SECTION 33 11 00

INSTALLATION OF 16-INCH AND SMALLER WATER MAINS AND APPURTENANCES

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Work under this Section includes installation of all necessary components complete in place to provide a functional potable water distribution system, in accordance with all the requirements as specified herein and as shown in the contract plans, including, but not limited to the following:

B. Installation of 4-, 6- and 8-inch U.S. Pipe Tyton joint ductile iron pipe and fittings with Field Lok gaskets

C. Installation of 12- and 16-inch American Flex-Ring joint ductile iron pipe and fittings with Fastite gaskets.

D. Installation of flanged joint ductile iron pipe and fittings.

E. Installation of 4-, 6-, 8- 12-inch Tyton joint gate valves with Field Lok gaskets.

F. Installation of 16-inch mechanical joint gate valves with EBAA Megalug mechanical joint restraints.

G. Installation of 2-inch air and blow off valves.

H. Installation of valve boxes and valve box covers.

I. Assembly and installation of 4- and 6-inch flushing assemblies.

J. Temporary and permanent piping support and bracing systems including thrust blocks.

K. Cleaning and hydrostatic testing of ductile iron pipe.

L. Coordinating and providing support for SFPUC-CDD work.

1.02 RELATED SECTIONS

A. Section 31 23 36 – Excavation and Backfill

B. Section 33 10 00 – Water Utility Piping materials

C. Section 33 11 41 – V-Bio Polyethylene Encasement of Ductile Iron Pipe

D. Section 33 13 00 – Sanitary Work Practices and Disinfection of Water Utility Distribution

1.03 REFERENCES

A. ANSI/ASME B 18.2.1 – Square and Hex Bolts and Screws; and Hex Cap Screws and lag Screws

B. ANSI/ASME B 18.2.2 – Square and Hex Bolts (Inch Series)

C. ANSI/ASME B 1.1 – Unified Inch Screw Threads

D. ANSI/NSF-61 – Drinking Water System Components

E. ASTM A193 or A194 Type 304 or 316

F. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings

G. AWWA C110 – Ductile-Iron and Gray-Iron Fittings

H. AWWA C111– Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

I. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

J. AWWA C153 – Ductile-Iron Compact Fittings

K. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service

L. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances

M. San Francisco Public Works Standard Specifications (latest version)

N. SFPUC-CDD Standard Plans

O. California Code of Regulations, Title 22, CA DPH

P. SFPUC Asset Protection Standards, May 2017 or latest revision

1.04 HANDLING AND DELIVERY MATERIALS

A. The Contractor shall provide all labor, equipment and transportation means required to provide materials to the jobsite. Piping materials and appurtenances shall be stored in a manner safe to the public and in accordance with the local agency requirements.

B. During loading, transportation and unloading, every precaution shall be taken to prevent damage to the material. Under no circumstances shall the pipe, fittings

and appurtenances be dropped or skidded against each other. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe.

C. Repair damaged coating and/or cement mortar lining to match quality, thickness and bonding of original in accordance with manufacture's requirement and AWWA standards. When coating and/or lining cannot be repaired or repairs are defective, replace piping material with undamaged one. The entire cost to repair or replace these materials shall be borne by the Contractor.

D. The Contractor shall store fittings and other accessories such that they do not accumulate and hold rainwater, dirt and debris. Gaskets shall be protected from long term exposure to sunlight. Openings in pipes shall be capped or plugged with removable plastic plugs or caps to prevent dirt and other foreign matter from entering the system. Plugs of rags, wood, cotton, waste or similar materials shall not be used. All piping materials shall be stored away from standing water.

1.05 SUBMITTALS

A. Pipe Shop Drawings

1. Contractor shall survey street grade and pothole to locate existing underground utilities. The new ductile iron pipe alignment shall be developed based on this information. Contractor shall be responsible for developing the alignment of the new pipeline with the incorporation of information found from the field survey and potholing.

2. Shop drawings shall show the pipe stationing and invert elevations at all changes in grade and horizontal alignment

3. Shop drawings shall include each pipe piece, fitting, valve, connection to existing pipes and other appurtenances.

4. Contractor shall submit the shop drawings and detailed installation drawings for approval prior to ordering materials for construction. The approval of shop drawings does not relieve the Contractor from the responsibility to furnish and install appropriate pipe pieces, fittings and appurtenances to successfully install the potable water distribution system. There will be no time extension for ordering and procuring materials.

B. Catalog cut sheets of all materials to be furnished by the Contractor.

C. Manufacturer's approved installation instruction including field cut joint assembly procedures.

D. Hydrostatic Test Plan

E. Schedule

1. The contract time allowance includes the time for the San Francisco Water Department (SFPUC-CDD) personnel to complete their work as specified herein after. The Contractor shall incorporate the SFPUC-CDD required times in his/her schedule. The Contractor shall confer with the City Representative in the preparation of the schedule that needs to satisfy the water distribution operation and minimize disruption of the services. No construction for water work shall be started until the City Representative approves the schedule.

2. The time required by SFPUC-CDD to complete each type of work is listed below per pipe segment.

    a. Request for pipeline connection measurement:

        i. Main connections and services larger than 2-inch diameter pipe require SFPUC-CDD to perform measurements for pipeline fabrication prior to any main connection or service change over.

        ii. Contractor is required to complete the required excavation and shoring prior to SFPUC-CDD performing the requested connection measurement. In the event the excavation size does not conform to paragraph 31 23 36 3.12.G or as directed by the City Representative or the excavation is not adequately shored, the Contractor will be required to perform the requested corrections prior to submitting a new request for measurement. The Contractor shall be responsible for any delays associated with performing the subject corrective work and additional connection measurements. The Contractor will be back charged all labor, equipment, and materials associated with SFWD mobilizing more than two times for same connection request.

        iii. 2 working days from the time connection measurement is requested by Contractor through the City Representative to completion of measurement by SFPUC-CDD.

        iv. For 12-inch and smaller pipes, up to four measurements per request can be submitted, provided that measurements are:

            A) All are either for services larger than 2-inch diameter pipe (excluding services with manifold meters) or for main connections, and

            B) All within the same pipe segment, and

            C) All within the same main shutdown.

        v. For 16- and 24-inch pipes, up to two measurements can be requested provided that measurements are:

            A) All main connections, and

            B) All within the same pipe segment, and

C) All within the same main shutdown.

b. Connection to an active main:

i. Flushing and Chlorinating connection (the first connection of a segment of pipe).

A) 14 working days from the time SFPUC-CDD completes connection measurements (for 12-inch or smaller diameter pipe).

B) 21 working days from the time SFPUC-CDD completes connection measurements (for 16-inch or larger diameter pipe).

ii. Main connection:

A) 14 working days from the time SFPUC-CDD completes all connection measurements for a main connection request up to four connections or 20 working days for up to eight connections (for 12-inch and smaller diameter pipe within the same pipe segment).

B) 21 working days from the time SFPUC-CDD completes connection measurements for up to two main connections (for 16-inch or larger diameter pipe within the same pipe segment).

Note: When a request involves multiple connections within the same main shutdown, SFPUC-CDD will not make any connection to an active main until all connection measurements in that request are completed.

c. Chlorination including sampling and laboratory testing

i. 5 working days from the time the flushing and chlorinating connection is made.

ii. Chlorination is required for the first main connection (flushing and chlorinating connection) of each segment. The remaining main connections in a chlorinated segment do not require chlorination.

d. Service change over and hydrant set request:

i. Service connections and hydrant set shall only be made to an approved chlorinated segment of pipe that has passed required water quality testing by SFPUC-CDD. Hydrant set can be requested independently from service change over. However, if a hydrant lateral is required to be connected to a chlorinated segment of pipe, a request shall be made as large service change over per subparagraph v.C). (Service larger than 2 inches in diameter).

ii. Contractor shall only request the same service change over type for each working day per the above schedule. Requests for a combination of service change over types for the same working day shall be subject to approval by the City Representative.

iii. The Contractor shall provide all required labor, equipment, and materials to support service renewals including completing required excavation and shoring along with providing required traffic control and materials to perform the work. The above working durations are based on the Contractor completing the required advance preparation work along with providing adequate support.

iv. All services shall be changed over before remaining main connections (non-flushing and chlorinating connections) can be made within the same pipe segment. Service change over and main connections will not be installed simultaneously.

v. Service Renew or Retap

A) 1-inch services.

- 1 working day for up to 8 retap (RT) services.
- 1 working day for up to 8 short renew (RN) services.
- 1 working day for up to 4 long renew (RN).

B) 2-inch services.

- 1 working day for up to 4 retap (RT) services.
- 1 working day for up to 3 short renew (RN) services.
- 1 working day for up to 2 long renew (RN) services.

C) Services larger than 2 inches in diameter

- 10 working days from the time SFPUC-CDD completes measurements for each replacement of a manifold meter.
- 10 working days from the time SFPUC-CDD completes measurements for up to four services or 15 working days for up to eight services (without replacement of manifold meters) within the same pipe segment.

3. The Contractor shall notify the City Representative in writing three weeks before any work by SFPUC-CDD personnel is required and confirm with the City Representative 72 hours (3 working days) before the actual work is required on the field. The Contractor shall complete the excavation of the water main connection pit and install appropriate shoring to the satisfaction of the City Representative before SFPUC-CDD personnel can do any work.

4. Contractor shall use the table below to identify pipe segments and develop the construction schedule for approval (example shown).

SEGMENT	CHLORINATION INTERSECTION	FLUSHING ASSEMBLY INTERSECTION	NO. OF CONN. AND DISCONN.
1	7th St and Townsend St	7th St and Mission Bay St	10
2	7th St and Townsend St	7th St and 16th St	6

F. Field Welding

1. If field welds are required during construction, the Contractor shall submit the following:

   a. Welding Procedure Specification (WPS), which shall address the equipment, materials and instructions how the work shall be performed;

   b. Welder Performance Qualification for each welder, which shall demonstrate that the welder has satisfactorily performed work regarding the specific materials, welding process, test position, etc., listed under the Welding Procedure Specification (WPS); and

   c. Certified Welding Inspector (CWI) Certification from the American Welding Society (AWS) for each welding inspector indicating that the welder to perform the work is accredited by national standards.

G. Slurry fill

1. Work Plan for slurry filling abandoned mains greater than 8 inches.

2. Mix design for slurry.

3. 28-day compressive strength of the slurry.

1.06 SUPPORT WORK

A. The Contractor shall provide traffic control, removal and resetting of steel plates and general housekeeping as requested by the City Representative for all main connection measurements, disinfections, main connection operations and service connections by SFPUC-CDD. This will be considered incidental work and no additional payment will be made therefore except for traffic control, which shall be paid through the Bid Item for Traffic Control.

1.07 QUALITY ASSURANCE

A. Inspection: Installation of all piping materials and appurtenances shall be subject to inspection by the City Representative, in accordance with the provisions of the referenced standard, as supplemented by the requirements herein. Inspection of pipe materials and appurtenances will be made by the City Representative after delivery. All materials and their installation shall be subject to rejection at any time on account of failure to meet any of the specified requirements.

B. City Representative may request support work at night. The Contractor's additional costs associated with the difference in standard and overtime for support work associated with SFPUC-CDD activities outside of normal working hours shall be paid through the Allowance Bid Item for Working Outside Normal Work Hours. Additional requests for support work at night at the same location will be compensated as time and material.

C. Night Noise Permit

2. If SFPUC night work is required, the Contractor shall obtain the night noise permit on behalf of SFPUC-CDD. SFPUC-CDD will provide the affidavit, mailing list and flyer for the permit application.

3. The durations set forth in Part 1 of this specification section does not include time to obtain night noise permits. No additional time will be given to obtain night noise permits.

D. Contractor shall provide a certified welding inspector to inspect all field cut welds. Welding shall be performed in accordance with the provisions of US Pipe field welding instructions (where TR Flex pipe joints are being installed).

1.08 WARRANTY

A. The Contractor shall furnish a two (2) year warranty for all work covered by this Section.

PART 2 – PRODUCTS

2.01 DUCTILE IRON PIPE MATERIALS

A. Contractor shall furnish all materials necessary to complete pipeline construction. This includes all pipe, fittings, valves, gaskets, nuts and bolts, tools, and other materials necessary to complete construction as specified in section 33 10 00 Water Utility Piping Materials. Materials to be furnished shall be approved by SFPUC-CDD prior to their purchase by the contractor.

B. The Contractor shall field verify the lengths at the time of construction, and furnish all the necessary pipe pieces, pipe appurtenances and material to complete the installation.

C. The Contractor is advised to thoroughly inspect all materials supplied by the manufacturer prior to acceptance of such materials. Materials found to be damaged shall be repaired or replaced as directed by the City Representative. The entire cost to repair or replace these materials shall be borne by the Contractor.

PART 3 – EXECUTION

3.01 INSTALLATION OF DUCTILE IRON PIPE AND FITINGS

A. Before any pipe may be installed, the grade of the trench bottom shall be approved by the City Representative. Immediately prior to installing the pipe, the Contractor shall remove all loose rocks and other objectionable material from the bottoms of the trench and bell holes. When the trench is properly prepared, the pipe shall be lowered therein, singly, without jarring or strain and joined to each adjoining pipe section in accordance with the manufacturer's recommendations.

B. Pipe trench widths and trench depths shall be as specified in SFPUC-CDD Standard Plans, latest revision. Pipe may be installed deeper than the trench depth prescribed in the SFPUC Standard Plans only when necessary to avoid subsurface obstacles and when approved by the City Representative.

C. The City requires that water mains with less than the minimum cover have a protecting slab or other structural protective measures. In addition, such alternate design shall require approval, on a case-by-case basis by SFPUC-CDD.

D. Restrained joints for ductile iron pipe and fittings shall be assembled per manufacturer's written installation instructions. The deflection at joints shall not exceed 2 degrees or 40 percent of maximum allowable deflection permitted by the manufacturer, whichever is less, and the bending radius shall be 300 feet minimum. Joint restraint devices shall be per SFPUC-CDD Standard Plans. Bolts, nuts, and tie-rods shall be stainless steel type 304 or 316.

E. Pipe Restraints

1. Restrainers and tie-rod joint restraints shall be installed at specified locations, as additional lugs/restrainers and tie-rods may be required by the City Representative if deemed necessary.

2. Restraint of field cut Flex-Ring® and TR FLEX® pipe shall be prepared as per manufacturer's field cutting and welding procedure. Any damage to the lining and coating shall be repaired to the satisfaction of the City Representative.

3. Additional restraints required in addition to joint restraint by pipe manufacturer (see also Standard Plan CDD-LP-006):

   a. General

      1) Tie-rod restraint shall be installed on TYTON® joints with FIELD LOK® gaskets at the following situations to provide double safety. No tie-rod is required for flanged joints.
         A) First valve on a tee branch from a run.

B) All joints within 26 feet upstream of an opened end (normally terminated with a cap or a valve for future connections; or a hydrant or blow-off valve outlet).

b. Fitting Bells with TYTON® Joints

1) Fitting bells and tees with two cast-in restraining lugs, with 7/8-inch diameter holes. Attach the ¾-inch tie-rod to the cast-in restraining lugs with nuts and washers to provide the restraint to bells.

c. Pipe Bells with TYTON® Joints

1) Pipe bells do not have lugs cast into the bell. Restrainers that take the bearing on the back of the pipe bell shall be used to provide the attachment point, referred hereafter as "Pipe Bell Restrainer." Size and number of tie-rods shall be as per the restrainer's manufacturer to restrain the test pressure.

2) Bell restraint harness may also be used.

d. Plain End Pipe with TYTON® Joints

1) Restrainer with the wedge action on the pipe to provide the attachment point shall be used with all gate valves and will be referred herein after as "Plain End Restrainer". Restraint harness may also be used if approved by the City Representative.

2) To restrain a fitting bell with restraining lugs to a Plain End Restrainer, use two ¾-inch tie-rods.

3) To restrain a Bell Restrainer to a Plain End Restrainer, the same quantity and size of tie-rods as required by the manufacturer to resist the test pressure shall be used.

4) To restrain a Plain End Restrainer to another Plain End Restrainer, the same quantity and size of the tie-rods as recommended by the manufacturer to resist the test pressure shall be used.

F. The assembly for cut pipe to bell shall be completed as described for full-length pipe and per manufacturer instructions. Care should be taken to ensure that all corners are rounded and no sharp edges remain that might damage or dislodge the gasket. Any damage to the lining or coating shall be repaired to the satisfaction of the City Representative.

G. If the joint assembly is not accomplished with the application of reasonable force, the plain end of the pipe should be removed to check the proper position of the gasket. Care shall be exercised to protect the pipe laid from any foreign materials or obstructions entering the pipe. At the end of each day, the Contractor shall, to

the satisfaction of the City Representative, plug or cover the open end of the pipe laid.

H. As the pipe is being installed a minimum of 75 feet shall be maintained between the end of the new pipeline and the end of the trench being excavated (except where trenching reached the end of the design alignment) or from any visible obstructions. The purpose of this stipulation is to permit the City Representative to see in advance whether any horizontal or vertical adjustments in the pipe alignment will be required to avoid conflicts.

I. Temporary Blowoffs and Flushing Assemblies

4. Contractor shall coordinate with the City Representative prior to the installation of temporary blowoffs or the flushing assembly in a segment. One flushing assembly is required at the end of each segment as shown in the drawings and temporary blowoffs are required at all remaining open ends of the segment. Flushing assemblies may be required at more than 1 location if so determined by the City Representative.

5. Flushing assembly shall be installed in accordance with SFPUC CDD Standard Plan CDD-LP-005.

J. TYTON® Joint Pipe

1. Tyton joints for ductile iron pipe and gate valves shall be restrained by use of FIELD LOK® gaskets unless otherwise directed by the City Representative.

2. Any foreign matter in the socket shall be removed prior to installing the gasket; the gasket seat shall be thoroughly inspected to be certain it is clean. The gasket shall be wiped clean, flexed and then placed in the socket with the large round end entering first so that the gasket is seated evenly around the inside of the socket with the heel of the FIELD LOK® gasket or other approved gaskets fitting snugly in the retainer seat. Looping the gasket will facilitate inserting the gasket. A thin film of lubricant shall be applied with a paintbrush to the exposed surface of the gasket. The last 6 or 8 inches of the pipe shall be thoroughly cleaned before applying a thin film of lubricant to the outside of the plain spigot to a line about one inch back from the end. The pipe spigot shall not be allowed to touch the ground or trench side after it is lubricated. Lubricant other than that furnished with the pipe shall be used. The spigot end of the pipe shall be aligned and carefully started into the socket until it just makes contact with the gasket. Joint assembly shall then be completed by forcing the spigot end of the pipe past the gasket until the inside edge of the first painted strip or the spigot end of full-length pipe is approximately flush with the bell face. The deflection of the joint shall be done after this. The pipe shall then be moved in the opposite direction to lock the joint.

3. When TYTON® joint pipe is cut in the field, the outside of the duct end shall be beveled about one-quarter inch at an angle of about 30 degrees and the leading edge founded. The prepared cut end shall be marked in accordance with the dimensions specified by the manufacturer for FIELD LOK® gaskets.

Pipe Size	Location of Assembly Mark
4”	2-3/4”
6”	2-15/16”
8”	3-1/4”
12”	3-5/16”
16”	4-1/2”

K. Flex-Ring® Joint Pipe

1. Flex-Ring Joint piping materials with Fastite gaskets shall be installed per manufacturer’s instructions.

2. Field Cut Pipe

   a. The installation of a 16-inch Field Flex-Ring is not the same as installation of Field-Flex Rings 12 inches and smaller. Contractor shall be familiar with the difference in installation methods and follow the installation instruction from American Cast Iron Pipe Company.

   b. Pipe sizes 12 inches and smaller: Field Flex-Ring shall be installed with a groove on the spigot end of the field cut pipe

      i. For Flex-Ring joint pipe 12 inches and smaller in diameter, Field Flex-Rings shall be used to restrain a Flex-Ring bell with a field-cut spigot. Installation of Field-Flex Rings on pipe diameters up to 12 inches requires the use of a pipe grooving machine.

      ii. Any grooves not deemed suitable for use by the City Representative shall be redone on a new piece of pipe. Contractor shall be responsible for all costs related to reinstalling the groove including the material cost of the new pipe.

      iii. Dimensions of the groove shall be in strict conformance with the groove dimensions and tolerances from American Cast Iron Pipe Company.

      iv. Contractor shall be responsible for following the grooving instructions from American Cast Iron Pipe Company.

   c. Pipe sizes equal to 16 inches

i. For pipe diameters 16 inches and larger, Field Flex-Rings shall be used to restrain a bell joint with a field cut pipe in lieu of a standard Flex-Ring joint spigot with a factory welded-on ring.

d. When Flex-Ring joint pipe is cut in the field, the outside of the plain end shall be beveled about 3/8" to 5/8" long at an angle of about 30 to 40 degrees with the axis of the pipe. All sharp corners or rough edges that might damage or dislodge the Fastite gasket or Field Flex-Ring should be removed from the beveled pipe end. The prepared cut end shall be marked in accordance with the dimensions specified by the manufacturer for Fastite gaskets.

3. Flex-Ring Pipe and Fitting sockets allow a small amount of axial movement which provides substantial flexibility after installation. Unwanted expansion shall be prevented by manually pulling the pipe to full extension after installing the locking ring and prior to setting the joint deflection to minimize joint take-up in test or service conditions. In any application where axial or lateral movement may be undesirable, such as certain bridge crossings, certain exposed or unburied piping applications, or certain connections of restrained pipe sections to rigid piping, special provisions, including effective joint extension, may be necessary to control unacceptable pipeline movement.

4. The correct positioning of the yellow Flex-Ring or yellow restraining segments (if pipe diameter larger than 12 inches) in the socket locking groove shall be verified by visual or physical inspection.

5. For field-cut Flex-Ring pipe, spigot assembly stripes shall be located as shown in the table below. The dimensions in the table are not to be confused with the dimensions for grooving a Field Flex-Ring.

Pipe Size	Location of Assembly Mark
4"	5.49"
6"	5.49"
8"	5.61"
12"	6.59"
16"	7.25"

L. TR Flex® Joint Pipe

1. TR FLEX® piping materials with TYTON® gaskets shall be installed per manufacturer's instructions.

2. When TR FLEX® joint pipe is cut in the field, field weldments or TR FLEX® Gripper Rings shall be used at the cut end. All field cutting and field welding and/or installation of Gripper Rings shall be in strict accordance with the manufacturer's instructions.

3. In TR FLEX® Pipe and Fitting sockets, there is a small amount of slack or pullout available at each joint. This pullout, or expansion capability, is the result of clearance inside the socket required for the insertion of the locking segments. The joints shall be manually pulled to full extension after installing the locking segments and prior to setting the joint deflection to prevent unwanted expansion when the pipe is pressurized.

4. TR FLEX® Gripper Rings shall not be installed with TR FLEX® fittings. Where field cut is necessary, the contractor shall perform field welding of the weld bead on the pipe per manufacturer's recommended procedures and as approved by the City Representative.

5. When TR FLEX® joint pipe is cut in the field, the outside of the plain end shall be beveled about one-quarter inch at an angle of about 30 degrees and the leading edge founded. The prepared cut end shall be marked in accordance with the dimensions specified by the manufacturer for TYTON® gaskets.

Pipe Size	Location of Assembly Stripe
4"	4.375"
6"	4.875"
8"	5.375"
12"	5.875"
16"	7.500"

3.02 FLANGED JOINTS

A. Before installing gaskets in flanged joints, the faces of the flanges shall be power-brushed to the satisfaction of the City Representative.

1. Bolts for flanged joints shall be of sufficient length to give a full nut engagement plus three full threads when the joint is made up.

2. When bolting up flanges, the bolts shall be tightened in such a way that the flanges in the completed joint will be parallel and free from unequal stresses.

3. Care shall be taken to prevent damage to the bolt heads, nut and threads.

4. All damaged material shall be replaced.

5. Flanged joints showing leaks will not be acceptable.

6. Leaks shall be stopped by one or all of the following methods, cleaning flange face; replacement of gaskets, and adjustment of tension on bolts. No other method will be permitted.

7. Where, in the opinion of the City Representative, conditions prevent the use of hex head bolts, stud bolts of the proper size shall be substituted.

3.03 THRUST BLOCKS

A. Thrust blocks shall be installed at hydrant and hydrant laterals, blow offs and other locations as shown on the Contract Drawings or per SFPUC-CDD Standard Plans. The concrete shall be poured against a satisfactory bearing surface and be of sufficient size to prevent any movement of the pipeline when subjected to the hydrostatic test pressure.

3.04 INSTALLATION OF HYDRANTS

A. Location of fire hydrants shall be as required by SFFD and as shown on the approved plans.

B. Hydrants shall be installed near the street curb, and shall be accessible to fire trucks, and protected from traffic. Hydrants shall be located at a distance of 24" minimum and 27" maximum from the face of curb to center of the hydrant, and at least five (5) feet from a utility pole, traffic control box, or fixed object or structure. Hydrants shall not be installed with curb return areas or in sidewalk areas serving crosswalks.

C. In addition to FIELD LOK® gaskets or other type of restrained joints, all joints on hydrant laterals shall be restrained as shown on SFPUC-CDD Standard Plans.

D. Contractor shall install hydrant laterals, valves, hydrant buries, and risers. SFPUC-CDD will install breakaways and hydrants at the cost of the Contractor.

3.05 INSTALLATION OF VALVES AND VALVE BOXES

A. GATE VALVES

1. Gate valves shall be located on all branches of the main including services that are 4-inches or larger. Each fire hydrant shall be provided with an isolating valve. An additional gate valve shall be installed next to the main if the hydrant lateral is longer than 20 feet. On long distribution mains, valves shall be installed at every 500 feet in commercial areas and no more than one block apart or within an interval of 800 feet in other areas. Dead ends for future expansion shall be provided with a gate valve and a blow-off valve. All taps to existing mains shall be provided with valves.

2. Valves on service pipes 2-inch or less shall be "corporation stop" type and buried.

B. AIR RELEASE AND BLOW-OFF VALVES

1. Air release valves shall be installed next to a shut-off valve and at the high points in the distribution system isolated by two gate valves.

2. Blow-offs shall be installed at dead ends and at low points in the distribution system isolated by two gate valves.

3. When installed as a set, center to center spacing between the air release valve and blow-off valve to the gate valve shall be 3 feet. The first air release valve/blow-off valve shall not be more than 3 feet behind the property line (typically in line with the crosswalk striping at the intersection).

4. The air release valve/blow-off valve and gate valve shall not be under sidewalks, reinforced concrete bus pads, bulb-outs or concrete gutters and crosswalk areas.

C. VALVE BOXES & COVERS

1. Over each buried valve, or other similar appurtenance, a piece of ductile iron pipe of such size shall be placed vertically to form a valve box. A suitable cover shall be placed on top of the pipe or box. The bottom of the box shall rest on a steel plate furnished by the SFPUC-CDD so placed as to prevent the box from bearing on the buried devices. Steel plates supporting boxes, over valves shall be set on an asphalt bed. Contractor shall cut the box to such lengths that the top of the gate cover will be flush with the surface of the finished pavement or as shown on the Contract Drawings. Valves boxes for 16-inch and smaller gate valves shall be furnished by the City and installed by the Contractor.

3.06 INSTALLATION OF BACKFLOW PREVENTER

A. All backflow prevention assemblies must be located as close as possible/practical to the water meter or point of connection (POC) but in no case more than 25 feet from the POC. If any part of a service line extends over bay or ocean waters, assemblies must be installed upstream of the seawall (and within 25 feet of the POC).

B. Assemblies must be installed in the orientation intended by the manufacturer and approved by the USC FCCCHR. An assembly that was designed and approved for horizontal installation must not be installed vertically, and vice versa.

C. Required clearances:

1. Minimum 12 inches above ground or floor.

2. Minimum 12 inches from each side.

3. If an assembly is installed 5 feet or more above the finished floor/ground, a platform approved by CALOSHA (California Occupational Safety and Health Administration) must be used for testing/serving by testers or contractors. The platform may be permanent or portable.

D. The backflow prevention assembly must be installed so that its make and serial number are visible in a readily accessible location. These identifiers must not be painted over or otherwise made illegible.

E. Assemblies may not be installed in pits or vaults in the ground.

F. If an enclosure is used, the enclosure must be large enough or removable to allow for testing/servicing.

G. No water connections may be between the POC and a backflow prevention assembly.

H. When a reduced pressure principle assembly is installed, a drain funnel must also be installed to prevent flooding.

I. If the domestic service does not require a separate backflow prevention assembly, the supply line to fire sprinklers must tee off the domestic service such that the distance from the center of the domestic tee to the inlet of the backflow prevention assembly does not exceed 12 inches.

J. WQD must confirm installation of the required backflow prevention assembly(ies) before CDD will install the service line.

K. For non-fire service, after installing the service line, (CDD) flushes the service line to the point of connection and installs the water meter.

L. For fire service, contractors must contact CDD to arrange for flushing of the service line. After the service line has been flushed, contractors must call the SFPUC Cross-Connection Control Program at (650) 652-3199 or backflow@sfwater.org to arrange for installation of the red-top water meter.

M. Backflow prevention assemblies must be tested upon first water turn-on, annually thereafter, and whenever they are relocated, reoriented, or repaired. Testers must have a valid Permit to Operate issued by the San Francisco Department of Public Health. The tester must submit the test reports to the Cross-Connection Control Program within five calendar days of the test date.

3.07 PIPE MARKING

A. The Contractor shall provide and install buried non-detectable warning tape in trench, continuously over the centerline of the pipe, as per Section 31 23 36 – Excavation and Backfill and SFPUC-CDD Standard Plans.

3.08 IDENTIFICATION OF RESTRAINED GASKET JOINTS

A. The Contractor shall identify all joints by spraying white marking paint on top of each bell and also by taping a direct burial tape around the spigot end of each pipe, just in front of the bell. The Contractor shall provide paint and tape.

3.09 CLOSING OF UNINSPECTED WORK

A. The Contractor shall not cover, or allow to be covered, any of the work installed under this Contract before it has been inspected and approved by the City Representative. Should any of the work be covered prior to such approval, the City Representative shall have the authority to require the work to be uncovered for inspection and approval, recovered, and all resultant damage required, all at the Contractor's expense (also refer to Article 8 of the General Conditions).

3.10 HYDROSTATIC TEST IN THE FIELD

A. When the pipeline or portion of the pipeline installation is completed, the Contractor shall, under direction of the City Representative, test the line to a hydrostatic pressure as specified below. The pressure test shall be maintained for not less than 2 hours during which time no additional water shall be added to the line under test. All screw taps or valves at service outlets shall be closed before the pipe line may be tested. Gate valves shall also be tested at the same time that the adjacent pipeline is tested.

B. The Contractor shall furnish all necessary labor, material and equipment, such as pumps, piping, connections, pressure gauges, etc., for the test. The Contractor shall also submit for approval, furnish and install necessary temporary restraints including but not limited to anchorage and blocking to prevent movement of the pipe line under test.

C. During the installation

1. Contractor shall examine City-provided pipes, fittings and gaskets for any visible defect. This should be done before trench backfill. Contractor shall be responsible for all costs related to retest except if the leak is due to visible defect of City-provided materials.

D. Before the Test

1. Before performing the hydrostatic test, Contractor shall make sure that:

a. Restrained gaskets such as FIELD LOK or equivalent have been installed at every push-on joint. Ensure every joint is pulled to confirm FIELD LOK gaskets are positively engaged prior to testing.

b. Locking rings in the Flex-Ring joints are properly installed and the joint has been manually pulled to full extension to eliminate any expansion slack in the joint.

c. The first valve on a lateral from the run was restrained to the run with plain end restrainers or flanged connections.

d. Every open end of the line subject to the test is terminated with an end cap or a blind flange. Every end cap must have been restrained to the line with tie-rods or restrainers. A mechanical joint with FIELD LOK gasket is not allowed to restrain an end cap to the line.

e. All joints within 26 feet upstream from an end cap or blind flange or hydrant or blow-off valve outlet have been restrained with tie-rods or restrainers.

f. Tie-rods and thrust blocks have been installed on hydrant laterals and blow-off valves (refer to SFPUC-CDD Standard Plans).

g. Opened-end cap or blind flange shall be exposed for the test. No external restraint shall be used to prevent possible axial pipe movement at any end cap or blind flange (such as lumber between the cap or blind flange and end of trench).

E. Test Pressure

1. Test pressure shall be 150% of the maximum operating pressure or 225 psi, whichever is greater, or as specified or as determined by the City Representative.

2. No pressure drop is allowed during the 2 hours minimum test time during which no additional water shall be added to the line under test.

F. Backfill and hydrostatic test

1. Contractor may backfill the new installation (except open ends) prior to hydrostatic test. If the test fails, it is the contractor's responsibility to locate the leak, fix the leak and retest at no cost to the City, except that the leak was caused by invisible defect from City provided materials.

3.11 DISINFECTION

A. Upon completion of satisfactory hydrostatic test, the SFPUC-CDD will chlorinate the main. The Water Department will supply and install all piping, fittings and other materials necessary to chlorinate the main, except screw taps and risers, which shall be installed by the Contractor.

B. The estimated time required for disinfecting each pipeline segment may be up to 5 working days. Depending on the size and length of the pipe, the actual time required for the completion of disinfection and bacteriological testing may vary depending on site conditions. It is the Contractor's responsibility to plan ahead of the construction schedule and coordinate with the City Representative to allow sufficient time for SFPUC-CDD to complete the disinfection work.

C. During the disinfection of the new pipeline segment, the Contractor is advised not to excavate other main connection holes within the segment. This is to allow access to the blow off valves for collecting water samples. If the Contractor chooses to excavate the other connection holes prior to completion of disinfection work, Contractor shall be responsible for providing full access to the blow off valves when requested by the City Representative. Providing access to the blow off valves will be incidental and no payment will be made thereof. Measurements for the other main connections will not be made until disinfection for the segment is passed.

3.12 WATER MAIN ABANDONMENT

A. For existing 8-inch or smaller mains that are to be abandoned in place, the ends shall be plugged with grout and sealed with plastic to prevent future connection.

B. For pipes larger than 8-inches to be abandoned in place, the entire pipe length shall be filled with slurry.

END OF SECTION