

SECTION 33 11 00 (Rev. 1)

WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.1 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 Drawings, including, but not limited to the following:
1. Installation of 4-, 6-, and 8-inch U.S. Pipe Tyton ductile iron pipe and fittings with Field Lok gaskets.
 2. Installation of 12- and 16-inch American Flex-Ring ductile iron pipe and fittings with Fastite gaskets.
 3. Installation of flanged joint ductile iron pipe and fittings.
 4. Installation of 16-inch mechanical joint gate valves with EBBA Megalug mechanical joint restraints.
 5. Furnish and install 36-inch U.S. Pipe HDSS Joint restraint push-on DIP and appurtenances.
 6. Installation of Tyton joint gate valves and hydrant burys with Field Lok gaskets.
 7. Install 1- and 2-inch corporation stops.
 8. Installation of valve boxes and valve box covers.
 9. Installation of 2-inch air/blow off valves, furnishing and installation of 6-inch and 8-inch blow-off assemblies.
 10. Furnishing and installation of 8-inch air release and vacuum break valve.
 11. Assemble and installation of 4- and 6-inch flushing assemblies.
 12. Temporary and permanent piping support and bracing systems, thrust blocks; furnishing and installing all tie-rod restraining devices for pipeline related installation.
 13. Coordinating and providing support for SFPUC-CDD work.
 14. Cleaning and hydrostatic testing of ductile iron pipe.
 15. Installation, labor, and piping accessories.
 16. Field – adjust/relocate gate valves, fire hydrants and water meters.

17. Excavation, backfill and compact all water lines trenches/pits including lines installed by SFPUC-CDD crew.
18. Installation of 4-, 6-, 8- and 12-inch Tyton joint gate valves with Field Lok gaskets.

1.2 RELATED SECTIONS

- A. Section 31 23 36 – Excavation and Backfill for Water Work.
- B. Section 33 11 41 – V-Bio Polyethylene Encasement of Ductile Iron Pipe
- C. Section 33 13 00 – Sanitary Work Practices and Disinfection of Water Utility Distribution

1.3 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. SFDPW Standard Specifications (latest version)
- N. SFPUC-CDD Standard Plans
- O. California Code of Regulations, Title 22, CA DPH
- P. American Pipe Manual (latest version) (www.american-usa.com)

1.4 HANDLING AND DELIVERY MATERIALS

- A. The Contractor shall provide all labor, equipment and transportation means required to load City-furnished material stored at SFPUC-CDD Corporation Yard (1990 Newcomb

Avenue, San Francisco, CA 94124) and University Mound Reservoir Pipe Yard (800 Bacon Street, San Francisco, CA 94134) and haul such 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. Pipes and fittings shall be stored at a minimum of six inches above the ground and away from standing water. The City Representative reserves the right to reject any contaminated pipes and fittings not stored properly on site. The cost of replacing such materials shall be borne by the Contractor.

1.5 SUBMITTALS

- A. Pipe Shop Drawings
 - 1. Contractor shall survey street grade and excavate test holes 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 installing pipe or 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 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 the work is listed below per each pipe segment.
 - a. Request for pipeline connection measurement:

Main connections and services larger than 2-inch diameter pipe require measurements prior to any main connection or service change over.

 - 1) 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.
 - 2) 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 3.12G 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 SFPUC-CDD mobilizing more than two times for same connection request.
 - 3) 2 Working days from the time connection measurement is requested by Contractor through the City Representative to completion of measurement by SFPUC-CDD.
 - 4) 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.
 - b. For 16- and 24-inch pipes, up to two measurements can be requested provided that measurement are:
 - 1) All main connections, and
 - 2) All within the same pipe segment, and
 - 3) All within the same main shutdown.

- c. Connection to an active main
 - 1) 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).
 - 2) 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.
- d. Chlorination including sampling and laboratory testing:
 - 1) 5 working days from the time the flushing and chlorinating connection is made.
 - 2) 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.
- e. Service change over and hydrant set request:
 - 1) 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).
 - 2) 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.
 - 3) 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.
 - 4) 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.

5) 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" in diameter.

10 working days from the time SFPC-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 is required and confirm with the City Representative 3 working days before the actual work is required in 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 including measurements and connections.
4. Extension of time will only be granted for delay that is on critical path and effectively delays the progress of the construction as stipulated in these specifications. Such delays shall be considered non-compensable and require the Contractor to submit a time impact analysis and associated support documents to the satisfaction of the designated City Representative for any request for time extension due to delay caused by SFPUC-CDD personnel.
5. Contractor shall use the table below to identify pipe segments and develop the construction schedule for approval.

SEGMENT	WATER MAIN SIZE	FROM	TO	NO. OF CONN. AND DISCONN.	LARGE SERVICES (>2")	SMALL SERVICES (1" & 2")	PLAN NO
1	36"	Vicente Street	Sloat Blvd	2	0	0	P.2 to P.5
2	16"	Vicente Street	Sloat Blvd	2	0	0	P.2 to P.5
3	6"	19 th Ave	Sloat Blvd	2	0	0	P.2 A
4	8"	19 th Ave	Sloat Blvd	3	0	1	P.2 B
5	8"	19 th Ave	Vicente Street	5	0	1	P.5 A
6	8"	19 th Ave	Holloway Ave	3	0	0	P.19 A
7	8"	19 th Ave	Ocean Ave	2	0	0	P.20 B
8	8"	19 th Ave	Ocean Ave	4	0	0	P.20 C
9	8"	19 th Ave	Ulloa Street	8	0	1	P.21 A
10	8"	19 th Ave	Taraval Street	10	0	3	P.22
11	8"	19 th Ave	Santiago Street	2	0	0	P.23 A
12	8"	19 th Ave	Santiago Street	4	0	0	P.23 B
13	8"	19 th Ave	Rivera Street	4	0	4	P.23 D
14	8"	19 th Ave	Quintara Street	2	0	0	P.24 A
15	8"	19 th Ave	Quintara Street	4	0	0	P.24 B
16	8"	19 th Ave	Pacheco Street	4	0	0	P.24 D
17	8"	19 th Ave	Ortega Street	4	0	0	P.25 B
18	8"	19 th Ave	Noriega Street	3	0	0	P.25 D
19	8"	19 th Ave	Moraga Street	4	0	2	P.26 B
20	8"	19 th Ave	Lawton Street	4	0	0	P.26 D
21	8"	19 th Ave	Kirkham Street	4	0	0	P.27 B
22	8"	19 th Ave	Judah Street	0	1	5	P.27 D
23	8"	19 th Ave	Irving Street	2	0	0	P.28 A
24	8"	19 th Ave	Irving Street	4	0	0	P.28 B

F. Field Welding

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

1.6 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.
- 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

1. 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.
2. 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.

1.7 QUALITY CONTROL

- A. The Contractor's quality control is the means by which ensures that construction is performed according to the Contract Drawings and Specifications, including that of Subcontractors and Suppliers.
- B. The Contractor is responsible for quality control and shall establish, document, implement and maintain an effective contractor quality control system.
- C. The Contractor shall perform specified and required quality control activities including inspections and tests by qualified personnel to verify that it is conformed to contract requirements. Upon request, the Contractor shall furnish to the City Representative duplicate samples of test specimens for possible testing by the City.

1.8 QUALITY CONTROL

- A. All work including but not limited to materials, workmanship, testing and manufacture and fabrication of components shall be subject to inspection and testing by the City or by other authorized personnel designated by the City. Such inspection or test is for the sole benefit of the City and shall not relieve the Contractor of the responsibility for providing quality control measures to assure the work strictly complies with the Contract requirements. No inspection, test, surveillance or audit by the City shall be construed as constituting or implying acceptance. Inspection, test, surveillances or audits by the City shall not relieve the Contractor of the responsibility for damage to or loss of material prior to acceptance, nor in any way affect the continuing rights of the City after acceptance of the completed work.
- B. Installation of all piping materials and appurtenances shall be subject to inspection by the City Representative, in accordance with the provisions of the referenced standards, 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.

1.9 WARRANTY

- A. The Contractor shall furnish a two (2) year warranty for all work covered by this Section beginning on the date that the Substantial Completion certificate is issued by the City.

PART 2 – PRODUCTS

2.1 CONTRACTOR-FURNISHED MATERIALS

- A. Contractor shall provide at no additional cost to the City materials not listed in the Contract Documents and not specified as provided by the City but are required for a complete and operating water distribution system.
- B. 36" U.S. Pipe HDSS DIP shall be Class 54 to ensure a restraint joint pressure rating of 350 psi with Zinc coating. All ductile iron shall be manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. 10% of pipes supplied shall be "gauged" all along the length and identified as such on each pipe. Contractor shall furnish and install the 36" DIP with related appurtenances.
- C. 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.
- D. The Contractor is advised to thoroughly inspect all materials supplied by the manufacture 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.
- E. The Contractor shall furnish all material below as needed when field cutting Flex-Ring or HDSS pipe. These materials shall be approved for use on Flex-Ring pipe by American Cast Iron Pipe Company or HDSS pipe by U.S. Pipe.
 - 1. Welding electrodes or wire.
 - 2. Weld rings for field-cut Flex-Ring 16-in pipe.
 - 3. Weld Rings for field-cut HDSS pipe.
 - 4. Groove Field Flex Rings for field-cut Flex-Ring of 12-inch and smaller pipe.
- F. Field Flex-Ring

The Contractor shall furnish all material below as needed when field cutting Flex-Ring pipe. These materials shall be approved for use on Flex-Ring pipe by American Cast Iron Pipe Company.

 - 1. Groove Field Flex Rings for field-cut Flex-Ring of 12-inch and smaller pipe.
- G. Flanged Pipe, Nuts, Bolts and Washers
 - 1. Ductile iron flanged pipe thread-fabrication shall be Special Thickness Class 53 and shall be in accordance with AWWA C115/A21.15. (Bolt circle and bolt holes shall match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges). The flanges shall be rated for at least 250 psi working pressure. The threaded flanges shall be individually fitted and machine tightened on the pipe ends at the factory. Flange facing shall be smooth or with shallow serration per AWWA C115.
 - 2. Flange gaskets

- a. All flange gaskets shall be new, type "E", 1/8 inch thick, and in compliance with ANSI/NSF-61 requirements. Sealing element placement shall accommodate flat faced flanges. The quad-ring seals shall be pressure energized. The G-10 retainer shall have a 550 volts/mil dielectric strength and a minimum 50,000 psi compressive strength. The flange gasket shall be one of the following:
 - 1) Quad-seal, pyrox G-10 material, as manufactured by Advance Products & System, Inc., Part number GETQG10F.
 - 2) One full faced isolating and sealing gasket, Linebacker G-10 retainer containing precision tapered grooves to accommodate the controlled compression of EPDM quad-ring sealing elements. Four grooves per gasket.
 - 3) Garlock Multi-Swell 3760U.
 - b. Outside/inside diameter of the gasket shall be equal to the outside/inside diameter of the flange. Before installation, all gaskets shall require inspection for adherence to the specifications by the City Representative.
3. Nuts, bolts and washers for ductile iron flanges: bolts and nuts for flanged joints shall be stainless steel Type 316.
- H. Polyethylene encasement shall be V-Bio Enhanced Polyethylene Encasement. See Specification section 33 11 41 V-Bio Polyethylene Encasement of Ductile Iron Pipe.
- I. White marking paint.

2.2 CITY FURNISHED MATERIALS TO BE INSTALLED BY THE CONTRACTOR

- A. The Water Department will furnish 4-, 6- and 8-inch Tyton-joint ductile iron pipe and fittings and Field Lok gaskets. The Water Department will also furnish 6-inch hydrants and Tyton-joint hydrant buries, 12- and 16-inch ductile iron Flex-Ring joint pipe and fittings, Flex-Ring locking rings and Fastite gaskets. The City will provide tie-rod restraining devices for ductile iron pipe up to 16-inches, hydrants and Tyton-joint hydrant buries. The City will provide 4-, 6-, 8-, 12- and 16-inch Tyton-joint resilient seated gate valves and 2" AV/BO assembly materials.
- B. The City will not provide any ductile iron flange pipe, flange fittings, flange gaskets, flange bolts, nuts and polyethylene encasement of ductile iron pipe.
- C. The City will not provide any Flex-Ring groove-on rings and grooving machine. The City will only provide Field Flex-Rings for 16-inch pipe.
- D. The Water Department will furnish and Contractor shall install valve covers, valve box, steel base plates, ductile iron riser pipes, brass fittings for air valves and blow-offs, and miscellaneous metals as required for valve box assemblies.
- E. The Contractor is advised to thoroughly inspect all materials supplied by the Water Department prior to acceptance of such materials. Materials found to be damaged in loading, transportation and unloading following acceptance of materials by the Contractor 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.
- F. The Contractor shall be liable for all damaged and lost surplus materials and shall compensate costs of such materials to the satisfaction of the City.

- G. The Contractor shall notify the City Representative immediately upon determination of the amount and type of materials required from the Water Department. No materials will be issued to the Contractor without a requisition itemizing such materials and signed by the City Representative. The Contractor shall give three (3) working days of advance notice to the City Representative prior to loading and unloading of materials at the storage area.
- H. The Contractor shall not subject any materials supplied by the San Francisco Water Department to any unnecessary jars or shocks during the progress of the work. The Contractor shall be responsible for all said materials and such materials lost or damaged by the Contractor shall be replaced at his/her own expense.

PART 3 – EXECUTION

3.1 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. Variances in maximum cover shall be permitted and 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 the City Representative.
- 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, except that bolts, nuts, and tie-rods shall be stainless steel type 316.
- E. Restrainers and tie-rod joint restraints shall be installed at specified locations in accordance with SFPUC CDD Standard Plan CDD-LP-006 and as required by the City Representative if deemed necessary. Installation of restrainers and tie-rod joint restraints shall be considered as incidental work and no direct payment will be made therefore.
- F. The assembly for cut pipe to bell shall be completed as described for full-length pipe. 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 Blow-offs and Flushing Assemblies
1. Contractor shall coordinate with the City Representative prior to the installation of temporary blow-offs 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 blow-offs 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
 2. Flushing assembly shall be installed in accordance with SFPUC CDD Standard Plan CDD-LP-005.
- J. HDSS PIPE
1. HDSS piping materials with Tyton gaskets shall be installed per manufacturer's instructions.
 2. When HDSS joint pipe is cut in the field, field weldments shall be used at the cut end. All field cutting and field welding shall be in strict accordance with the manufacturer's instructions.
 3. In HP LOK Pipe and HDSS 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. When HDSS joint pipe is cut in the field, the outside of the plain end shall be beveled about one 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
30"	8-7/8"
36"	8-7/8"

- K. Tyton Joint
1. Tyton joints for ductile iron pipe and gate valves shall be restrained by use of US Pipe 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"

L. Flex-Ring Joint Pipe

1. Flex-Ring Joint piping materials with Fastite gaskets shall be installed per manufacturer's instructions.
2. Field Cut Pipe

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 Field Flex-Ring assembly instructions from American Ductile Iron Pipe Company.

 - a. 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 12 inches and smaller in diameter, Field Flex-Rings shall be used to restrain a Flex-Ring bell with a field-cut spigot in lieu of a standard Flex-Ring joint spigot manufacturing welded-on retainer ring. Installation of Field-Flex Rings on pipe diameters up to 12 inches requires the use of a pipe grooving machine.
 - ii. Contractor shall be responsible for following the grooving instructions from American Cast Iron Pipe Company.

- iii. Dimensions of the groove shall be in strict conformance with the groove dimensions and tolerances from American Ductile Iron Pipe Company.
 - iv. The Contractor shall provide access for the City Representative to inspect all field cut grooves. The Contractor shall be required to measure and record all field cut grooves to demonstrate that the field cut grooves are within the manufacturer's specified tolerances.
 - v. Any grooves which are determined by the City Representative to not be within the manufacturer's specified tolerances shall be redone on a new piece of pipe. Contractor shall be responsible for all labor, material, and equipment costs, including the material cost of the new pipe, along with project delays related to reinstalling the groove.
 - b. 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 manufacturing welded-on ring.
 - c. 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. When the distance between two fittings is greater than the lay length of one uncut pipe, Contractor shall use an uncut Flex-Ring spigot end with factory weld ring and a standard locking ring in one of the fitting sockets rather than using a field-cut plain end. For 16" Flex-Ring, a Field Flex-Ring and cut pipe can then be used in the next pipe socket.
5. 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.
6. 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"

3.2 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.

3.3 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.
- B. Thrust blocks shall also be installed at main connections as directed by the City Representative.
- C. Thrust blocks shall provide a minimum bearing surface area of 18 inches by 18 inches against the soil to prevent any pipe movement.
- D. 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. Installation of thrust blocks shall be considered as incidental work and no direct or additional payment will be made thereof.

3.4 INSTALLATION OF HYDRANTS

- A. Location of fire hydrants shall be as required by SFFD.

- 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. Hydrants shall be installed in accordance with SFPUC CDD Standard Plan CDD-LP-004.
- D. Contractor shall install hydrant laterals, valves, hydrant buries, and risers. SFPUC-CDD will install breakaways and hydrants at the cost of the Contractor.

3.5 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 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. 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 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.

3.6 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.

3.7 IDENTIFICATION OF RESTRAINED GASKET JOINTS

- A. The Contractor shall identify all joints by spraying white marking paint on top of each bell. The Contractor shall provide paint and tape.

3.8 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).

3.9 HYDROSTATIC TEST IN THE FIELD

- A. When the pipeline or portion of the pipeline laid under this contract is completed, the Contractor shall 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. All in-line gate valves shall be open during the test.
- 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 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. Flex-Ring joints including field-cut joints are properly installed and the joint has been manually pulled to full extension to eliminate any expansion slack in the joint.
 - c. HDSS and HP Lok joints including field-cut joints are properly installed and the joint has been manually pulled to full extension to eliminate any expansion slack in the joint.

- d. Joints have been restrained with restrainers and tie-rods per SFPUC CDD Standard Plan CDD-LP-006.
- e. 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.
- f. 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.
- g. Contractor shall completely fill the main for a minimum of 24 hours prior to the pressure test.

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. No time extension will be granted therefore.

4.0 DISINFECTION

- A. Upon completion of satisfactory hydrostatic test, the Contractor shall excavate an initial connection hole for measurement and connection. SFPUC-CDD will make the connection to flush, disinfect, chlorinate and take bacteriological water samples from the new water main.
- 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.

END OF SECTION