

DATE: December 28, 2022

MEMO TO: Holders of EBMUD Standard Specifications and Standard Drawings for  
Installation of Water Mains 20" and Smaller

FROM: Jonathan K. Tham, Senior Civil Engineer 

SUBJECT: Addendum 1 to October 2022 Booklets

Notice is hereby given that the STANDARD SPECIFICATIONS AND STANDARD DRAWINGS FOR INSTALLATION OF WATER MAINS 20" AND SMALLER of the East Bay Municipal Utility District has been revised as follows:

VOLUME 1 – STANDARD SPECIFICATIONS

1. Table of Contents
  - A. Replace the Table of Contents (TOC) with the attached TOC dated 12/16/22.
2. 33 05 31.17P – Fabrication of PVC Pipe and Restrained Fitting Systems
  - A. After Section 33 05 19.07P, insert the attached Section 33 05 31.17P dated 12/16/22.
3. 33 05 31.18P – Installation of PVC Pipe and Restrained Fitting Systems
  - A. After Section 33 05 31.17P, insert the attached Section 33 05 31.18P dated 12/16/22.
4. 33 11 13.21P – General Pipeline Installation Requirements
  - A. Replace Section 33 11 13.21P with the attached Section 33 11 13.21P dated 12/16/22.
5. 33 11 22P – Installation of Polyvinyl Chloride Pipe and Fittings, Cast Iron Fittings, and Ductile Iron Fittings
  - A. Delete Section 33 11 22P in its entirety. (This section has been replaced with Sections 33 05 31.17P and 33 05 31.18P)

JKT;jkt  
Attachments



**EAST BAY MUNICIPAL UTILITY DISTRICT  
STANDARD SPECIFICATIONS FOR INSTALLATION OF  
WATER MAINS 20" AND SMALLER**

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## APPENDIX A

1. Flushing and Chlorination Checklist
2. Sample Tap Installation Drawing
3. EBMUD Contingency Plan for Contaminated Soils (District Forces Only)

## REFERENCES

1. Volume 2 – Standard Drawings for Installation of Water Mains 20" and Smaller, October 2022

SECTION 33 05 31.17P  
(FORMERLY SECTION 02514.1)

FABRICATION OF POLYVINYL CHLORIDE (PVC) Pipe  
AND RESTRAINED FITTING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Fabrication of PVC pipe, gaskets, restrained ductile iron fittings, and restrained PVC fittings, including but not limited to the following:
  - 1. 4-inch through 12-inch PVC pipe and gaskets
  - 2. 4-inch through 12-inch ductile iron restrained fittings
  - 3. 4-inch through 12-inch PVC restrained fittings
  - 4. 2-inch PVC pipe and fittings, Schedule 80
- B. Related Sections
  - 1. Section 33 05 31.18P – Installation of PVC Pipe and Restrained Fitting Systems

1.2 REFERENCES

- A. American Water Works Association (AWWA):
  - 1. AWWA C104 Cement-Mortar Lining for Ductile Iron Pipe and Fittings
  - 2. AWWA C110 Ductile-Iron and Gray-Iron Fittings
  - 3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
  - 4. AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - 5. AWWA C116 Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
  - 6. AWWA C153 Ductile-Iron Compact Fittings
  - 7. AWWA C219 Bolted, Sleeve-Type Couplings for Plain-End Pipe

8. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
9. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in.
10. AWWA C907 Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 24 In. (100 mm Through 300 mm) for Water, Wastewater and Reclaimed Water Services

B. ASTM International (ASTM):

1. ASTM D1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
2. ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
3. ASTM D2241 Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
4. ASTM D2464 Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
5. ASTM D2467 Socket-type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
6. ASTM D2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Piping Systems
7. ASTM D2855 Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
8. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
9. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
10. ASTM F1674 Standard Test Method for Joint restraint Products for Use with PVC Pipe

### 1.3 SUBMITTALS

- A. Applicant shall submit a manufacturer's affidavit, including references to the lot numbers of the pipe and fittings, with each shipment prior to or at the time of

delivery to the jobsite. The affidavit shall state that the requirements specified herein have been met for all the pipe and fittings furnished.

#### 1.4 QUALITY ASSURANCE

- A. All pipe and fittings shall be subject to inspection by the Engineer at the jobsite.
- B. Each section of pipe and each fitting shall be inspected and approved by the Engineer as acceptable prior to installation.
- C. Applicant shall furnish records of quality control testing within five calendar days of the Engineer's request.
- D. Pipe and fittings rejected as unacceptable by the Engineer shall be removed from the jobsite.

#### 1.5 IDENTIFICATION OF PIPE AND FITTINGS

- A. PVC pipe shall be clearly marked in compliance with the manufacturing standards. Upon request, the manufacturer shall provide information for deciphering the manufacturer's production code. At a minimum, the following shall be printed on the pipe:
  - 1. Name and/or trademark of manufacturer
  - 2. Nominal pipe size in inches
  - 3. Pressure class or dimension ratio
  - 4. NSF-61 marking
  - 5. Manufacturing standard reference (AWWA, ASTM, etc.)
  - 6. Production code from which the date and location of manufacture can be determined
  - 7. Clearly marked circumferential line drawn on the spigot end to guide the extent of insertion into the adjoining bell at installation.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pipe ends shall be sealed during shipping and storage on site.
- B. Store pipe, fittings, and other accessories such that they do not accumulate and hold rainwater, dirt or debris. Protect pipe and gaskets from long-term exposure to sunlight. Do not use plugs of rags, wood, cotton, waste or similar materials. Store all piping materials away from standing water.

- C. Take every precaution during loading, transportation, and unloading to prevent damage to the material. Under no circumstances shall the pipe, fittings and appurtenances be dropped or skidded against each other.
- D. Pipe laid out for installation shall be placed on earth berms or timber cradles to prevent damage to the bottom during storage, and with support to prevent bending of the pipe.
- E. When long-term storage (more than two years) with exposure to direct sunlight is unavoidable, cover PVC pipe with an opaque material and provide adequate air circulation around the pipe to prevent excessive heat accumulation.
- F. Do not store PVC pipe near excessive heat sources such as heaters, boilers, or engine exhaust.
- G. Protect gaskets from excessive exposure to heat and/or direct sunlight. Do not expose to oil, grease, and/or ozone.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All water system materials that will eventually come into direct contact with drinking water shall be certified as meeting the specifications of NSF-61. This includes, but is not limited to pipes, fittings, coatings, linings, solvent cements, sealing materials, gaskets, and lubricating oils.
- B. Provide joint lubricants with pipe materials. Lubricants shall be compatible with the pipe, fittings, and gasket materials, shall be water-soluble and shall be certified by NSF-61 for use with potable water when used in potable water systems.

### 2.2 PVC PIPE

- A. PVC pipe 4-inch through 12-inch shall be Class 305 pressure pipe, cast iron O.D., DR 14 with EPDM gaskets with integral bell ends.
- B. PVC pipe 4-inch through 12-inch shall meet or exceed the minimum requirements of AWWA C900.
- C. PVC pipe for potable water distribution shall be blue in color.
- D. PVC pipe for recycled water conveyance shall be purple in color (Pantone Purple 512C).
- E. Pipe shall be furnished in standard laying lengths of 20 feet  $\pm$  1 inch. Other lengths will not be accepted.
- F. Acceptable manufacturers:

1. JM Eagle
2. Westlake Pipe & Fittings
3. IPEX
4. PPI Pipe
5. VINYLTECH
6. Or equal as approved by the Engineer

### 2.3 GASKETS FOR PVC PIPE

- A. All gaskets shall be EPDM rubber unless otherwise specified and in compliance with NSF-61 requirements. Gaskets shall be certified by the manufacturer to be chloramine resistant.
- B. Internally restrained gaskets shall be approved for use by the pipe manufacturer and suitable for making AWWA C900 pipe joints. Restrained gaskets shall also meet the requirements of ASTM F477, D3139, and F1674. Acceptable gaskets include:
  1. Turner Lock by Hultec
  2. Or equal as approved by the Engineer

### 2.4 DUCTILE IRON FITTINGS FOR PVC PIPE – 4-INCH THROUGH 12-INCH

- A. Restrained push-on fittings:
  1. Fittings include elbows, tees, crosses, reducers, couplings, and flange adapters.
  2. Ductile iron fittings shall meet all requirements of AWWA C153 for compact fittings or AWWA C110 for standard-style fittings. All ductile iron fittings shall meet the requirements of ASTM A536.
  3. Restrained fittings shall meet the requirements of ASTM F1674, F477, and D3139.
  4. Each ductile iron fitting shall have plainly cast on the body:
    - a. The required markings of AWWA C153 or C110.
    - b. An identifying mark indicating the type of pipe for which the fitting is designed.
  5. Fittings shall have push-on bell ends unless shown otherwise on drawings. Push-on fittings shall be designed to accept cast iron O.D. PVC pipe.

6. Gaskets shall conform to AWWA C111 and shall be furnished by the fitting manufacturer.
7. All fittings shall be smooth and free from defects. No plugging or filling will be allowed.
8. All flange adapters and flanged fittings shall be one-piece castings and shall have smooth or shallow serrated face with drilling and dimensions meeting the requirements of AWWA C115 and ANSI B16.1 Class 125 Cast Iron Flanges.
9. All fittings shall be epoxy coated and lined. Fusion-bonded epoxy shall be in accordance with AWWA C116 and Section 09 96 56.10P. There shall be no lining material on gasket groove.
10. Acceptable products:
  - a. LOKX by Georg Fischer
  - b. Flex-Tite by Revelation Connection Technologies (RCT)
  - c. Or equal as approved by the Engineer

B. Restrained bolted sleeve-type fittings:

1. Bolted sleeve-type fittings include flexible couplings or flange coupling adapters.
2. All bolted sleeve-type fittings shall meet all requirements of AWWA C219.
3. Sleeve bolts shall be Type 303 or 304; stainless steel; or equivalent.
4. Sleeve and followers shall be fusion bonded epoxy lined and coated in accordance with Section 09 96 56.10P.
5. All flange adapters and flanged fittings shall be one-piece castings and shall have smooth or shallow serrated face with drilling and dimensions meeting the requirements of AWWA C115 and ANSI B16.1 Class 125 Cast Iron Flanges.
6. Gaskets shall be EPDM and be furnished by the fitting manufacturer.
7. Acceptable manufacturers:
  - 1) Hymax Grip by Hymax USA
  - 2) Alpha Coupling by Romac Industries
  - 3) Smith-Blair
  - 4) Or equal as approved by the Engineer

## 2.5 PVC FITTINGS – 4-INCH THROUGH 12-INCH

- A. PVC fittings 4-inches through 12-inches include elbows, tees, couplings, and reducers.
  - 1. PVC fittings shall be Class 235 pressure fittings, cast iron O.D. Standard gasket material shall be EPDM.
  - 2. PVC fittings and gaskets shall meet all requirements of AWWA C907 and each PVC fitting shall have the required markings of AWWA C907.
  - 3. Acceptable PVC fitting manufacturers include:
    - a. Harco
    - b. IPEX
    - c. Or equal as approved by the Engineer
  - 4. Restrained fittings shall meet the requirements of ASTM F1674. Acceptable restrained fittings systems for PVC fittings include:
    - a. Bulldog® Restraint System
    - b. Or equal as approved by the Engineer
  - 5. Restrain all PVC fittings joints through the use of approved internally restrained gaskets or external restraint harnesses.

## 2.6 EXTERNAL RESTRAINT HARNESSSES AND FITTINGS FOR PVC PIPE

- A. External restraint harnesses and fittings shall be made for AWWA C900 PVC pipe and be manufactured of ductile iron conforming to ASTM A536.
- B. External restraint harnesses and fittings shall be fusion bonded epoxy coated.
  - 1. Acceptable products:
    - a. EBAA Iron, Inc. Series 1900, 2500, and 15PF00
    - b. EBAA Iron, Inc. Megalug Series 2000PV
    - c. Or equal as approved by the Engineer

## 2.7 PVC PIPE AND FITTINGS – 2-INCH

- A. 2-inch PVC pipe and fittings shall be made from polyvinyl chloride Type 1, Grade 1 (Cell Classification 12454-B) conforming to ASTM D1784.

- B. Pipe and fittings shall be Schedule 80 and shall conform to:
  - 1. Pipe: ASTM D1785
  - 2. Threaded fittings: ASTM D2464
  - 3. Socket-type fittings: ASTM D2467
- C. Welding solution and primer shall be in accordance with ASTM D2564, which shall be furnished by the same supplier who furnished the pipe and shall be of a type compounded specifically for use with the pipe furnished.

PART 3 - NOT USED

END OF SECTION

SECTION 33 05 31.18P  
(Formerly SECTION 02514.1)

INSTALLATION OF POLYVINYL CHLORIDE (PVC) PIPE  
AND RESTRAINED FITTING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Installation of PVC pipe, restrained ductile iron fittings, and restrained PVC fittings.
- B. Related Sections:
  - 1. Section 03 30 76P – Concrete for Pipeline Installation
  - 2. Section 05 05 26P – Flange Bolting
  - 3. Section 09 96 56.10P – Fusion-Bonded Epoxy Coatings
  - 4. Section 31 12 16.81P – Asphalt Pavement Replacement
  - 5. Section 31 23 23.15P – Imported Backfill and Drain Rock Materials
  - 6. Section 31 23 33P – Trenching and Backfilling
  - 7. Section 33 05 31.17P – Fabrication of Polyvinyl Chloride (PVC) Pipe and Restrained Fitting Systems
  - 8. Section 33 10 01P – Protection from Corrosion
  - 9. Section 33 11 13.10P – Polywrap
  - 10. Section 33 11 13.21P – General Pipeline Installation Requirements

1.2 REFERENCES

- A. American Water Works Association (AWWA):
  - 1. AWWA C104 Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
  - 2. AWWA C110 Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
  - 3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

4. AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
5. AWWA C116 Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
6. AWWA C153 Ductile-Iron Compact Fittings, 3" through 12", for Water and Other Liquids
7. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in. for Water Distribution
8. AWWA C605 Installation of PVC Pipe
9. AWWA C907 Polyvinyl Chloride (PVC) Pressure Fittings for Water-4 in. through 8 in.

B. ASTM International (ASTM):

1. ASTM D1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
2. ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
3. ASTM D2241 Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
4. ASTM D2464 Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
5. ASTM D2467 Socket-type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
6. ASTM D2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
7. ASTM D2855 Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
8. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
9. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

10. ASTM F1674 Standard Test Method for Joint restraint Products for Use with PVC Pipe

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS FOR PVC PIPE SYSTEMS

- A. Refer to Section 33 05 31.17P – Fabrication of Polyvinyl Chloride (PVC) Pipe and Restrained Fitting Systems.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle pipe and fittings in accordance with Section 33 05 31.17P.

3.2 PREPARATION FOR INSTALLATION

- A. Keep interior of pipe and fitting surfaces clean at all times. Each section of pipe and fittings shall be cleaned of dirt and debris before lowering into the trench and immediately prior to assembly. Protect pipe ends at the job site by maintaining plugs and/or caps in good condition.
- B. If gasket is not preinstalled, clean gasket grooves with a wire brush or similar tool, to ensure the groove is free of dirt or debris.
- C. Protect pipe, pipe ends, fittings and appurtenances from damage at all times.

3.3 PLACING PIPE IN TRENCH

- A. Install PVC pipe in accordance with AWWA Manual M23 and AWWA C605 except as modified below.
- B. Do not install pipe in same trench with other utilities without approval of the Engineer.
- C. Install pipeline in trench per Drawing 1992-A. Install pipeline with a minimum cover of 36-inches below finished grade or as directed by the Engineer. Maximum cover shall be 48-inches or as directed by the Engineer.
- D. Install pipe in accordance with California Code of Regulations, Title 22, Division 4, Chapter 16, Article 4, Section 64572, Water Main Separation, or as directed by the Engineer based on variance approval.
- E. Pipe interior shall be free of dirt and debris and shall be maintained in the same manner during and after installation.

- F. Install pipe with uniform bearing on compacted Class I backfill or as approved by the Engineer.
- G. Clearance under joints shall be at least 2 inches.
- H. Bending of PVC pipe is not permitted. Install PVC pipe such that there is no residual stress on any individual length of pipe. Maintain alignment through the use of pipe fittings or high deflection couplings.
- I. In lieu of thrust blocks or anchors, restrain horizontal or vertical offsets, dead-ends, or tees using restrained push-on fittings or external restraint harnesses specifically for PVC pipe.
- J. When pipe laying operations are not in progress, install watertight plugs for closure of open ends of pipeline and cover with backfill material at the end of each work day.

### 3.4 JOINTS

#### A. Pipe-to-Pipe Joints:

1. Restrain all pipe-to-pipe joints through the use of approved internally restrained gaskets or external restraint harnesses.
2. Joint deflection at the bell and spigot connection is not permitted. Changes in pipe direction shall be achieved through the use of high deflection couplings and fittings.
3. Inspect the gasket for damage. Clean the bell (including gasket) and spigot end to remove dirt or foreign matter. Ensure gasket is seated properly in the gasket socket around the entire circumference of the pipe. Apply lubricant to the gasket and evenly on the bevel-end approximately mid-way to the insertion line. Do not allow pipe to touch the ground after lubrication.
4. Align the spigot and bell end of the pipe both horizontally and vertically and slide the spigot into the bell to the insertion line. Use a wood block and digging bar or come-along with fabric straps around the pipe to join the pipe. Do not use heavy equipment directly against pipe surfaces to assemble push on joints.
5. Assemble pipe-to-pipe joints only to the manufacturer-provided insertion line on the spigot end of the pipe.

#### B. Pipe-to-Fitting Joints:

1. Restrain all joints with approved restrained fittings or external restraint harnesses.

2. Assemble pipe and fittings in accordance with the manufacturer's instructions using the recommended amount of pipe lubricant.
  3. Gaskets shall be EPDM unless otherwise noted on the drawings.
  4. For restrained fittings, take extra care to ensure the pipe and fitting are squarely aligned, otherwise the restraining teeth may engage at an unacceptable deflection angle. Once spigot end and fitting are in alignment, slide pipe into fitting.
  5. Block all restrained push-on elbows to prevent elbow rotation once buried.
- C. 2-inch PVC Pipe and Fittings:
1. The connection method (threaded or socket-joint) shall be as shown on the drawings. Use socket-joint connections wherever the connection method is not shown.
  2. Make socket joint connections for plastic piping in accordance with ASTM D2855.

### 3.5 FIELD CUTS

- A. When field cuts are necessary:
1. Mark the pipe prior to cutting to obtain a square cut.
  2. Cut pipe using a handsaw, power driven abrasive disc, or approved cutting tool. Do not use a chainsaw. Cuts shall provide a smooth end at right angles to the longitudinal axis of the pipe.
  3. Use a beveling tool to bevel the trimmed end per factory finished pipes, ensuring a smooth gradual bevel that will not snag or roll a gasket upon insertion.
  4. Measure and draw an insertion limit line on the new spigot end using a factory marked spigot end as a guide.
  5. Field cut pipe sections connected to a fitting or bell shall be fully inserted per the manufacturer's requirements maintaining separation between the fittings or bell ends such that they are not touching.
  6. Field cut pipe sections where tapping is required must meet the minimum distance requirements in Article 3.6.

### 3.6 SERVICE TAPS

- A. Services 2-inch and smaller shall be installed with a service saddle per Drawing 9020-GB.
- B. Tap location should not be located closer than 24 inches away from the back of bell (where bell transitions to barrel of pipe), the spigot insertion line, and any joint restraint.
- C. When making multiple taps on a section of pipe, tap locations should be staggered around the outside axis of the pipe and at least 18 inches apart longitudinally.
- D. If taps are not staggered circumferentially, then they need to be spaced at least 36 inches apart longitudinally.
- E. Location of the tap should be between springline or 45 degrees above the springline. Staggering tap locations involves alternating tap location between springline and 45 degrees above the springline.
- F. Services 3-inch and larger shall be installed with a tee per Drawing 3684-B or 3684-B-1.

### 3.7 ADDITIONAL INSTALLATION REQUIREMENTS

- A. See Section 33 11 13.21P for installation requirements for the appurtenances and items listed below.
  - 1. Thrust Blocks
  - 2. Blowoffs
  - 3. Air Valves
  - 4. Tracer Wire
  - 5. Identification Tape
  - 6. Location Markers
  - 7. Valves, Valve Boxes, and Operators

### 3.8 HYDROSTATIC PRESSURE TESTING, FLUSHING, AND CHLORINATION

- A. Conduct hydrostatic pressure testing, flushing, and chlorination per the requirements listed in Section 33 11 13.21P – General Pipeline Installation Requirements.

END OF SECTION

SECTION 33 11 13.21P  
(Formerly SECTION 02511.1)

GENERAL PIPELINE INSTALLATION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Miscellaneous work required for the installation of water mains and appurtenances:

1. Installation of Valves
2. Obstacles in the Way
3. Installation of Fire Hydrants
4. Installation of Blowoffs
5. Installation of Air Valves
6. Installation of Thrust Blocks
7. Installation of Tracer Wire
8. Installation of Identification Tape
9. Installation of Location Markers
10. Installation of Valve Pots
11. Installation of Cathodic Protection
12. Connections to Existing Pipelines
13. Hydrostatic Pressure and Leakage Test
14. Flushing and Chlorinating
15. Salvage or Abandonment of Existing Facilities

B. Related Sections:

1. Section 31 23 33P – Trenching and Backfilling
2. [Section 33 05 19.07P – Installation of Ductile Iron Pipe and Fittings](#)
3. [Section 33 05 31.18P – Installation of PVC Pipe and Restrained Fitting Systems](#)

~~2.4.~~ Section 33 11 13.06P – Installation of ML&PCS Pipe – 20" and Smaller

~~3.5.~~ Section 33 11 13.07P – Installation of ML&CS Pipe – 20" and Smaller

~~4.6.~~ Section 33 11 13.10P – Polywrap

~~5. Section 33 11 22P – Installation of Polyvinyl Chloride Pipe and Fittings, Cast Iron Fittings, and Ductile Iron Fittings~~

~~6.7.~~ Section 33 11 13.47P – Installation of HDPE Pipe

~~7. Section 33 05 19.07P – Installation of Ductile Iron Pipe and Fittings~~

C. Furnished by the District:

1. Materials: See Section 01 64 05P.

2. Water: See Section 01 00 00.01P.

## 1.2 REFERENCES

A. Standard Methods – AWWA Standard Methods for the Examination of Water and Wastewater

B. Latest AWWA Standard C651 for Disinfecting Water Mains

C. NSF/ANSI Standard 60 Drinking Water Treatment Chemicals – Health Effects

## 1.3 SUBMITTALS

A. Contractor shall submit a detailed discharged water control and disposal plan for the District's record prior to any work at the jobsite. Plan shall comply with all requirements of the specification and with regulations of the California Regional Water Quality Control Board, San Francisco Bay Region, California Department of Fish and Game, County Flood Control Districts, and any other regulatory agency having jurisdiction, whichever is most stringent.

B. Contractor shall submit a chlorination and flushing plan for approval prior to release of District-furnished material. All phases of filling, flushing, chlorinating, and dechlorinating shall be monitored for chlorine intrusion into the existing piping system. The plan shall address, as a minimum, the key elements listed in checklist provided in Appendix A.

PART 2 - NOT USED

PART 3 - EXECUTION

## 3.1 INSTALLATION OF VALVES

- A. Install valves at locations shown on the drawings. See Drawing 1241-A for valve operating shaft installation details.
  - 1. Install butterfly valve operating shaft extension with shearpin on all butterfly valves. Top of operating nut shall be between 12 to 24 inches of finished grade.
  - 2. Install gate valve operating shaft extension on gate valves if the valve operating nut is more than 36 inches below ground level. Top of shaft extension operating nut shall be between 12 to 24 inches of finished grade.
  - 3. For installation of mechanical or restrained push-on valves, trim the pipe/bevel if necessary to ensure gasket is in contact with the full pipe barrel, and not in contact with the bevel.

### 3.2 OBSTACLES IN THE WAY

#### A. Alignment and Elevation

- 1. The clearance from existing utilities (pipelines, conduits, cables, and structures) shall be a minimum of 12 inches vertical and 5 feet horizontal, unless approved otherwise by the Engineer.
- 2. When 12 inches vertical clearance cannot be obtained between District metallic pipe and other metallic utility, install shield between the pipes per Drawing 308-EA.

#### B. Locating Utilities

- 1. Locate utilities per Section 31 23 33P – Trenching and Backfilling.

#### C. Changes in Alignment and Elevation

- 1. Engineer may make adjustments as required during the progress of the work.
- 2. Contractor shall perform additional fabrication and installation work per Drawings 1870-A, 1996-A, and 2010-A as required. If pipeline cover at utility crossings is less than 30 inches, a 6-inch concrete cap per Drawing 2003-A is required. Install per District standard unless directed otherwise by the Engineer.

### 3.3 INSTALLATION OF FIRE HYDRANTS

- A. Install hydrant assembly per Drawings 9496-GB and 9496-GB-1 at locations indicated on the drawings. Applicant is responsible to verify that all fire hydrant locations are in compliance with District and Fire District Standards.
- B. Install hydrant with proper setback clearances from face of curb and edge of sidewalk. Maintain minimum 5 feet clearance from fences, walls, structures, and edges of driveways.

- C. For steel hydrant ell, if riser flange is above top of curb height or visible, raise hydrant by cutting riser and welding on an appropriate pipe section to conform to final grade elevation. Repair mortar as required. Otherwise an approved hydrant extension is acceptable if approved by the Engineer.
- D. Wrap fire hydrant outlets with plastic bags after installation. Plastic bags shall remain in place until water quality has been cleared and fire hydrants are placed in service.

### 3.4 INSTALLATION OF BLOWOFFS

- A. Install 4-inch blowoff in accordance with Drawing 169-EA, 332-EA, or 332-EA-1 at locations shown on the drawings or as specified by the Engineer.
- B. Install 6-inch blowoff and pumping tee in accordance with Drawing 199-EA at locations shown on the drawings or as specified by the Engineer.

### 3.5 INSTALLATION OF AIR VALVES

- A. Install 1-inch and 2-inch air and vacuum and air release valves per Drawing 189.1-B and 189.2-B, at the locations shown on the drawings or as specified by the Engineer.
- B. Install 4-inch air and vacuum and air release valves per Drawing 333-EA at the locations shown on the drawings or as specified by the Engineer.

### 3.6 INSTALLATION OF THRUST BLOCKS

- A. Anchor all unrestrained horizontal and vertical bends greater than 11-1/4°, dead-ends, tees, and crosses with concrete as shown on Drawings 194-EA and 3360-B.
- B. Anchor all 90° bends with concrete as shown on Drawing 3360-B.
- C. Install collars and rods with concrete anchors on all cast iron plugs and at other locations indicated on the drawings, or at locations deemed necessary by the Engineer.
- 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.

### 3.7 INSTALLATION OF TRACER WIRE

- A. Install AWG No. 12 TW or THHN, solid, insulated tracer wire with all pipe installation methods, including jacking or drilling.
  - 1. Install wire on the trench bottom under the vertical projection of the pipe to protect the wire in all installations. Wire shall not spiral around pipe barrel.
  - 2. Tracer wire shall form a mechanically and electrically continuous line throughout the pipeline, including jacked or drilled portions, and shall then

extend to the nearest valve or other pipeline appurtenance designated by the Engineer. At the valve, the wire shall extend up outside the valve pot riser pipe into the concrete valve pot space where there shall be a 12-inch lead for testing purposes. At other designated appurtenances, the wire shall extend up to the box and terminate with a 12-inch pigtail.

3. Wire shall be spliced with a splicing device consisting of an electro-tin plated seamless copper sleeve connector. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.
4. Demonstrate that the wire installation is electrically continuous by performing a continuity test in the presence of the Engineer.

### 3.8 INSTALLATION OF IDENTIFICATION TAPE

- A. Non-detectable 3 inch blue tape, black-imprinted with "CAUTION - BURIED LINE BELOW" shall be installed as follows:
  1. Install tape approximately 1 foot above and along the centerline of the pipe.
  2. If the tape is not continuous, the tape ends shall be overlapped by 2 feet.

### 3.9 INSTALLATION OF LOCATION MARKERS

- A. See Drawing 303-EA for pipeline markers.
- B. See Drawing 1336-A for valve, blowoff, air valve, and test station markers.
- C. See Drawing 2002-A for curb field markings.

### 3.10 INSTALLATION OF VALVE POTS

- A. Install valve pots at locations shown on the project drawings. See Standard Drawing 321-EA for installation details. See Article 3.1A for installation of valve operating shaft extension.
- B. Valve Pot Cover Color Code:
  - Red = Zone Valves (always closed)
  - White = Hydrant Valves
  - Blue = Distribution Line Valves
  - Purple = Recycled Water

### 3.11 INSTALLATION OF CATHODIC PROTECTION

- A. Install cathodic protection as shown and specified.
- B. Steel pipe with an insulating coating shall meet the cathodic protection criteria of NACE RP0169-92, Paragraph 6.2.2.1.1.

- C. District will test for compliance with specified corrosion control requirements after main has been placed in service.
- D. In the event of noncompliance, repair as directed by the Engineer until compliance is obtained.

### 3.12 CONNECTIONS TO EXISTING PIPELINES

#### A. General:

1. Connections to the existing mains are shown on the drawings. When a wet tap is designated or when it is determined by the Engineer that a wet tap is required, the District will install the gate valve and split tee or nozzle, and will make the tap. The Contractor shall perform all other work necessary to complete the connection including, but not necessarily limited to, traffic control, excavation, shoring, preparation of the existing pipe for wet tap, connection of the new main to the gate valve, repair of coating to the existing main, application of coating to new installation, adequate blocking where required and concrete anchors where applicable, backfill, compaction, and pavement replacement.
2. Connections to the existing mains prior to hydrostatic pressure testing and chlorination are permitted if subsequent pressure tests are performed against closed, resilient-seated gate valves. If the gate valves are found to be leaking or not of resilient seat, the new pipeline shall be physically isolated and shall have passed the pressure test and chlorination before connection is made to the existing main. Only one connection to the source main is permitted until the pipeline has successfully passed the water quality testing.
3. Applicant only: The existing main may not be located as shown on the contract drawings. The Applicant shall pothole the point of connection to determine the exact location of the main prior to the start of work. The District is not responsible for additional costs incurred arising from the existing main being located differently from that shown on the contract drawings.
4. Applicant only: All costs of making connections to existing mains shall be borne by the Applicant, regardless of the day or time at which the connection work is performed. Pressure testing against closed, resilient-seated gate valves shall be done at Applicant's risk. The District assumes no liability for Applicant's additional costs resulting from District-furnished valves which are found to be leaking during pressure testing.
5. Applicant Only: Give a minimum 5 work days written notification to the Engineer to schedule any flushing and connection operations to be performed.

#### B. Shutdowns of Existing In-Service Pipelines and Other Distribution Facilities:

1. District personnel will operate all valves in the service system for shutdown.

2. Shutdowns shall be scheduled, for as short a period as possible, during a regular working day unless ordered otherwise by the Engineer.
  3. Shutdowns shall cause minimum interference with the operation of the District's distribution system.
  4. Connection work shall be completed without interruption.
  5. Schedule of shutdown and connection operations shall be prepared jointly by the Contractor and the Engineer.
  6. Applicant only: When shutdowns exceed their scheduled time limits and there is no improvement shown in the progress of the work, the District reserves the right to bring in its own crew to complete the connection and restoration of water service and to backcharge the Applicant for all of the associated costs.
- C. Existing Mains that are Provided with Fittings for Connecting to New Main:
1. Flush blowoff on existing main and install sample tap 5 days prior to connection.
  2. Remove plug or bulkhead from existing main.
  3. Remove dished heads or ring-tight plugs after new main is satisfactorily pressure tested and chlorinated, if applicable.
  4. Clean and disinfect the ends. Swab or spray the interior of connection pipe with a 1 percent hypochlorite solution.
  5. Make connection.
  6. Restore water service to existing main. Flush and sample.
  7. Repair protective coating, as necessary.
- D. Existing Mains that are not Provided with Fittings for Connecting to New Main:
1. Flush blowoff on existing main and install sample tap 5 days prior to connection.
  2. Remove the required amount of existing pipe.
  3. Remove dished heads or ring-tight plugs after new main is satisfactorily pressure tested and chlorinated, if applicable.
  4. Make connection by means of fittings and pipe.
  5. Restore water service to existing main. Flush and sample.
  6. Apply necessary protective coating.

- E. If new pipeline is isolated for pressure test and chlorination, final connection piping shall be thoroughly disinfected prior to installation per the requirements of AWWA C651. Flush and request sampling by the District. See Article 3.14.C.
- F. Collars and rods shall be used on all plugs.
- G. Cement Lining: See Section 33 11 13.06P and 33 11 13.07P, Article 3.9.
- H. Mortar Coating (ML&CS) Pipe: See Section 33 11 13.07P, Article 3.10.
  - 1. Valves, fittings, branches, and damaged areas:
    - a. Hand plaster with mortar.
    - b. Repair original damaged coating.
    - c. Bond new coating to old with epoxy or adhesive under strong pressure to provide coating of thickness of pipe coating.
    - d. If the existing pipe is wrapped with polywrap or a similar material, install polywrap in accordance with Section 33 11 13.10P.

### 3.13 HYDROSTATIC PRESSURE AND LEAKAGE TEST

#### A. Test Equipment Set-up:

- 1. Contractor shall furnish hoses, pumps, pressure gauges, leakage measuring device, connections, relief valves, other necessary apparatus, and personnel required for making the tests.
- 2. The pressure gauge shall register pressure in pounds per square inch gauge (psig). The range of the gauge shall be from 0 psig to  $((1.5 \times \text{test pressure}) + 50.0)$  psig. The gauge face shall have a 1 psig increment inscribed. The gauge shall be calibrated within 45 days prior to the hydrostatic test and the calibration tag affixed to the gauge.
- 3. The gauge assembly shall be equipped with a 3/4" hose bib and isolation valve to allow the Engineer to install a second gauge and pressure monitoring device.
- 4. The Engineer may test pressure gauges for accuracy.

#### B. General:

- 1. Applicant only: Give a 5 work day minimum written notification to the Engineer to schedule filling and testing of the pipeline. The Applicant shall not fill the pipeline until the submittals of Article 1.3 have been submitted and reviewed by the Engineer.

2. Hydrostatic pressure and leakage test shall be performed in the presence of the Engineer.
  3. Pipeline may be divided into sections and tested in stages as approved by the Engineer.
  4. Test shall be scheduled to begin and be completed during weekday (Monday - Friday) work hours.
- C. Before Testing:
1. All appurtenances shall be completed and shall be tested concurrently.
  2. Interior of the pipeline shall be thoroughly cleaned and flushed with water for 1-2 minutes immediately prior to actual testing.
  3. Trench backfill, except permanent pavement, shall be installed, compacted, and tested to the satisfaction of the Engineer.
  4. Concrete thrust or reaction blocks shall be cured for at least seven days. The time required may be reduced if additional restraint, approved by the Engineer, is provided.
  5. Testing shall not be performed against closed valves except where prior approval has been granted by the Engineer.
- D. Filling the Pipeline:
1. All air vents and fire hydrants shall be open during the filling of the pipeline with water.
  2. For mortar-lined steel pipe only: After a test section is completely filled, and air vents and fire hydrants closed, the pipeline shall be allowed to stand under pressure for a minimum of 24 hours, to allow the lining to absorb water and permit the escape of air.
  3. Examine valves and exposed connections for leaks during this period. Repair all visible or known leaks.
  4. The volume of water added to the pipeline to maintain test pressure during the test, if any, shall be measured in the presence of the Engineer.
- E. Hydrostatic Pressure and Leakage Test:
1. For physically isolated pipeline only: After filling the pipe, the filling apparatus shall be either disconnected or physically isolated from the pipeline.
  2. Except when otherwise specified on the drawings, all points in the pipeline being tested shall be subject to a minimum pressure of:

- a. PVC or DI – 150 psi at the lowest pressure point of the main, or 125% of working pressure at the highest pressure point of the main, whichever is greater.
  - b. Steel or copper – 175 psi at the lowest pressure point of the main, or 125% of working pressure at the highest pressure point of the main, whichever is greater.
  - c. HDPE – See Section 33 11 13.47P for HDPE pipeline hydrostatic testing requirements.
3. Raise the pipeline pressure to the initial test pressure by means of a pump connected to the pipe in a manner satisfactory to the Engineer.
  4. For 16 and 20 inch pipe:
    - a. The pipeline pressure shall be maintained within 10 psig of the test pressure for a period of 24 hours. At no time shall the pressure be allowed to drop more than 10 psig below the test pressure. At the end of the test period, the pressure shall be brought back to the test pressure for determining the total leakage or as specified by the Engineer.
  5. For pipe less than 16 inch diameter:
    - a. Maintain pressure within 10 psig of the initial test pressure specified for 30 minutes. Then reduce pressure to line pressure.
    - b. Repeat 3. above.
    - c. Maintain test pressure within 10 psig of the initial test pressure specified for two hours minimum. At the end of the test period, bring pressure back to the initial test pressure to determine total leakage.
  6. An inspection for leaks along the pipeline shall be made by the Contractor while pipe is under pressure and in the presence of the Engineer.
  7. Any leaks found shall be recorded by the Contractor and record provided to the District.
  8. Use of sound level meter for detecting leaks in the pipeline and its results will not relieve Contractor of responsibilities for furnishing a pipeline which will pass the leakage test.
  9. Measured leakage for the pipe is the total quantity of water required to be pumped into the pipeline to maintain the test pressure specified during the respective 24-hour or 2-hour test and to bring pressure back to the initial test pressure less the measured leakage through the bulkheads and exposed connections.

10. For successful completion of the test, the measured leakage shall not exceed:
  - a. 7.5 gallons per inch of inside diameter per mile of pipe per 24 hours for PVC or ductile iron pipe 4" and larger.
  - b. 1.5 gallons per inch of inside diameter per mile of pipe per 24 hours for steel pipe and 2" PVC or copper pipe.

F. Repairs and Retests:

1. Repair all known leaks and retest the pipe until the hydrostatic pressure and leakage test is successfully completed.
2. Any damage to the protective lining and coating of the pipe and to the caulking or jointing material after the testing shall be repaired.
3. Repairs shall be made subject to the approval of the Engineer.
4. Excavate where required to locate and repair leaks or other defects that develop under the test.
  - a. Remove backfill and paving already placed.
  - b. After repairs, backfill and pave in same manner as initial work.

### 3.14 FLUSHING AND CHLORINATING

- A. Flushing and chlorinating shall be conducted only after the successful completion of the hydrostatic pressure and leakage test.

Applicant only:

1. Provide a written minimum 5 working day notification to the Engineer to schedule flushing and chlorinating operations.
  - a. Schedule shall allow delivery of samples to the District's Laboratory Services Division in Oakland before 2:00 p.m. Monday through Friday, on day samples are taken.
2. Give 24-hour telephone notification to confirm scheduling of the Engineer to witness all phases of flushing and chlorination and dechlorination procedures.
3. Applicant shall not perform flushing, chlorinating, or dechlorinating without the presence of the Engineer.
4. Applicant shall not chlorinate or sample the new pipeline on weekends, District holidays, or outside the hours of 7:00 am - 4:30 pm. See General Conditions, Article 4.

B. Contractor shall:

1. Make necessary piping connections.
  - a. Install District-furnished chlorination taps for injection of chlorine at locations designated by the Engineer.
  - b. Install temporary blowoffs at every 1,000 feet of pipeline or at locations designated by the District. Each temporary blowoff shall be equipped with a sample tap. See sample tap installation drawing, Appendix A. Sample taps, once installed, shall remain on the blowoffs until water quality test results are satisfactory to the Engineer.
  - c. Temporary blowoffs shall permit adequate flushing of the main. The minimum size of blowoffs and minimum number of outlets shall be:

DIAMETER OF MAIN TO BE FLUSHED	REQUIRED BLOWOFF DIAMETER	NUMBER OF OUTLETS
2"	2"	1
4"	2"	1
6"	4"	1
8"	4"	2
12"	4"	3
16"	6"	4
20"	6"	8

Use 2-1/2" fire hose and dissipator on each outlet.

- d. Remove temporary chlorinating and flushing assemblies when water quality test results are satisfactory to the Engineer. Removal shall be accomplished in the presence of the Engineer. Return District-furnished chlorination taps to the Engineer.
2. Flush and chlorinate the pipeline in accordance with AWWA C651, AWWA Standard for Disinfecting Water Mains (latest edition).
  - a. Use Sodium Hypochlorite per Section 4.1.2 of AWWA C651. Sodium hypochlorite to be used for chlorinating shall be NSF/ANSI 60 certified. Available chlorine shall be 12-1/2% to 13% by volume. Sodium hypochlorite shall be stored out of sunlight.
  - b. Use Continuous Feed Method of Section 4.4 of AWWA C651. The main shall be flushed until all of the water in the line has been replaced once and for such additional time as may be required for the blowoff water to flow clean.
  - c. Pump shall have a pumping capacity range up to 24 GPH. The use of a high-pressure/high-capacity pump to inject chlorine is prohibited. Pump shall be Chem-O-Feeder Model No. 1210 Simplex or Duplex Series type pump or approved equal.

- d. Provide an eyewash station that complies with ANSI Z358.1 (1998) regulations onsite during the chlorination.
3. Connect to water source, convey to piping, and dispose of water during flushing without flooding, inundating or damaging any property, or harming the environment with the chlorinated water.
  - a. See Section 4.5 and Appendix C of AWWA C651 for disposal of heavily chlorinated water.
  - b. Water to be discharged shall meet the requirements of Section 01 10 00.01P, Article 1.6.B., Discharged Water.
4. Provide English-speaking personnel on the job to work with the Engineer at all times during flushing, chlorinating, dechlorinating, and sampling. There shall be radio communication between injection pump operator and personnel operating blow-offs and valves.
5. Operate valves, under District direction, and provide other necessary assistance to the District. System gate valves shall only be operated by the District.
6. Cover fire hydrant openings with plastic bags to prohibit usage prior to chlorination. Cover shall remain in place until water quality test results are satisfactory to the Engineer.
7. Applicant only: Prior to chlorination set up sample points on the existing source main in accordance with approved chlorination and flushing plan to ensure that the existing system chlorine residual is maintained during the chlorination process. Check chlorine residual in source main continuously during chlorination as directed by the Engineer and again, once all chlorination equipment is disconnected from the chlorination tap to ensure that the source water is left at a safe level.
8. Immediately after chlorination, relieve pressure on the chlorinated main, through proper discharges, to a pressure lower than the pressure of the source water at the source connection by a minimum of 10 psi or as directed by the Engineer.

C. District will:

1. Designate locations for chlorination taps and temporary blowoffs.
2. Take a source sample after proper notification by the Contractor:
  - a. Prior to initial chlorination and filling.
  - b. Each time the tract is fully sampled.
3. Direct and control the operation of valves at all times.

4. Sample and test the water to determine if it meets the following required water quality standards:
  - a. Coliform Bacteria: Absence of coliforms as interpreted by the enzyme substrate assay technique in accordance with Procedure 9223B of Standard Methods for the Examination of Water and Wastewater.
  - b. Chlorine Residual: Chlorine residual equivalent to the source water reading or at an acceptable level determined by the District as interpreted by the N,N-Diethyl-p-phenylenediamine (DPD) colorimetric method in accordance with Procedure 4500-Cl G of Standard Methods for the Examination of Water and Wastewater.
5. Notify the Contractor of test results within 3 work days after sampling.

D. Flushing/Chlorinating/Testing Operations:

1. These operations normally take about five working days.
2. If the test results indicate that:
  - a. Following chlorination, if chlorine readings indicate that the residual chlorine has not been lowered to a level equivalent to the source water or at a higher level determined to be acceptable by the District, then, the Contractor shall continue flushing to bring the residual chlorine level down to the acceptable level.
  - b. Following reflush, if chlorine readings indicate that the residual chlorine is less than a level equivalent to the source water or at a lesser level determined to be acceptable by the District, the Contractor shall flush at a velocity of at least 3 ft/sec until water equal to a minimum of 3 times the volume of the new pipe has been displaced.
  - c. If conditions in a and b above are encountered, the collection of bacteriological samples may require rescheduling for a later date.
3. Applicant only: All costs for resampling and retesting shall be borne by the Applicant unless it is determined by the Engineer that the need for resampling and retesting is not the fault of the Applicant.

### 3.15 SALVAGE OR ABANDONMENT OF EXISTING FACILITIES

- A. Abandon existing facilities as indicated on the drawings (usually RFS - remove from service drawings).
- B. Pipelines:
  1. Diameters 12" and under:

- a. Remove and dispose of water from the pipeline to be abandoned.
  - b. Abandon existing facilities as indicated on the Remove from Service (RFS) drawings.
  - c. Fill abandoned pipe ends with minimum 12" of concrete from end.
  - d. Plug, rod, and collar every known opening on the pipeline to be abandoned in place. All buried outlets (hydrants, blow-offs, air valves, etc.) shall be closed, capped, and restrained as indicated on the Remove from Service (RFS) drawings.
  - e. Verify that the pipeline is positively plugged and sealed.
2. Diameters greater than 12": Contact the Engineer.
- C. Valves:
1. Salvage valve pot covers over abandoned valves.
  2. Cut and remove top 6" of abandoned valve pots and fill with Class II aggregate base rock, compact in same manner as trench backfill and install permanent asphalt paving.
- D. Hydrants:
1. Close hydrant valve in street and comply with Paragraph C.
  2. Salvage hydrant bodies.
  3. Remove upper portion of the hydrant ell or extension to minimum 6" below existing ground.
  4. Fill remaining portion of ell with concrete.
- E. Air Valves:
1. Salvage valves and boxes. If valve box is located in sidewalk, remove box in its entirety and repair sidewalk satisfactory to the agency having jurisdiction.
- F. Test Stations:
1. Remove and dispose of.
- G. Markers:
1. Remove locating markers and/or curb markers.
- H. Materials Salvaged:

1. Deliver and unload at the District's Oakport Storage Center, 5601 Oakport Street, Oakland, California.

END OF SECTION