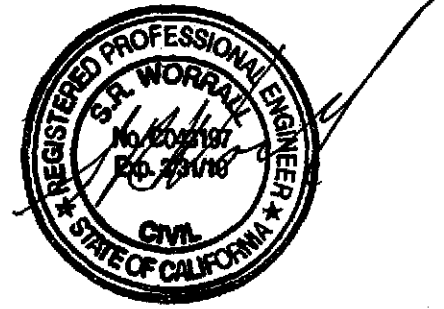


STANDARD SPECIFICATIONS  
FOR WATER IMPROVEMENTS  
AND APPURTENANCES



1.00 SPECIAL PROVISIONS - General

1.01 DEFINITIONS

This section shall conform to Subsection 1-2 of the Standard Specifications and these Special Provisions.

|           |   |
|-----------|---|
| Agency:   | City of Santa Ana   |
| Board:    | City Council of the City of Santa Ana   |
| Caltrans: | State of California, Dept. of Transportation  |
| County:   | County of Orange  |
| Engineer: | The Executive Director of the Public Works Agency of the City of Santa Ana or his authorized representative |
| Federal:  | United States of America  |

1.02 STANDARD SPECIFICATIONS

The Standard Specifications of the AGENCY are contained in the latest edition of the Standard Specifications for Public Works Construction, as written and promulgated by the Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California District of the Associated General Contractors of California. Copies of these Standard Specifications are available from the Publisher of Building News, Incorporated, 10801 National Boulevard, Los Angeles, California 90064, telephone (310) 202-7775.

The Standard Specifications set forth above will control the general provisions, construction materials, and construction methods for this contract, except as amended by the Plans, Special Provisions, or other contract documents. The following Special Provisions are supplementary and in addition to the provisions of the Standard Specifications, unless otherwise noted. ONLY THOSE SECTIONS REQUIRING ELABORATIONS, AMENDMENTS, SPECIFYING OF OPTIONS, OR ADDITIONS ARE CALLED OUT.

1.03 PLANS AND SPECIFICATIONS

This section shall conform to Section 2-5 of the Standard Specifications and these Special Provisions.

The Contractor shall maintain a control set of plans and specifications on the project site at all times. As approved by the Engineer, all final locations determined in the field and any deviations from the plans and specifications shall be marked in red on this control set to show the as-built conditions. Upon completion of all work, the Contractor shall submit the control set to the Engineer.

1.04 WORK BY AGENCY FORCES BECAUSE OF NONPERFORMANCE BY CONTRACTOR

Should the Contractor fail to correct deficiencies or public nuisances that have been created because of his/her operation, then these will be considered to be of an emergency nature, and will call for the AGENCY to move in on the project to take corrective action. Such work will be done on a force account basis with an additional callout charge. There is a minimum two-hour charge for labor on any callout plus an additional callout charge of \$75.

1.05 LIABILITY INSURANCE

This section shall conform to Subsection 7-3 of the Standard Specifications and these Special Provisions.

The certificate of liability insurance shall be provided by the contractor prior to issuance of a street work permit.

1.06 UTILITIES

This section shall conform to Section 5 of the Standard Specifications and these Special Provisions.

Upon completion of the project, the Contractor shall remove all painted utility markings done by him or the respective utility owners from the surfaces of sidewalks, driveway approaches, curbs and gutters using the removal method acceptable to the Engineer. Any damage to sidewalks, driveway approaches, curbs and gutters due to the Contractor's removal operation shall be repaired at the Contractor's expense and to the satisfaction of the Engineer. Payment for removing utility markings shall be included in other items of work, and no additional compensation will be allowed therefore.

If utility construction work within the area is required during the construction of this project, the Contractor shall to coordinate and cooperate with the utility company(s) and their workers during construction and relocation of utilities within the construction area to assure proper installation of the utilities with a minimum of conflict.

The last paragraph of Section 5-1 shall be revised to read as follows:

"The Contractor shall determine the location and depth of all utilities including service connections, which may affect or be affected by its operation."

1.07 WORKING DAY

This section shall conform to Subsection 6-7.2 of the Standard Specifications and these Special Provisions.

The Contractor's activities shall be confined to the following hours:

1. From 7:00 a.m. to 5:00 p.m., Monday through Friday on local and collector streets.
2. From 9:00 a.m. to 3:00 p.m., Monday through Friday on arterial streets.

Deviation from these hours/days shall not be permitted without the prior consent of the Engineer, except in emergencies involving immediate hazard to persons or property, or as specified otherwise.

1.08 CONTRACTOR'S EQUIPMENT AND FACILITIES

This section shall conform to Subsection 7-1 of the Standard Specifications and these Special Provisions.

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract. Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the Manufacturer. The noise level from the Contractor's operations shall not exceed 95 dba at a distance of 50 feet. This requirement in no way relieves the Contractor from responsibility for complying with the City of Santa Ana Noise Ordinance. Based on the City's Noise Ordinance, the maximum noise level at the adjacent property line shall not exceed 55 dba at any residential dwelling between 7:00 a.m. and 10:00 p.m. on weekdays, including Saturday.

The said noise level requirements shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers, or transient equipment that may or may not be owned by the Contractor. The use of loud signals shall be avoided in favor of light warnings, except those required by safety laws for the protection of personnel.

Pursuant to the authority contained in Section 591 of the Vehicle Code, the Department has determined that, such areas as are within the limits of the project and are open to public traffic, the Contractor shall comply with all the requirements set forth in Divisions 11, 12, 13, 14 and 15 of the Vehicle Code. Attention is directed to the statement in Section 591 that this Section shall not relieve him or any person from the duty of exercising due care. The Contractor shall take all necessary precautions for safe operation of his/her equipment and the protection of the public from injury and damage from such equipment.

## 1.09 LICENSES & PERMITS

This section shall conform to Subsection 7-5 of the Standard Specifications and these Special Provisions.

1. Business License: Each prime Contractor and Subcontractor shall obtain and pay for a Santa Ana Business License. Detailed information concerning business license may be obtained from the Finance and Management Services Agency, (714) 647-5447, City Hall.
2. Street Work Permit: Prior to commencing any work within the public right of way, the Contractor shall obtain a street work permit from the Public Works Agency (714) 647-5036 or 647-5838
3. Construction Water Permit: Each prime Contractor or Subcontractor which desires to obtain water from AGENCY-owned fire hydrants for construction or any other purpose shall first obtain and pay for a permit from the Corporate Yard of the City of Santa Ana, at 220 South Daisy Avenue. Information concerning costs and conditions may be obtained from the AGENCY by calling (714) 647-3320. Use of private water from a hose bib is not allowed.

For safety reasons, the Agency will not allow Contractor to stretch construction water hoses across open traffic lanes. Where required, Contractor shall use water truck.

## 1.10 CLEAN-UP & DUST CONTROL

This Section shall conform to Subsection 7-8.1 of the Standard Specifications and these Special Provisions.

The Contractor shall keep the work site clean and free from rubbish and debris at the end of every working day.

## 1.11 PUBLIC CONVENIENCE & SAFETY

This section shall conform to Subsection 7-10 of the Standard Specifications and these special provisions.

Street closures, detours, signs and barricades used for handling traffic shall conform to the requirements of the latest edition of the "Work Area Traffic Control Handbook" (WATCH), City Standard Plan 1125F (SP 1125F), the Manual on Uniform Traffic Control Devices (MUTCD) the 2003 MUTCD California Supplement, and these Special Provisions.

All signs shall be illuminated or reflectorized when they are used during hours of darkness. All cones, pylons, barricades, or posts used in the diversion of traffic shall be reflectorized.

All signing, barricading and diversion of traffic shall be subject to the approval of the Engineer. The Contractor shall provide a telephone number at which the Contractor's

representatives can be reached should an emergency occur requiring replacement or relocation of the required traffic devices.

Prior to the start of construction operations, the Contractor shall notify the Police and Fire Departments of the AGENCY, giving the approximate starting date, completion date, and the name and telephone number of responsible persons who may be contacted at any hour in the event of a critical condition requiring immediate correction.

At least two weeks prior to starting work, the Contractor shall notify the Orange County Transportation Authority, bus service of the approximate starting date and completion date.

At least two weeks prior to starting work, the Contractor shall deliver notices supplied by the Agency to the residents and businesses in the area affected by the construction. At least 48 hours before blocking access, the Contractor shall contact the affected parties in person or by written notice to provide information as to the reason for the closure and the expected duration.

#### 1.12 TEMPORARY STEEL PLATE BRIDGING:

When backfilling operation of an excavation in the travel way, whether transverse or longitudinal cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow. In such cases, the following shall apply:

1. Steel plate used for bridging must extend a minimum of twelve (12") inches beyond the edge of the trench.
2. Steel plate bridging shall be installed to operate with *minimum noise*.
3. The trench shall be adequate to support the bridging and the traffic load. Contractor shall be responsible for determining whether shoring is necessary.
4. Temporary paving with cold asphalt concrete shall be used to feather the edges of the plate.
5. Bridging shall be secured against displacement by adjustable cleats, shims, or other devices.

Approaches plate and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2") inches into the pavement. Subsequent plates are butted to each others. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope of 8.5% with a minimum of twelve (12") inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either fines of asphalt concrete mix, concrete slurry or an equivalent slurry satisfactory to the Engineer.

The Contractor shall be responsible for maintenance of the steel plates, shoring, and asphalt concrete ramps.

Unless specified, use of steel plate bridging at any given location should not exceed four (4) consecutive working days in any given week. Backfilling of excavation shall be covered with a minimum of three (3") inches of temporary layer of cold asphalt concrete.

The following table shows the required minimal thickness of steel plate bridging for a given trench width:

| <u>Trench Width</u> | <u>Minimum Plate Thickness</u> |
|---------------------|--------------------------------|
| 1.0 foot            | 1/2 inch                       |
| 1.5 foot            | 3/4 inch                       |
| 2.0 feet            | 7/8 inch                       |
| 3.0 feet            | 1 inch                         |
| 4.0 feet            | 1 1/4 inch                     |

For spans greater than four (4') feet, a structural design for the steel plate bridging shall be prepared by a registered civil engineer and approved by the Engineer. Steel plate bridging shall be designed for HS20-44 truck loading per Caltrans Bridge Design Specifications Manual. The Contractor shall maintain steel plates with a non-skid surface having a minimum coefficient of friction equivalent to 0.35 as determined by California Test Method 342. The Contractor may use standard steel plate with known coefficient of friction equal or exceeding 0.35.

A Rough Road sign (W33) with black lettering on an orange background shall be used in advanced of steel plate bridging. This is to be used along with any other required construction signing.

Payment for steel plate bridging shall be included in the other items of work involved and no additional payment will be allowed therefore.

### 1.13 ORDER OF WORK AND SCHEDULING OF SHUTDOWNS

The general order of work to be performed by the Contractor will be determined by the Contractor and a schedule will be submitted to the City for approval.

In case of necessary shutdown of existing facilities for the purposes of connecting to and testing of the newly installed facilities, the Contractor shall request a schedule for shutdown from the City. To request a schedule for shutdown, the Contractor shall request in writing, a minimum of two weeks (14 calendar days) prior to temporary shutdown of the facilities, the locations, dates, times and anticipated durations of each shutdown. The written request will be submitted to the Engineer.

City personnel will operate all existing valves and in no event will the Contractor be allowed to operate City-owned facilities or to shut down water mains without the prior written approval of the City and in the presence of City personnel.

2.00 **SPECIAL PROVISIONS - WATER MAIN IMPROVEMENTS**

2.01 **OPEN TRENCH OPERATIONS, EXCAVATION, BEDDING AND BACKFILL**

Open trench operations, excavation, bedding and backfill shall conform to the applicable provisions of Section 306 of the Standard Specifications and these Special Provisions.

Contractor shall excavate open trench 100 feet ahead of pipe laying operations to allow for any adjustments in grade necessary to resolve unforeseen utility conflicts.

All trenches shall be backfilled and have 3" temporary pavement installed or covered with steel traffic plates at the end of each working day.

The third paragraph of Subsection 306-1.1.1 of the Standard Specifications is hereby deleted and replaced as follows:

Excavation shall include the removal of all excess excavated materials and all water and materials of any nature, which interfere with the construction work.

All pavement removals shall be sawcut.

All removed pavement and excess excavated material shall be immediately disposed of off the project site at a legal dumpsite at the Contractor's expense.

Trench bedding and backfill shall be accomplished in accordance with the City of Santa Ana Standard Plan No. 1428 and these contract documents and shall consist of import bedding and backfill up to pavement sub-grade. Native soil will not be allowed. All material tickets (i.e. Sand, Asphalt, Concrete, etc.) shall be given to the City Inspector on a daily basis.

Sand for bedding and backfill shall be manufactured or naturally produced by the disintegration of rock and shall be sufficiently free of organic material, mica, loam, clay and other deleterious substances and shall have a minimum sand equivalent of 30. A sample shall be submitted for Engineer's approval prior to construction.

The following test methods shall be used for determining relative compaction:

|                     |                        |
|---------------------|------------------------|
| California Test 216 | (Sand Cone Method)     |
| California Test 231 | (Nuclear Gauge Method) |

The Contractor will be provided with compaction test at locations deemed necessary by the Engineer. If compaction fails to meet the contract specifications, then the Contractor shall make the necessary adjustments and is responsible for the cost of additional compaction tests until compaction per the specifications is met.

All trench and structure backfill sand shall be compacted to 90% of maximum density at optimum moisture.

If any trench, through the neglect of the Contractor, is excavated below the grade required by the plans and these Special Provisions, it shall be refilled to grade with additional bedding. This excess excavation and the additional bedding shall be at the Contractor's expense.

Work shall not be allowed in more than one intersection at any one time.

Payment for all removals, trenching operations, excavation, shoring, backfill and related work as specified herein including furnishing, placing and compacting bedding and backfill shall be considered included in the contract unit prices paid for other items of work and shall be considered full compensation for furnishing all labor, materials, tools, equipment, water for compaction and all incidentals for doing all the work as specified herein and as shown on the plans and no additional compensation will be allowed therefore.

~~Any increase in the depth of excavation of 1 ft. or less shall be considered to be included in the contract unit price for said work and no additional compensation will be allowed.~~

## 2.02 TEMPORARY PAVING

All trenches shall be backfilled and have temporary pavement installed or covered with steel traffic plates at the end of each working day.

Within four consecutive calendar days following installation of the conduit, or after compaction is approved by the Engineer, whichever comes first, steel traffic plates shall be removed and two inches of temporary pavement installed.

Cross streets are to be paved with temporary pavement on the same day that excavation and backfill are completed. Temporary pavement shall be maintained so that a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, holes and loose gravel. Temporary paving shall be removed and disposed of by the Contractor before the permanent resurfacing is placed. Payment for construction and maintaining temporary pavement shall be included in the price bid for other items of work, and no additional allowance will be made therefore.

The contractor shall construct temporary asphalt concrete with a slope of 1:1 at the edge of open excavation (remove and reconstruct section) if all the following occur:

1. Clearance between travel lane and open excavation is less than five (5) feet
2. Excavation depth is four (4) inches or deeper, and
3. If open excavation will last more than 24 hours

Payment for construction and maintaining temporary pavement shall be included in the price bid for other items of work, and no additional compensation will be made therefore.

2.03 PERMANENT ASPHALT CONCRETE PAVEMENT REPLACEMENT

This work shall consist of constructing permanent asphalt concrete pavement replacement and shall be accomplished in accordance with the details shown on the Plans, these Special Provisions and the street work permit.

Asphalt concrete construction shall conform to Section 400, 200, 203, and 302 of the Standard Specifications and these Special Provisions. Tack coat is required.

Course aggregate shall consist of material, which at least 75% by weight shall be crushed particles in lieu of the requirements of Section 400-2.3.

The AC trench pavement replacement for each street shall consist of an AC base course and a 2" thick AC surface course.

Local Streets:           6" thick deep lift A.C.

Arterial Streets:       12" thick deep lift A.C.

The required AC mix designs shall be as follows:

|                        |                           |
|------------------------|---------------------------|
| Base Course            | III-B3-AR-4000 or PG64-10 |
| Overlay/Surface Course | III-C3-AR-4000 or PG64-10 |
| Crack Filler           | III-F-AR-4000 or PG64-10  |

Payment for constructing permanent asphalt concrete replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

2.04 PERMANENT PORTLAND CEMENT CONCRETE (P.C.C.) TRENCH PAVEMENT REPLACEMENT

P.C.C. pavement replacement shall be at least 6 inches thick and shall be 1 inch thicker than existing. P.C.C.

Portland cement concrete shall conform to Sections, 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for street pavement and bus pad construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

- A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.
- B. Flexural strength test data for the same batch of concrete used in "A" above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.2 entitled "Tamping" of the Standard Specifications shall be modified by adding the following:

The outer edge of the gutter shall not be used as a side form for the mechanical tamper except where existing gutter is to remain as shown on the construction Plans.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

Delete all reference to wetted burlap. Final finish of the pavement surface shall be textured by stiff brooming that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following brooming.

Joints in the concrete pavement shall be constructed as described in Section 302-6.5 of the Standard Specifications except as modified herein. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours per Engineer's directions. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

All joints shall be sawed before uncontrolled shrinkage cracking occurs. A standby saw shall be available in the event of breakdown. All weakened plane joints shall be saw cut to a depth equal to one fourth of the pavement thickness. Longitudinal joint spacing shall be at 10' minimum and 15' maximum on either side of centerline joint. Transverse joint spacing shall be at 10' minimum and 15' maximum for pavement, curb and gutter. Longitudinal joints shall be aligned such that they will cross manholes and water valves at centerline if possible. Transverse construction joints within 1' shall cross all manholes and water valves. Provide a weakened plane joint around the perimeter of all utility vaults. Payment for cold joint construction or weakened plane saw cutting shall be included in the PCC Construction Bid Item and no additional compensation shall be allowed therefore.

The Cleaness Value requirement of Section 200-1.4 shall be replaced with the following:

| <u>Tests</u>    | <u>Test Method</u> | <u>Requirements</u> |
|-----------------|--------------------|---------------------|
| Cleanness Value | California 227     |                     |
| Individual Test |                    | 70 min*             |
| Moving Average  |                    | 75 min*             |

The Sand Equivalent requirement of Section 200-1.5.3 shall be replaced with the following:

|                 |                |         |
|-----------------|----------------|---------|
| Sand Equivalent | California 227 |         |
| Individual Test |                | 70 min* |
| Moving Average  |                | 75 min* |

Evaluation of Sand Equivalent and Cleanness Value results shall conform to the provisions of Standard Specifications Subsection 400-1.4.

**Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain 7 day compressive strength in 3 days.**

Traverse joints shall match those of the adjacent pavement.

The concrete pavement shall be immediately barricaded upon its installation and no vehicular traffic will be permitted thereon until the expiration of 3 days.

Payment for constructing permanent P.C.C. concrete trench pavement replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

#### 2.05 PORTLAND CEMENT CONCRETE CROSS GUTTER

This work shall consist of replacing Portland Cement Concrete (PCC) cross-gutter from the spandrel to street centerline to facilitate water main construction. All work shall be accomplished in accordance with City of Santa Ana Standard Plan No. 1109. The replacement areas are clearly indicated on the plans.

The cost of this work shall be considered included in the contract unit price for PCC cross-gutter and shall be considered full compensation for furnishing all labor, materials, and incidentals for accomplishing the work, complete and in place and no additional compensation allowed.

#### 2.06 EXISTING UTILITIES AND ADJUSTMENTS IN GRADE

All existing utilities shall be protected in place, unless otherwise noted on the plans. The Contractor shall be responsible for any damage to existing utilities as a result of his operations. The location of existing utilities as shown on the plans was obtained from a search of available records. It shall be the Contractor's responsibility to notify the respective utility owners and

Underground Service Alert (1-800-422-4133) to determine the exact field location of all utilities shown or not shown on the plans, which may conflict with his operations. Potholing of existing utilities and service connections to determine exact depth and field locations shall be the responsibility of the Contractor.

The Contractor shall excavate trench 100 feet in advance of pipe laying operations to allow for any necessary adjustments in grade to clear any unmarked or unforeseen utilities. In addition, The Contractor shall determine the location and depth of all utilities including service connections, which may affect or be affected by its operation, three (3) weeks in advance. In the event of any conflicts The Engineer shall be immediately notified.

City owned utility frames and covers for survey monuments, water meter, water valves, traffic signal and street light pull boxes, and manholes within the area to be paved or graded, shall be set to finish grade by Contractor after construction of new asphalt concrete pavement. In portland cement concrete pavement and sidewalk areas, City utility frames and covers shall be adjusted to grade prior to placement of concrete.

Prior to paving, an "I.D. Locator" shall be attached to each valve box or manhole cover. An "ID Locator" is a rubberized marker approximately 4" high that adheres to the utility cover and pops-up after paving for easy identification and location of the respective valve box or manhole. Contractor shall measure and tie-out locations of manholes and water valves prior to paving.

## 2.07 DUCTILE IRON WATER MAIN AND APPURTENANCES

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the American Water Works Association Standards (AWWA), the City of Santa Ana Standard Plans and these Special Provisions.

This work shall include constructing ductile iron pipe, fittings, and appurtenances complete and in place, to the alignment and grade as indicated on the plans. The minimum cover over the top of the pipe shall be 36" to finished surface.

Fittings shall be push-on-joint, (P.J.), mechanical joints (M.J.) or flanged (FLG) except where noted otherwise. All valve to fitting connections shall be flanged. Valves for lateral lines, hydrant leads and service lines shall be bolted directly to main line tee, unless otherwise indicated different on the plans. Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

All flanged fittings and connections shall comply with the applicable provisions of AWWA C110. The bolt circle and boltholes of these flanges shall match those of the Class 125 flanges shown in ANSI B16.1.

The Contractor shall coordinate the flange requirements with the connecting pipe and valve manufacturers.

Contractor shall provide flange to connecting pipe adapters as needed. Adapters may be flange by connecting pipe fittings (e.g. FLG x P.J.) or Megaflange-Flange adapter. "E-Z Flange" and similar setscrew type adapters are not acceptable.

All ductile iron pipe and fittings shall be manufactured in accordance with all applicable requirements of ANSI/AWWA Standards and Specifications.

Concrete thrust blocks shall be provided at all valves, fittings and hydrants in accordance with A.W.W.A. Standards and City of Santa Ana Standard Plans Nos. 1412 and 1420.

Installation shall be in accordance with the Ductile Iron Pipe Research Associations "Guide for the Installation of Ductile Iron Pipe" and manufacturer's recommendations. Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

Pipe shall not be dropped into the trench.

All ductile iron pipe, fittings, valves, and appurtenances buried underground shall be wrapped with 10 mils polyethylene sheeting. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

All nuts and bolts shall be cadmium plated and shall have **NON-OXIDE GREASE** or mastic such as 3M EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping.

The existing water main facilities shown on the plans are at or near the same elevation as the new main.

When crossing existing water main or service line, Contractor shall adjust grade as necessary to install the new main beneath the existing facility, unless otherwise directed by the Engineer.

When making connections to existing water main or service line, Contractor shall provide all fittings necessary (i.e. tees, bends, adaptors, etc.) to adjust the grade and alignment as needed to facilitate the connection. The cost of this work shall be included in the unit price for ductile iron water main and no additional compensation will be allowed.

When there are specific locations indicated on the plans where it is known that additional excavation will be required to avoid conflicts with other utilities, these locations and required depths are clearly noted on the plans. The Contractor shall include any associated cost for this work in unit price per linear foot for ductile iron water main bid items and no additional compensation will be allowed.

Hydrostatic testing: pressure and leakage tests shall be in accordance with the applicable provisions of AWWA Std. C600-05. The line shall be tested at a pressure of 200 psi. Hydrostatic pressure testing of the main shall not be performed directly against a valve. A steel

test plate shall be inserted between the valve and main when performing hydrostatic pressure testing.

All new pipelines and appurtenances shall be chlorinated and disinfected in accordance with AWWA Std. C651-99 and shall meet all health department standards. The Contractor shall submit a "Disinfection and Flushing Plan" prior to commencing construction.

After disinfection, the lines shall be flushed by the Contractor and water samples taken by an approved laboratory representative for bacterial analysis in accordance with AWWA specifications. Discharge from flushing of pipelines shall be routed to the sanitary sewer system.

Connection to existing water main facilities shall be made only after the successful completion of pressure test and bacteria test.

For all water main tie-ins, Contractor shall notify residents/property owners a minimum of 48 hours prior to any interruption in service. Every effort shall be made to minimize the inconvenience to the customer. Contractor shall coordinate these activities with the City of Santa Ana Water Resources Division a minimum of four (4) working days prior to beginning tie-ins. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer. In no case shall any property be without service for more than four (4) hours. In special circumstances, emergencies, or when directed by the Engineer, the Contractor shall provide temporary service lines, with approved NSF hoses, to prevent any interruption in service.

The unit price per linear foot for ductile iron water main shall include full compensation for furnishing all pipe, fittings, appurtenances, labor, materials, tools and equipment for all related items of work necessary for the water main installation complete in place, backfilled, paved, and tested.

~~Any increase in the depth of excavation for the pipe shall be considered to be included in the contract unit price for said work and no additional compensation will be allowed.~~

## 2.08 PVC WATER MAIN

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the American Water Works Association Standards (AWWA), the City of Santa Ana Standard Plans and these Special Provisions.

This work shall include constructing AWWA C900-97, Class 200 DR14, PVC Water Main, and appurtenances complete and in place, of the size and class, and to the alignment and grade as indicated on the plans. The minimum cover over top of pipe shall be 36" to finished surface.

Fittings shall be gray or ductile iron conforming to AWWA Standards and shall be push-on-joint (P.J.), mechanical joint (M.J.) or flanged (FLG) except where noted otherwise. All valves to fitting connections shall be flanged. Valves for lateral lines, hydrant leads and service lines shall be bolted directly to main line tee, unless otherwise noted on plans.

All flanged fittings and connections shall comply with the applicable provisions of AWWA C110. The bolt circle and boltholes of these flanges shall match those of the Class 125 flanges shown in ANSI B16.1.

The Contractor shall coordinate the flange requirements with the connecting pipe and valve manufacturers.

Contractor shall provide flange to connecting pipe adapters as needed. Adapters may be flange by push on fittings (FLG x P.J.) or flange by mechanical joint (FLG x M.J.) adapter. "E-Z Flange" and similar setscrew type adapters are not acceptable. Grip rings for PVC pipe restraint, such as Romac RomaGrip are acceptable.

All ductile iron and gray-iron fittings shall be manufactured in accordance with all applicable requirements of ANSI/AWWA Standards and Specifications.

Concrete thrust blocks shall be provided at all valves, fittings and hydrants in accordance with AWWA Standards and City of Santa Ana Standard Plans Nos. 1412 and 1420.

Installation shall be in accordance with AWWA Manual No. M23 - "PVC Pipe Design and Installation" and the manufacturer's recommendations. Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

Pipe shall not be dropped into trench.

All ductile iron or gray iron fittings, valves, and appurtenances buried underground shall be wrapped with 10 mils polyethylene sheeting. Any existing or connecting iron pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

All nuts and bolts shall be cadmium plated and shall have **NON-OXIDE GREASE** or mastic such as 3M EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping.

The existing water main facilities shown on the plans are at or near the same elevation as the new main.

When crossing existing water main or service line, Contractor shall adjust grade as necessary to install the new main beneath the existing facility, unless otherwise directed by the Engineer.

When making connections to existing water main or service line, Contractor shall provide all fittings necessary (i.e. tees, bends, adaptors, etc.) to adjust the grade and alignment as needed to facilitate the connection. The cost of this work shall be included in the unit price for PVC water main and no additional compensation will be allowed.

When there are specific locations indicated on the plans where it is known that additional excavation will be required to avoid conflicts with other utilities, these locations and required

depths are clearly noted on the plans. The Contractor shall include any associated cost for this work in unit price per linear foot for PVC water main bid items and no additional compensation will be allowed.

Hydrostatic testing: pressure and leakage tests shall be in accordance with the applicable provisions of AWWA Std. C600-05. The line shall be tested at a pressure of 200 psi. Hydrostatic pressure testing of the main shall not be performed directly against a valve. A steel test plate shall be inserted between the valve and main when performing hydrostatic pressure testing.

All new pipelines and appurtenances shall be chlorinated and disinfected in accordance with AWWA Std. C651-99 and shall meet all health department standards. The Contractor shall submit a "Disinfection and Flushing Plan" prior to commencing construction.

After disinfection, the lines shall be flushed by the Contractor and water samples taken by an approved laboratory representative for bacterial analysis in accordance with AWWA specifications.

Discharge from flushing of pipelines shall be routed to the sanitary sewer system.

Connection to existing water main facilities shall be made only after the successful completion of pressure test and bacteria test.

For all water main tie-ins, Contractor shall notify residents/property owners a minimum of 48 hours prior to any interruption in service. Every effort shall be made to minimize the inconvenience to the customer. Contractor shall coordinate these activities with the City of Santa Ana Water Resources Division a minimum of four (4) working days prior to beginning tie-ins. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer. In no case shall any property be without service for more than four (4) hours. In special circumstances, emergencies, or when directed by the Engineer, the Contractor shall provide temporary service lines, with approved NSF hoses, to prevent any interruption in service.

The unit price per linear foot for PVC water main shall include full compensation for furnishing all pipe, fittings, appurtenances, labor, materials, tools and equipment for all related items of work necessary for the water main installation complete in place, backfilled, paved, and tested.

~~Any increase in the depth of excavation of 1 ft. or less shall be considered to be included in the contract unit price for said work and no additional compensation will be allowed.~~

## 2.09 STEEL WATER PIPE AND APPURTENANCES

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the American Water Works Association (AWWA) Standards, the City of Santa Ana Standard Plans, and these Special Provisions.

This work shall include constructing cement-mortar lined and coated steel pipe, fittings, and appurtenances complete and in place, to the alignment and grade as indicated on the plans.

Steel pipe shall be cement-mortar lined and coated. Steel shall comply with ASTM A53, Type E, Grade A, except the pipe wall thickness shall have a maximum allowable variation of -3% and +2% of the specified thickness. Installation of steel pipe and appurtenances shall be in accordance with the AWWA M11 Steel Pipe Manual. Cement for cement-mortar lining shall be ASTM C 150, Type II or V. Cement for cement-mortar coating shall be ASTM C 150, Type V. All fittings shall be the same material as the pipe or shall comply with ASTM A 283 (Grade D), ASTM A 570 (all grades). Cement-mortar lining and I.D. dimensions shall be the same as the specified pipe.

All above ground steel pipe shall be fusion-bonded epoxy coated with cement-mortar lining in conformance with applicable Subsections of Section 306 of the Standard Specifications, the American Water Works Association (AWWA) Standards, the City of Santa Ana Standard Plans, and these Special Provisions.

Fusion-bonded epoxy coating shall comply with AWWA C213. Welded joints shall have a liquid applied epoxy coating in conformance with AWWA C210. This work shall include constructing fusion-bonded steel pipe, fittings, hangers, pipe rollers and appurtenances complete and in place, to the alignment and grade as indicated on the plans.

~~Minimum wall thickness for 12" diameter pipe and less shall be 0.25" for pipe and fittings. For 12" in diameter, the minimum pipe wall thickness shall be 0.250"~~

Fittings and all valve to fitting connections shall be electric-resistance welded, lined, and coated steel water pipe, slip-jointed for field welding. Welds shall be in accordance with ANSI B41.1, paragraph 327.4. Welding preparation shall comply with ANSI B31.3, paragraph 327.3. Limitations on imperfections in welds shall conform to the requirements in ANSI B31.3. Welding electrodes shall comply with AWS A5.1. Each layer of deposited weld metal shall be cleaned using a power-driven wire brush prior to depositing the next layer of weld metal. The final pass shall be cleaned by a power-driven wire brush. Welds shall be full circumferential.

Field-welded joints and connections shall be performed in accordance with the American Welding Society by operators currently qualified under the Standard Qualification Procedure, Standard D10.9, of the American Welding Society, as last revised. Joints shall be welded externally only. The weld shall be equal in thickness to the thinnest member being joined.

Concrete thrust blocks shall be provided at all valves, fittings, and hydrants in accordance with AWWA Standards and City of Santa Ana Standard Plan Nos. 1412 and 1420.

Pipe shall not be dropped into the trench.

Hydrostatic testing: pressure and leakage tests shall be in accordance with the applicable provisions of AWWA Std. C600-05. The line shall be tested at a pressure of 200 psi. Hydrostatic pressure testing of the main shall not be performed directly against a valve. A steel

test plate shall be inserted between the valve and main when performing hydrostatic pressure testing.

All new pipelines and appurtenances shall be chlorinated and disinfected in accordance with AWWA Std. C651-99 and shall meet all health department standards. The Contractor shall submit a "Disinfection and Flushing Plan" prior to commencing construction.

After disinfection, the lines shall be flushed by the Contractor and water samples taken by an approved laboratory representative for bacterial analysis in accordance with AWWA specifications.

Discharge from flushing of pipelines shall be routed to the sanitary sewer system.

Connection to existing water main facilities shall be made only after the successful completion of pressure test and bacteria test.

For all water main tie-ins, Contractor shall notify residents/property owners a minimum of 48 hours prior to any interruption in service. Every effort shall be made to minimize the inconvenience to the customer. Contractor shall coordinate these activities with the City of Santa Ana Water Resources Division a minimum of four (4) working days prior to beginning tie-ins. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer. In no case shall any property be without service for more than four (4) hours. In special circumstances, emergencies, or when directed by the Engineer, the Contractor shall provide temporary service lines, with approved NSF hoses, to prevent any interruption in service.

The unit price per linear foot for steel water main shall include full compensation for furnishing all pipe, fittings, appurtenances, labor, materials, tools and equipment for all related items of work necessary for the water main installation complete in place, backfilled, paved, and tested.

## 2.10 TRACING WIRE

A minimum of 12 gauge (Blue) Tracing Wire, insulated with high molecular weight polyethylene (HMWPE) specifically for use in direct burial applications, shall be placed and secured to the top of all PVC pipe as it is being laid. The tracing wire shall be stubbed up at each valve (left accessible inside the valve box) and hydrant (coiled around the barrel just below the top flange with 16 inches excess). Tracing wire shall be secured to the top of the pipe at 5-foot intervals or less to ensure that the wire remains at the same location as the PVC pipe being laid.

All splices of the wire shall be made securely and covered thoroughly with a Direct Bury Splice Kit, 3M DBY/DBR or approved equal. The Contractor shall schedule a conductivity test (conducted by City) on completion of the water main installation and prior to the final pavement. If conductivity test fails, the Contractor shall be responsible for making the necessary repairs, until passing results are achieved. Additional compensation will not be allowed therefore.

## 2.11 RESILIENT WEDGE GATE VALVES

This work shall consist of furnishing and installing gate valves, including risers with valve boxes, and P.C.C. collars where indicated on the plans. All work shall conform to City of Santa Ana Standard Plans 1410 or 1410A as applicable.

Gate valves shall be of the size and configuration as indicated on the plans and shall be AWWA and ULFM tested, resilient wedge with operating nuts and non-rising stems, and shall be designed for a working pressure of 200 psi and be tested at 400 psi. Gate valves shall be Clow, Mueller, Renselear, or approved equivalent. Valves shall have all stainless steel nuts and bolts and shall be manufactured in accordance with AWWA C509 Standards.

All valve to fitting connections shall be flanged. Valves for lateral lines shall be bolted directly to main line tee, unless otherwise noted on the plans. Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

All valve box frame and covers shall require P.C.C. collars and shall be adjusted to finished grade following paving operations. Collars on arterial and collector streets shall be constructed using Rapid Set® Concrete per City of Santa Ana Standard Plan No. 1410A. Contractor shall have Rapid Set® Set Control retardant on job site when adjusting valve frame and covers. Contractor shall warranty all valve collars constructed with Rapid Set® for a period of 2 years. If collars are found to be deficient during the warranty period, Contractor shall, at his expense, reconstruct collars per Standard Plan No. 1410A.

The contract unit price for each size of valve shall be considered full compensation for furnishing all labor, materials, tools, equipment and incidentals to accomplish the work as specified herein including valve box frame and cover with PCC collar, PVC riser pipe and all appurtenances, adjustment to finished grade, and no additional compensation will be allowed therefore.

## 2.12 BUTTERFLY VALVES

This work shall consist of furnishing and installing butterfly valves, including risers with valve boxes, and P.C.C. collars where indicated on the plans. All work shall conform to City of Santa Ana Standard Plans and AWWA C504.

Butterfly valves shall be of size and configuration as indicated on the plans and shall be designed for a working pressure of 150 psi and be tested at 300 psi. All valves shall be factory epoxy lined and coated. Epoxy lining shall be 15 mils of keysite 740. All butterfly valves shall be rubber seated in accordance with ANSI/AWWA C504-00. Valve shafts shall be stainless steel ASTM 276, Type 304. All buried valves shall have operators specifically designed for buried service. These operators shall be lubricated for the life of the valve. Butterfly valves shall be Pratt, Mueller, M & H or approved equivalent.

All valve to fitting connections shall be flanged. Valves for lateral lines shall be bolted directly to main line tee. Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

All valve box frame and covers shall require P.C.C. collars and shall be adjusted to finished grade following paving operations. Collars on arterial and collector streets shall be constructed using Rapid Set® Concrete per City of Santa Ana Standard Plan No. 1410B. Contractor shall have Rapid Set® Set Control retardant on job site when adjusting valve frame and covers. Contractor shall warranty all valve collars constructed with Rapid Set® for a period of 2 years. If collars are found to be deficient during the warranty period, Contractor shall, at his expense, reconstruct collars per Standard Plan No. 1410B.

The contract unit price for each size of valve shall be considered full compensation for furnishing all labor, materials, tools, equipment and incidentals to accomplish the work as specified herein, including valve box frame and cover, PVC riser pipe and all appurtenances, and no additional compensation will be allowed therefore.

#### 2.13 TEMPORARY WATER SERVICE (If Necessary)

When waterline construction work requires construction of new water mains in existing water main alignments the Contractor shall provide all necessary "high line" temporary piping, connections, ramps, valves, and fittings from live fire hydrants to existing water services to maintain water service to customers. A maximum 4-hour disruption in water service is allowed no more than once per week. Contractor shall disinfect all piping, fittings, and connections in accordance with health department requirements. Contractor shall provide protection for temporary waterlines and services at driveways and street crossings while maintaining vehicle access in public right-of-way and at private driveways. Contractor shall install temporary water lines and water services to prevent tripping hazards.

Contractor shall install a double detector check valve at all fire hydrants serving temporary water connection systems.

The lump sum price for providing temporary water service shall include full compensation for furnishing all pipe, fittings, appurtenances, connections, ramps, pipe protection devices, labor, materials, tools, excavation, saw cutting, pavement restoration, disinfection, testing, and temporary water main and service removal, as required and equipment for all related items of work necessary to provide temporary water service. **No above ground hoses/piping are allowed across travel lanes.**

#### 2.14 WATER SERVICE AND FIRE LINES

All work shall conform to City of Santa Ana Standard Plans and meet all A.W.W.A. Specifications. All ductile or cast iron pipe, fittings, valves, and appurtenances buried underground shall be wrapped with 10 mils polyethylene sheeting. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

Service laterals shall be installed perpendicular to the centerline of the main.

Removal and replacement of sidewalk, as necessary to facilitate water service meter installation, shall be included as part of this work. All work shall conform to City of Santa Ana Standard Nos. 1401, 1402, and 1104.

The City shall furnish and install the water meter after all other work is complete.

Note: Angle meter stops are not acceptable. The connection to the meter coupling shall be a curb stop with locking wing nut.

For all water service relocations and installations, Contractor shall notify residents a minimum of 24 hours prior to any interruption in service. Every effort shall be made to minimize the inconvenience to the customer. Contractor shall coordinate these activities with the City of Santa Ana Water Resources Division a minimum of four (4) working days prior to beginning work on services. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer. In no case shall any property be without service for more than four (4) hours. In special circumstances, emergencies, or when directed by the Engineer, Contractor shall provide temporary service lines, with approved NSF hoses, to prevent any interruption in service.

The unit price for each fire line and/or service shall include full compensation for furnishing all pipe, fittings, thrust blocks, gate valves, gate valve frame and cover, labor, paving, materials, tools, equipment and appurtenances for all related items of work necessary for the installation complete in place, backfilled, paved and tested. No additional compensation will be allowed.

1" Services Extension for Street Widening:

Relocations of these services require the installation of a new continuous copper service line from the water main to the meter. No splices or mid-line connections will be allowed. All work shall be accomplished in accordance with City of Santa Ana Std. No. 1401.

2" Water Service Extension for Street Widening:

Relocation of these services may be accomplished by constructing the required length of new copper service line necessary for the relocation, and then connecting back to the existing service line. All work shall conform to City of Santa Ana Std. Plan No. 1402.

1" & 2" New Water Service Construction:

This work shall consist of constructing a complete new water service where indicated on the plans, and shall include service saddle, corporation stop, curb stop, copper tubing, meter box, and appurtenances all in accordance with City of Santa Ana Std. Plan No 1401 and 1402.

3" and Greater Relocating Services and Fire Lines:

Relocation of these facilities may be accomplished by installing new portions of pipe as necessary to complete the relocation and connecting back to the existing service line. Pipe may be either ductile iron or C-900, PVC. If relocation requires an increase in depth or horizontal realignment of the pipe, 45° Bends shall be used to re-route the pipe. Thrust blocks shall be required in accordance with City of Santa Ana Standard Plans Nos. 1403A, 1403B, 1403C, and

1412. All pipe trenches shall have 6" minimum of sand bedding beneath the pipe and sand backfill over the pipe compacted to 90% relative compaction.

3" and Greater New Services and Fire Lines:

This work shall consist of constructing a complete new water service of the size and type indicated on the plans. All work shall conform to City of Santa Ana Standard Plans No. 1403A, B, or C as applicable.

The Contractor shall furnish and install the water meter, as well as all valves, piping fittings and appurtenances, including meter vault for the complete installation of these services.

The meter vault for these services shall be constructed in accordance with City of Santa Ana Standard Plan No. 1403D.

2.15 FIRE HYDRANTS

This work shall consist of furnishing and installing fire hydrants and bury assemblies (including spools if required) in the locations indicated on the plans. **Hydrant lateral pipe and gate valves are included as part of this work.**

All hydrants shall be painted O.S.H.A. white and shall have a primer coat and finish coat applied.

Hydrant shall be installed as detailed on City Standard Plan No. 1405. Where necessary, Contractor shall saw-cut, remove and replace sidewalk to facilitate hydrant installation. Sidewalk shall be replaced per City of Santa Ana Standard Plan No 1104.

Hydrants shall be either Clow, Model F-2500; Kennedy Guardian, Model K81D; or Mueller Super Centurion 250.

Contractor shall install drain valve plugs on fire hydrant assembly per City Standard Plan No. 1405.

The unit cost for each fire hydrant shall include all materials, labor, incidentals, and appurtenances necessary to install each fire hydrant assembly, complete and in place; including repair of surface improvements and decorative brick sidewalk as needed.

2.16 HOT TAP CONNECTIONS

This section describes materials, requirements and procedures for hot taps (system under pressure) connections to existing distribution system.

All approved manufactures and materials shall comply with City Standard No.1408.

Tapping sleeves shall be epoxy coated fabricated steel with stainless steel nuts and bolts. The tapping sleeve shall be installed in accordance with manufacturer's instructions and to the satisfaction of the Water Engineer. The pipe barrel shall be thoroughly cleaned with a wire

brush to provide a smooth, hard surface for the sleeve. The sleeve shall be supported independently of the pipe during the tapping operation and shall be pressure tested prior to the hot tap in the presence of the Water Engineer. Thrust blocks shall be provided at the tapping location per City Standard No. 1412.

The hot tap into the existing pipe shall be made using the appropriate type of cutting machine and shell cutting bit for material being tapped. Tapping machine must be operated per manufacturer's instructions. Proper care shall be taken to prevent cutting material from entering the pipeline and the tapping coupon must be extracted.

The interior of the tapping valve and connecting piping shall be sprayed with a sodium hypochlorite solution prior to connection.

All nuts and bolts shall be stainless steel and shall have mastic such as 3M EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping. All buried iron shall be wrapped with 1 layer of 10 mil polyethylene sheathing taped in place. All tapping sleeves must be a minimum of 24" from the nearest joint or service.

## 2.17 DISINFECTION AND FLUSHING PLAN

Prior to start of construction, the Contractor shall submit to the City for review and approval a water line "Disinfection and Flushing Plan" prepared by a D3 or T3 Operator Certified with California Department Health Services, or a Registered Civil Engineer practicing in the field of water resources, indicating the following as a minimum:

- Phasing of disinfection and flushing
- Source of flushing water
- Type and configuration of connection required to introduce flushing water into the propose water main
- Method of disposal of flushed water
- Total number and locations of sampling points
- Types of testing to be performed
  - Acceptable Bacteriological :
    1. Total Coliform = Negative
    2. Fecal Coliform = Negative
    3. Heterotrophic Plate Count Less than 150 CFU per 1 ml
    4. Chlorine Residual: Free or Total
- Company performing sampling and testing

## 2.18 WATER MAIN TIE-INS, SHUTDOWN AND ABANNDONMENT

The following is the procedure for water main shut down to facilitate tie-ins or abandonment of existing mains:

1. Contractor to pot hole and expose existing connection.
2. Engineer to verify existing conditions. Excavation to be plated, not backfilled.

3. Prior to any shutdown of existing water system, Contractor shall have all necessary fittings and equipment on site to complete the water main tie-in or abandonment.
4. Shut down can be scheduled for 8:30 a.m. to 12:30 p.m. 48 hours following notification of residents and businesses. Water shall not be shut off prior to 8:30 a.m. except in an emergency.

All work necessary to shutdown an existing public water main shall be coordinated by the Water Maintenance Division. Unless at the direct supervision of the Construction Inspector, under no circumstances shall the Contractor operate valves, hydrants, and other appurtenant equipment on the existing public water system. It shall be the Contractor's responsibility to coordinate the necessary shutdown schedules through the Construction Inspector assigned to the project. Scheduled shutdowns shall require sufficient time to allow water maintenance personnel to review, approve, and develop an appropriate Operation Program. Contractor shall coordinate shut down activities with the City of Santa Ana Water Resources Division a minimum of four (4) working days prior to any water main shutdown. The Contractor shall be responsible for maintaining all schedules current and coordinating all deviations, which may occur from time to time with the Construction Inspector.

The City will make a concerted effort to isolate the system as planned with the Contractor. However, the Contractor shall be prepared to employ pumping equipment if a water tight seal cannot be achieved. City will not be responsible for any delays due to system shutdown and isolation if water tight seal cannot be achieved.

When an extensive water main shutdown is required, the Water Department will determine what temporary service connections may be required. The Contractor shall furnish all necessary appurtenances (i.e. hose, piping, valves, and water trucks) and associated labor required to provide such temporary service. All piping and associated equipment used in temporary service connections shall be flushed and disinfected. All hoses shall be NSF approved.

#### 2.19 AS-BUILT

The Contractor shall maintain a control set of plans and specifications on the project site at all times. As approved by the Engineer, all final locations determined in the field and any deviations from the plans and specifications shall be marked in red on this control set to show the As-Built conditions. Upon completion of all work, the Contractor shall submit the control set to the Engineer. **Final payment will not be made until this requirement is met.**