

CITY OF FULLERTON

WATER UTILITY SPECIFICATIONS

PUBLIC WORKS DEPARTMENT
WATER ENGINEERING DIVISION
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ALL DEVELOPERS, CONTRACTORS, AND OTHER INDIVIDUALS OR COMPANIES PERFORMING ANY WORK ON THE CITY OF FULLERTON'S WATER SYSTEM SHALL COMPLY WITH THESE SPECIFICATIONS. IT IS THEIR RESPONSIBILITY THAT THEY HAVE THE MOST CURRENT COPY BY CONTACTING THE WATER ENGINEERING DIVISION.

APPROVED  DATE 5/24/2022
MEG MCWADE
PUBLIC WORKS DIRECTOR

APPROVED  DATE 5/9/2022
STEPHEN BISE, PE, TE
CITY ENGINEER/ASSISTANT PUBLIC WORKS DIRECTOR

INTRODUCTION

These Water Utility Specifications (Specifications) are to be used as a guide by Developers, Engineers, and Contractors in the design and installation of all additions, replacements, and modifications to the City of Fullerton's public water system. It is the intent that these Specifications will provide uniformity in materials and installation of piping, valves, fire hydrants, service laterals, meters, and other water system appurtenances. The Specifications shall also provide construction methods and controls to be used by contractors to construct, pressure test, disinfect and place in service all improvements and modifications to the City's public water system.

CITY OF FULLERTON

WATER UTILITY SPECIFICATIONS

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SECTION 1 – GENERAL

1-01 PLANS AND SPECIFICATIONS

Construction of all water system improvements by contract and/or intended to be dedicated to Water Utility of the City of Fullerton will be governed by plans and specifications approved by the City. All work shall be in accordance with these plans and specifications and shall be inspected by the Utility to insure conformity.

In cases of conflict of information, the following documents will have precedence in the order listed:

1. Permits and licenses from affected agencies.
2. Special Provisions to the specifications of the City of Fullerton.
3. Construction plans approved by the City Engineer.
4. The City of Fullerton, Public Works Department, Water Engineering Division Water Utility Specifications, herein called Specifications.
5. The applicable requirements of the Standard Specifications for Public Works Construction, “Greenbook”, as last revised, herein called Standard Specifications.

Conflicts and discrepancies noted by the Contractor shall be brought to the attention of the Engineer. Instructions will be given by the Engineer to provide a complete and satisfactory project. The most stringent/restrictive condition shall apply unless otherwise determined by the Engineer.

Provisions of reference specifications and publications of any scientific or technical society or other organization noted in these specifications and plans shall have the same effect as if written herein. Any reference specification or publication in the absence of designation to the contrary, shall be understood to refer to the latest revision of the specification, standard, method, or publication as of the date of the beginning of the work.

1-02 DEFINITIONS

- | | |
|----------------------------|--|
| a. City, Engineer, Utility | The Director of Public Works of the City of Fullerton, or their authorized representative. |
| b. Owner/Developer | The person or organization having legal responsibility for construction of water system improvements in conjunction with development of property. |
| c. Contractor | The individual, partnership, corporation, joint venture, or other legal entity having a contract with the City to perform the construction of water system improvements. In the case of improvements being done under a permit issued by the City. |
| d. Superintendent | The field representative of the Contractor, present at the job site at all times during work, which is authorized to receive and fulfill instruction from the City. |
| e. Consultant | The agent of the Developer or independent engineer who has responsibility for the design and drawing of construction documents. |
| f. Water Supplier | The City of Fullerton who owns and operates the City's public water system. |
| g. Regulatory Agency | State Water Resources Control Board (SWRCB) and/or the Santa Ana Regional Water Quality Control Board (SARWQCB). |
| h. Plans | Those drawings accompanying the specifications that show the location, nature, extent and form of the work, together with applicable details. |
| i. Standard Specification | Latest edition of the Standard Specifications for Public Works Construction, also known as the "Greenbook". |
| j. Approved Materials List | List of materials approved for use in the City of Fullerton's Public Water system. |
| k. Or approved equal | A product equivalent to that specified in these water utility standard specifications and approved by the Utility before start of construction. No approved equal product is intended. |

1-03 ABBREVIATIONS AND UNITS

Whenever the following abbreviations are used in these specifications, the meaning shall be interpreted as follows:

- | | |
|-------------|--|
| a. ANSI | American National Standards Institute |
| b. ASTM | American Society for Testing and Materials |
| c. AWWA | American Water Works Association |
| d. CAL/OSHA | Division of Industrial Safety of the State of California |
| e. DIPRA | Ductile Iron Pipe Research Association |
| f. NSF | National Sanitation Foundation |
| g. SWRCB | State Water Resources Control Board |
| h. SARWQCB | Santa Ana Regional Water Quality Control Board |
| i. UL | Underwriter's Laboratory |
| j. WATCH | Work Area Traffic Control Handbook |

Whenever the following units are used in these specifications, the meaning shall be interpreted as follows:

- | | |
|--------|------------------------|
| a. gpm | Gallons per Minute |
| b. psi | Pounds per Square Inch |

1-04 LICENSES, PERMITS, AND FEES

The Contractor shall have a Class "C-34" Pipeline or Class "A" General Engineering Contractor's License valid in the State of California and shall meet all the applicable requirements of the Fullerton Municipal Code.

The Contractor and/or Developer shall obtain all necessary permits, licenses, or agreements required by any legally constituted agencies, pay all fees, and give all necessary notices required for the construction of the work.

Prior to beginning any work, a water permit and an excavation permit from the Engineering Division including any required deposits and bonds, are required for excavation in the public right-of-way within the City of Fullerton. Pavement repair shall be made by a licensed paving contractor and shall conform to these Specifications and the Standard Specifications. The contractor is responsible for all costs associated with the work performed, including any corrections or repairs. In the event the Contractor fails to complete the work or make any required corrections/repairs, any and all costs incurred by the City will be deducted from the deposit or the surety will be billed for these expenses. Said deposit or bond shall be retained by the City for payment and for material and labor.

Before the Contractor or any subcontractor performs work, it shall be necessary for each company to obtain a business license from the City of Fullerton.

1-05 INSPECTION

The construction of any water system improvement intended for dedication to the City and used for public water service shall be subject to inspection and approval/acceptance by the Engineer. Such inspection will assure that all phases of the work are in compliance with these Specifications. The City's designated inspector will be the representative of the Engineer and shall coordinate the various responsibilities of the Utility throughout the work. Contractor shall schedule pre-construction meeting with Utility a minimum of two business days prior to construction. Inspection costs will be paid by the Developer at the rate or fee prescribed by the City Council resolution.

The inspector shall have access to the work area and shall be furnished every reasonable facility for ascertaining full knowledge of the progress, material, and workmanship used to complete the work. The Contractor shall provide at least one business day advance notice of major phases of construction for purposes of inspection. All material shall be approved prior to placement and all water system works shall be visually inspected prior to backfilling.

The Engineer shall have the authority to suspend the work wholly, or in part, for such time as it may deem necessary due to failure of the Contractor to perform any provisions of the plans or specifications. The work may only continue when the defective material or construction method is recognized as corrected by the Engineer.

1-06 GUARANTEE

The Contractor shall guarantee the work against defective material or workmanship for a period of one year from the date of completion of the contract and/or acceptance of the work by the City and/or filing of Notice of Completion. The City may conduct a warranty inspection at any time during the warranty period and produce a punch list of defective items. Damage due to acts of God or from sabotage and/or vandalism is specifically exempted from the guarantee. When defective materials and/or workmanship are discovered which requires repairs to be made under this guarantee, all such work shall be done by the Contractor at their own expense and shall begin within five working days after written notice of such defects have been given to them by the City. Should the Contractor fail to repair such defective materials or workmanship within five working days thereafter, the City may cause the necessary repairs to be made and charge the Contractor with the actual cost of all labor and materials required.

In emergencies demanding immediate attention, the City shall have the right to repair the defects and charge the contractor with the actual cost of all labor and materials required. Any repair work performed as herein specified shall be done under the provisions of the original work specifications.

SECTION 2 – DESIGN GUIDELINES

2-01 GENERAL

Establishing realistic design criteria is paramount to evaluating the existing water system's adequacy and planning for future water system improvements. Minimum design criteria for the City of Fullerton water system are in accordance with the standards and requirements put forth by the U.S. Environmental Protection Agency, State Water Resources Control Board (SWRCB), California Plumbing Code, California Building Code, California Fire Code, and American Water Works Association (AWWA).

Minimum design criteria addressed in this section include water supply requirements, storage volume, distribution system and transmission main capacity, and water quality standards. These criteria will be utilized to determine existing deficiencies in the water system and projected water system requirements for the City of Fullerton's water system. These criteria are in addition to the City's Water Utility Specifications, Water Rates, Rules, and Regulations, Standard Drawings, City Municipal Code and City Ordinance.

2-02 PLANNING CONSIDERATIONS

Public water systems should be designed to provide firefighting capability in accordance with the requirements of the jurisdiction(s) within which the utility operates.

Phased development is permitted where full development will take several years.

2-03 RELIABILITY CONSIDERATIONS

Multiple water sources are recommended in combination with adequate emergency reserve in gravity storage to allow for interruption of supply at one point, while still maintaining water supply to the system at the design rate.

Pumping stations are to contain multiple booster pumps of sufficient capacity to meet the maximum day demands with the largest pump out of service.

Auxiliary power is required where adequate gravity storage is not provided.

2-04 GENERAL FACILITY PLACEMENT

All piping, pumping, source, storage and other facilities, shall be located in public rights-of-way, dedicated utility easements, or on City-owned property. Utility easements must be a minimum of 20 feet in width, and piping shall be installed no less than 5 feet from the easement's edge. Unrestricted access shall be provided to all public water system lines and their appropriate appurtenances and all public fire hydrants.

Where existing utilities or storm drains are in place, new facilities shall conform to these standards as nearly as practicable and still be compatible with the existing installations.

Mains shall at a minimum be extended to the furthest boundary of the Developer's property to allow for future extension by others, unless a more limited extension is approved by the City.

2-05 SYSTEM ANALYSIS

The Developer will be required to submit an analysis of anticipated flow demands: peak hour flow, minimum hour flow, and maximum day plus fire flow. The City shall accept or request modifications to the submitted analysis. The proposed water system shall be analyzed for the following three conditions:

2-05.01 Peak hour demands

For the peak hour demand flow analysis, the pressure at each node shall be a minimum of 40 psi and a maximum of 120 psi. The maximum velocity in the pipelines shall be 7.5 feet per second (certain exceptions may apply). The wells/pump stations are on.

2-05.02 Minimum hour demands

For the minimum hour demand analysis, the maximum velocity in the pipelines shall be 5.0 feet per second (certain exceptions may apply) and the maximum pressure at each node shall be 120 psi. The demand will be 10% of peak hour demand. The wells/pump stations are on.

2-05.03 Maximum day demand plus fire flow

For the maximum day demand plus fire flow analysis, fire flow should be selected for the worst-case scenario (typically the hydrant furthest from the connection(s) to the City's distribution system or the hydrant at the highest system elevation) and as directed by City staff. Analysis at multiple hydrants may be required. The pressure at each node shall be a minimum of 20 psi and the maximum velocity in the pipelines shall be 7.5 feet per second (certain exceptions may apply). The capacity in the pipes to any individual hydrant shall have a combined minimum of 1500 gpm or as dictated in the latest version of the California Fire Code, whichever is greater. The wells/pump stations are off.

2-06 WATER PRESSURE

Water systems shall be designed to provide an adequate quantity of water at a positive pressure of at least 40 psi under peak hour demand flow conditions, measured at any customer's water meter.

For fire flow, the distribution system shall be designed to provide the required fire flow at a residual pressure of 20 psi throughout the system during fire flows under peak hour flow conditions.

Water pressures exceeding 80 psi require installation of a pressure reducing valve(s) in accordance with the California Plumbing Code, as directed by the City Engineer.

2-07 CONSERVATION REQUIREMENTS

The developer shall conform to any drought requirements as part of the design. In the event that no drought requirements are in place, the developer shall strive to promote water conservation through water-efficient landscaping, efficient fixtures, water use management and water conservation via the use of water-efficient landscaping, wise use of turf areas and appropriate use of irrigation technology and management.

2-08 MATERIALS

All materials used in the water distribution system shall be in accordance with the City's Approved Materials List. Materials not listed on the City's Approved Materials List must be approved by the City prior to use. All materials shall be installed in accordance with the installation procedures provided by the manufacturer.

Distribution water mains are typically PVC C900. Where ductile iron is being proposed, polyethylene encasing shall be utilized. Soil samples may be required prior to final plan approval, at the City's discretion, to determine soil corrosiveness that may affect the life of the pipeline. Based on the soil sample results, additional protection as determined by the City shall be installed.

2-09 PIPE DESIGN

Minimum water distribution pipe diameter is 8 inches nominal inside diameter in locations that include fire hydrants. In other locations, as approved by the City, pipe diameter may be no smaller than 4 inches nominal inside diameter. All pipelines shall be designed and constructed for ultimate domestic and fire flow conditions as determined by the City. 10, 14, and 20 inch pipes are no longer acceptable sizes for mains.

Water main size shall be adequate to deliver required fire flows and the maximum day demand while maintaining minimum system pressures of 20 psi.

Distribution systems are to be sized to provide peak hourly demand flow.

Maximum velocity in distribution pipelines is not to exceed 7.5 feet per second under peak hour demand conditions.

Dead-end mains are generally not accepted by the City, except in phased development projects or where no potential for future interconnection of facilities exists. Approved dead-end mains that will not serve fire hydrants may be sized as hydraulically appropriate in residential areas and 8 inches in commercial areas.

Lateral runs from main line to standard hydrants less than 50 feet in length must be a minimum of 6 inches in diameter. Lateral runs from main line to standard hydrants more than 50 feet in length must be a minimum of 8 inches in diameter.

Minimum cover over pipes shall be 42 inches from top of pipe to the finished grade.

Installation of piping and backfill materials shall be in accordance with the City's Standard Drawings, Water Utility Specifications, and the City's Approved Materials List.

No native backfill may be used for the installation of a new water main.

Water source pumping facilities and storage facilities must be designed so that, in combination, they can supply the maximum instantaneous flow demand at any time in all parts of the system.

Water lines installed in dedicated residential easements shall avoid installation of horizontal and vertical bends (45°, 90°, etc).

2-10 SEPARATION REQUIREMENT

To prevent the contamination of the public water supplies from nearby sanitary sewers/storm drains, the following California Department of Public Health (CDPH) criteria shall be required.

2-10.01 Basic Separation Standards

The “California Waterworks Standards” sets forth the minimum separation requirements for water mains and sewer lines/storm drains. These Standards, contained in Section 64572, Title 22, California Administrative Code, specify:

Parallel Construction: The horizontal distances between pressure water mains and sewer lines shall be at least 10 feet. The horizontal distances between pressure water mains and storm drain lines shall be at least 4 feet.

Crossing Construction: Pressure water mains shall be no less than 45 degrees to and at least one foot above sanitary sewer and storm drain lines where these lines must cross. No connection joints shall be made in the water main within eight horizontal feet of the sewer main.

Separation distances shall be measured from the nearest edges of the facilities (i.e., dimensions are from outside of water main to outside of sewer/storm drain line or manhole).

Refer to Figure 1 and Figure 2.

Common trench: Water mains and sewer/storm drain lines must not be installed in the same trench.

The lack of separation between water mains and sanitary sewers/storm drains results in an increased potential for contamination of the water supply. 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 required herein.

A waiver must be obtained from the SWRCB Division of Drinking Water for installations that do not meet the separation requirements.

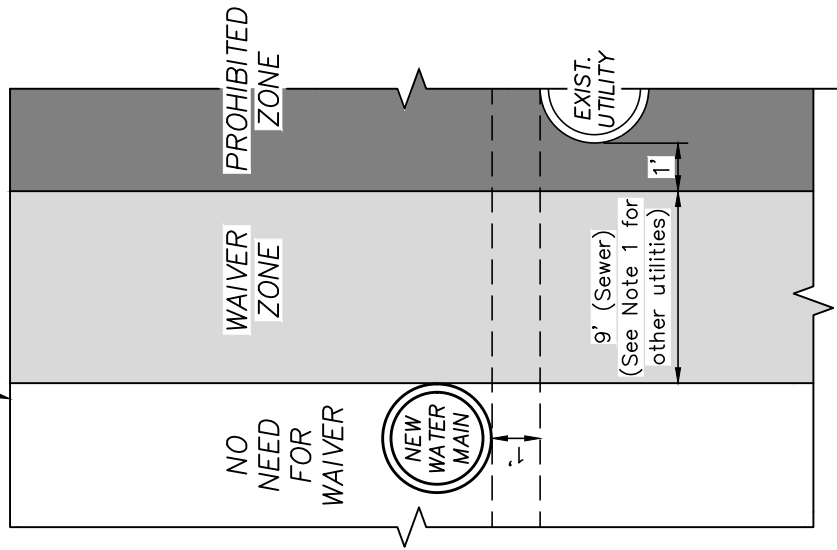
2-10.02 Exceptions To Basic Separation Standards

Local conditions, such as available spaces, 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. Exceptions must be approved by both the City Engineer and the SWRCB Division of Drinking Water.

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

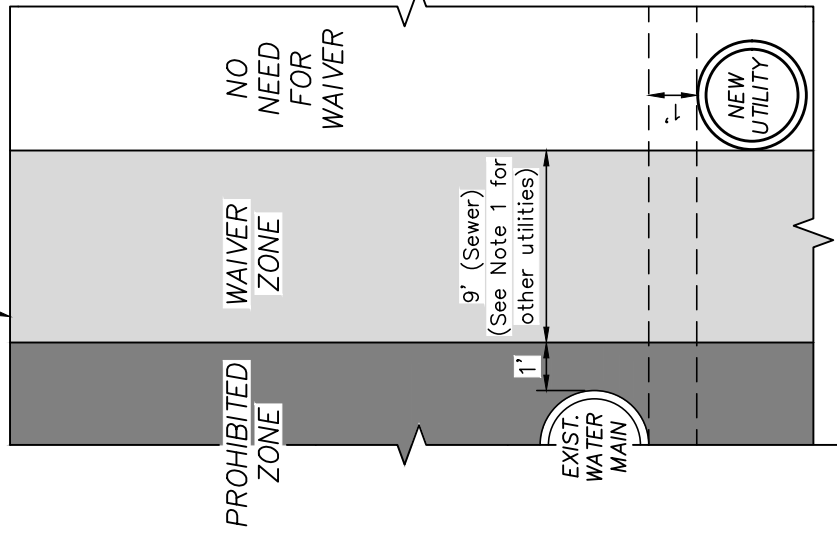
NEW WATER MAIN
EXISTING UTILITY

Finished Surface



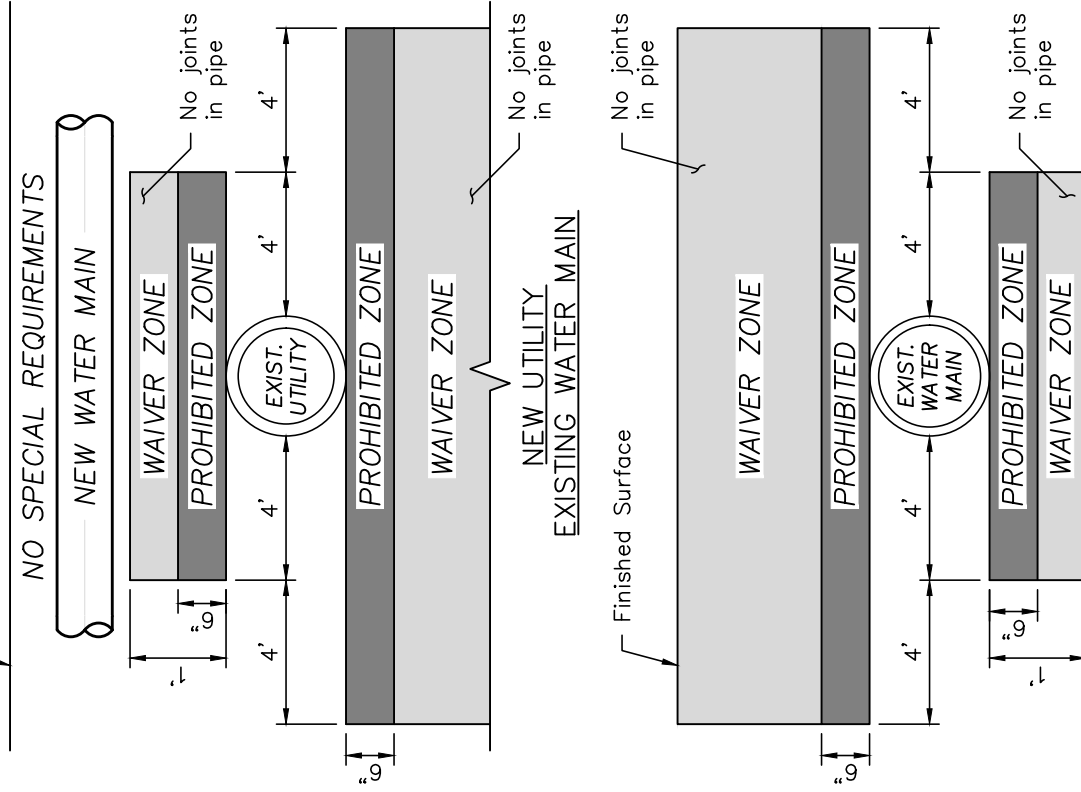
NEW UTILITY
EXISTING WATER MAIN

Finished Surface



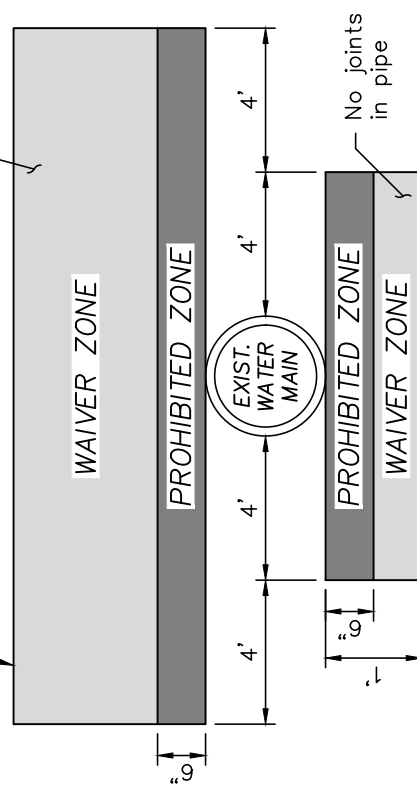
NEW WATER MAIN
EXISTING UTILITY

Finished Surface



NEW UTILITY
EXISTING WATER MAIN

Finished Surface



NO SPECIAL REQUIREMENTS

NEW UTILITY MAIN

Figure 1 – PARALLEL CONSTRUCTION

Figure 2 – CROSSING CONSTRUCTION

- NOTE:
- 1) Refer to Section 64572, Title 22, of California Code of Regulations for separation requirements.
 - 2) A waiver must be obtained from the SWRCB Division of Drinking Water for installations that do not meet the separation requirements.
 - 3) Zones are identical on either side of pipe.

2-11 CROSS-CONNECTION CONTROL

Where the possibility of contamination of potable water exists, water services shall be equipped with appropriate cross-connection control assemblies in accordance with State requirements and the "Cross-Connection Control Manual, Accepted Procedure and Practice," published by the American Water Works Association. The need, size, location, and type of cross-connection assemblies shall be determined by the City and shall be installed in accordance with the City's Standard Drawings and Section 3.

2-12 SYSTEM CONNECTION – INFRASTRUCTURE TIE-INS

New sections of water main must be flushed and disinfected in accordance with these Specifications.

A hot tap method in accordance with the Standard Drawing 701 shall be used when tapping into the live water system.

Where an existing cap, tee, stub out or other connection is present, the connection shall be utilized unless directed otherwise by the City.

2-13 VALVES

Installation shall be in accordance with City Standard Drawing 650.

Valves 12 inch and smaller shall be resilient wedge gate valves. Valves larger than 12 inches shall be butterfly or as otherwise directed by the City.

Valves shall be installed in a configuration that permits isolation of individual lines.

Valves should be installed at intersections with normal maximum spacing at 500 feet in commercial, industrial, and multi-family areas; 800 feet in residential areas; and 1/4 mile in transmission mains. Valve shall be spaced so that no more than 20 lots are to be out of service at one time. Additional isolation valves may be required by the City and will be determined on a case-by-case basis.

Zone isolation valves shall be installed at pressure zone boundaries to permit future pressure zone realignment without the need for pipeline reconfiguration.

Air relief valves are to be installed, per City Standard Drawing 627, at appropriate high elevation points in the system. All piping in the system shall be sloped to permit escape of any entrained air.

A blow-off assembly or fire hydrant shall be installed on all dead-end runs and at designated points of low elevation to provide a means for adequate flushing of the system. The blow-off assembly shall be installed in a utility right-of-way, unless a written access and construction easement is provided to the City.

Pressure Reducing Stations may be required by the City, including pressure relief valves or various other types of control valves, and shall be individually designed for their application.

2-14 HYDRANTS

Maximum spacing for hydrants shall be dictated by the latest version of the California Fire Code, or as directed by the City of Fullerton Fire Chief.

The plans shall designate either a Standard or Steamer type hydrant. A Standard hydrant shall have one 2½ inch hose outlet and one 4 inch pumper outlet. A Steamer hydrant shall have two 2½ inch hose outlets and one 4 inch pumper outlet.

Unless required by the Fire Marshall and/or City Engineer, fire hydrants installed in Single Family Residential areas shall be Standard type. Fire hydrants installed in all other locations shall be Steamer type.

2-15 THRUST RESTRAINT

Thrust restraints are required at all changes in direction or as determined by the City.

Thrust restraints are required at all dead ends. All valves shall be considered dead ends in either direction.

The use of internal restraints is preferred over externally restrained harnesses or thrust blocks. Use of externally restrained harnesses or thrust blocks must be approved by the City.

Installation shall be in accordance with the City's Standard Drawings.

2-16 GUARD POST

Where required by the plans or by the City if field conditions so dictate, guard posts shall be installed. The number, size and specific location of such posts will be determined by the City if not shown on the plans.

2-17 WATER SERVICES / METERS / METERS BOXES

Installation shall be in accordance with the City's Standard Drawings.

Service line sizes shall be 1, 2, 4, 6, or 8 inch, depending on water demand.

Manifolding, combining, or connecting several smaller meters to meet a flow demand that could be provided by a single larger meter is not allowed. There shall be one meter per service line.

Domestic water service taps are prohibited on any large diameter laterals or any laterals primarily designed to service fire sprinkler systems and/or fire hydrants.

Water service taps shall have a minimum 2 feet separation between taps or to joints.

Service tapping to concrete cylinder pipes shall only be made under special approval by the City.

Water meter type shall be determined by the City based on application.

Meter boxes should be installed in areas accessible at all times. They should not be located in driveways, manmade or natural drainage channels, retention basins, etc. Meter boxes should avoid being installed in sidewalks, behind fences, or near trees.

Where a water main is installed in a residential easement (typically at cul-de-sacs for providing proper looping), water service taps shall be installed before any isolation valves.

In the case where a meter must be relocated, it may be relocated a maximum of 5 feet from the original location. If the location is greater than 5 feet, the service line must be severed at the corporation stop and a new service line installed.

2-18 FIRE LINES

A dedicated fire line must be installed where required by the Fire Marshal, California Fire Code, or California Building Code. Fire lines should be installed in areas accessible at all times.

2-19 WATER QUALITY STANDARDS/MONITORING

The maximum contaminant levels allowed in drinking water supplies are as put forth by California Division of Drinking Water and the federal SDWA (Safe Drinking Water Act). The City recognizes that additional monitoring requirements are forthcoming and will comply with such requirements as they are implemented in the State of California. Similarly, the City recognizes the SDWA requires a variety of source monitoring for water supplies and that the California Division of Drinking Water may require additional monitoring via online monitoring. The developer will incur all expenses including, but not limited to, design and installation of any additional monitoring to meet state requirements as part of the development, as required.

2-20 STORAGE

Impacts on storage requirements will be evaluated on an individual basis. At the Developer's expense, as required by the Director of Public Works, a new storage facility or enhancements to existing storage facilities may be required.

2-21 PUMP STATIONS

Need for additional pumping capacity will be evaluated on an individual basis. At the Developer's expense, as required by the Director of Public Works, a new pump station or enhancements to existing pump stations may be required.

Pump stations shall contain multiple booster pumps of sufficient capacity to meet the maximum day demands of the service area with the largest pump out of service.

2-22 TELEMETRY

At the developer's expense, in the determination of the City, when installations may impede with existing telemetry systems, the developer shall reimburse the City for any costs associated with evaluating and/or implementing required modifications.

SECTION 3 – BACKFLOW PREVENTION ASSEMBLIES AND FIRELINES

3-01 PUBLIC WATER SYSTEM PROTECTION

All water services, other than residential, connected to the public water system shall be required to include an approved backflow prevention assembly; the type to be designated by the Engineer. Certain types of residential services may be required to have an approved backflow prevention assembly. The type of protection approved shall be based on the existing or potential degree of hazard that exists on the user's premises, in the opinion of the Engineer. All assemblies shall be approved by the State Water Resources Control Board (SWRCB).

3-02 APPROVED BACKFLOW PREVENTION ASSEMBLIES

Approved manufactures/models of backflow prevention assemblies, including fire lines as mentioned elsewhere in this Section, are those approved by the SWRCB, as shown in its latest edition of "Approved Backflow Prevention Devices". The City Engineer will provide final approval of the device to be used. Contact the Water Engineering Division for SWRCB's list of approved assemblies.

Four inch and larger approved backflow prevention assemblies, including fire lines, have two gate valves and four test cocks. Gate valves for fire lines must be of the Outside Stem & Yoke (OS&Y) type with rising stems and tamper switches.

Four-inch and smaller backflow assemblies, other than fire lines, shall be installed in conformance with City of Fullerton Standard Drawings 603 and 604.

The horizontal run of all backflow assemblies shall be installed in a level position.

3-03 TESTING

The Owner/Developer or Contractor shall be responsible for the installation, initial test and certification of all new backflow prevention assemblies. Thereafter, backflow prevention assemblies will be maintained and tested annually by the owner or water user. All testing shall be done by a certified backflow device tester possessing a valid certification issued by the Orange County Environmental Health Agency and an active Fullerton business license. Contact the Public Works Water Operations Division for a list of certified testers.

3-04 LOCATION OF ASSEMBLIES

Backflow prevention assemblies shall be located as close as practical to the meter, a minimum 12 inches behind the property line and subject to approval by the Engineer. The assemblies shall be at least 12 inches from walls, buildings, obstructions, or other devices, readily accessible for testing, maintenance, and repairs. The lowest part of any reduced pressure principle backflow assembly shall be installed between 12 and 18 inches above finished grade. The above ground horizontal run segment of a backflow assembly shall be installed in a level position.

Backflow prevention devices shall be installed at locations other than immediately behind the water meter when required by law or when determined by the Engineer and regulatory agency that such additional devices are necessary to adequately protect the water supply.

There shall be no direct connections between the meter and the backflow assembly.

3-05 FIRELINES

All fire lines shall require a detector check meter (by-pass meter) and backflow protection; type and size determined by the Engineer. The standard fire line shall have a double check detector backflow assembly. When a higher degree of hazard exists, a reduced pressure principle detector backflow assembly is required. All fire lines shall be installed in conformance with City of Fullerton Standard Drawings 701 and 721.

The detector (by-pass) check meter shall be per the City's Approved Materials List.

The above ground horizontal run segment of a fire line assembly shall be installed in a level orientation.

3-06 AESTHETICS

The Owner/Developer is encouraged to locate all above ground large services, backflow prevention assemblies, and fire lines in a manner that is aesthetically pleasing. If a method of concealment is used, it shall not obscure the Fire Department's pumper connection, OS&Y rising stems, hinder access to the connection, or obscure the testing of the device.

**SECTION 4 – OPEN TRENCH OPERATIONS:
EXCAVATION, BEDDING, BACKFILL AND RESURFACING**

4-01 OPEN TRENCH OPERATIONS

Open trench operations, excavation, bedding, backfill, and resurfacing shall conform to the applicable requirements of these Specifications, the Standard Specifications, and City of Fullerton Standard Drawings, 312 and 313.

4-01.01 Traffic Control

The Contractor shall conduct their operations to cause the least possible obstruction to traffic inconvenience to the public. On arterial highways, lane closures require a traffic control plan completed by a registered civil or traffic engineer subject to approval from the City Traffic Engineer. Lane closures are restricted to the hours between 8:30 a.m. and 3:30 p.m. At least one lane of traffic must be maintained in each direction between these hours. All traffic lanes shall be open to traffic during all other hours. On minor residential streets, one lane of traffic shall be maintained for each direction at all times. If two travel lanes cannot be maintained, the roadway may be reduced to one 14-foot-wide lane between the hours of 8:00 a.m. and 4:00 p.m. Adequate flaggers, no less than two, whose sole duties shall consist of directing traffic, shall be provided at such times as the street is restricted to one lane of traffic. At least one 14-foot-wide lane controlled by flaggers shall be provided on all intersecting minor streets. A separate permit is required from the Department of Public Works for all work in public streets.

The City Traffic Engineer reserves the right to alter the above traffic conditions as required during construction.

The Contractor shall be required to provide and maintain all barricade delineators, flashers, signs, including temporary “No Parking” signs, and other safety equipment as set forth in the latest edition of Caltrans “California Manual on Uniform Traffic Control Devices” (CA MUTCD) and the “Work Area Traffic Control Handbook” (WATCH). All necessary traffic control devices shall be in place prior to the start of work.

On all designated or striped bicycle routes the Contractor shall install standard warning signs per the WATCH Manual at locations approved by the City Traffic Engineer.

Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. Hydrants under pressure, valve pit covers, valve boxes, meter boxes, fire or police call boxes, or other utility controls shall be left unobstructed and accessible during the construction period.

4-01.02 Surveying

The Contractor shall provide equipment, methods, and labor to accurately locate all proposed water facilities in accordance with the Standard Specifications and as modified herein. The Contractor shall guarantee the accuracy by constructing curb and gutter prior to the beginning of any water improvements in new developments or where the installation of curb and gutter is included as part of the work scope. The Contractor shall also be responsible for the preservation of existing survey monuments.

4-01.03 Potholing

The plans show the position of pipes, conduits, poles and other structures as they are believed to exist. The Contractor, before commencing any excavation shall determine from records, potholing, uncovering, or otherwise, the existence, exact position, and ownership of these or other facilities. It is the Contractor's responsibility to protect any pipes, conduits, poles, or any other existing improvements.

Potholing shall be done a minimum of 10 working days in advance of commencing any excavation and sub-structure information forwarded to the Engineer for review.

4-01.04 Sheeting and Shoring

All trench excavations shall be adequately secured to provide safe working conditions, and protection to adjacent facilities and structures. The contractor shall comply with all rules, regulations, and orders of Occupational Safety and Health Administration (OSHA).

Prior to any trench excavation where the depth of trench is greater than five feet, the Contractor shall submit to the Engineer a detailed shoring plan prepared, stamped and signed by a Civil or Structural Engineer registered in the State of California. The shoring plan shall show the design of shoring, bracing, sloping, or other provisions to be made for the workers' protection from the hazard of trench failure. Excavation shall not begin until the Engineer has accepted the plan and received a copy of the OSHA permit.

Sheeting and shoring shall not place any undue strains on existing utilities or structures, nor on completed sections of construction. Sheeting and shoring may be removed during backfilling, provided adequate protection is provided at all times. The Contractor shall be responsible for any damages to existing utilities or structures due to placement, removal or failure of any sheeting and/or shoring system. The Contractor shall repair or have repaired any damages as soon as practical.

4-01.05 Secured Trenches

Pipe trenches or other large excavations shall be backfilled or securely covered at the close of each working day, to the satisfaction of the Engineer. The Contractor shall fence any trench excavations that are necessary to be left open at night. Any trench that is left open shall be permitted only upon review and approval by the Engineer.

Covering of trenches with steel traffic plates shall be done in accordance with City of Fullerton Specifications and as directed by the Engineer. All steel plate covers shall be skid resistant and shall be installed flush with adjacent pavement in accordance with City Standard No. 314.

No backfill material or construction equipment may be stored on any City street without prior approval from the Engineer.

4-01.06 Tie-Ins

All tie-ins shall be excavated one working day in advance and covered with traffic plates or as required by the Engineer.

4-01.07 Interruption of Water Service

No valve or other control on the existing water system shall be operated for any purposes by the Contractor without approval of the Engineer. All consumers affected by such operation shall be given a notice letter by the Contractor at least three working days before the operation advising of water service outage and the probable time when service will be restored. The notice letter template will be provided by the Engineer to the Contractor. The Contractor shall complete the notice letter and submit to the Engineer for approval at least 5 working days before it is distributed.

4-02 TRENCH EXCAVATION

Trench excavation shall be in accordance with the details shown in the City of Fullerton Standard Drawings 312 and 313 and in accordance with the Standard Specifications.

The maximum length of open trench shall be the distance of pipe installed in one day. Shorter lengths of open trench may be necessary and may be ordered by the Engineer to meet traffic, weather, and other safety requirements.

In areas of new development, water main installation will not be permitted until the sub grade is established and the storm drain and sewer installation has been completed. Pipe shall be placed to the grade and depth specified on the plans. When not specified, pipe shall have a 42-to-48-inch cover from finished grade.

4-02.01 Removal of Surface Improvements

Bituminous pavement, concrete pavement, curbs, sidewalks, or driveways removed in connection with construction shall be removed in accordance with City of Fullerton Standard Drawings 312 and 313 and the Standard Specifications.

If the width of the remaining pavement between the final saw cut edge of the trench and the edge of the gutter is less than 36 inches, removal and new pavement limits shall extend to the edge of gutter.

Concrete sidewalk removal done in connection with water system work shall be saw cut to the nearest score marks. Concrete curbs, gutters and cross gutters shall be tunneled whenever possible. With prior approval of the Engineer, the concrete may be saw cut in such a manner in which there shall not be less than six feet to the nearest cold joint or expansion joint.

4-02.02 Abandoning Structures

Whenever existing pipes, culverts, or conduits are cut and abandoned, their open ends shall be securely closed by either a solid mechanical cap, a wall of concrete no less than six inches thick, or as directed otherwise by the Engineer.

4-02.03 Protecting and Replacing Existing Structures

Insofar as practicable during the progress of the work, any public or private property and/or improvements, at or below grade, shall be maintained in good operating condition at the expense of the Contractor. Wherever in the judgment of the Contractor, the economical performance of the work requires a temporary or permanent removal of any of the property named above in this section, the Contractor shall make arrangements with the owner of the same for its temporary or permanent removal, or for other changes that may be necessary in order to perform the work more readily. All expenses for maintenance, removal reconstruction, and repair of and such property shall be borne by the Contractor.

Whenever the Contractor makes agreements with owners for the removal and restoration of said property, the materials furnished and the methods of making such removal and restoration shall be satisfactory to the owner and the Engineer. In the event the Contractor disturbs, disconnects, or damages any of said property prior to making the necessary arrangements with the owners thereof, the Contractor shall immediately give notice to the property owner and the Contractor shall assume all responsibilities connected therewith. All property removed shall be reconstructed or restored promptly as is reasonably possible in approximately its original location and in condition as good as when removed and subject to the inspection of the owners or governing body having jurisdiction over same.

4-02.04 Excess Excavating Material

All excavated materials in excess of that required in the finished work shall immediately be hauled away and disposed of at a legally permitted site. The Contractor shall be responsible for all damages and claims that may arise from the disposal of the excess material. The contractor shall provide a signed release from the property owner.

4-03 TRENCH BEDDING

The pipe bedding and up to 12" above the pipe, shall be sand with S.E. = 30, as per City of Fullerton Standard Drawings 312 and 313. Jetting of trench bedding is subject to the approval of the Engineer.

4-04 TRENCH BACKFILL

Trench backfill shall be placed in accordance with the requirements shown in City of Fullerton Standard Drawings 312 and 313 and in accordance with the Standard Specifications. No native material shall be used for backfill. All backfill material shall be imported.

The Contractor shall compact the trench backfill material to the bottom of the structural section within one day after installation of the pipe. No flooding or jetting of the backfill will be allowed to achieve compaction.

If the Engineer determines that the Contractor is not able to obtain the required compaction in areas under curbs, cross gutters or other structures, trench backfill underneath these structures shall be 1-sack cement sand slurry or as specified by the Engineer.

4-05 COMPACTION TEST

Compaction tests will be taken along the pipelines, in the pipe zone, above the pipe zone, and at ground surface or subgrade at 200-foot intervals or less, or as directed by Engineer, and along all large service and fire hydrant laterals. The Engineer must be present when compaction tests are taken.

4-06 TEMPORARY RESURFACING

Temporary resurfacing, a minimum of two inches thick or as otherwise specified, shall be placed and properly maintained by the Contractor as determined by the Engineer unless permanent resurfacing is to be placed immediately.

Temporary resurfacing shall be placed in accordance with the Standard Specifications and shall be placed as soon as trench backfill is complete and shall remain in place until permanent resurfacing is placed. Prior to permanent resurfacing, temporary resurfacing shall be removed and discarded at a legal disposal site at Contractor's expense. Temporary asphalt paving as specified above shall be a minimum two inches thick or as specified by the Engineer.

At the end of each day, temporary striping shall be placed complying with the plans, as specified or as directed by the Engineer. Temporary striping shall conform to the Standard Specifications.

4-07 TRENCH RESURFACING

Trench resurfacing shall be placed in accordance with the requirements shown in the City of Fullerton Standard Drawings 312 and 313 and in accordance with the Standard Specifications.

Contractor shall place structural section other than surface course within five days of completion of backfill.

Concrete sidewalks, curbs and gutters, driveways and other structures shall be replaced in accordance with the applicable requirements in the Standard Specifications and the City of Fullerton Standard Drawings.

SECTION 5 – INSTALLATION OF DUCTILE IRON AND PVC PIPE, VALVES, FITTINGS, FIRE HYDRANTS, AND APPURTENANCES

5-01 GENERAL

Installation of Polyvinyl Chloride (PVC) Pressure pipe shall conform to the requirements of AWWA Standard C605, "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water". Installation of ductile iron pipe, valves, fittings, fire hydrants, and appurtenances shall conform to the applicable requirements of AWWA C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances," and the applicable provisions of the Ductile Iron Pipe Research Association (DIPRA) "Guide for the Installation of Ductile Iron Pipe."

The Contractor shall furnish all labor, equipment and materials required to construct, install, and complete the pipelines, connections, valves, fittings, fire hydrants, thrust restraints, and all other appurtenances as shown on the plans and specified herein.

5-02 CONSTRUCTION MATERIALS

The Contractor shall furnish only approved materials per Section 7 and Section 8 of these Specifications. All materials shall be new and of the best quality for their intended use. All like materials shall be of one manufacturer for any particular project.

5-03 INSTALLING WATER MAIN PIPE

The pipe and fittings shall be inspected for defects prior to lowering in trench. All lumps, blisters, excess coating, and other foreign materials shall be removed from the bell and spigot ends of each pipe. The outside of the spigot and the inside of the bell shall be wiped clean and dry and shall be free from oil and grease before the pipe is laid.

Pipe shall be lowered into the trench with fabric or other approved slings. Under no circumstances shall pipe be dropped, pushed off the bank, or allowed to fall into the trench. Every precaution shall be taken to prevent foreign materials from entering the pipe while it is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without getting soil into it, the Utility may require that before lowering the pipe into the trench, a temporary plug be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. No pipe or appurtenances shall be laid in water or when, in the opinion of the Engineer, trench or weather conditions are unsuitable for such work.

Except where necessary in making connections with other water pipelines, or where otherwise authorized by the Engineer, pipe shall be laid with the bells facing in the direction of installation. For lines on appreciable slopes, bells shall face upgrade.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by watertight plug or other means approved by the Engineer. This provision shall apply during lunch-hour breaks as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

5-03.01 Laying Ductile Iron Pipe, Bends, and Fittings

Whenever it is necessary to deflect pipe from a straight line either in the vertical or horizontal plane to avoid obstructions or where long radius curves are required, the amount of deflection allowed shall not exceed that required by DIPRA for a satisfactory joint and shall be approved by the Engineer. Short lengths of pipe may only be used at locations where fittings are to be installed or in situations where adequate total horizontal and/or vertical joint deflection may not be obtained by using a standard length of pipe.

After pipe has been set in trench, exterior of spigot and interior of bell shall be thoroughly cleaned. A water-soluble, NSF 61 approved and nontoxic lubricant as approved by pipe manufacturer shall be applied to rubber gasket. Pipe ends shall be aligned, and spigot shall be pulled into bell with come-along devices, or hoists with chains and slings. If a pry bar is used, a timber header shall be placed between the pipe and the pry bar before the spigot is pushed into bell.

Warning tape shall be installed 12 inches above the top of pipe.

5-03.02 Laying PVC (C900) Pipe

PVC bends and fittings are not allowed with the exception of high deflection couplings. The Uni-Bell Handbook of PVC Pipe-Design and Construction shall be used for details of pipe installation practice except as follows and were noted otherwise on plans. Contractor shall take measures to prevent over-insertion of pipe.

Tracer wire shall be installed and secured to the top of all PVC pipes as it is being laid. The tracer wire shall be grounded to the valve, to each service (grounded to the corporation stop), to all appurtenances and to all hydrants (grounded to the bury). Tracer wire shall be secured to the top of the pipe, at minimum of 10-foot intervals, with plastic adhesive tape.

The wire shall be electrically continuous throughout the entire piping system. All splices of the wire shall be made securely and covered thoroughly with an approved splice kit. The Contractor shall schedule a conductivity test (conducted by the City) on completion of the water main installation and prior to the final pavement. If the conductivity test fails, the Contractor shall be responsible for making the necessary repairs, until passing results are achieved.

Warning tape shall be installed 12 inches above the top of pipe.

5-03.02.01 Installation of Curvature

Bending of the PVC is not allowed. Any directional changes shall be accomplished through manufacturer approved 1 degree deflection of high deflection couplings, or ductile iron bends and fittings. Where required deflection is between one and five degrees, high deflection couplings shall be used. Contractor shall not exceed the manufacturer's recommendation for deflection for the couplings.

5-03.03 Cutting Pipe

The cutting of ductile-iron and PVC pipe for installing tees, fittings, or for other reasons shall be done in a neat manner without damage to the pipe or cement lining so as to leave a smooth end at right angles to the axis of the pipe. All such cutting of ductile iron and PVC pipe shall be done with a special cutting tool specifically made for cutting and machining pipe. Cut ends and rough edges shall be ground smooth and for push-on joints beveled at angles recommended by manufacturer.

5-03.04 Polyethylene Protective Wrapping

Polyethylene protective wrapping (Polywrap) for ductile iron pipe shall be furnished and installed on all buried water lines, except where water lines are within steel casing pipe, in accordance with the requirements of AWWA Standard C105, "Polyethylene Encasement for Ductile Iron Pipe Systems," Section 8 of these Specifications, and as supplemented herein. Polywrap shall be installed so as to prevent any sections of the pipe, fittings, valves, services, or appurtenances from contacting the soil. The polywrap shall be taped to provide a snug fit along the pipe.

Any punctures, tears or other damages shall be patched with polyethylene wrap and tape. Openings for service taps, blow offs or similar appurtenances shall be cut in the polywrap during backfilling of the trench. Rock or other materials that could damage the wrapping shall not be allowed in the backfill.

5-03.05 Protection of Metal Surfaces

All exposed metal surfaces of the valves, flanges, bolts, nuts, tie-rods, turn buckles, etc., in contact with the earth and backfill materials shall be coated with a minimum of 30 mils of bitumastic coating prior to backfilling. In addition to this coating, the main and fittings shall be encased in polyethylene wrapping as described in Section 5-03.04.

5-03.06 Thrust Restraints

Thrust restraints shall be required at all bends, tees, valves, pipe ends, and fire hydrant bury. Thrust restraints through other mechanical means as specified in Section 2-15 of these Specifications shall also be incorporated.

Where restrained joints are indicated on the plans or on Standard Drawings, push-on joints shall be restrained in accordance with the requirements of Section 2-15 of these Specifications.

5-03.07 Flushing

After the pipeline has been completely installed, flushing of the pipeline shall be done per the requirements of Section 6 of these Specifications.

5-04 VALVE BOX ASSEMBLY

Installation of a valve box assembly shall conform to the requirements of City of Fullerton Standard Drawings 650. All buried gate and butterfly valves shall be boxed with the valve cover flush with the finish street pavement grade. The valve box riser shall rest on the bonnet of the gate valve and shall be cut to the required length to assure a level and/or flush fit to finish grade. The valve box shall be installed so as not to transmit shock loads or stress to the valve. All valve boxing shall be installed straight and plumb and centered over the valve operating nut. All active valves shall be accessible at all times during construction operations.

A valve stem extension shall be installed as required per City of Fullerton Standard Drawing 651.

Excavation and backfill for a valve box assembly shall be per Section 4 of these Specifications.

5-05 FIRE HYDRANT ASSEMBLY

The installation of a fire hydrant assembly shall conform to City of Fullerton Standard Drawing 610. Hydrants shall be set plumb and at such elevation that the lateral and main shall have approximately the same depth of cover.

Fire hydrants shall be placed where shown on the plans. Locations shall provide complete accessibility and adequate pedestrian clearance in accordance with the Americans with Disabilities Act (ADA) requirements and minimize the possibility of damage from vehicles.

Where required by the plans or as directed by the Engineer, fire hydrant guard posts shall be installed per City of Fullerton Standard Drawing 615.

All hydrants not in service shall be bagged or otherwise identified as directed by the Engineer.

If required by the Engineer the Contractor shall field paint the fire hydrant barrel and guard posts in accordance with the applicable field painting requirements in Section 5-10.

5-06 LARGE SERVICE LATERALS, BACKFLOW ASSEMBLIES, AND FIRE LINES

Installation of large service laterals (3 and larger) shall conform to City of Fullerton Standard Drawings 603 and 701.

The Owner/Developer or Contractor shall be responsible for preparation of the necessary design plan showing the proposed large service installation together with meter and appurtenances, backflow assemblies and fire lines. The plan shall be submitted to the Engineer for review and must be approved prior to the beginning of construction. All licenses and permits, and other requirements shall be in accordance with the requirements of Section 1 of these Specifications.

The horizontal runs of all above ground large services, backflow assemblies, and fire lines shall be installed in a level position.

No sewer and water laterals shall be laid in the same trench.

Contractor shall field paint all aboveground, bare, or exposed piping and appurtenances of large services, backflow assemblies, and fire lines in accordance with the applicable field painting requirements addressed later in this Section.

5-06.01 Meters

The meter will be provided by the City and installed by the Contractor. The Contractor shall pay all associated fees. In certain situations, the meter may be required to be provided by the Contractor. All 3 inch and larger meter installations shall include provisions for a temporary bypass line. Meters shall conform to size, type and manufacturer as required by the City. The Engineer reserves the right to specify the type of meter if, in the Engineer's sole opinion, a specific type of meter is best suited for the proposed application. Meters shall read in US gallons.

5-06.02 Backflow Assemblies

All larger service installations shall include backflow assemblies per Section 3 of these Specifications.

5-06.03 Fire Lines

Installation of fire lines shall conform to City of Fullerton Standard Drawings 701 and 721.

5-07 SMALL SERVICE LATERALS

For one-inch and two-inch diameter service laterals, all materials except for the meter shall be supplied and installed by the Contractor per City of Fullerton Standard Drawings 601 and 602, respectively. The meter will be provided and installed by the City. The Contractor shall pay all associated fees. In certain situations, the meter may be required to be provided and/or installed by the Contractor. The service lateral shall consist of a double strap service saddle, corporation stop, copper tubing, curb stop, meter, customer valve, and meter box assembly.

If reconnecting to private plumbing it shall also include materials necessary to reconnect existing (customer) house pipe. Reconnection of house pipe shall be with like material. Reconnected copper pipe shall have soldered connections. Reconnected galvanized pipe shall include dielectric union at the brass nipple connection, downstream of meter box.

Service laterals shall be installed perpendicular to the centerline of the street with a four inch "W" letter chiseled into the curb face opposite the location of the corporation stop.

Meter boxes shall be brought to grade upon construction of concrete sidewalks and grading of parkway. Meter boxes for 1 inch service laterals located in areas subject to traffic loading or located behind rolled curbs shall be installed with traffic bearing covers. Regardless of location, all meter boxes for 1½ inch and 2-inch meters shall be installed with traffic bearing covers.

No sewer and water laterals shall be laid in the same trench.

All new services shall be installed before new mains are pressure tested and chlorinated.

5-07.01 Backfill Compaction

Backfill and compaction requirements in the area adjacent to the copper tubing service lateral shall conform to Section 4 of these Specifications. Compaction of

backfill materials by mechanical means directly over the exposed service tubing shall not be allowed.

5-07.02 Backflow Assemblies

Installation of backflow assemblies for small installations shall conform to City of Fullerton Standard Drawing 604 and Section 3 of these Specifications.

5-08 CONNECTION TO THE EXISTING DISTRIBUTION SYSTEM

Proper hydrostatic testing, disinfecting, and flushing of new facilities must take place per Section 6 of these Specifications prior to permanent connections. The Contractor shall make the connection to the existing distribution system as shown on plans or as directed by the Engineer. All connections must be made in the presence of the Engineer.

5-08.01 Hot Tapping

The Contractor may tap cast iron, ductile iron, and PVC C900 distribution mains under pressure. The exterior surface of the pipe shall be cleaned to provide a smooth surface for the tapping sleeve. The tapping sleeve shall be secured to the pipe to prevent movement during the tapping process.

Hot tapping of concrete cylinder pipe requires prior written approval by the Engineer.

5-08.02 Shutdown of Main

All work necessary to shut down an existing distribution main for the benefit of the Contractor shall be accomplished by the Public Works Department. No valves or other controls on the existing distribution system shall be operated for any purpose by the Contractor without the approval of the Engineer.

It shall be the Contractor's responsibility to coordinate the necessary shutdown schedules through the Engineer assigned to the project. Two working days are required for scheduled shutdowns to allow City personnel to review, approve, and develop an appropriate program. Shutdowns shall not be scheduled on City's scheduled Friday closures.

The City will make a concerted effort to isolate the system as planned with the Contractor. If a water-tight shut down cannot be achieved, the Contractor shall be prepared to employ necessary pumping equipment to remove the water from the trench. City shall not be responsible for any delays due to system shutdown and isolation.

All emergency situations shall be reported immediately to the Engineer. When an extensive and/or lengthy main shutdown is required, the Engineer will determine what temporary service connections may be required. The Contractor shall furnish all necessary hoses, piping, valves, tank trucks and associated labor required to provide such temporary service at no cost to the City. All piping, hoses, and associated equipment used in temporary service connections shall be flushed and disinfected in accordance with Section 6 of these Specifications.

In making connections to existing mains, the Contractor shall perform the work in the shortest time possible and shall do the work in such a manner and as such time that will cause the least inconvenience to water users because of shutoff water services. All consumers affected by such operations shall be notified in writing by the Contractor at least three working days before the operation and advised of the probable time when the service will be restored. The written notification must be approved by the Engineer prior to use/distribution. This notification shall occur only after the hydrostatic testing and disinfecting requirements of these Specifications have been met and approved by the Engineer.

All tie-in locations shall be excavated a minimum of one working day in advance of final connection to expose the affected portions of existing pipelines and to allow time for the necessary measurements, assembly of materials and equipment, and assuring that all pre-assembled piping and fittings will be compatible with the existing main.

The Engineer may postpone or reschedule any shutdown operations if for any reason they feel that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with connection work. If it appears the connection to the existing distribution main cannot be made in the time specified, the City shall order necessary corrective measures at the Contractors expense.

5-08.03 Transfer of Jurisdiction of Completed Work

The Contractor shall be aware that once a physical connection is made to the City's system, the valves and appurtenances are under the City's jurisdiction and shall only be operated by authorized City personnel on a prearranged program schedule. The transfer of jurisdiction does not relieve the Contractor of any responsibilities for the quality of work or materials.

5-09 ABANDONMENT OF EXISTING WATER MAINS, VALVES, AND APPURTENANCES

Existing water mains, valves and appurtenances shall be abandoned at the locations as shown on the plans. Contractor shall abandon the existing water main facilities after transferring of jurisdiction of the new main to the City. Contractor shall install plug and thrust restraints at the locations shown on the plans or as directed by the Engineer.

5-10 FIELD PAINTING

The Contractor shall field paint all above ground, bare, or exposed piping and appurtenances, or damaged factory coating, in accordance with the applicable specifications and plans. Painting of water system installations as identified below shall conform to the applicable requirements of the Standard Specifications and in accordance with manufacturer's recommendations. Contractor shall not spray paint during windy conditions.

5-10.01 Surface Preparation

Care should be taken to protect OS&Y valve stems, meter registry, glass, brass test cocks, I.D. tags and other surfaces identified by the Engineer during surface preparation. These items should be masked off and not receive any primer finished coat.

5-10.02 Primer

All installation surfaces shall be primed with an aerosol primer as required by the manufacturer's recommendations.

5-10.03 Finished Coat

The following installations shall have finished coats applied per manufacturer's recommendation. Listed below are installations and associated colors. Refer to the Approved Materials List for specific part numbers:

Dark Green	Fireline Assemblies Large Meter Assemblies Backflow Assemblies
Black	Steel Plate Meter Box Covers Valve Stem Extensions
Safety Red	Private Fire Hydrants Fire Dept. Connections
Safety Yellow	Public Fire Hydrants Air Release Assembly Covers Guard Posts

SECTION 6 – PIPELINE FLUSHING, HYDROSTATIC TESTING, AND DISINFECTING

6-01 GENERAL

The following are guidelines in accordance with these Specifications, Standard Drawings, Approved Materials List, and American Water Works Association (AWWA) recommendations and procedures.

Hydrostatic pressure testing and disinfection of newly laid pipelines and appurtenances must be completed before the pipelines can be connected to the existing water distribution system. **Pipelines and appurtenances shall remain isolated (disconnected) from the existing water distribution system, during hydrostatic testing and disinfecting. A temporary connection to the water distribution system through a City provided meter and backflow prevention assembly is allowed only during filling and flushing activities.**

6-02 TEMPORARY PIPING AND APPURTENANCES FOR FLUSHING, TESTING, AND DISINFECTING

The Contractor and/or subcontractor shall supply all materials, equipment, and labor necessary for pressure testing, chlorinating, and flushing of the newly laid pipeline.

6-03 FLUSHING

Heavily chlorinated water must be neutralized to a level so as not to cause harm or damage to the environment. Flushing shall take place until chlorine measurements show that the concentration of the water leaving the new water main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

6-04 HYDROSTATIC PRESSURE TESTING

The Contractor shall utilize a licensed independent subcontractor to conduct the required hydrostatic testing of newly laid pipelines. The subcontractor must bring their own calibrated equipment with proof of calibration. After completion of the hydrostatic testing, the subcontractor shall provide a signed copy of all test results to the Engineer. The Contractor and Engineer shall be present during the testing.

6-04.01 Preparation for Hydrostatic Test

The amount of pipeline to be tested at one time shall be determined by the Engineer and shall not exceed 1,200 feet in length. Testing against closed valves is not permitted.

6-04.02 Procedures for Hydrostatic Testing

Each section of pipeline and all fire hydrants, services, and appurtenances connected thereto, shall be subjected to the hydrostatic test.

After the entire section under test has been inspected and no leaks found, the test pressure shall be set at 1.5 times the static pressure at the lowest point along the test section (Engineer to furnish system static pressure data) with a minimum of 180 psi.

6-04.03 Repetition of Hydrostatic Test

If leakage in the section of pipeline tested exceeds the maximum allowable rate as specified by AWWA, such section will be considered defective. The Contractor shall determine the points of leakage and make the necessary repairs at no cost to the City. The subcontractor will then conduct another hydrostatic test. This procedure shall be continued until the leakage falls below the allowed maximum.

6-04.04 After Satisfactory Hydrostatic Test

After test sections have successfully met the hydrostatic test requirements to the satisfaction of the Engineer, the entire pipeline or each test section shall be filled or shall remain filled with potable water until the pipeline is disinfected.

Regardless of the hydrostatic test results, the Contractor shall repair all detectable leaks.

6-05 DISINFECTING

The Contractor shall supply the materials, labor, equipment and methods necessary to disinfect the water main. The Contractor shall hire a state certified laboratory to perform the required bacteriological tests.

6-05.01 Preparation For Disinfecting Pipe Lines

Contractor shall tightly shut off every service connection served by the pipeline being disinfected at the curb stop before water is applied to the pipeline. Care should be taken to expel all air from the main and services during the filling operation.

6-05.02 Retention Period Required and Required Residual

Chlorinated water shall be retained in the pipeline for a minimum of 24 hours. After the chlorine-treated water has been retained for the 24 hours, the chlorine residual shall be tested at the pipeline extremities and at other representative points and meet the minimum chlorine residual requirements. If the tests show less than the required residual, the water main and appurtenances shall be rechlorinated and held for another 24 hour period.

During the retention period, all valves and other appurtenances shall be operated to insure internal exposure with the heavily chlorinated water.

6-05.03 Final Flushing

Following the chlorination period of 24 hours and after confirming the minimum chlorine residual, the newly laid pipeline shall be thoroughly flushed to remove the chlorinated water and any foreign materials. A minimum flushing velocity of 2½ feet per second is required for each section of the pipeline. Water shall be flushed from the

line at its extremities and at all outlets until the chlorine residual of the section being flushed is equal to or less than the distribution system level.

The disposal of the flushed chlorinated water is described later in this Section.

6-05.04 Bacteriological Tests

Bacteriological test requires that two sets of samples are collected at least 16 hours apart.

The Contractor shall have a State certified laboratory perform the bacteriological tests. Samples shall be taken at the direction of the Engineer with at least one set of samples collected at:

- every 1200 feet of the new water pipeline
- each dead-end main section
- each branch (i.e., laterals 4 inch and larger).

All samples shall show the absence of coliform organisms and a standard heterotrophic plate count (HPC) of 500 CFU/ml or less.

The results of the bacteriological tests must be reviewed and approved by the Engineer prior to connecting the newly laid pipeline to the existing water distribution system. Should the test results from the State certified laboratory disclose that the water from the new pipeline does not meet drinking water bacteriological standards, or is not of equal or better quality to that in the distribution system, the process shall be repeated until it meets the required standard.

At the time of connection to the existing distribution system, a bacteriological sample shall be collected downstream of the nearest point from the final tie in connection on the new water main.

6-06 DISPOSAL OF TEST WATER

The disposal of all water used in flushing, hydrostatic testing, and disinfecting the sections of pipeline shall be the sole responsibility of the Contractor. The disposal of water shall, in all cases, be carried out in strict observance of the SWRCB Division of Drinking Water.

For contracts administered by the City, the Contractor will be authorized to discharge under the National Pollutant Discharge Elimination System (NPDES) permit issued to the City if all requirements and procedures per such permit are followed. For all other projects, including Developer projects, Contractor or Developer shall obtain a NPDES permit and comply with that permit.

The Contractor shall apply a reducing agent to the solution to neutralize residual chlorine or chloramines remaining in the water. In addition, the flow of water from the section of pipeline shall be controlled to prevent erosion of surrounding soil, damage to vegetation, altering of ecological conditions in the area, and damage to any construction or maintenance activities occurring in any ditches or storm drains downstream of discharge.

6-07 CONNECTING TO EXISTING DISTRIBUTION SYSTEM

After all hydrostatic tests and disinfections have been completed and demonstrated to comply with the Specifications, the Contractor shall connect newly laid pipeline to the existing distribution system.

Where connections are to be made to an existing potable water system, swab or spray the interior surfaces of all pipe and fittings used in making the connections with a 5% or greater hypochlorite solution as directed by the Engineer.

As soon as the connection is completed, thorough flushing is required until all discolored water is removed. **A bacteriological sample shall be collected downstream of the nearest point from the final tie in connection on the new water main.**

6-08 REMOVAL OF TEMPORARY PIPING AND APPURTENANCES

After the newly laid section of pipeline has been approved by the Engineer for connection to the existing distribution system, the Contractor shall disconnect and remove all temporary piping, equipment, fittings, and other appurtenances used for pressure testing, chlorinating and flushing.

Contractor shall remove and replace all stops used for testing and disinfecting of the pipeline with stainless steel repair clamps.