall be Crispen “Universal Air Valve”, Apco “Heavy Duty Combination Air Release Valve”, one-inch (1”) 143C; two-inch (2”) 145C; or approved equal.

8.9 Vault and Lid

All vaults and lids shall be Brooks Products, Quik-set or approved equal. The vault size shall be adequate to contain and allow room to service all valves and appurtenances contained therein. Paint shall be Rustoleum Dunes Tan #7671 using Rustoleum #1069 H. D. Red Primer. Lids are fabricated of steel with vented 6” column pipe minimum .188 wall thickness. Box shall be concrete construction 13” x 24” in dimension Brooks 38 Series or approved equal.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 9.0
WATER

TESTING AND DISINFECTION OF WATER LINES

9.1 General

It is the intent of the Plans and Specifications that the completed water pipes, blow-off's, flush-outs, hydrants and any other appurtenances shall be water tight and clean.

9.2 Testing

Hydrostatic and leakage test shall be performed in accordance with the American Water Works Association Standard Procedure for Pressure and Leakage Test, AWWA C603-65, Section 19, except as herein modified.

All labor, material and equipment for tests shall be furnished by the Contractor. Water for the first test shall be furnished by the District. Water for subsequent tests shall be furnished by the District, but paid for by the Contractor.

9.2.01 Hydrostatic Test

Upon completion of the laying, joining, backfilling and compacting of backfill, and at least seven days after the last concrete thrust device has been placed, the pipe and fittings involved in the construction shall be filled with water for a minimum of 24 hours. Care shall be taken to see that all air vents are open during the filling, and after the section has been completely filled, it shall be allowed to stand under a light pressure for a sufficient length of time to allow any cement mortar lining to absorb and to allow the escape of air from any air pockets. During this period, all fittings, specials, manholes, and connections shall be examined for leaks. If any are found, they shall be stopped. A test pressure 50 percent greater than the class of pipe and fittings shall then be applied to sections and maintained for a four hour period. Test sections will be chosen which give, as nearly as possible, constant pressure throughout the section with the pressure being measured at the lowest point.

9.2.02 Leakage Test

After the pressure test is satisfactorily completed, the piping shall be tested for leakage at a pressure equal to the pressure class of the pipe and fittings involved in each test section. The Contractor shall test the piping sections as designed by the Engineer and the required pressure shall be maintained for a two hour period, during which time leakage shall be accurately measured.

The measured leakage shall not exceed the rate of 12 gallons per inch of diameter per 24 hours per mile of pipeline.

Contractor, at his own expense, shall do all excavation necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed, and shall replace such excavated material and shall make all repairs necessary to provide the required until the pipe and fittings meet the water tightness requirements to the satisfaction of the Engineer.

9.3 Disinfection of Water Mains

Before being placed in service, each portion of the line shall be disinfected in accordance with the American Water Works Association Standard for Disinfecting Water Mains, AWWA C651-92, Sections 5.2 and 5.3.

When using chlorine, it must be documented. Final flushing, bacteriological testing, re-disinfection and final connections to existing mains shall be in accordance with AWWA Standard C651-92, Sections 6-9. The Contractor shall provide the Owner or Engineer with bacteriological test results in accordance with the State of California Department of Health Services.

Disinfection procedures when cutting into or repairing existing mains – shall be in accordance with AWWA C651-92, Section 10.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 10.0
WATER

MISCELLANEOUS ITEMS OF WORK

10.1 General

The Contractor shall furnish and install the following at locations shown on the plans and in accordance with these Specifications to include all costs for a proper and complete installation.

10.2 Concrete Blanket

The Contractor shall install Concrete Blankets in accordance with the District's Standard Drawing No. H-11, at the locations shown on the plans and in conformance with these Specifications. A Type I blanket is to be used at locations where the pipe is to be protected from surcharge and wheel loadings. A Type II blanket is to be used at locations where the pipe installation is to be protected from erosion due to the flow of water over the pipe.

10.3 Air Gap

The Contractor shall provide an Air Gap as shown on the District's Standard Drawing No. H-12 to protect the water system.

10.4 Temporary Water Service

The Contractor shall provide a Temporary Water Service as shown on the District's Standard Drawing No. H-13.

10.5 Adjustable Pipe Support

The Contractor shall install an Adjustable Pipe Support as shown on the District's Standard Drawing No. H-14 at the locations shown on the plans.

10.6 Guard Post Installation

The Contractor shall install a Guard Post as shown on the District's Standard Drawing No. H-15 at the locations shown on the plans.

10.7 Pipe Encasement

The Contractor shall install a Pipe Encasement as shown on the District's Standard Drawing No. H-16 at the locations shown on the plans.

10.8 Concrete Thrust Blocks

The Contractor shall install Thrust Blocks as shown on the District's Standard Drawing No. H-17 (2 Sheets) at the locations shown on the plans. Concrete Thrust Blocks shall only be used as shown on the Construction Drawings or as approved by the District. Pipe joint restraints to account for imbalanced forces shall be delineated on the Construction Drawings and are the method of choice to account for thrust restraint.

The contractor shall construct all anchor and thrust-blocks as required and where directed by the Owner and as shown on the Drawings. In general, thrust blocks will be placed at all angles greater than 10°.

Each thrust block shall be designed to have a sufficient bearing area and shall be placed to safely transmit the forces to the surrounding soil. Bearing areas shall be per District's Standard Drawing, No. H-17.

Thrust devices shall be cast-in-place concrete, metal harness, or other suitable devices. Thrust blocks shall be constructed of Class IV concrete and shall be placed against freshly cut and undisturbed trench wall or bottom of sound material. If the thrust exceeds the bearing value of the surrounding soil, the soil shall be precompacted before placing

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 11.0
WATER

REMOVAL AND REPLACEMENT OF PAVED SURFACES

11.1 General

Street pavement and surfaces shall be removed and replaced in all areas of construction excavation in conformance with details shown on the plans and as specified herein. Resurfacing of existing pavement and surfaces damaged or removed in connection with the construction of the improvements, including all appurtenances, shall conform to the provisions of these technical specifications unless the provisions or permits issued by controlling jurisdictions include more stringent requirements. In that case, the work shall conform to the more stringent requirements.

11.2 Excavation and Backfill

The Contractor is directed to Section 1 – Earthwork, of these Technical Specifications for all items pertaining to excavation and backfill.

11.3 Pavement Removal

11.3.01 General

Street pavement, existing road surfacing, or other surfacing materials shall be removed within the limits of all construction excavations prior to proceeding with excavation operations of any nature. Surplus material shall be removed as provided in Section 1 – Earthwork, of these Technical Specifications.

Prior to removal of existing surfacing, pavement cuts shall be made as shown on the plans and as specified herein. All pavement cuts shall be neat and straight along both sides of the trench, and approximately parallel to the alignment of the pipe, to provide an unfractured and level pavement joint. When large irregular surfaces are removed, such trimming or cutting as hereinafter provided shall be parallel with, or at right angles to, the roadway centerline. All cut edges shall provide clean, solid and vertical faces free from loose material and debris.

11.3.02 Plant-Mix Surfacing (Asphalt Concrete Pavement)

Streets and alleys surfaced with asphalt concrete pavement shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts shall be made by sawcutting or other methods as approved by the Engineer.

11.3.03 Road-Mixing Surfacing

Streets and alleys surfaced with road-mixed surfacing shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts shall be made with pneumatic tools or other methods as approved by the Engineer.

11.4 Replacement

11.4.01 General

In all streets or areas in which the surface is removed, broken or damaged by equipment, or in which the ground has caved in or settled due to the Contractor's operations, the surface shall be restored to the original grade and crown section by the Contractor. In the absence of specific designation on the plans, and where the street has been improved with roadway surface, base course, curb, sidewalk or gutter, trenches or damaged sections shall be restored with the type of improvement conforming to the standards of the agency having jurisdiction over the right-of-way.

Prior to resurfacing, the existing surfacing shall be removed as provided above. Wall work shall match the appearance of the existing improvements and finish pavement shall not deviate from existing grade by more than one-eighth inch (1/8") in ten feet (10') and shall be free from ruts, depressions and irregularities.

11.4.02 State Highway Right-of-Way

Construction of water facilities within State Highway rights-of-way shall be subject to the Department of Transportation utility encroachment permit, a copy of which shall be supplied to the District, 5 working days prior to the start of construction. All work done within highway rights-of-way shall conform to the "Terms and Conditions Relating to Utility Encroachments" as issued by the Department of Transportation and as indicated on the plans.

11.4.03 City and County Roads

Construction of water lines within City and County rights-of-way shall be subject to the terms and conditions of the encroachment permit issued by the County of Riverside Department of Transportation or the Cities of Hemet or San Jacinto. A copy of a valid encroachment permit shall be provided to the District 5 working days prior to the start of construction.

11.4.04 Base Material and Subgrade Preparation

Base material shall be furnished, placed and compacted in the trench excavation when required by the agency having jurisdiction.

Base material shall be Class 2 Aggregate Base conforming to Section 26 Aggregate Bases of the State of California, Department of Transportation (Caltrans) Standard Specifications, latest edition.

The subgrade to receive aggregate base shall conform to the compaction tolerance specified and shall be free of loose or extraneous material. Compaction of the subgrade and aggregate base shall conform to Section 26-1.05 Compacting of the Caltrans Standard Specifications.

11.4.05 Plant-Mix Surfacing (Asphalt Concrete Pavement)

All asphalt concrete surfaces, including but not limited to payments, curbs, driveways and sidewalks, which are removed, damaged or broken by the Contractor's activities shall be replaced and/or reconstructed. All asphalt concrete shall be placed on compacted fills or base material as herein specified. Replacement and/or reconstruction shall be to the same dimensions as existing surfaces unless otherwise stated herein or required by the agency having jurisdiction over the roadway.

Materials and workmanship for asphalt concrete shall conform to the requirements of Section 39 "Asphalt Concrete" of the Caltrans Standard Specifications, latest edition.

Plant-mix surfacing shall be Type B asphalt concrete and shall conform to the above referenced Specifications.

Mineral aggregate for asphalt concrete shall conform to the grading requirements specified in Section 39-2.02 "Aggregate" of the above referenced Specifications. Mineral aggregate specified for asphalt concrete to be used for trench repair or as a base paving course shall conform to the grading requirements for 3/4 -inch maximum, medium aggregate. Mineral aggregate specified for use as overlay or in the final paving cap shall comply with the grading requirements for 3/8-inch maximum aggregate.

Asphalt binder to be mixed with aggregate shall be steam-refined paving asphalt conforming to the provisions of Section 92 "Asphalts" of the Caltrans Specifications, and shall be Grade AR-4000, unless otherwise approved by the Engineer.

Paint binder (Tach Coat) shall be grade RS-1 conforming to the provisions of Section 94 "Asphaltic Emulsions" of the Caltrans Specifications and shall be applied to all vertical surfaces of existing pavement, curbs, gutters and construction joints in the surfacing against which additional material is to be placed. Paint binder shall be applied in one application at a rate of 0.02 to 0.10 gallons per square yard of surface covered.

11.4.07 Cap Pavement

Trenches shall be capped with a machine placed, plant-mixed asphalt concrete overlay. The Contractor shall place 0.1 feet (compacted thickness) of asphalt concrete overlay to limits specified in the applicable encroachment permit. Prior to placing the overlay, all existing pavement shall be broomed, loose pavement removed and paint binder, RS-1 Grade, applied in one application, loose pavement removed and paint binder, RS-1 Grade, applied in one application at a rate of 0.05 to 0.10 gallon per square yard of surface covered.

The final overlay shall not be placed until after the Contractor has received, and forwarded to the District, certification that all backfill is compacted to the specified relative density and that all water lines have been tested as specified herein. Said certification or acceptance is meant to be an indication of the effort achieved by the Contractor in compaction and paving operations and shall not release the Contractor of his responsibility in guaranteeing the work for the period of time specified.

11.4.08 Temporary Resurfacing

The Contractor shall furnish, place and maintain temporary resurfacing as herein specified over backfill in paved streets, or as required by State, County or City encroachment permits.

Temporary resurfacing shall be placed to the line and grade of existing surfaces and rolled and compacted no later than the third day after the waterline has been placed and shall be in place on weekends and holidays. The Contractor shall maintain all temporary resurfacing in proper, usable condition until the permanent resurfacing operations are completed. Temporary resurfacing shall be removed and disposed of by the Contractor prior to placing permanent resurfacing.

Temporary resurfacing shall be placed at the locations and of the thickness required by the encroachment permit and/or the Engineer (2-inch minimum thickness) and shall consist of a cold-mix asphalt concrete. Binder shall be liquid asphalt, grade SC-800 or equal.

LAKE HEMET MUNICIPAL WATER DISTRICT
TECHNICAL SPECIFICATIONS

SECTION 12.0
WATER

EROSION CONTROL

12.1 General

The Contractor shall provide erosion control measures as defined herewith on all areas where the natural vegetation has been disturbed by the installation of water facilities. If a ground cover other than natural vegetation has been disturbed, this section does not apply; and the Contractor shall replace said ground cover in kind.

12.2 Preparation

After the backfill has been compacted and the pipeline tested, the Contractor shall remove and dispose of rocks and debris from the area to be reseeded. No seeding shall be performed during windy weather or when the ground is too wet or in an untellable condition. The fertilizer and seed shall be spread before the straw cover material is applied. Commercial fertilizer shall not be applied until after the seed has been sown.

12.3 Material

Materials shall consist of the following:

12.3.01 Seed

The seed shall consist of the following mixture: Crested Wheatgrass, forty-seven percent (47%); Intermediate Wheatgrass, twenty-seven percent (27%); Wimmera Ryegrass, thirteen percent (13%). The seed shall be spread at the rate of one hundred (100) pounds per acre and shall be applied by the use of a "Cyclone Seed Sower" or equal.

12.3.02 Fertilizer

The fertilizer shall be Ammonium Phosphate (16-20-0) spread at the rate of three hundred (300) pounds per acre and shall be applied by the use of a "Cyclone Seed Sower" or equal.

12.3.03 Mulch

After the application of the seed and fertilizer, new straw (stable bedding straw shall not be used) shall be uniformly spread at the approximate rate of four tons

per acre. The straw shall then be “mulched” into the ground by the use of a “wire” roller or other approved equipment.

12.4 Protection for Steep Slopes

In cases where the grade over the pipeline exceeds twenty-five percent (25%) slope, the Contractor shall provide additional erosion control measures to stabilize the backfill material. The Contractor shall submit to the District, for their approval, special engineering details of the method to be used.

LAKE HEMET MUNICIPAL WATER DISTRICT

TECHNICAL SPECIFICATIONS

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WATER

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CRITERIA FOR THE SEPARATION OF WATER MAINS AND SANITARY SEWERS DEPARTMENT OF HEALTH SERVICES

DATED 4/5/83

DATE	REVISION	BY
APPROVED BY	<i>Robt V. Linder Jr.</i>	8/1/97
	GENERAL MANAGER	DATE
	<i>M. A. [Signature]</i>	7/21/97
	DISTRICT ENGINEER	DATE
LAKE HEMET MUNICIPAL WATER DISTRICT WATER IMPROVEMENT		
SEPARATION OF WATER MAINS & SANITARY SEWERS		
STANDARD H-1, SHEET 1		



CRITERIA FOR THE SEPARATION
 OF WATER MAINS AND SANITARY SEWERS

A. PUBLIC HEALTH CONSIDERATIONS

Waterborne disease outbreaks attributed to the entry of sewage-contaminated groundwater into the distribution systems of public water supplies continue to be a problem in the United States. A community with its buried water mains in close proximity to sanitary sewers is vulnerable to waterborne disease outbreaks.

Sanitary sewers frequently leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly constructed joints, and subsidence or upheaval of the soil encasing the conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer lines are broken. Sewage spills into the excavation and, hence, enters into the water main itself. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or man-made disaster, simultaneous failure of both conduits often occurs.

The water supplier is responsible for the quality of the water delivered to consumers and must take all practical steps to minimize the hazard of sewage contamination to the public water supply. Protection of the quality of the water in the public water system is best achieved by the barrier provided by the physical separation of the water mains and sewer lines.

This document sets forth the construction criteria for the installation of water mains and sewer lines to prevent contamination of the public water supplies from nearby sanitary sewers.

B. BASIC SEPARATION STANDARDS

The "California Waterworks Standards" sets forth the minimum separation requirements for water mains and sewer lines. These standards, contained in Section 64630, Title 22, California Administrative Code, specify:

- (c) (1) Parallel Construction: The horizontal distance between pressure water mains and sewer lines shall be at least 10 feet.
- (2) Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.

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STANDARD H-1, SHEET 2

- (d) Separation distances specified in (c) shall be measured from the nearest edges of the facilities.
- (e) (2) Common Trench: Water mains and sewer lines must not be installed in the same trench.

When water mains and sanitary sewers are not adequately separated, the potential for contamination of the water supply increases. Therefore, when adequate physical separation cannot be attained an increase in the factor of safety should be provided by increasing the structural integrity of both the pipe materials and joints.

C. EXCEPTIONS TO BASIC SEPARATION STANDARDS

Local conditions, such as available space, limited slope, existing structures, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in Section E should be followed, subject to the special provisions in Section D.

Water mains and sewers of 24 inches diameter or greater may create special hazards because of the large volumes of flow. Therefore, installations of water mains and sewer lines 24 inches diameter or larger should be reviewed and approved by the health agency prior to construction.

D. SPECIAL PROVISIONS

1. The Basic Separation Standards are applicable under normal conditions for sewage collection lines and water distribution mains. More stringent requirements may be necessary if conditions, such as, high groundwater exist.
2. Sewer lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.
3. New water mains and sewers shall be pressure tested where the conduits are located ten feet apart or less.
4. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipeline.
5. Special consideration shall be given to the selection of pipe materials if corrosive conditions are likely to exist. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit, such as a septic sewage which produces corrosive hydrogen sulfide.

6. Sewer Force Mains

- a. Sewer force mains shall not be installed within ten feet (horizontally) of a water main.
- b. When a sewer force main must cross a water line, the crossing should be as close as practical to the perpendicular. The sewer force main should be at least one foot below the water line.
- c. When a new sewer force main crosses under an existing water main, all portions of the sewer force main within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.
- d. When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

E. ALTERNATE CRITERIA FOR CONSTRUCTION

The construction criteria for sewer lines or water mains where the Basic Separation Standards cannot be attained are shown in Figures 1 and 2. There are two situations encountered:

Case 1 -- New sewer line -- new or existing water main.

Case 2 -- New water main -- existing sewer line.

For Case 1, the alternate construction criteria apply to the sewer line.

For Case 2, the alternate construction criteria may apply to either or both the water main and sewer line.

The construction criteria should apply to the house laterals that cross above a pressure water main but not to those house laterals that cross below a pressure water main.

Case 1: New Sewer Being Installed (Figures 1 and 2)

Zone Special Construction Required for Sewer

- A Sewer lines parallel to water mains shall not be permitted in this zone without approval from the responsible health agency and water supplier.
- B A sewer line placed parallel to a water line shall be constructed of:
1. Extra strength vitrified clay pipe with compression joints.
 2. Class 4000, Type II, asbestos-cement pipe with rubber gasket joints.
 3. Plastic sewer pipe with rubber ring joints (per ASTM D3034) or equivalent.
 4. Cast or ductile iron pipe with compression joints.
 5. Reinforced concrete pressure pipe with compression joints (per AWWA C302-74).
- C A sewer line crossing a water main shall be constructed of:
1. Ductile iron pipe with hot dip bituminous coating and mechanical joints.
 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent, centered over the pipe being crossed.
 3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered over the pipe being crossed.
 4. Any sewer pipe within a continuous sleeve.
- D A sewer line crossing a water main shall be constructed of:
1. A continuous section of ductile iron pipe with hot dip bituminous coating.
 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent, centered on the pipe being crossed.
 3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered on the pipe being crossed.
 4. Any sewer pipe within a continuous sleeve.
 5. Any sewer pipe separated by a ten-foot by ten-foot, four-inch thick reinforced concrete slab.

Case 2: New Water Mains Being Installed (Figures 1 and 2)

Zone

- A No water mains parallel to sewers shall be constructed without approval from the health agency.
- B If the sewer paralleling the water main does not meet the Case 1, Zone B, requirements, the water main shall be constructed of:
1. Ductile iron pipe with hot dip bituminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200, Type II, asbestos-cement pressure pipe.
 4. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 5. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).
- C If the sewer crossing the water main does not meet the Case 1, Zone C, requirements, the water main shall have no joints in Zone C and be constructed of:
1. Ductile iron pipe with hot dip bituminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).
- D If the sewer crossing the water main does not meet the requirements for Zone D, Case 1, the water main shall have no joints within four feet from either side of the sewer and shall be constructed of:
1. Ductile iron pipe with hot dip bituminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).

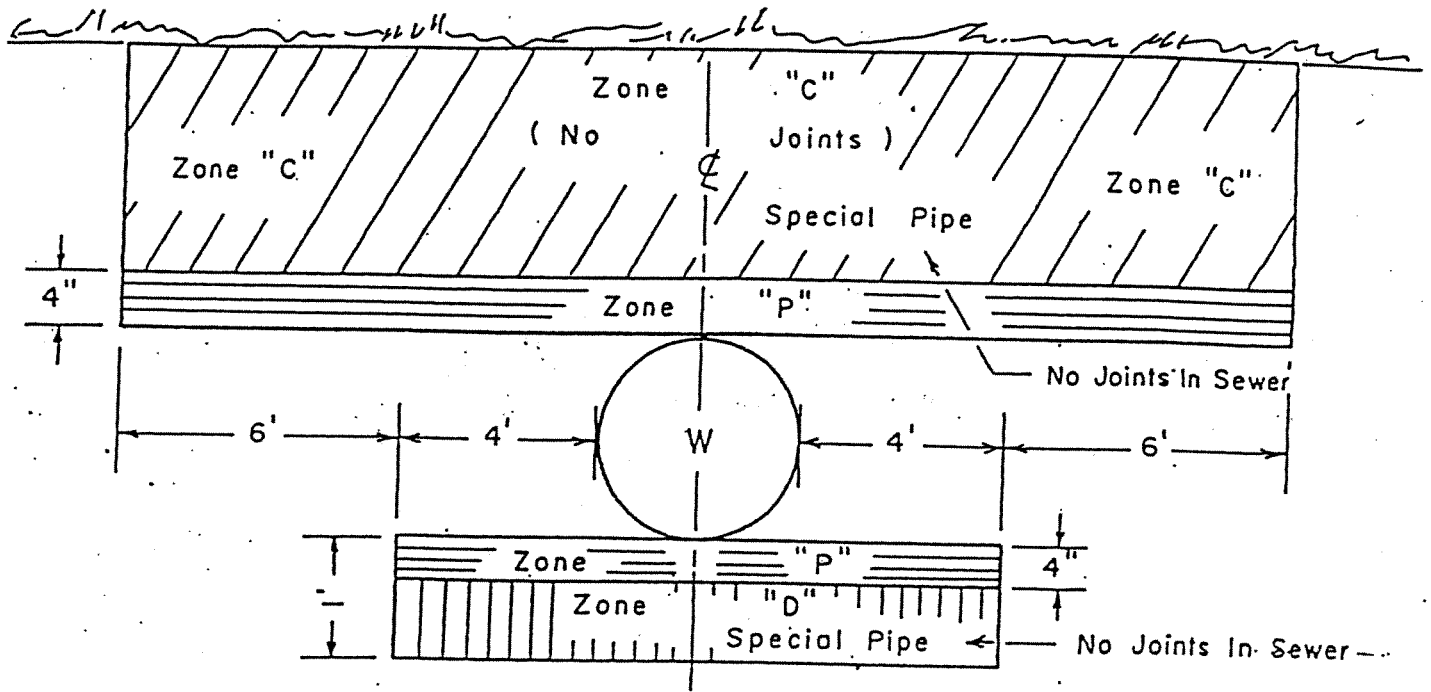
NOTES AND DEFINITIONS:

1. HEALTH AGENCY -- The Department of Health Services. For those water systems supplying fewer than 200 service connections, the local health officer shall act for the Department of Health Services.
2. WATER SUPPLIER -- "Person operating a public water system" or "supplier of water" means any person who owns or operates a public water system.
3. LOW HEAD WATER MAIN -- Any water main which has a pressure of five psi or less at any time at any point in the main.
4. Dimensions are from outside of water main to outside of sewer line or manhole.
5. COMPRESSION JOINT -- A push-on joint that seals by means of the compression of a rubber ring or gasket between the pipe and a bell or coupling.
6. MECHANICAL JOINTS -- Bolted joints.
7. RATED WORKING WATER PRESSURE OR PRESSURE CLASS -- A pipe classification system based upon internal working pressure of the fluid in the pipe, type of pipe material, and the thickness of the pipe wall.
8. FUSED JOINT -- The jointing of sections of pipe using thermal or chemical bonding processes.
9. SLEEVE -- A protective tube of steel with a wall thickness of not less than one-fourth inch into which a pipe is inserted.
10. GROUND WATER -- Subsurface water found in the saturation zone.
11. HOUSE LATERAL -- A sewer connecting the building drain and the main sewer line.

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CASE 1

NEW SEWER



Note: "P" is a prohibited construction zone

CASE 2

NEW WATER MAIN

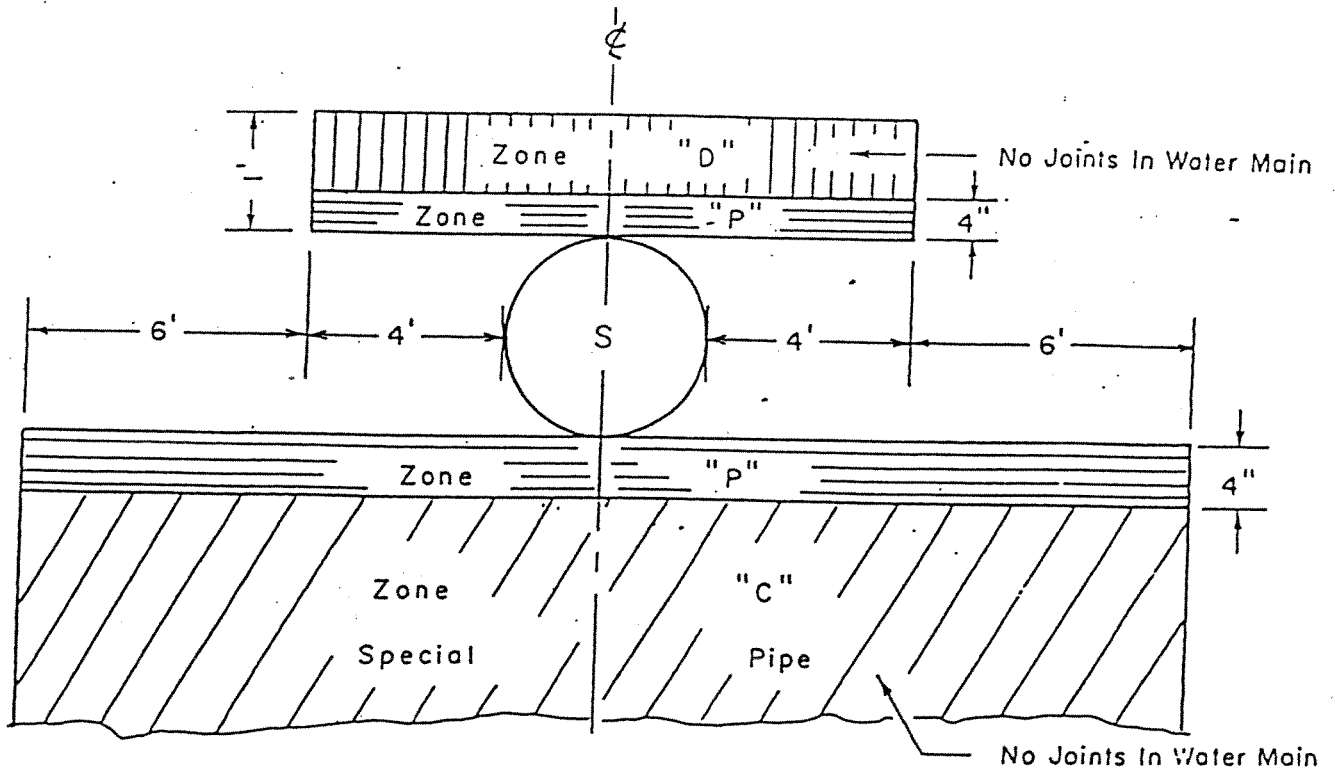
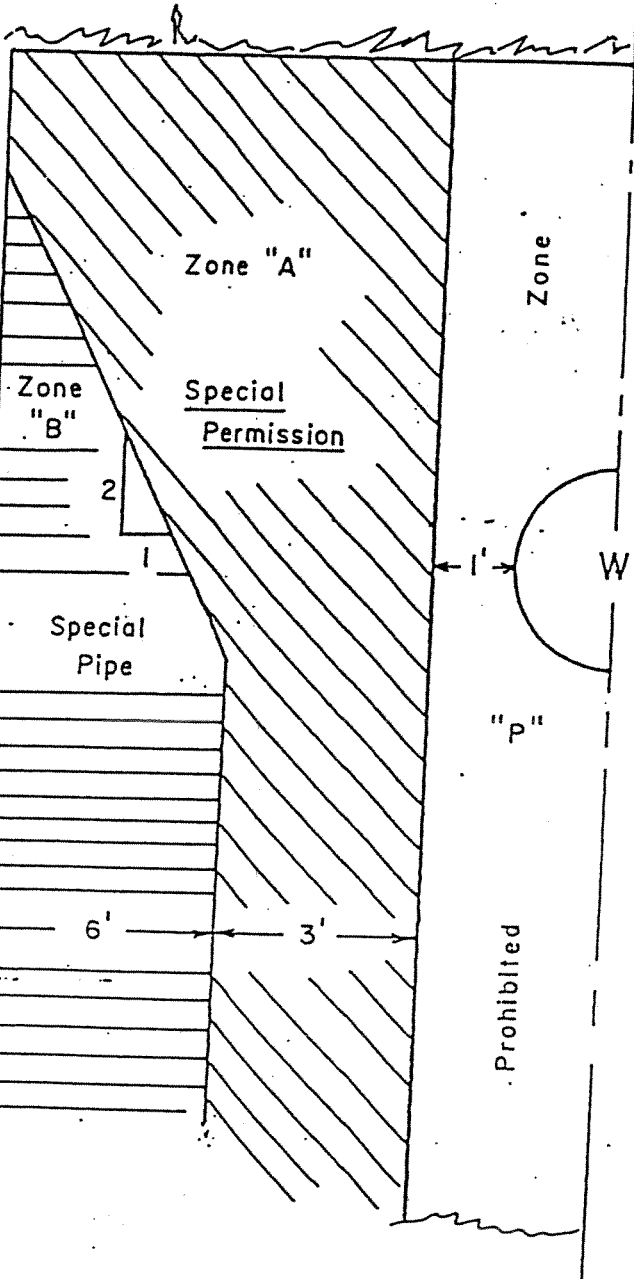


Figure 2 - CROSSINGS STANDARD H-1, SHEET 8

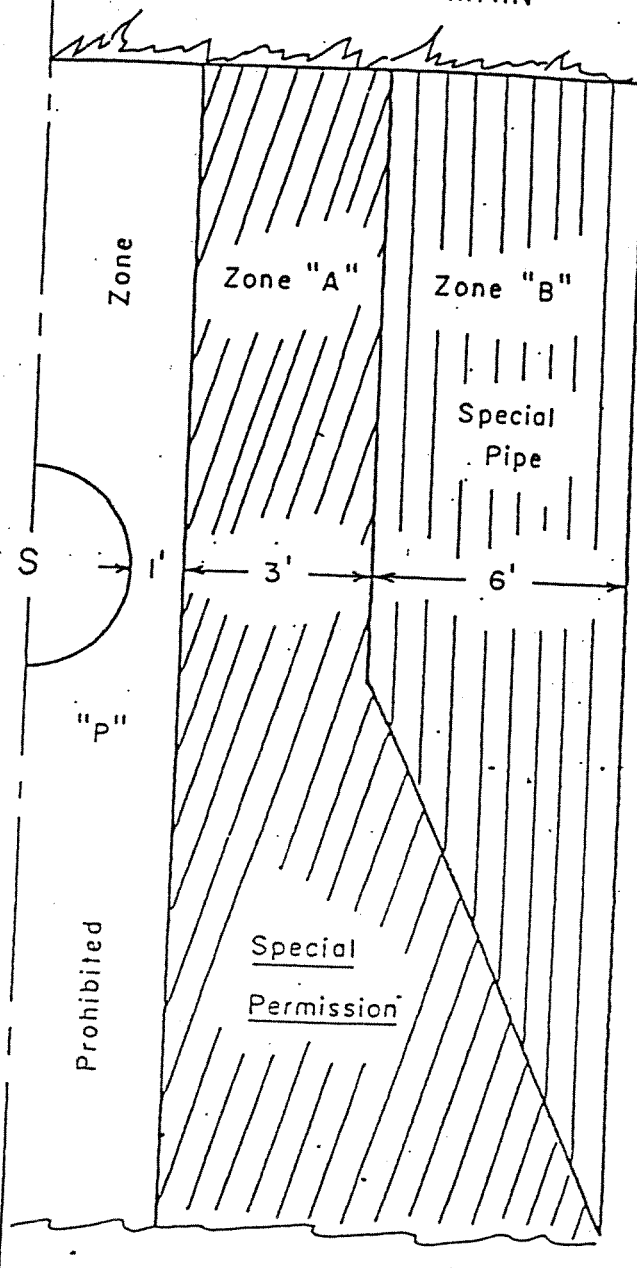
CASE 1

NEW SEWER



CASE 2

NEW WATER MAIN



Note: Zones identical on either side of center lines.

Zone "P" is a prohibited zone, Section 64630 (e) (2) California Administrative Code, Title 22

Figure 1 - PARALLEL CONSTRUCTION