



**westborough
water district**

**SOUTH SAN FRANCISCO, CALIFORNIA
STANDARD SPECIFICATIONS
AND
STANDARD DRAWINGS**

DECEMBER 2018



Pakpour Consulting Group, Inc.

VERSION 2.1

STANDARD SPECIFICATION

**WESTBOROUGH WATER DISTRICT
STANDARD SPECIFICATIONS AND DRAWINGS
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SECTION 01 33 00 - SUBMITTALS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included in this section consists of furnishing various submittal items as listed herein, as required for the work.

1.02 SUBMITTAL PROCEDURE

- A. The Contractor shall deliver all applicable submittals listed in the schedule included in this section a minimum of 20 days before the anticipated start of construction. This time limit shall not apply to those items to be furnished during the course of the work or near or at the conclusion of the work such as test reports and record drawings. Two (2) hard copies or electronic files in PDF format of all submittal materials shall be furnished. Prior to installation of materials, the Contractor shall submit two (2) hard copies or electronic files in PDF format of corrected final submittal material. Installation shall not commence until submittal material has been reviewed by the District and final submittals have been delivered.
- B. The following procedure shall be used by the Contractor in submitting and processing submittals for review by the District:
 - 1. Each submittal item shall be forwarded to the District with an individual transmittal letter or form. The letter or form shall include the following items:
 - a. Project name.
 - b. Submittal number.
 - c. Description of submittal item.
 - d. Specification section and drawing references.
 - e. Certification by the Contractor's representative that the submittal is complete and correct.
 - f. When required in a specific specification section, a "Letter of Compliance" shall be furnished stating that material and/or equipment furnished complies with the specifications.

- C. The District reserves the right to require submittals in addition to those called for herein.

1.03 SHOP DRAWINGS

- A. The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, furnished by Contractor to explain in detail specific portions of the work required by the contract.

- B. The Contractor shall coordinate all such drawings, and review them for legibility, accuracy, completeness and compliance with contract requirements and shall so indicate that such coordination and review has been done by signing the transmittal letters. Shop drawings submitted to the District without evidence of Contractor's review will be returned for resubmission.
- C. Review by the District shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with requirements of this contract. If shop drawings show variations from contract requirements, Contractor shall describe such variations in writing, separate from the drawings, at time of submission. All such variations must be approved by the District.
- D. In these Standard Specifications, whenever the trade name of a product or the name of a manufacturer appears, it shall be understood to specify the product so identified and no equivalent is allowed. If the District Standards Specifications allow for use of an equivalent data may be submitted by the Contractor for a period of fifteen (15) days from receipt of the Notice to Proceed to substantiate a request for substitution as an equivalent item.
- E. Wherever in these Standard Specifications, or in any orders that may be given by the District pursuant to or supplementing the specifications, it is provided that the Contractor shall furnish materials for which no detailed specifications are set forth, the materials shall conform to accepted quality standards for materials of the kind required, with due consideration for the use to which they are to be put.

1.04 SAMPLES AND TESTS

- A. The source supply of each material furnished shall be approved by the District, unless the District advises the Contractor to the contrary at least ten (10) calendar days prior to the time when delivery is started, of any of the material used in the work. Representative preliminary samples of the character and quality prescribed and the manufacturer's test certificates pertaining thereto shall be submitted by the Contractor for all materials to be used in the work, as required by these Standard Specifications or as requested by the District.
- B. All tests of materials will be made in accordance with commonly recognized standards of national organizations, and such special methods and tests as are prescribed in these project specifications. The approval of any material on the basis of sample tests and/or certificates will be considered as general approval only, and will not constitute a waiver of the District's right to demand full compliance with the Contract requirements. After delivery of materials to the job, the District will make such check tests as deemed necessary in each instance, and may reject materials, equipment, or accessories which fail to meet the check tests, even though such materials have previously been given general approval.
- C. Laboratory test reports shall cite the contract requirements, the test of analysis procedures used, the actual test results, and includes a statement that the item tested or analyzed conforms or fails to conform to specification requirements. All test reports shall be signed by a representative of the testing laboratory authorized to sign certified test reports.
- D. The cost of all testing will be borne by the District, except for the following situations: (1) The Contractor shall assume all costs of retesting materials which fails to meet Contract requirements; (2) The Contractor shall assume all costs of testing materials offered in

substitution of those found to be deficient; (3) The Contractor shall assume all costs of testing materials offered in lieu of specified materials, to prove their quality equivalence.

1.05 CERTIFICATES

- A. For those items called for in individual sections of these Standard Specifications or shown on project drawings, furnish certificates from manufacturers, suppliers, or other certifying that materials or equipment being furnished under the contract comply with the requirements of these Standard Specifications.

1.06 PROGRESS SCHEDULES

- A. The Contractor shall submit a schedule at the preconstruction meeting for the project showing the estimated startup and completion date for each element of the work, in conformance with the requirements of the Standard Specifications.

1.07 TRAFFIC CONTROL PLAN

- A. Traffic Control Plan submittal shall be per Section 01 52 00 – Traffic Control Plan, of these Standard Specifications.
- B. The Contractor shall notify the City of South San Francisco/City of Pacifica Works Department, the City of South San Francisco/City of Pacifica Fire Department, The City of South San Francisco/City of Pacifica Police Department, County of San Mateo Fire Protection Services, County of San Mateo Public Works or/and County of San Mateo Sheriff's Office (if applicable) at least 72 hours in advance whenever lane closures are planned. Such notification shall include the details and location of such closure, its anticipated duration and traffic control and signing to be used during such closure.

1.08 RECORD DRAWINGS

- A. Using colored ink, each Contractor shall make changes on a set of clean prints. Indicate all changes and revisions to the original design that affect the permanent structures and will exist in the completed work. Reference underground utilities to semi-permanent or permanent physical objects. Reference water, sewer, telephone, storm drain, gas, and electric lines to corners of buildings and survey markers.
- B. The record drawings shall be kept current. Project record drawings are the property of the District. The original hard copies of the record drawings shall be delivered to the District before project closeout.

1.09 SUBMITTAL SCHEDULE

- A. The list below is a general representation of materials to be used on the project. The Contractor is responsible for reviewing each individual specification section for specific requirements to ensure all material information is submitted and reviewed.

<u>Section No.</u>	Item
	Safety Plan per the General Standard Specifications
01 50 00	Staging Plan
01 52 00	Traffic Control Plan
01 57 23	Storm Water Pollution Control Plan
01 70 00	Tests
	Certificates and Guarantees
	Record Drawings
31 80 00	Subgrade Material
	Bedding Material
	Aggregate Base
	Written Shoring Safety Plan prepared by a registered Civil Engineer
13 47 13	Catalog data on anodes
	Test boxes
	Shunts
	Thermite welds
	Weld coating
32 10 00	Aggregate Base
	Aggregate Surfacing
	Asphaltic Concrete
	Bonding Coat and Crack Seal
	Temporary Paving
	Control Density Fill
	Type II Slurry Seal
33 14 13	Ductile Iron Pipe
	PVC Pipe
	Thrust-Resistant Restraint for Ductile Iron Pipe and/or PVC Pipe
	Thrust Blocks
	Hardware
	Tubing and Fittings
	V-Bio Polyethylene Encasement and tape
	Marker Tape for Buried Piping
	Tracer Wire
	Disinfection Plans
	Disposal of Chlorine Water
33 14 20	Gate Valves – Resilient Wedge and O.S.&Y. Type
	Pressure Reducing Valves
	Wye Strainers
	Pressure Gauges
	Blow Off
	Meter Fittings and Valves
	Flow Meter
	Air Combination Valve
	Valve and Meter Boxes
	Hydrants

PART 2 MATERIALS - NONE

PART 3 EXECUTION - NONE

*****END OF SECTION*****

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SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of performing or conforming to quality control procedures and requirements as listed herein and in the various technical specification sections that comprise these Standard Specifications

1.02 GENERAL QUALITY

- A. All material shall be new and of a quality equivalent to that specified.
- B. The work shall be executed in conformity with the best accepted standard practice of the trade so as to contribute to maximum efficiency of operation, accessibility and appearance, and minimum cost of maintenance and construction of future alterations and additions.

1.03 QUALITY IN ABSENCE OF DETAILED SPECIFICATIONS

- A. Whenever the Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the normal commercial grade in quality and workmanship obtained from firms normally furnishing such materials or equipment or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required with due consideration of the use to which they are to be put. In general, the work performed shall be in conformity with the intent to secure the normal commercial standard of construction and equipment of the work as a whole or in part.

1.04 DEFECTIVE MATERIALS

- A. All materials not conforming to these Standard Specifications shall be considered defective; and all such materials, whether in place or not will be rejected, and shall be immediately removed from the site of the work, unless otherwise permitted to remain by the District. Rejected materials, the defects of which have been subsequently corrected, shall not be used until approval in writing has been obtained from the District. Upon failure of the Contractor to comply with any order of the District made under the Standard Specifications of this article, the District shall have the authority to remove and replace defective materials and to deduct the cost of same from any monies due or to become due the Contractor.

1.05 GUARANTEE

- A. All materials, and workmanship shall be guaranteed by the Contractor for a period of two (2) years from the date of initial operation or the date of acceptance thereof, whichever is later, against all defects that might render the work unsatisfactory for the intended purpose. Defective materials and workmanship occurring during the guarantee period shall be replaced by the Contractor at his expense, together with the repair or replacement of any adjacent work which may be damaged or displaced in the process.

- B. In addition to the above guarantee, the Contractor shall assign to the District all material guarantees issued by manufacturers or subcontractors which guarantees extend beyond the two (2) year period stipulated.

PART 2 MATERIALS - NONE

PART 3 EXECUTION - NONE

*****END OF SECTION*****

SECTION 01 70 00 - PROJECT CLOSEOUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of conforming to the job completion-related requirements of other Standard Specifications Sections and of furnishing various materials needed to complete the project.

1.02 SUBMITTALS

- A. Tests
 - 1. Submit any test results done during the course of the work and not previously submitted in accordance with applicable sections of these Standard Specifications.
- B. Certificates and Guarantees
 - 1. Furnish all certificates and/or guarantees as required by individual Standard Specifications Sections and in accordance with applicable sections of these Standard Specifications.
- C. Record Drawings
 - 1. Furnish record drawings.

1.03 INSPECTION

- A. Final Inspection
 - 1. Submit written certification that project, or designated portion of project, is substantially complete, and request, in writing, a final inspection. The District will make an inspection within ten (10) days of receipt of the request.
 - 2. Should the District determine that the work is substantially complete, the District will prepare a punch list of deficiencies that do not preclude operation and use of the facility; however, final payment will be withheld until all deficiencies are corrected and all close-out requirements of the encroachment permits are met.
 - 3. Prior to the District accepting the project, the Contractor shall perform a final sweep using a regenerating air type street sweeper along the project limits 14 days after the paving and striping operations. Work shall be coordinated with the District inspector.
 - 4. Until receipt of a letter of final acceptance, the Contractor shall be responsible for the work.
- B. Post Construction Inspection
 - 1. Prior to expiration of the performance bond, and approximately 23 months from date of final acceptance, the District will inspect project to determine whether corrective work is needed. The Contractor will be notified in writing of any deficiencies. The Contractor must begin corrective work on the noted deficiencies within 10 days after receipt of notification.

PART 2 MATERIALS - NONE

PART 3 EXECUTION

3.01 CLEANING

- A. Cleanup and cleaning shall be done in accordance with applicable sections of these Standard Specifications.

*****END OF SECTION*****

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing and installing all materials, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with, or properly incidental to furnishing and installing cast-in-place concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom except as hereinafter specifically excluded.
- B. Defective Work
 - 1. Work considered to be defective may be ordered by the District to be replaced in which case the Contractor shall remove and replace the defective work at their expense.
- C. Applicable Standards
 - 1. All concrete shall be mixed, delivered, placed, finished, and cured in accordance with Sections 51 – Concrete Structures, and Section 90 - Concrete, of the latest requirements of Caltrans Standard Specifications, and with American Concrete Institute (ACI) 301-11 - Standard Specifications for Structural Concrete.

1.02 SUBMITTALS

- A. The Contractor shall make submittals for the following as required by Section 01 33 00 – Submittals.
 - 1. Mix Designs in compliance with ACI and Caltrans procedures for each class of concrete on the project, and shall show names and brands of all materials, proportions, slump, strength, gradations of coarse and fine aggregates, and location to be used.
 - 2. Manufacturer's data including catalog cuts, drawings, and samples, and letters of compliance as appropriate for epoxies, grout, admixtures, curing compounds, chemical hardeners, moisture barriers, water stops and other items as referenced elsewhere.
 - 3. Shop Drawings and mill certificates for reinforcing steel that show diagrammatic elevations of all walls, footings, columns, beams, slabs, etc. at a scale sufficiently large enough to show clearly the positions and erection marks of reinforcing bars, their dowels, and splices. Shop drawings shall show details for congested areas and connections. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
 - 4. Concrete placement schedule which shall show all proposed construction joint locations, limits of each placement sequence, order of placement, any type of joint at each joint location.
- B. Approval of Testing Agencies and Reports

1. Any laboratory where testing of materials is to be performed shall receive prior approval from the District. Documentary evidence, satisfactory to the District, that the material has passed the required inspection and testing must be furnished prior to the incorporation of such materials in the work, and rejected materials must be promptly removed from the premises. Lab reports shall show the name of the testing agency, date of testing, types of tests performed, and shall be signed by a principal of the testing agency who is a licensed Civil Engineer in the State of California.

PART 2 MATERIALS

2.01 FORMWORK

- A. Plywood formwork shall be 5/8" plywood, Exterior Type, DFPA Grade "Concrete Form Exterior", or better.

2.02 PORTLAND CEMENT

- A. Portland cement shall conform to ASTM C150 for Type II cement, or Type II-V modified for corrosive environments. Use one standard brand throughout all work.
 1. Fly ash shall conform to ASTM C618 for Class F fly ash. Fly ash percentages shall conform to the latest requirements of the Caltrans Standard Specifications.

2.03 ADDITIVES

- A. Water reducing additive shall conform to ASTM C-494 Type A
- B. Water reducing and retarding shall conform to ASTM C-494 Type D
- C. Retarding shall conform to ASTM C-494 Type B

2.04 CONCRETE AGGREGATES

- A. Concrete aggregates shall conform to Section 90 – Concrete, of the latest requirements of the Caltrans Standard Specifications, dated 2010, for hardrock concrete aggregates.

2.05 WATER

- A. Water shall be clean and free from deleterious amounts of acids, alkalies, or organic materials.

2.06 CONCRETE

- A. All structures, minor structures, foundations, and slabs shall be constructed of concrete as specified in Section 51 - Concrete Structures, of the latest requirements of Caltrans Standard Specifications, and shall develop a minimum compressive strength of 3,600 psi at 28 days. Thrust blocks and incidental concrete used for underground piping applications shall be Minor concrete. If backfill occurs same day, high early strength concrete shall be used.
- B. The maximum water-cement ration shall be 0.45. If a pozzolan is used in the concrete, the maximum water-cement plus pozzolan ratio shall be 0.45.

- C. The slump shall be 3-inch minimum and 4.5-inches maximum for footing slabs and walls. The slump shall be 1-inch minimum and 4-inches maximum for other slabs, beams, and columns.

2.07 CONTROL DENSITY FILL

- A. Control density fill shall consist of a fluid, workable mixture of aggregate, cement, and water. The aggregate cement and water shall be proportioned by weight. 188 pounds of cement (2-sack) shall be used for each cubic yard of material. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.
- B. The 2-sack mix should have a 28-day compressive strength of no more than 300 psi. The aggregate (sand) should conform to ASTM C33 (for gradation), and should have a Sand Equivalent of no less than 75.

2.08 BARS

- A. Bars for reinforcing shall be deformed, domestic steel bars conforming to ASTM A706, Grade 60, except that for Minor structures as defined in the latest requirements of Caltrans Standard Specifications, ASTM A615, Grade 60 may be used.

2.09 WIRE

- A. Wire for tying reinforcement in place shall be No. 18 or heavier, AWG black annealed.+

2.10 THRUST BLOCKS

- A. Thrust blocks shall be constructed of 2,000 psi, high early strength, minor concrete, as defined in Section 90 – Concrete, of the latest requirements of Caltrans Standard Specifications with a minimum 505 pounds of cementations material per cubic yard.

PART 3 EXECUTION

3.01 FORMWORK

- A. Forms shall be designed and constructed in accordance with the requirements of Section 51 - Concrete Structures, of the latest requirements of Caltrans Standard Specifications, and ACI 301-11.
- B. The forms shall be smooth, mortar-tight, true to the required lines and grades, and of sufficient strength to resist springing out of shape during the placing and vibrating of concrete. All dirt, chips, sawdust, and other foreign matter shall be completely removed before concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly coated with a form sealer. The form sealer shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete or be incompatible with concrete paint.
- C. All exposed sharp edges shall be rounded or chamfered with triangular fillets, 3/4 -inch, unless shown otherwise on the drawings.

- D. Forms shall be removed in such a manner and at such time so as to insure the complete safety of the structure and proper curing of the concrete.

3.02 INSTALLATION OF REINFORCING STEEL

- A. Reinforcing steel shall be cleaned, fabricated, placed, tied, and supported in accordance with the ACI detailing manual, SP-66(04), and Section 52 – Reinforcement, of the latest requirements of Caltrans Standard Specifications.
- B. Steel reinforcement shall be accurately placed and shall be supported and secured against displacement by the use of adequate and proper supporting and spacing devices, tie wires, etc., so that it will remain in its correct location in the finished work. No supporting devices shall be used that will impede the placement of concrete.
- C. The clear spacing between parallel bars shall be not less than 1-1/2 times the normal diameter of the maximum size aggregate, and in no case less than 1-1/2-inches except at splices which shall be wired together. Concrete cover, and other reinforcing spacing requirements, shall conform to the latest requirements of the ACI 318 2011 version.
- D. Reinforcing steel shall extend to the far face of the concrete and terminate in a 90 degree hook.
- E. Lap splice lengths shall be per the latest edition of ACI 318, dependent on bar orientation and confinement.

3.03 PLACEMENT OF CONCRETE

- A. Place concrete so that a uniform appearance of surfaces will be obtained and the concrete will be free of all rock pockets, honeycombs, and voids.

3.04 CURING

- A. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

3.05 CONSTRUCTION JOINTS

- A. Joints not shown on the Drawings shall be so made and located as to least impair strength of the structure. A pour schedule for each structure showing all construction joints shall be submitted to the District for review.
- B. The surfaces of all concrete joints shall be thoroughly cleaned and all laitance removed by sandblasting. In preparation for the next pour, the joints shall be dampened. Where directed by the District, joints shall be intentionally roughed as described in the Standard Specifications to amplitude of ¼ inch.

3.06 EXPANSION JOINTS

- A. Pre-molded expansion joint material shall be installed where concrete walks abut buildings, walls, and curbs, where shown on the Drawings and at 20'-0" on centers maximum, where not specifically shown.

3.07 EMBEDDED ITEMS

- A. All sleeves, inserts, anchors, ladders, and other embedded items required for adjoining work or for its support shall be placed prior to concreting. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.

3.08 REPAIR OF SURFACE DEFECTS

- A. All tie holes and all repairable defective areas shall be patched immediately after form removal in accordance with the applicable provisions of Section 51 - Concrete Structures, of the latest requirements of Caltrans Standard Specifications.
- B. Finishes

1. Schedule of Finishes

<u>Element</u>	<u>Finish</u>
Walls not exposed	Ordinary Surface Finish
Exposed walls	Class 1 Finish
Exposed slabs	Broom finish

2. Ordinary and Class 1 Surface Finishes

- a. Shall conform to latest Standard Specifications.

3. Broom Finish

- a. Concrete shall first be finished with power floats, then with power trowels, and final by hand trowels before it is given a coarse, scored texture by drawing a broom, or burlap belt, across the slab surface.

3.09 CONCRETE COMPRESSIVE STRENGTH TESTS

- A. Concrete will be tested and inspected as work progresses. One compressive strength test shall be made for each pour and as described in the Standard Specifications. One complete test shall consist of making three (3) cylinders in accordance with ASTM C31, storing the cylinders for 24 hours at the pour site, delivering the cylinders to the testing laboratory, testing one cylinder at 7 days and the other two cylinders at 28 days in accordance with ASTM C39. Four copies of certified test results shall be forwarded to the District upon completion of the testing.

3.10 CONCRETE SLUMP TESTS

- A. Each pour shall be tested for slump at the beginning of the pour, at the time the sample for the strength test is taken, and whenever the consistency of the concrete appears to vary. The test shall conform to ASTM C143.

*****END OF SECTION*****

SECTION 13 47 13 – GALVANIC ANODE CATHODIC PROTECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing and constructing a galvanic anode cathodic protection system for steel or ductile iron metallic pipe fittings. The anodes and appurtenances are to be installed as shown on the standard drawings and as specified herein.

1.02 SUBMITTALS

- A. Submit catalog data on anodes, test boxes, shunts, exothermic welds, and weld coating.

PART 2 MATERIALS

2.01 ZINC ANODES

- A. Zinc anodes shall weigh 15 lb, 30 lb or/and 60 lb as directed by the District. All zinc anodes to be packaged inside a cotton cloth bag with special backfill as shown on Standard Drawings. A #12 AWG THHN, solid copper lead wire shall be silver soldered to the galvanized steel anode core and the connection sealed by the supplier. The lead wire shall be of sufficient length to reach the test station without splicing.
- B. Anode alloy and special backfill shall conform to the following chemical compositions:

Anode Composition

Lead 0.006% Max.
Iron 0.0030% Max.
Cadmium 0.025 - 0.07%
Copper 0.005% max.
Aluminum 0.1 – 0.55%
Zinc Remainder

Anode Special Backfill

Ground Hydrated Gypsum 75%
Powdered Wyoming Bentonite 20%
Anhydrous Sodium Sulfate 5%

2.02 ANODE BOXES

- A. Anode boxes shall be precast concrete with cast iron locking cover marked "ANODE" and shall be a Christy Concrete G05T box with G05CT cover.

2.03 TEST BOARDS

- A. Test boards shall be COTT Manufacturing "Big Fink". Hardware shall be nickel plated brass. Solderless lugs shall be nickel plated copper or red brass of the smallest size suitable for the wire sizes. Identify each lead wire with a wire marker and coat with a clear heat shrink sleeve as shown in drawing.

2.04 WIRE

- A. Anode wires are specified under Zinc Anodes. Other wiring to be of the size and color shown on Standard Drawing and shall have THHN insulation.

- B. For connecting wiring from anodes and fittings into test stations, the District will only allow the use of a single anode and single test station for fittings / tees / valves which are located within 20 feet or less of each other. These fittings / tees / valves shall be connected to a separate terminal with a wire labelled for identification, unless directed by the district otherwise.
- C. Any fittings / tees / valves located 20 feet or more of each other shall have their own anode and test station unless directed by district otherwise.
- D. Long bond wires shall be taped to the pipe every five (5) feet.

2.05 SHUNTS

- A. Current measuring shunts shall be 0.01 ohm, with 5 ampere current capacity, Holloway type RS, Cott Manufacturing Company, or equivalent.

2.06 EXOTHERMIC WELDS

- A. Exothermic welds shall be "Cadweld" by Erico Products, or "Thermoweld" by Continental Industries Inc. Mold shall be the type recommended by the manufacturer for the wire size, metal shape, and orientation. Weld alloy shall be formulated for use on steel or iron pipe as appropriate and shall be of the weight recommended by the manufacturer for the size cable and mold being used. Welds to be buried or submerged shall be primed with an elastomer resin based primer then be covered with a 100% solids mastic filled plastic cap. Primer and cap shall be Roybond Primer 747 and Handy Cap manufactured by Royston Laboratories.

2.07 INSULATED JOINTS

- A. Insulate flange joints to electrically isolate tanks from below piping will be a full face dielectric gasket and double washer bolt insulation on each bolt and restraining rod passing through or around the dielectric gasket. Dielectric gasket shall be 1/8-inch thick, full face phenolic with a nitrile or neoprene sealing element in a groove in the gasket designed for 250 PSI pressure in a waterline. Bolt insulation shall be phenolic washers and polyethylene or mylar sleeves or shall be one piece Minlon sleeve and washer. Insulating materials shall be manufactured by Central Plastics Company, or PSI.

PART 3 EXECUTION

3.01 PIPE-TO-SOIL POTENTIALS

- A. Measure native pipe-to-soil and open anode potentials at each wire at each test station to portable reference cells. Repair or replace any wires, test stations, or anodes that are not operating properly. Remeasure potentials at least one hour after all anodes have been connected and measure anode shunts. Type data in clear tabular form and submit to water district.

3.02 ANODES

- A. Anodes shall be installed as shown on the drawings. Anodes may be installed vertically or horizontally. Center anode in package by massaging package as necessary. The anode packages shall be soaked with ten gallons of water after backfilling to a point 12" above the top of the

anode. Anode wires shall be carefully run and protected against damage during installation and backfilling operations. The anode lead wire shall not be used for lowering or handling the anode.

3.03 EXOTHERMIC WELDS

- A. Clean pipe to bright metal. Weld according to manufacturer's instructions. Test completed weld by striking weld with a hammer and pulling on wire. If weld comes off, repeat pipe cleaning and welding, and retest. Remove flux and coat as specified above.

3.04 SPLICE

- A. Splices shall be made only where shown or approved by District as a repair. Splices shall be made using split bolt connectors or crimp connectors of the smallest size compatible with the cables being used. Connections shall be insulated with two half lapped layers of rubber tape and at least one half lapped layer of plastic tape, by encasing in resin (3M Scotchcast), heat shrink sleeve (Raychem ASE).

3.05 BACKFILL

- A. All backfill material and compaction shall be per Section 31 80 00 – Trench Excavation, Bedding, and Backfill.

*****END OF SECTION*****

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SECTION 31 80 00 - TRENCH EXCAVATION, BEDDING, AND BACKFILL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing all necessary labor, materials, tools, equipment, and services in connection with and reasonably incidental to clearing, sawcutting pavement, excavating, installing bedding and backfill material, and disposing of excess excavated materials required for the construction of water mains and storm drains. Work required shall also include the furnishing of all materials and equipment necessary for the construction and installation of all temporary shoring, sheeting and bracing and other facilities which may be necessary to perform the excavations and to place and compact the bedding and backfill, and the subsequent removal of such sheeting, bracing and other facilities.
- B. Excavation and backfill shall be in accordance with the Standard Drawings and these Standard Specifications.

PART 2 MATERIALS

2.01 BEDDING MATERIAL

- A. Bedding material shall be "Quarry Fines," produced by Steven Creek Quarry, Cupertino, CA, free of organic material and clay.

2.02 AGGREGATE BASE

- A. Aggregate base shall conform to the requirements of Section 26 – Aggregate Bases of Caltrans Standard Specifications excluding processed reclaimed asphalt concrete. Grading and Quality Characteristics requirements shall meet 3/4" maximum, Class 2 material.

2.03 DRAIN ROCK

- A. Drain rock shall be 3/4" crushed rock.

2.04 PAVEMENT

- A. Pavement shall conform to the requirements in Section 32 10 00 - Paving, Restoration, and Resurfacing Work of these Standard Specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION ACROSS IMPROVED AREAS

- A. Asphalt concrete pavement or driveways removed or damaged in connection with construction shall be rebuilt to these Standard Specifications and have the same quality as the portion removed. Where pavement or driveways must be removed, they shall be saw-cut prior to excavation.
- B. The Contractor may, when approved by the District, tunnel under driveways. Where existing driveways are removed or damaged by the Contractor, the Contractor shall replace the same

after completion of the installation of the water main or utilities with the same type and quality of material as that which was removed or damaged.

3.02 UNDERGROUND OBSTRUCTIONS

- A. The Contractor shall notify North USA at (811) a minimum of 2 working days before proceeding with the work. Work may not begin until utilities marked.
- B. The Contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages by the Contractor's failure to exactly locate and preserve any and all underground utilities.
- C. Excavation and other work under or adjacent to existing water mains, conduits, or structures of any kind, shall be executed in such a manner as not to interfere with the safe operation and use of such installations. Should any damage occur to these facilities during the operations of the Contractor, they shall immediately notify the District and the facility owner(s) or authorities, and shall arrange for the immediate repair of the facilities at his own expense. If any conflicts are encountered during construction, the District shall be notified immediately.

3.03 TRENCH EXCAVATION

- A. Trench Width
 - 1. In all cases, trenches must be of sufficient width to permit the proper jointing of the pipe. However, trenches wider than the maximums specified herein will result in a greater earth load on the pipe than it was designed for; consequently, if the maximum trench widths specified are exceeded by the Contractor without the written permission of the District, the Contractor will be required, at their own expense for both labor and material, to provide a higher class of pipe or to embed the pipe in a concrete cradle as directed by the District.
 - 2. Permissible trench widths are as follows: For all pipes up to and including 18" diameter, and in all types of soil, maximum trench width of 24" greater than the outside diameter of the pipe will be permitted. This shall be interpreted to permit a maximum of no more than 12" on each side of the pipe. This clearance shall be measured from the outside of the barrel of the pipe to the sides of the trench and shall include any sheeting used. The minimum width of un-shored trenches shall be 12" plus the outside diameter of the pipe (a minimum of 6" on each side of the pipe). Where shoring is required the Contractor shall allow sufficient width to comply with codes and regulatory safety requirements.
- B. "T" Cut
 - 1. A second saw-cut operation is required prior to final paving to achieve the "T"-cut section as shown on the standard drawings. Saw-cutting a wider trench during initial trench excavation to achieve a "T" cut section will not be allowed.
- C. Shoring
 - 1. The Contractor shall furnish, place and maintain shoring and bracing as may be required to support the sides of excavations for the protection of workers, to facilitate the work; to prevent damage to manholes, structures, and water mains being constructed; to protect

adjacent embankments, structures or facilities from damage; and as required by applicable local, State and Federal safety codes.

2. Shoring shall be removed by the Contractor unless field conditions make the removal of sheeting impractical. In such case, the District may permit portions of the sheeting to be cut off to a specified depth and to remain in the trench. Backfill shall be brought to one foot above the top of the pipe before sheeting may be removed.
3. When trenching or excavation over five (5) feet in depth, under the Labor Code Section 6705, Contractor shall provide the following:
 - a. Written and detailed plan covering trench and excavation safety procedures that meets CalOSHA requirements under the Construction Safety Orders Sections 1539-1543.
 - b. Submit a written safety plan reviewed and approved by a registered civil or structure engineer for review and approval prior to the start at work.
 - c. Assign a competent person to supervise trenching and excavation operations when work is being performed.
 - d. The Contractor shall obtain and provide the District a copy of a CalOSHA permit for all trench and excavation operations.
4. The Contractor must provide ladders or a safe access within 25 feet of a work area in trenches 4 feet or deeper.

D. Dewatering

1. During water main excavation and backfill operations, the Contractor shall provide temporary drains, diversion ditches, pumps, cofferdams, or other devices as may be necessary to remove surface water or groundwater from the work area. Unless otherwise specifically permitted by the District, water, either of surface or subsurface origin, will not be permitted in the trenches or in new or existing water mains at any time during construction and until backfilling over the top of the pipe has been completed; nor will the groundwater level in the trench be permitted to rise above an elevation 4" below the invert of the pipe. If trench has been flooded prior to placement of bedding material, the bottom of the native trench shall be compacted to the satisfaction of the District. Special care shall be taken during dewatering to ensure compliance with (Section 01 57 23 - Storm Water Pollution Control Plan).
2. All excavations shall be kept free from water during the time when concrete is being placed and until such time as water will not be detrimental to the finished work. Dewatering trenches, when required, may be accomplished in any manner the Contractor desires, provided the method is acceptable to the District. Any damage resulting from the failure of the chosen method to operate properly shall be the responsibility of the Contractor and shall be repaired in a manner satisfactory to the District, at the Contractor's expense.

E. Structural Clearances

1. Excavation near structures such as catch basins, manholes, and drain inlets shall be sufficient to leave at least 12" between the outer surfaces of the structure and the sides of the excavation.

F. Care of Excavated Material

1. All material excavated from trenches and piled adjacent to the trench, or in a roadway or public thoroughfare, must be piled and maintained in such a manner that the toe of the slope of the excavated material is at least a lateral distance equal to the height of the excavation from the edge of the trench. It shall also be piled so that as little inconvenience as possible is caused to public travel. Free access shall be provided to all fire hydrants, water valves, and meters, and all other conduits shall be kept clean to allow free flow of storm water.

G. Open Trench

1. Unless otherwise directed by the District or stated otherwise on the project drawings, no trench shall be excavated more than 200 feet, nor left unfilled past construction working hours or non-working hours.
2. All trenches in roads, whether located on the project roads or in an easement, shall either be backfilled or plated during non-working hours.

H. Excavation Below Grade

1. Except where unsatisfactory native subgrade material exists, no excavation below the bottom of the water main bedding will be permitted. If, for any reason other than unsatisfactory subgrade, excess material is excavated beyond the limits specified for bedding, such excavation below grade shall be replaced beneath the pipe zone with thoroughly compacted subgrade material at the expense of the Contractor. Unsatisfactory subgrade material shall be removed and replaced as directed by the District.

I. Tree Roots

1. Tree roots two inches or more in diameter at adjacent trees shall not be cut without prior approval of a licensed arborist or the District. Material shall be removed from around root system to avoid damage thereto. Roots shall be protected with burlap wrapping while exposed.

J. Excavation

1. All excavation is unclassified. Work shall consist of performing all excavation operations regardless of the character of subsurface conditions. The Contractor shall make their own evaluation of the type of materials which may be encountered.

K. Excavated Trench Material Disposal

1. Any excess material resulting from trench excavation shall be disposed of offsite by the Contractor own expense in a manner satisfactory to the District. Such excess material may

be deposited on private property if so, requested by the property owner and their approval, proper permits shall be obtained for the pertinent local agencies by the property owner and the Contractor. It is recommended that disposed of materials be recycled wherever possible.

L. Trench Plates

1. When backfilling operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring shall be required to preserve unobstructed traffic flow. Smooth surface plates are not allowed. No more than two (2) trench plates in length will be allowed unless directed by the District.
2. Trench plates shall be A-36 grade steel, non-skid, a minimum of 1-inch thick, and rated for H/20 loading or greater.
3. Tack weld plates together when using multiple plates.
4. Trench plate signage shall be per Section 01 52 00 - Traffic Control Plan.
5. The Contractor shall maintain trench plates at all time and respond to and correct shifting trench plates regardless of the time of day. If the Contractor fails to correct sinking backfill material or shifting trench plates in a timely manner, the District reserves the right to correct the problem at the expense of the Contractor.
6. In the event pending inclement weather or other conditions as determined by the District may adversely affect the use of trench plates, they shall be removed, the excavation backfilled, and the surface secured with temporary asphalt.

3.04 TRENCH BACKFILL

A. General

1. No backfilling shall commence until the pipe has been inspected and approved by the District, until concrete in masonry structures such as thrust blocks or encasement has attained a proper strength, and until required fittings are installed and inspected.
2. In backfilling the trench, the Contractor shall take all necessary precautions to prevent damage or shifting of the pipe. Backfilling from the sides of the trench will be permitted after sufficient material has first been carefully placed over the pipe to such a depth as is acceptable to the District.
3. Any backfill which becomes displaced or depressed during construction or during the warranty period, shall be refilled, shaped, and restored to proper grade as frequently as is necessary until the surface is unyielding, at the Contractor's expense.
4. Placement and compaction operation shall be done in 8" maximum loose lifts unless otherwise specified by the District. Lifts shall be compacted by the use of mechanical means approved by the District. Compaction equipment or methods that produce horizontal or vertical earth pressures, which may cause excessive displacement or may damage the water main or structure, shall not be used. Ponding or jetting of backfill materials will not be

permitted. The trench excavation and adjacent areas shall be backfilled to the grades existing prior to construction.

B. Pipe Embedment Zone Definitions

1. Quarry Fine Bedding shall be defined as the area between the bottom of the pipe and 4" below the bottom of the pipe. Pipe Bedding shall consist of leveling the bottom of the trench and furnishing, placing, and compacting quarry fines or other specified material as shown on the project drawings and as specified herein.
2. Quarry Fine Backfill shall be defined as the area between the pipe, the sides of the trench, and 6" above the pipe. Pipe Backfill shall consist of furnishing, placing and compacting quarry fines above the pipe or other specified material as shown on the project drawings and as specified herein.
3. Bedding and backfill material shall be compacted to 90% relative compaction and placed in three lifts. Quarry fines shall be placed in no more than 6" lifts or as specified here in. Vibratory plate will not be allowed to compact the pipe backfill.

C. Pipe Embedment Zone Lifts

1. **Lift One** – The first lift shall consist of placing 4" of compacted quarry fines to the satisfaction of the District prior to the placement of the pipe. The pipe shall be placed prior to the second lift.
2. **Lift Two** – The second lift shall consist of placing quarry fines around the pipe to the top of the pipe to the satisfaction of the District. The top of the pipe shall be visible prior to the start of compaction for the second lift. Compaction of the backfill around the pipe shall be performed by a pneumatic means such as a "Powder Puff." No other means of compaction tool shall be allowed without prior approval by the District. Contractor shall use extreme care to avoid hitting the pipe and V-Bio polyethylene wrapping while compacting.
3. **Lift Three** – The third lift shall consist of placing and compacting 6" of quarry fines.

D. Pipe Upper Level Zone

1. "Type A" Trench (Paved Surfaces)
 - a. Shall be defined as filling the trench with class 2 aggregate base and compacting it in uniform layers to a relative density of 95%. Temporary pavement of 2" minimum thickness shall be placed and maintained to the satisfaction of the District. Compact temporary pavement per Section 32 10 00 - Paving, Restoration, and Resurfacing. The existing paved surface shall then be replaced with a minimum 6" thickness of asphalt concrete within 30 days of placing temporary pavement.
2. "Type B" Trench (Graveled Areas and Road Shoulders)
 - a. Shall be defined as filling the trench with class 2 aggregate base and compacting it in uniform layers to a relative compaction of 95% to the surface.

3. "Type C" Trench (Unimproved Areas)

- a. Shall be defined as compacting native material removed from the trench in uniform layers to a relative density of 90%. Material removed from the trench shall be deposited at a suitable site acquired by the Contractor or on abutting property if requested by the property owner, in writing.

4. "Type D" (Controlled Density Fill)

- a. Shall be defined as filling the trench with density fill as defined in Section 03 30 00 – Cast in Place Concrete Structures to within 6" minimum of the surface.

5. "Type E" (Drain Rock at Bottom)

- a. Shall be defined as placing $\frac{3}{4}$ " drain rock, as defined in Section 31 80 00, wrapped in filter fabric at 12" thickness layer at the bottom of the trench within 4" minimum of water main.

E. Subgrade

- 1. If the bottom of the trench contains stones or other hard objects which would interfere with the proper placement of bedding material or is unsatisfactory for supporting the pipe, it shall be removed to a depth to be determined by the District and backfilled with bedding material as directed by the District.
- 2. If water is encountered in the trench or the District inspector determines the subgrade below the pipe embedment zone is unstable the Contractor shall excavate and additional 12" and install crashed drain rock. Drain Rock at Bottom shall be defined as placing $\frac{3}{4}$ " drain rock, as defined in Section 31 80 00, wrapped in filter fabric at 12" thickness layer at the bottom of the trench within 4" minimum of water main.

F. Compaction Tests

- 1. The Contractor is responsible achieving the compaction requirements of these specifications. At its discretion the District may perform compaction tests on its own to determine the adequacy of the trench bedding and. Retesting for compaction required by a failing test shall be paid for by the Contractor.

*****END OF SECTION*****

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SECTION 32 10 00 - PAVING, RESTORATION, AND RESURFACING WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work required under this section consists of furnishing all labor, materials, tools, and equipment incidental to placing new asphalt concrete and/or driveway, road restoration. Paving shall include asphalt concrete surfacing and untreated aggregate base course. Paved and gravel roads includes excavation, filling, spreading, and compaction of the filled areas to conform to the lines, grades, and slopes as shown on the drawings. The work also includes furnishing, installing and maintaining temporary paving and trench plates during construction.

1.02 SUBMITTALS

- A. The Contractor shall submit manufacturer data including catalog cuts, drawings and samples, as appropriate, and letter(s) of compliance as required by Section 01 33 00 - Submittals.

PART 2 MATERIALS

2.01 AGGREGATE BASE/SURFACING

- A. Aggregate shall conform to the requirements of Section 26 - Aggregate Bases, of the latest requirements of Caltrans Standard Specifications. Grading requirements shall be for ¾" Class 2 aggregate base.

2.02 ASPHALT CONCRETE

- A. HMA shall be confirm to local agencies Standard and Specification and Section 39 - Asphalt Concrete, of the latest requirements of Caltrans Standard Specifications.

2.03 ASPHALT BINDER

- A. Asphalt binding shall be Grade PG 64-10, per Section 92 - Asphalt Binders, of the latest requirements of Caltrans Standard Specifications.

2.04 TACK COAT

- A. Material for covering all (vertical and horizontal) surfaces of old pavement shall be asphalt emulsion Types SS-1 or RS-1, Section 94 - Asphalt Emulsions, of the latest requirements of Caltrans Standard Specifications.

2.05 TEMPORARY PAVING

- A. Temporary pavement shall consist of 2" of cold mix asphalt over Class 2 aggregate base. The aggregate base shall be equal in depth to the new pavement structural section or more. The aggregate base shall be brought within two (2") inches of the top of the existing pavement and covered with temporary "cold mix" asphalt paving using an SC-250, SC-800 or approved equal. All temporary surfacing shall be installed the same day as backfilling and shall be level with existing paving.

2.06 SLURRY SEAL

- A. Slurry seal shall be Type II conforming Section 37 - Bituminous Seals, of the latest requirements of Caltrans Standard Specifications.

2.07 STRIPING AND PAVEMENT MARKINGS

- A. Striping and pavement markings shall be thermoplastic per Section 84 – Markings, of Caltrans Standard Specifications.
- B. Striping shall be placed in a continuous operation. The Contractor shall ensure there is enough material to prevent any stopping during placement. No overlapping of striping material or markings is permitted.

PART 3 EXECUTION

3.01 AGGREGATE BASE COURSE

- A. The aggregate base course shall be spread and compacted on the prepared subgrade. The base course material shall be placed in 6-inch max compacted layers and shall be compacted to a minimum relative density of 95%, or for water main work be spread and compacted as described under Section 31 80 00 - Trench Excavation, Bedding, and Backfill.

3.02 AGGREGATE SURFACING COURSE

- A. Gravel road surfacing shall be an aggregate course applied to the base course after compaction in the same manner as specified for the aggregate base course. The surface course shall be placed in one layer. Special care shall be taken to maintain crown or slope for drainage.

3.03 TACK COAT

- A. Apply tack coat to all horizontal and vertical surfaces of existing pavement and to vertical surfaces of curbs, gutters, conforms, and construction joints before placing asphalt concrete on or against them, at the rate of 0.10 gallons per square yard.

3.04 TEMPORARY PAVING

- A. Temporary paving shall be installed over all trenches to a thickness of 2-inches. Temporary paving shall be installed on the same day as acceptable trench compaction is obtained and base material installed and shall be smoothed out using a vibratory plate or other means approved by the District. No tire/wheel rolling compaction will be allowed. Temporary paving shall be maintained on a daily basis until permanent paving is installed. The final paving operation shall occur within 30 days of placing temporary paving.

3.05 ASPHALT CONCRETE

- A. Asphalt concrete shall be placed in accordance with local agencies Standard and Specifications and Section 39 - Asphalt Concrete, of the latest requirements of Caltrans Standard Specifications for method compaction.

1. Minimum Temperature: The minimum temperature of asphalt concrete delivered to the site shall be at least 250° F, and no more than 370° F.
2. Lift Thickness: Where the total thickness of asphalt concrete to be placed is greater than 3", place in lifts of equal thickness, none of which shall exceed 3".

3.06 SLURRY SEAL

- A. Slurry seal shall be placed in accordance with Section 37 - Bituminous Seals, of the latest requirements of Caltrans Standard Specifications. Slurry seal shall be fully cure prior of placing traffic striping/markings.

3.07 TRAFFIC STRIPING

- A. Traffic striping shall be placed, per the City of South San Francisco, City of Foster City and/or County of San Mateo requirements, minimum two weeks after placing slurry seal, and shall comply with Section 84 – Markings, of the latest requirements of Caltrans Standard Specifications. All damaged striping and reflectors shall be replaced in kind to duplicate, insofar as possible, pre-construction striping. Cat track shall be approved by the City/County prior to placing any striping and/or marking.

3.08 DAMAGE REPAIR

- A. The Contractor shall be responsible for any damage to existing infrastructures such as curbs, gutters, sidewalks, driveways and any asphalt concrete, liquid asphalt or asphaltic emulsion stains occurring during the course of this Contract. Stains shall be cleaned by sandblasting or any other method satisfactory to the District.

*****END OF SECTION*****

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SECTION 33 14 10 - ABANDONMENT OF EXISTING WATER MAIN AND FACILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing all necessary labor, materials, tools, equipment, and services necessary to abandon existing water main facilities as specified herein.
- B. Where indicated on the plans, existing water mains and valves shall be abandoned after completion and acceptance of the work.

PART 2 MATERIALS

2.01 AGGREGATE BASE

- A. Aggregate base shall be as specified in Section 31 80 00 - Trench Excavation, Bedding and Backfill.

2.02 PAVEMENT REPLACEMENT

- A. Paving replacement materials and methods shall be as specified in Section 32 10 00 - Paving, Restoration and Resurfacing Work.

PART 3 EXECUTION

3.01 ABANDONMENT OF EXISTING WATER MAIN & FACILITIES

- A. The procedure described herein shall apply, as applicable, to all water mains and appurtenances designated for abandonment.
 - 1. This work shall not be done until the new water main has been successfully tested and is in operation. All work shall be coordinated with the District.
 - 2. Remove existing fire hydrants by cutting 18-inches below grade and concrete cap the pipe as shown on the plans after new hydrant assemblies have been installed and tested. Deliver the removed hydrants to the District's corporation yard. Stand pipes shall become the property of the Contractor. Remove any hydrant marker posts for abandoned hydrants.
 - 3. Remove valve boxes (but not extensions of those boxes) and covers on valves located on mains, and fire hydrant runs, to be abandoned. Remove any valve marker posts for abandoned valves.
 - 4. Remove existing meters and their respective boxes. Meters are to be delivered to the District's corporation yard. The abandonment and removal of the existing meter box shall include removal of the angle meter stop and crimping the copper line within 2-feet of the meter box.
 - 5. Services on live water mains shall be abandoned at the water main by installing a Smith-Blair stainless steel clamp as directed by District.

6. At the discretion of the District, the existing meter boxes, angle meter stops, and copper segments shall be salvaged and delivered to the District's yard.
7. The new meter box for the service and/or PRV shall be installed after the abandonment and removal of the existing copper line and angle meter stop.
8. At the discretion of the District, the existing meter boxes, angle meter stops, and copper segments shall be salvaged and delivered to the District's yard.
9. All other appurtenances within the box such as the angle meter stop and copper piping after abandonment shall be delivered to the District's yard at the same time as the salvaged meter boxes.
10. Cut, drain, and plug both ends of all existing mains and tees that are to be abandoned. The existing water main shall be drained until no water is visible within the pipe. Mains shall be plugged or capped with fittings approved by District.
11. Backfill shall be in accordance with Section 31 80 00 - Trench Excavation, Bedding and Backfill.
12. Restore paved surface as specified in Section 32 10 00 - Paving, Restoration and Resurfacing Work.
13. All abandoned facilities shall be water-tight.
14. Contractor shall use due care when working with asbestos cement pipe and shall comply with all applicable laws and regulations regarding such work. When cutting asbestos cement pipe, Contractor shall ensure that adequate means are used to protect its workers and the environment against asbestos exposure. Asbestos cement pipe shall not be cut with a saw or comparable dust-generating tool, unless adequate encapsulation is provided. Asbestos cement pipe removed by the Contractor's operations shall become his property and be properly bagged and disposed of in an approved manner as required by federal, state, and local regulations.

*****END OF SECTION*****

SECTION 33 14 13 – WATER MAIN

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing and installing all water main piping, fittings and appurtenances shown on the project drawings and as specified herein.
- A. All water mains, including hydrant runs and tie-ins, shall be constructed entirely of Class 350 Ductile Iron restrained fittings and pipe; wrapped in low density V-Bio polyethylene film. Where the corrosion is an issue, as directed by the District, water mains, including hydrant runs and tie-ins shall be constructed entirely of Polyvinyl Chloride (PVC) pipe; marked with No. 8 standard tracer wire. In some cases, the District may require existing soil to be tested prior to any construction and/or design.

1.02 SUBMITTALS

- A. The Contractor shall submit manufacturers' data including catalog cuts, drawings and samples, as appropriate, and letter(s) of compliance as required by Section 01 33 00 - Submittals.

PART 2 MATERIALS

2.01 DUCTILE IRON (DI) PIPE

- A. General
 - 1. Ductile iron pipe shall conform to ANSI A21.50 and A21.51 (AWWA C150 and C151) and shall be Pressure Class 350.
- B. Joints
 - 1. Buried pipe and pipe fittings shall all have restrained push-on joints ("Field Lok,"), specified otherwise. At fittings and tie-ins, pipe shall have restrained push-on joints or mechanical joints (mega-lugs). Mechanical joints may be used for closures, subject to meeting thrust restraint requirements. Flanged ends, or plain ends with restrained couplings, shall be used for piping above ground.
 - 2. For mechanical joints, dimensional and material requirements for pipe ends, glands, bolts, nuts and gaskets shall conform to ANSI A21.11 (AWWA C111).
 - 3. For flanged joints, ends of pipe and fittings shall be provided with ductile iron flanges conforming to ANSI A21.10 and A21.15 (AWWA C110 and C115), as applicable. Bolts, nuts, and gaskets for flanged connections shall conform to ANSI B16.1 and as specified in Section 2.08 - Hardware. All flanged connections shall use "Ring Flange-Tyte" gaskets as manufactured by U.S. Pipe capable of withstanding pressures up to 350 psi.
- C. Fittings

1. Fittings shall be ductile iron conforming to ANSI A21.53 (AWWA C153) with push-on joint bell design to fit the particular make of the pipe furnished or to fit a pipe-to-fitting adapter unless specified on the plans. Fittings shall have a pressure rating at least equivalent to that of the pipe used.

D. Coating and Lining

1. Buried ductile iron pipe, sleeves and fittings shall be asphalt seal-coated and cement-mortar lined. The lining shall conform to the Standard Specifications of AWWA C104. All above ground fittings and couplings shall be fusion epoxy lined and coated.

E. V-Bio Polyethylene Encasement

1. All buried ductile iron pipe and fittings shall be wrapped in low density V-Bio polyethylene in accordance with AWWA C105, Method A. The tape used to secure the encasement shall be black polyethylene pipe wrap tape, minimum 10 mil thick. No other tape is allowed.

F. Pipe End Caps During Transport / Storage

1. The interior of all pipe, fittings, and other accessories shall be kept clean and free from organic matter at all times. All pipes shall be delivered to the construction site with end caps on both ends. End cap components must adhere sufficiently to withstand the stresses caused by wind during shipment. Pipes delivered on-site with damage shall be immediately field cleaned to remove all undesirable material along the entire length of the pipe interior. New end caps shall be installed after cleaning.
2. Cut pipe lengths of 5.0 feet or less, fittings, and valves do not require end caps but shall be field cleaned prior to installation.

2.02 PVC PIPE

A. General

1. PVC water mains shall conform to the applicable requirements of latest AWWA C900. Pipes shall be DR 14 pressure class 305 with a DI pipe equivalent outside diameter. Maximum length of each section of pipe between elastomeric rings shall be twenty (20) feet.

B. Joints

1. Buried pipe and pipe fittings shall all have internally restrained push-on joints, unless shown otherwise on the drawings or specified otherwise. At fittings and tie-ins, pipe shall have restrained push-on joints or mechanical joints (mega-lugs). Plain ends with restrained couplings, shall be used for piping above ground.
2. For mechanical joints, dimensional and material requirements for pipe ends, glands, bolts, nuts and gaskets shall conform to latest ANSI A21.11 (AWWA C111).
3. For flange joints with adapters, ends of pipe and fittings shall be provided with flange couplings. Bolts, nuts, and gaskets for flanged connections shall conform to ANSI B16.1 and as specified in Section 2.08 - Hardware. All flanged connections shall use "Ring Flange-Tyte" gaskets as manufactured by U.S. Pipe capable of withstanding pressures up to 350 psi.

C. Fittings

1. Fittings for use on C900 PVC shall be DI conforming to the applicable requirements of latest ANSI A21.53 (AWWA C153). Joints shall be restraint (mega-lug). All bolt-up sets (nuts, bolts and washers) and tie rods for buried valves and fittings shall be stainless steel, ASTM A-276 type 316L. Isolated fitting and associate adjacent restraints shall be cathodically protected per Section 13 47 13 – Galvanic Anode Cathodic Protection System.

D. Coating and Lining

1. Buried and/or above ground DI fittings and sleeves shall have all internal and external ferrous surfaces coated with a fusion bonded epoxy coating of 10 mils nominal thickness. The coating shall conform to latest AWWA C116.

E. Pipe End Caps During Transport / Storage

1. The interior of all pipe, fittings, and other accessories shall be kept clean and free from organic matter at all times. All pipes shall be delivered to the construction site with end-covers on both ends. End-cover components must adhere sufficiently to withstand the stresses caused by wind during shipment. Pipes delivered on-site with damage shall be immediately field cleaned to remove all undesirable material along the entire length of the interior of the pipe. New end covers shall be installed after cleaning.
2. All pipe to be used for water main installation located in the storage area, staging area, or left overnight prior to installation shall have the ends of the pipes covered with plastic (visqueen) and secured with tape to keep the pipe free of debris and dirt.
3. Cut pipe lengths of 5.0 feet or less, fittings, and valves do not require end-covers but shall be field cleaned prior to installation.

2.03 THRUST RESTRAINTS

A. Push-On Joint Locking Gasket

1. The locking gasket type restrained joint shall consist of stainless steel locking segments molded into the gasket that shall grip the spigot end of the pipe to prevent joint separation. This restrained joint system shall be "Field Lok", manufactured by U.S. Pipe for DI pipe and "RieberLok" manufactured by McWane for PVC pipe or equivalent.

B. Mechanical Joint Restraint

1. Mechanical joint fittings shall be EBAA Iron "Megalug". Bolts, nuts, and washers shall be low alloy (Corten).
2. Wedge gaskets shall be used with all mechanical joints. Standard mechanical joint gaskets are not allowed.

2.04 THRUST BLOCKS

- A. Concrete thrust blocks are optional except where required on the drawings. Thrust blocks shall be constructed per Standard Drawings.

2.05 PIPE CONNECTORS

A. Flexible Couplings

1. Flexible couplings shall be Macro HP Extended Range manufacturer by Romac Industries Inc. Flex coupling must conform to latest AWWA C-219, with type 316 bolts, nuts, and washers.

B. Flanged Coupling Adapters

1. Flanged coupling adapters shall be EBAA 2100 adapter. Flanges, spools and sleeves shall be high strength ductile iron with Type 316 stainless steel bolts, nuts, and washers.
2. Flange gaskets shall conform to Section 2.01 – Ductile Iron Pipe, Sub-Section 2, Joints and Section 2.02 – PVC Pipe, Sub-Section 2, Joints.

C. Tapping Sleeves

1. Tapping sleeves shall be JMC 6432 all Type 316 stainless steel body, mechanical joint. Bolts, nuts, washers and associated hardware not part of a mechanical joint assembly shall be plated. No tapping sleeves shall be used for asbestos cement pipe.

2.06 HARDWARE

- A. All bolts, nuts and washers, and restraining tie rods and associated hardware, used with flanged fittings, couplings and appurtenances shall be Type 316 Steel for all buried and exposed applications. All bolts shall be furnished with finished hexagonal nuts. The dimensions of all heads and nuts shall be not less than those required for the American Standard regular, and the height shall be sufficient to break the bolt in the body portion when tested. Threads shall be American Standard screw thread, coarse thread series.
- B. Type 316 Steel bolts and nuts hardware shall be used one time per application. Reusing Type 316 Steel hardware is not permitted.
- C. Mechanical joint hardware EBAA shall be high strength, low alloy (Corten).

2.07 TUBING AND FITTINGS

- A. Copper tubing and fittings used for service connections and reconnections shall be Type K, soft, and conform to ASTM 88.

2.08 MARKER TAPE FOR BURIED PIPING

- A. Marker tape shall be metallic foil bonded to plastic film not less than 2-inches wide. The adhesive shall be colored and be compatible with the foil and film. Film shall be inert polyethylene plastic with thickness not less than ten (10) mil.
- B. The buried utility line tape shall be identified with an appropriate imprint such as "Caution: Water Main Below" and the identification repeated at approximately 24-inch intervals. Letters shall be 3/4-inch high minimum. The tape shall have a blue imprint.

- C. Marking and warning tape shall be as manufactured by Calpico, Inc., Lineguard, Inc., Allen Systems, Inc., Paul Potter Associates, all of Wheaton, Illinois, or Reef Industries, Houston, Texas, or equivalent.

2.09 TRACER WIRE

- A. Tracer wire shall be No. 8 AWG, standard copper THWM, 600 volts with solid blue insulation.

PART 3 EXECUTION

3.01 TRENCH EXCAVATION, BEDDING AND BACKFILL

- A. Trench excavation, bedding and backfill work shall be performed in accordance with Section 31 80 00 - Trench Excavation, Bedding and Backfill, per the Standard Drawings.

3.02 EXISTING UTILITIES AND STRUCTURES

- A. The locations of underground utilities and drainage facilities, where shown on the project drawings, are approximate only. It is the Contractor's responsibility to determine the exact locations of all existing utilities. Where existing culverts, underground facilities, under-ground structures, power, telephone or guy poles or guy wires interfere with construction, the Contractor shall be responsible for coordinating with the appropriate utility companies before removing or relocating any interfering utilities providing that the interfering utilities are shown on the drawings or are visible above grade.

3.03 HANDLING AND DISTRIBUTION OF MATERIALS

- A. Pipe and appurtenances shall be stored in a manner to avoid damage to the materials and to linings and coatings.
- B. The pipe shall be inspected before laying for cracked, broken, or defective pieces. Pipe sections shall be carefully lowered into the trench to prevent damage using padded blocking or cables. All dirt or other foreign matter shall be removed from inside the pipe before lowering into the trench and shall be kept clean during installation. The Contractor shall replace all damaged pipe.

3.04 INSTALLATION OF BURIED PRESSURE PIPING

- A. General
 - 1. Pipe, fittings, and appurtenances shall be installed in accordance with the manufacturer's instructions and in accordance with the latest AWWA C600 for DI pipe and AWWA C605 for PVC pipe.
 - 2. The Contractor shall furnish such parts and pieces as may be necessary to complete the fixtures and apparatus in accordance with best practices of the trade and to the satisfaction of the District.
- B. Handling
 - 1. The pipe shall be protected to prevent entrance of foreign materials during installation.

2. All pipe and fittings shall be carefully examined for defects, and no piece shall be installed which is known to be defective. Special care shall be taken to avoid leaving bits of wood, dirt, or foreign particles in the pipe.
3. All pipe and fittings shall be carefully handled at all times and at no time while loading, unloading, moving, or installing any lined pipe and fittings shall be dropped. All pipe and fittings shall be handled by mechanical means. Wye belt sling shall be used for all coated pipe.

C. Alignment

1. Piping shall be installed as indicated on the project drawings. Where not detailed, exposed pipe shall be installed in straight horizontal and vertical runs parallel to the axis of the structures.
2. Parallel runs of pipe shall be grouped and kept uniformly parallel. Bends and fittings shall be properly located to maintain uniform spacing and elevation of pipe groups at changes of direction and at branch connections.
3. All pipe shall be carefully placed and supported, and proper lined and grade. Minor adjustments may be necessary to avoid architectural and structural features. Major relocations shall be approved by the District.
4. Project drawings are diagrammatic for piping that is not shown in detail. Size of piping and their location are indicated, but it is not limited to show every offset and fitting nor every structural difficulty that may be encountered during the installation for the work. The pipe alignment shall be varied from indicated on the project's drawings without extra expense to the District where necessary to complete the fixtures and apparatus in accordance with the best practice of the trade and to the satisfaction of the District.
5. The allowable angle of deflection at any joint shall not exceed the amount recommended by the pipe, or coupling, manufacturer for the particular pipe size used.
6. A minimum 3 foot homogeneous length of pipe shall be installed before and after any fitting, valve or other appurtenance. Any sections less than 3 feet will not be permitted.
7. Trench Dams shall be placed on new water main alignments where slopes exceed 15% or as directed by the District and shall be placed every 100' in accordance with the Standard Drawings.

D. Valves

1. Valves shall be set with the stems upward and in vertical position, unless indicated otherwise on the drawings. The Contractor shall not operate existing District valves at any time.

E. Joints

1. Pipe shall be assembled and joined in accordance with the manufacturer's published instructions for the type of pipe and joint used. All portions of the joints shall be thoroughly cleaned before the sections of pipe are assembled. The ends of each pipe shall abut against

the next pipe section in such a manner that there will be no unevenness of any kind along the bottom half of the interior of the pipe.

2. Where mechanical joints are used with ductile iron pipe, the pipe shall be marked in such a manner that it can be determined after installation that the pipe is properly seated.

F. Pipe Plugs

1. When pipe laying is not in progress, the open ends of the installed pipe shall be closed with a water tight plug. The plug shall be fitted with means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation if the trench fills with water.

G. Thrust Resistance

1. Restrained joints shall be provided on all joints, at all bends, vertical bends, tee branches, and dead ends for ductile iron pipe.
2. Concrete thrust blocks shall be cast between undisturbed ground and the fitting to be anchored as shown on Standard Drawings. Blocks shall be poured so that the pipe and the fitting will be accessible for repairs.
3. Restraints must be used throughout the full length of any DI and/or PVC pipe installed in a casing to the nearest fitting on each side of the casing (i.e., the casing installation does not provide effective thrust resistance.
4. Where restraints are used, the manufacturer's written instruction for installation shall be followed.

H. Encasement for Ductile Iron Pipe and Fittings

1. Installation of 8-mil V-Bio polyethylene encasement for ductile iron pipe and fittings shall be in accordance with ANSI/AWWA C105/A21.5-05 Method A.
2. Ductile iron pipe and fittings shall be encased with the encasement prior to placement in the trench. Encasement shall be cut approximately 2 ft. longer than the length of the pipe. It shall be slipped around the pipe, centering it to provide a 1 ft. overlap on each adjacent pipe section and bunching it in an accordion-fashion lengthwise until it clears the pipe end.
3. After assembling the pipe joint, the overlap of the encasement from the proceeding shall be pulled over to the new length of pipe and secured in place. Then, the overlap end of the encasement from the new pipe section shall be slip over to the preceding pipe and secured in place. Installation of the next section of pipe shall be in the same manner.
4. The excess encasement along the length of the pipe shall be folded back and secured at quarter points. The slack of the pipe shall be snug but not tight.
5. Cuts, tears, punctures, or other damage to the encasement shall be repaired with adhesive tape or with a short length of encasement sheet wrapped around the damaged area.
6. Bends, reducers, offsets, and other pipe shaped appurtenances shall be covered with encasement in the same manner as the pipe.

I. Installation of Marker Tape

1. Install tape in backfill directly over each water main, as shown on the Standard Drawings.

J. Installation of Tracer Wire

Standard tracer wire No. 8 shall be taped to PVC and DI pipe every six feet (6') along top center axis.

K. Corrosion Protection

1. Corrosion protection for buried metallic fitting and appurtenances located where the corrosion is an issue or anywhere else with known corrosive soils as directed by the District shall be used per Section 13 47 13 - Galvanic Anode Cathodic Protection System.

L. Disinfection

1. Disinfection of the water main shall be supervised by the District. The Contractor shall not disinfect the water main until they have coordinated with the District.
2. Disinfection of water main shall be in accordance with latest ANSI/AWWA C651.
3. Prior to construction, Contractor shall submit disinfection plans and material information for the District review and approval, per Section 01 33 00 – Submittals.
4. Filling and contact time shall be per AWWA C651. When installation is completed, the water main shall be filled with water at a rate to ensure the water within the water main will flow at a velocity no greater than 1 ft/sec (0.3 m/sec). Precautions shall be taken to ensure air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 F (5 C), the water shall remain in the water main for at least 48 hours.

M. Bacteriological Test

1. Standard conditions:
 - a. After the final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new water main. At least one set of samples shall be collected from every 1,200 ft of the new water main, plus one set from the end of the line and at least one set from each branch. Samples shall be tested for bacteriological (chemical and physical) quality in accordance with the most recent *Standard Methods for the Examination of Water and Wastewater* (AWWA, 6666 W. Quincy Avenue, Denver, CO 80232, (303) 794-7711, APHA, 800 I Street, NW, Washington, DC 20001, (202) 777-2742, or WEF, 601 Wythe Street, Alexandria, VA 22314-1994, (800) 666-0203). Water shall show absence of coliform organisms, and the chlorine residual shall be within 0.4 mg/l of the chlorine residual of the water being used to fill the new water main and HPC count shall be less than 500 colony-forming units (cfu) per ml. If the first sample test fails the District will require additional tests to find the turbidity, pH, and a standard heterotrophic plate count (HPC) level.

2. Special conditions:

- a. If excessive quantities of dirt, debris, or trench water have entered the new water main, bacteriological samples shall be taken at intervals of approximately 200 ft or as directed by the District. Additional samples shall be taken of water that stood in the new water main for at least 16 hours after final flushing has been completed.

3. Sampling Procedure:

Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate, as required by *Standard Methods of the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples without prior approval from the District. If no other sampling ports are available, a well-flushed fire hydrant with a hose bib may be used with the understanding they do not represent optimum sampling conditions. A corporation-stop with a copper standpipe assembly or a temporary combination blow-off assembly may be used for sampling the new water main. The sampling pipe must be dedicated and clean, disinfected and flushed prior to sampling. There should be no water in the trench up to the connection for sampling. All samples shall be delivered to the lab within 8 hours after collection.

4. Sample Results.

- a. If sample results from the lab indicate a measured coliform organism and/or HPC greater than 500 colony-forming units (cfu) per mL, flushing should be resumed and another coliform and HPC set of samples should be taken until no coliform are present and the HPC is less than 500 cfu/mL.

5. Record of Compliance.

- a. The record of compliance shall be the bacteriological test results certifying the water sampled from the new water main is free of coliform bacteria contamination.

6. Re-disinfection

- a. If the initial disinfection fails to produce satisfactory bacteriological results, the new water main shall be re-flushed, re-chlorinated, and re-sampled at the expense of the Contractor. If check samples also fail to produce acceptable results, the water main shall be re-chlorinated until satisfactory results are obtained – that being two consecutive sets of acceptable samples taken 24 hours apart.

N. Tie-ins

1. Final connection to existing water main shall be in accordance with latest ANSI/AWWA C651.
2. Water main and all appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. The new pipe, fitting, and valve(s) required for the

connection shall be swabbed with a minimum 1-5% solution of chlorine just prior to installation.

3. District shall be notified at least 2 working days in advance of any scheduled tie-ins.
4. No tie-ins, or shutdowns, will be allowed on Fridays or the day preceding a holiday.
5. No shutdown shall exceed 6 hours in duration.
6. The Contractor shall designate a person to contact should trench maintenance or other problems arise during non-working hours or days. The District shall be given that person's name and phone number.

3.05 INSTALLATION OF ABOVE GROUND EXPOSED PRESSURE PIPING

A. General

1. Pipe, fittings, and appurtenances shall be installed in accordance with the manufacturer's specifications and related section 3.04 of these Standard Specifications or as directed by the District.

B. Exposed Pipe

1. Extreme care shall be taken to ensure watertight joints. All pipe shall be free of all dirt and grease to secure a tight bond with concrete or waterproof material.
2. Metallic pipe shall be coated with fusion epoxy bound.

3.06 CASING

A. Fittings

1. Field locks shall not be used on the first fittings on the pipe coming out of the steel casing.

3.07 ACCEPTANCE TESTS FOR PRESSURE PIPING

- A. All newly installed sections of pressure piping including but not limited to service connections shall be pressure and leak tested as described herein. Testing procedures shall be in accordance with the requirements of latest AWWA C600 for ductile iron pipe and latest AWWA C605 for PVC pipe as modified herein. The tests may be run simultaneously at the Contractor's option.
- B. For buried pressure water mains, tests shall be made on sections not to exceed 2500 feet in length. All necessary equipment, material and labor required shall be furnished by the Contractor. The District will monitor all testing operations. Testing against new valves is permitted at the Contractor's risk. No testing is permitted against existing system valves.
- C. Tests can only occur after the trench has been backfilled.
- D. The test pressure shall not be less than 1.25 times the stated working pressure of the water main measured at the highest elevation along the test section and not less than 1.5 times the stated working pressure at the lowest elevation of the test section. The test pressure in the main shall be maintained for a period of 2 hours. The test pressure shall not vary by more than

±5 psi for the duration of the test. The water required to maintain the test pressure within the allowance pressure loss shall be measured by means of a graduated barrel, drum or similar device at the pump suction.

- E. No leakage shall be permitted for exposed piping.
- F. Allowable leakage for buried pipe shall be as follows:

$$L = \left(\frac{SD\sqrt{P}}{148,000} \right) \times 2$$

L = testing allowance (makeup water) (gph for 2 hours)

S = length of pipe tested (ft)

D = nominal diameter of the pipe (in.)

P = average test pressure during the hydrostatic test (psi [gauge])

Allowable Leakage for DI/PVC (gal/1000 ft./2 hrs.)

Test Pressure	6-inch	8-Inch	10-Inch	12-Inch
150 psi	0.99	1.32	1.66	1.99
175 psi	1.07	1.43	1.79	2.15
200 psi	1.15	1.53	1.91	2.29

- G. Should testing disclose leakage in excess of that required in the preceding table, defective joints or pipe shall be located, repaired and retested until satisfactory at no additional cost to the District.

3.08 FLUSHING AND DECHLORINATION

- A. Flushing and dechlorination of the water main shall be supervised by the District. The Contractor shall not flush or dechlorinate the water main until they have coordinated with the District.
- B. A Storm Water Pollution Control Plan must be approved by the District prior to any flushing or draining of the new/abandoned water main, fire hydrants, reconnects.
- C. Prior to any flushing, the Contractor shall install and secure BMP's at storm drain inlets/catch basins. Repair, replace, and secure BMP's if needed before proceeding with the flushing operation.
- D. A flushing sock shall be installed to treat chlorinated water with dechlorination tablets.
- E. All foreign matter shall be flushed from the water main prior to disinfection. Hoses, temporary piping, or other devices shall be provided to dispose of flushing water without damage to adjacent properties. An approved backflow device shall be used when flushing and filling newly-constructed mains.

- F. Following chlorination, all treated water shall be flushed from the mains until the replacement water shall, upon testing, both chemically and bacteriologically, be proven equal to the water quality at the point of supply. Chlorination shall be repeated, if necessary, by the Contractor if the replacement water does not prove equal to the water quality at the point of supply. Actual testing of the bacteriological water sample for chlorine residual shall be conducted by District personnel.
- G. A disposal plan of chlorine-water mixture shall be submitted to the District 5 working days in advanced for review. Upon approval of the disposal plan by the District, the Contractor may proceed with disposal of the chlorine-water mixture per Section 01 57 23 – Storm Water Pollution Control Plan\Erosion Control.
- H. The Contractor shall not allow the treated water to discharge onto open surface or waterway without adequate dechlorination or other satisfactory method of reducing the chlorine concentration to zero.

3.09 CUTTING AND DISPOSAL OF EXISTING ASBESTOS CEMENT PIPE

- A. Contractor shall use due care when working with asbestos cement pipe and shall comply with all applicable laws and regulations regarding such work. When cutting asbestos cement pipe, Contractor shall ensure that adequate means are used to protect its workers and the environment against asbestos exposure. Asbestos cement pipe shall not be cut with a saw or comparable dust-generating tool, unless adequate encapsulation is provided. Asbestos cement pipe removed by the Contractor's operations shall become his property and be properly bagged and disposed of in an approved manner as required by federal, state, and local regulations.

*****END OF SECTION*****

SECTION 33 14 20 - VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included under this section consists of furnishing and installing valves and appurtenances as shown on the Standard Drawings and as specified herein.

1.02 SUBMITTALS

- A. The Contractor shall submit manufacturer's data including catalog cuts, drawings and letter(s) of compliance as required by Section 01 33 00 - Submittals.

PART 2 MATERIALS

2.01 GENERAL

- A. Brass goods furnished under this section shall be new and unused. All fittings shall conform to latest ANSI/AWWA Standard C800.
- B. All brass components in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of .25% by weight. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved. Brass saddles shall be made from CDA/UNS C83600.
- C. All fittings shall be stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified above.

2.02 GATE VALVES

- A. Gate valves shall be Mueller A-2362 and have either flanged or mechanical joint ends as shown on the Standard Drawings. The valve shall be resilient seat and fully comply with the latest AWWA C509, and also be UL listed and FM approved. The valves shall be tested and certified to ANSI/NSF 61.
- B. The valve shall have a 250psig working pressure. Each valve shall be factory seat tested to 250psig and shell tested to 500psig. Buried valves shall be NRS (non-rising stem), equipped with a 2-inch square bronze operating nut (open left), and have an arrow cast on the operating nut opening direction. The bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with valve wrench operation.
- C. All main line valves shall be 8" or larger in diameter and shall have flanged or mechanical joint ends (on PVC or DI pipes) or push-on with FieldLok (on DI pipes). Valves smaller than 8" shall require prior written approval by the District. Flanges shall be dimensioned, faced and drilled in accordance with ANSI B16.1 for Class 125 unless stated otherwise on the drawings or the specifications. All necessary caulking materials, gaskets, bolts, and nuts shall be provided. All valves shall be protected from damage before installation and until completion of work.
- D. All buried valves shall be furnished with Type 316 stainless steel valve stem packing and bonnet bolts. All external flanged bolts, nuts and washers for all valves shall be Type 316 stainless

steel. Corten T-bolts are allowed on mechanical joints. The valves shall have Type 316 stainless steel bolts and nuts for the stuffing box and bonnet.

- E. The valve stem shall be made of ASTM B98-C66100/H02 (Everdur) bar stock material. The stem shall have at least one “anti-friction” thrust washer above and below the stem collar to reduce operating torque. The design of the NRS valve stem shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool. The stem material shall provide a minimum 70,000psi tensile strength with 20% elongation and yield strength of 38,000psi. Valves with two-piece stem collars are unacceptable.
- F. The NRS valves shall have a stuffing box (with dirt seal) that is o-ring sealed. Two o-rings shall be placed above and one o-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the o-rings from the waterway and from outside contamination providing permanent lubrication for long term ease of operation. Valves without a stuffing box are unacceptable. Valves without at least three stem o-rings are also unacceptable.
- G. The valve disc and guide lugs must be fully (100%) encapsulated in EPDM. The peel strength shall not be less than 75 pounds per inch. Guide caps of an Acetal bearing material shall be placed over solid guide lugs to prevent abrasion and to reduce the operating torque. Guide lugs place over bare metal are not acceptable.
- H. The valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mils nominal thickness. The coating shall conform to AWWA C550.
- I. The valves shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture. The manufacturing facility for the valves must have current ISO certification.

2.03 GATE VALVE EXTENSION

- A. Gate valve extension is required on any valve nuts installed more than 3’ below finished grade. Gate valve extension shall be ProSelect, PS4000 series with centering plate.
- B. The Contractor shall have various sizes of valve extension on hand to accommodate varying field conditions. The extension length selected shall be such that the top of extension nut is installed at least 18-inch but no more than 20-inch below the finished grade

2.04 HYDRANTS

- A. Hydrants shall be Clow 960 (wet barrel) with Clow Valve model LB400 break-off check valve assembly. The break-off check valve assembly shall have Type 316 stainless steel bolts and nuts between the body and extension/riser.
- B. Hydrants shall have two 2½-inch outlets and one 4½-inch pumper outlet. Hydrants shall have a 6-inch flanged inlet per the Standard Drawings.

- C. The Contractor shall have various sizes of hydrant buries on hand to accommodate varying field conditions. The bury length selected shall be such that the bottom of the break-off flange is at least 1-inch but no more than 4-inch above the finished grade.
- D. Hydrants and all metal above the concrete collar shall be factory painted "safety yellow" using Ellis priming V17500 and semi-gloss high solids polyurethane P29 direct to metal paint as manufactured by Ellis. Contractor shall submit a color sample for review.
- E. All bolts, nuts and washers, and restraining tie rods and associated hardware, used with flanged fittings, couplings and appurtenances shall be Type 316 stainless steel.

2.05 COMBINATION AIR VALVES

- A. Combination air valves shall be capable of positive action in releasing air accumulations in water mains under full line operating pressure and shall vent or exhaust air during filling and draining operations. Valves shall be of the size and pressure rating indicated on the project drawings or if not so indicated shall be 1-inch with a $\frac{5}{64}$ -inch orifice and simple type lever, rated for operation at 300 psi minimum for water main 8-inch and smaller, and 2-inch with a $\frac{3}{32}$ -inch orifice and simple type lever, rated for operation at 300 psi minimum for water main 10-inch and larger. Combination air valve shall be A.R.I. D-040.

2.06 METER VALVES AND COUPLINGS

- A. All service fittings shall be certified as suitable for contact with drinking water by an ANSI accredited organization in accordance with ANSI/NSF Standard 61, Drinking Water Systems Components – Health Effects.
- B. Compression ball angle meter valves shall be angle pattern, with lock wing. Compression ball angle meter valves for 5/8" and 1" meter connections shall be Mueller B-24258N. Compression ball angle meter valves for 1-1/2" and 2" meter connections shall be Mueller B-24276N.
- C. When a 5/8" meter is being installed, Ford A-13-NL and/or Ford A-14-NL meter adapters shall be installed on the inlet and/or outlet sides of the meter.
- D. Meter couplings shall be Mueller H-10871N (insulated).
- E. Residential ball valve shall be Red White 5044AB
- F. When the customer's water service is PVC, Mueller V-15442 (female) or V-15440 (male) Pack Joint connection shall be used.

2.07 CORPORATION STOPS

- A. Corporation stops shall be Mueller N-35008N (insulated), with inlet AWWA taper thread and outlet compression connection for 5/8" and 1" service.
- B. Corporation stops shall be Mueller B-20045N on a 1" combination air valve.
- C. Corporation stops shall be Mueller N-35008N on a 1½" to 2" service connection.
- D. Corporation stops shall be Mueller B-20045N on a 2" combination air valve.

2.08 SERVICE SADDLES

- A. Service saddles shall be bronze with neoprene gaskets with double bronze straps, Mueller No. BR2B "CC" for DI pipe and Mueller No. BR2S "CC" for PVC pipe, sized for the exact outside diameters of the pipes on which they will be installed.

2.09 BLOWOFF ASSEMBLY

- A. Blowoff assembly shall have a 2-inch vertical FIP inlet and 2-inch NIP for mains 6-inches and smaller, or 4-inch vertical FIP inlet and 4-inch MIP outlet for mains 8-inches and larger. Blowoff assembly shall be operated by turning a top-mounted square operating nut. All internal working parts and the inlet and outlet fittings shall be manufactured from low-lead brass. All working parts shall be serviceable from above without removing the valve box. Blowoff assembly shall be Truflo Model No. TF550 (2-inch) or Model No. 7600 (4-inch) as manufactured by the Kupferle Foundry Co., St. Louis, MO.

2.10 BACKFLOW PREVENTER

- A. Backflow preventer shall operate on the reduced pressure principle and shall consist of two spring-loaded check valves and a spring-loaded, diaphragm actuated, differential pressure relief valve located between the two check valves, in accordance with the Standard Drawings. The backflow preventer assembly shall meet all applicable requirements of latest AWWA C511 and shall be included on the most current "List of Approved Backflow Prevention Assemblies" of the San Mateo County Health System.
- B. Backflow preventer shall be provided on all service connections to properties having a supplemental source of water, wells, fire sprinkler system, irrigation system that has an automatic chemical feeding control, pumps, multi story buildings or any other instances that has a potential to contaminate potable water supply or as directed by the District.

2.11 VALVE AND METER BOXES

- A. Valve boxes shall be concrete traffic-type boxes with cast iron traffic covers. Covers shall be marked "WATER". Concrete extension pieces shall be provided with each box as required. For deep bury conditions for valve boxes, 8" SDR 35 PVC pipe extensions shall be. Diameter shall be 10 ³/₈-inches minimum with 9-inch throat diameter. Valve boxes shall be Christy "Machined Faced" Model G05T with G505CT cover.
- B. For ⁵/₈-inch or 1-inch meters, meter boxes shall be Christy Model B16 concrete box with B16P reinforced concrete lid. For 1½-inch or 2-inch meters, meter box shall be Christy Model FL30T Fiberlyte box with a FL30P Fiberlyte lid. For 1 ½-inch or 2-inch meters with bypass, meter box shall be Christy Model N48 concrete box with a N48-62D-P Steel lid. Meter Lids shall be marked "WATER" and have one recessed probe hole, made for Sensus TR/PL Housing Assembly, #PA-110 radio readers. Traffic rated box and cover shall be provided in traffic area and where directed by the District.
- C. Water service PRV boxes shall be concrete reinforced concrete cover. For 1-inch PRV, boxes shall be a Christy BX09B with a BX09D reinforced concrete lid or as noted on the plans. For 2-

inch PRV, boxes shall be a Christy B16B with a B16G reinforced concrete lid or as noted on the plans.

- D. Boxes for the 2" and 4" blowoff assembly shall be Christy Model B1324 (H/20 loading) with B1324-61JH steel checker plate cover.
- E. Boxes installed in driveways and other paved areas shall be traffic rated box and have traffic rated covers.

2.12 PRESSURE REDUCING VALVE

- A. The pressure reducing valve shall be installed according to the project plans. Contractor shall submit for review and approval shop drawings for the pressure reducing valve and vault assembly.
- B. Pressure reducing valve shall be a Cla Val, models approved by the District, and installed per the plans and manufacturer's recommendation.
- C. Pipe supports shall be installed per detail drawings.
- D. Pressure gages shall be liquid filled and accommodated pressure shown on plans.
- E. After the pressure reducing valve and vault has been installed, the vault shall be cleaned from all construction debris.
- F. All bolts, nuts and washers, and restraining tie rods and associated hardware, used with flanged fittings, couplings and appurtenances shall be Type 316 stainless steel.
- G. Contractor shall coordinate with District for a temporary shutdown.

PART 3 EXECUTION

3.01 INSTALLATION OF VALVES

- A. Valves shall be carefully installed in their respective positions, accessible for operation and repair, and free from all distortion and strain, with joints made as specified, and shall be left in satisfactory operating condition. Buried gate valves, and valve boxes, shall be installed in accordance with the Standard Drawings.
- B. Before installation, all valves and appurtenances shall be thoroughly cleaned of all foreign material, and shall be inspected for proper operation, both opening and closing and to verify that the valves seat properly. Valves shall be installed so that the stems are vertical.
- C. A marker post shall be installed adjacent to each gate valve, combination air valve, air/vacuum valve, and blow-off assembly. The location for each post will be selected by the District based on field conditions.
- D. Valves located within 10' of a fitting shall be moved directly to the fitting and connected via a flanged joint or as directed by the District.
- E. Gate valve marker signs will be supplied by the district, it is the responsibility of the Contractor to install the post and affix the sign on the post per Standard Drawings.

3.02 INSTALLATION OF VALVE AND METER BOXES

- A. Valve boxes shall be centered and set plumb over the wrench nuts of the valves and shall not transmit shock or stress to the valves. Valve box covers shall be set flush with the surface of the finished grade or as directed by the District. Backfill shall be placed around the valve boxes and thoroughly compacted to a 95% relative in such a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be re-excavated, replumbed, and backfilled at the Contractor's expense. No riser or extension rings are allowed. 8" SDR 35 PVC pipe extensions shall overlap the gate valve box a minimum of 6".
- B. Water meter boxes shall be the last item set after the existing angle meter and copper piping is removed. Meter boxes shall be set parallel to the service line following the contour of existing ground. After the box is set and aligned with the meter, contractor may use native material, aggregate base, or fines to backfill around the box as directed by the District and as applicable. Soil within a 12-inch perimeter of the box shall be compacted to a relative density of 90% using a pneumatic device such as a "Powder Puff" or other mechanical means approved by the District.
- C. Finished elevation of the box shall be 1-inch above finished grade when located in non-traffic areas and flush with pavement when located in traffic areas and pathways.
- D. Contractor shall set the box "knockout" in-line with service, and a 1-inch clearance between the box and service line. The box shall not sit on top of the service line.
- E. After the box has been set and compacted, any debris and dirt inside the box shall be removed and disposed of to the satisfaction of the District.
- F. Contractor shall bear the responsibility of private property structures such as mail boxes, retaining walls, landscaping, etc., during construction.

3.03 INSTALLATION OF SERVICES

- A. All services shall be 1" or 2" in size and installed in conformance with the Standard Drawings. Applications for services larger than 1" require hydraulic calculation justification and prior approval from the District. Services larger than 2" also require submitting a shop drawing.
- B. When connecting copper to PVC, Mueller's V-15442 (female) or V-15440 (male) pack joint connections shall be used. Contractor is responsible to determine ahead of time the necessary material to connect the service with the resident's service line. Contractor shall coordinate with the District to determine the configuration and location of the service.
- C. Direct tapping of ductile iron pipe shall be done using the "preferred method" described in AWWA C600, Section 4.8 to preserve the integrity of the existing encasement. This method requires the application of two or three layers of polyethylene adhesive tape completely around the pipe to cover the area where the tapping machine and chain will be mounted. The corporation stop shall then be installed directly through the polyethylene tape and encasement. If damaged, the encasement and/or tape shall be repaired with tape.
- D. Direct tapping of PVC pipe shall be done using the "preferred method" described in AWWA C605, Section 6.4.

- E. Service relocations shall be done by “freezing” the service line with CO₂, or other approved method by the District to temporary discontinue the supply of water while relocating the service. Crimping will not be allowed to temporary block the supply of water.

3.04 INSTALLATION OF FIRE HYDRANTS

- A. Fire hydrants shall be plumbed vertical and installed in accordance with the Standard Drawings. Fire hydrants shall be set so the bury line mark on the break-off is level with finish grade.
- B. All hydrants shall be flushed and tested after installation to ensure a sound setting and smooth operation. All valves shall close drip tight.
- C. Contractor shall install a two-way, reflective pavement marker at each fire hydrant location as directed by the local agencies. If the marker does not adhere to existing ground, place it on top the gate valve cover located directly off the main. For fire hydrants located on fire roads, fire a hydrant marker post shall be installed per the Standard Drawings. The markers shall be furnished and installed in accordance with applicable paragraphs of Section 84 – Markings, of the latest requirements of Caltrans Standard Specifications. Fire hydrant valve lid and rim shall be painted direct to metal Safety Yellow.

3.05 INSTALLATION OF BLOW-OFF ASSEMBLY

- A. Blow-off assembly shall be installed in accordance with the Standard Drawings.

3.06 INSTALLATION OF COMBINATION AIR VALVES

- A. Combination air valves shall be plumbed vertical and installed in accordance with the Standard Drawings.

3.07 INSTALLATION OF BACKFLOW PREVENTERS

- A. Backflow preventer shall be installed horizontal and level, with the minimum clearances for obstructions as shown on the Standard Drawings. Vertical installations are allowed but require District approval prior to design and installation. A ball valve shall be installed on both sides of the backflow preventer assembly. Mueller’s H-15531N compression x MIPT 90°’s shall be used at both ends of the assembly to allow removal of the unit in the event of a malfunction. Backflow preventers assembly shall be tested and certified by a San Mateo County’s Certified Tester prior to being put in service. Valves failing the test shall be replaced, and retested.
- B. Contractor is responsible to determine ahead of time the necessary material to connect the backflow preventer with the resident’s service line. Contractor shall coordinate with the District to determine the configuration and location of the backflow preventer.

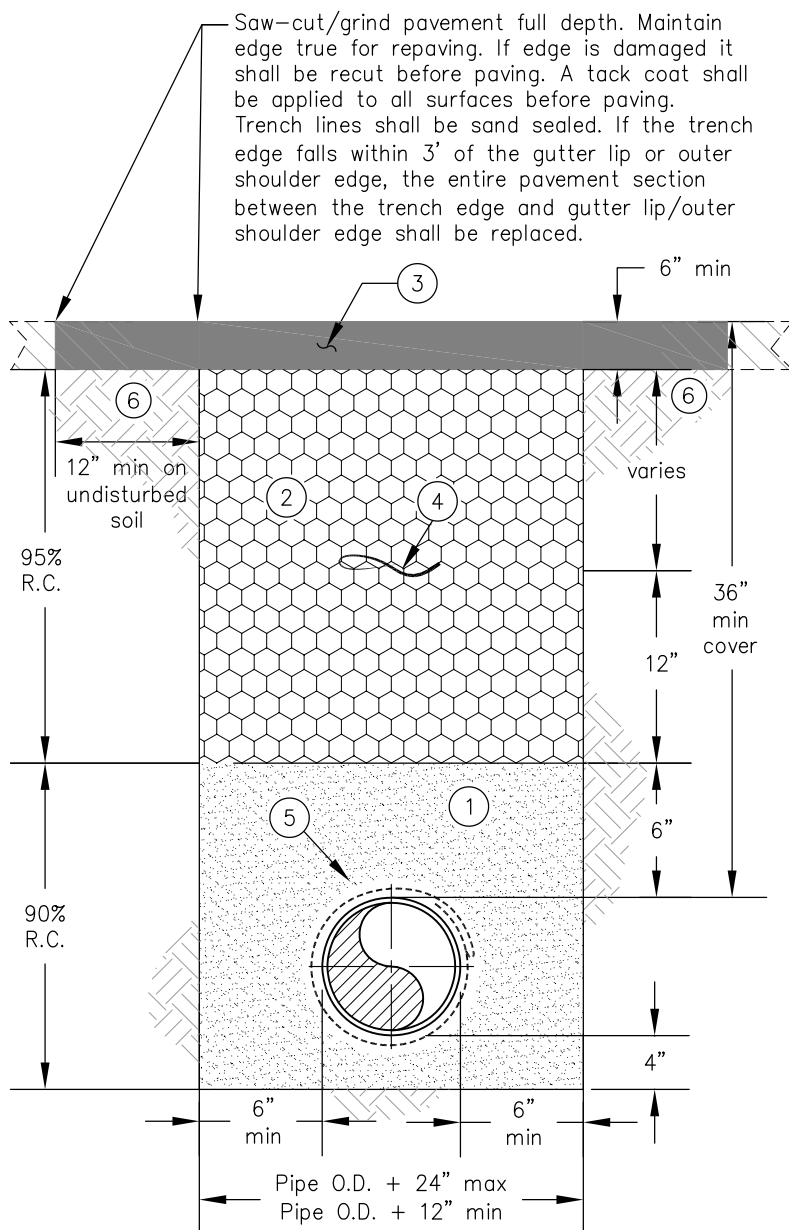
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STANDARD DRAWINGS

DESCRIPTION	STANDARD DRAWING NO.
Trench Section – Type A Paved Surfaces	WW-01
Trench Section – Type B Graveled Areas/Road Shoulders	WW-02
Trench Section – Type C Unimproved Area	WW-03
Trench Section – Type D Control Density Fill	WW-04
Gate Valve Assembly	WW-05
Water Valve/Water Main Marker Post	WW-06
Thrust Restraint – Thrust Block Details	WW-07
Fire Hydrant Assembly	WW-08
Fire Hydrant Retaining Wall	WW-09
Hydrant Clearances	WW-10
Bollard	WW-11
5/8" or 1" Service Connection	WW-12
1 ½" or 2" Residential Service Connection	WW-13
1 ½" or 2" Service Connection with Bypass	WW-14
Service Meter Location and Clearances	WW-15
1" or 2" Combination Air Valve	WW-16
Blow-off Assembly	WW-17
Sampling Station	WW-18
Minimum Pipe Separation Requirements	WW-19
Trench Dam	WW-20
Fire Service Connection Requirements (4" or Greater)	WW-21
Reduced Pressure Backflow Preventer Assembly (Residential)	WW-22
Anode Test Station – Fitting	WW-23
Anode Test Station – Cross and Valve	WW-24
Anode Test Station – Fire Hydrant/Blow Off	WW-25
Anode Test Station – Tee and Valve	WW-26
Anode Test Station – Inline Valve	WW-27
Anode Test Station - Vault	WW-28

DESCRIPTION	STANDARD DRAWING NO.
Anode Terminal Box with Multiple Fittings Example	WW-29
Flush Mount Test Station	WW-30
Exothermic Weld	WW-31
Pipe Joint Bonding	WW-32
Heat Shrink Label	WW-33
Tank Insulating Flange Assembly	WW-34
Zinc Anode	WW-35



LEGEND

- ① Embedment Zone (quarry fines) shall be placed in three lifts:

Lift One – Shall consist of placing and compacting 4" of material prior to the placement of the pipe. The pipe shall then be placed prior Lift Two.

Lift Two – Shall consist of placing material around the pipe to the top of the pipe. The top of the pipe shall be visible prior compaction of the second lift. Compaction around the pipe shall be performed by pneumatic means such as a "Powder Puff." No other means of compaction shall be allowed without prior approval by the District. Contractor shall use extreme care to avoid hitting the pipe, polyethylene wrapping, and tracer wire while compacting.

Lift Three – Shall consist of placing and compacting material to 6" above the pipe.
- ② Upper Trench Zone (Class 2 aggregate base) shall be placed and compacted in 12" lifts.
- ③ Asphalt concrete shall be replaced in kind but no less than 6" in depth.
- ④ Marker tape to be installed 18" above water main.
- ⑤ Encase DIP with V-Bio enhanced polyethylene encasement. Tape a blue No. 8 AWG copper tracer wire to top of pipe every 6'.
- ⑥ A second operation is required prior to final paving to achieve the "T" cut section. Saw cutting/grinding a wider trench line during initial trench excavation to achieve a "T" cut section is not permitted.

NOTES

1. Replace existing tracer wire if damaged during trenching operation. On existing steel pipes, weld the new tracer wire end to the steel pipe if tracer wire is not present.
2. If water is encountered in the trench or the District inspector determines the subgrade below the pipe embedment zone is unstable, the Contractor shall excavate an additional 12" and install $\frac{3}{4}$ " crushed drain rock. Drain rock section shall be wrapped with filter fabric on all sides.

TRENCH SECTION – TYPE A

REV. 11/18

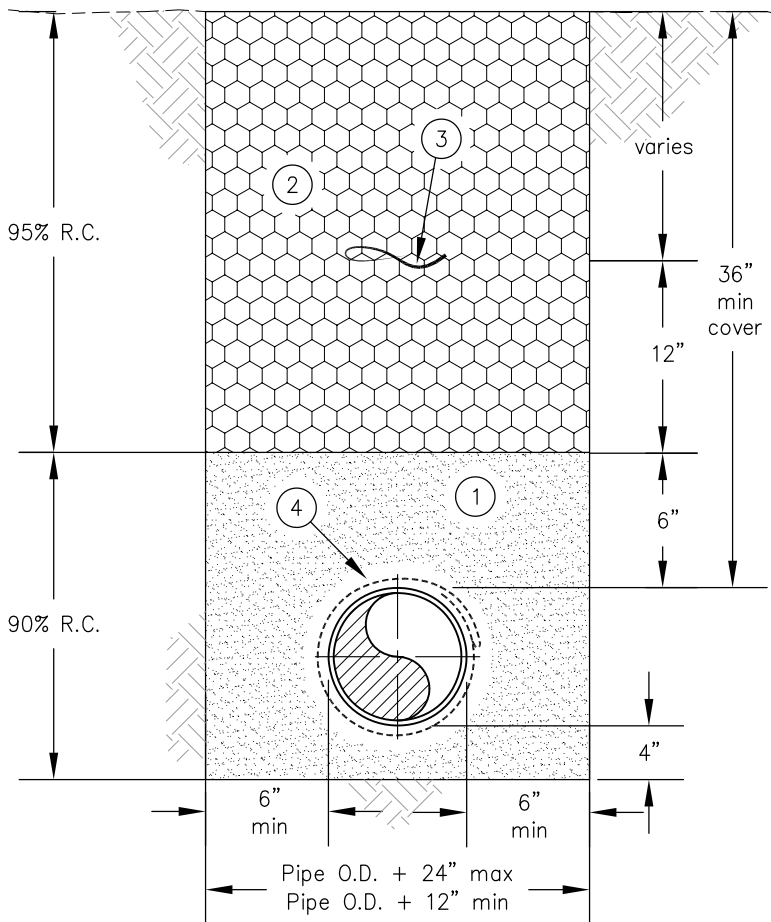


Approved by:

Darryl A. Barrow, General Manager

Joubin Pakpour, District Engineer, RCE
No. 59155

STD. NO.
WW-01



LEGEND

- ① Pipe Embedment Zone (quarry fines) shall be constructed in three lifts:

Lift One – Shall consist of placing and compacting 4" of material prior to the placement of the pipe. The pipe shall then be placed prior Lift Two.

Lift Two – Shall consist of placing material around the pipe to the top of the pipe. The top of the pipe shall be visible prior compaction of the second lift. Compaction around the pipe shall be performed by pneumatic means such as a "Powder Puff." No other means of compaction shall be allowed without prior approval by the District. Contractor shall use extreme care to avoid hitting the pipe, polyethylene wrapping, and tracer wire while compacting.

Lift Three – Shall consist of placing and compacting material to 6" above the pipe.

- ② Upper Trench Zone (Class 2 aggregate base) shall be placed and compacted in 12" lifts.
- ③ Marker tape to be installed 18" above water main.
- ④ Encase DIP with V-Bio enhanced polyethylene encasement. Tape a blue No. 8 AWG copper tracer wire to top of pipe every 6'.

NOTES

1. Replace existing tracer wire if damaged during trenching operation. On existing steel pipes, weld the new tracer wire end to the steel pipe if tracer wire is not present.
2. If water is encountered in the trench or the District inspector determines the subgrade below the pipe embedment zone is unstable, the Contractor shall excavate an additional 12" and install $\frac{3}{4}$ " crushed drain rock. Drain rock section shall be wrapped with filter fabric on all sides.

TRENCH SECTION – TYPE B GRAVELED AREAS / ROAD SHOULDERS

REV. 11/18



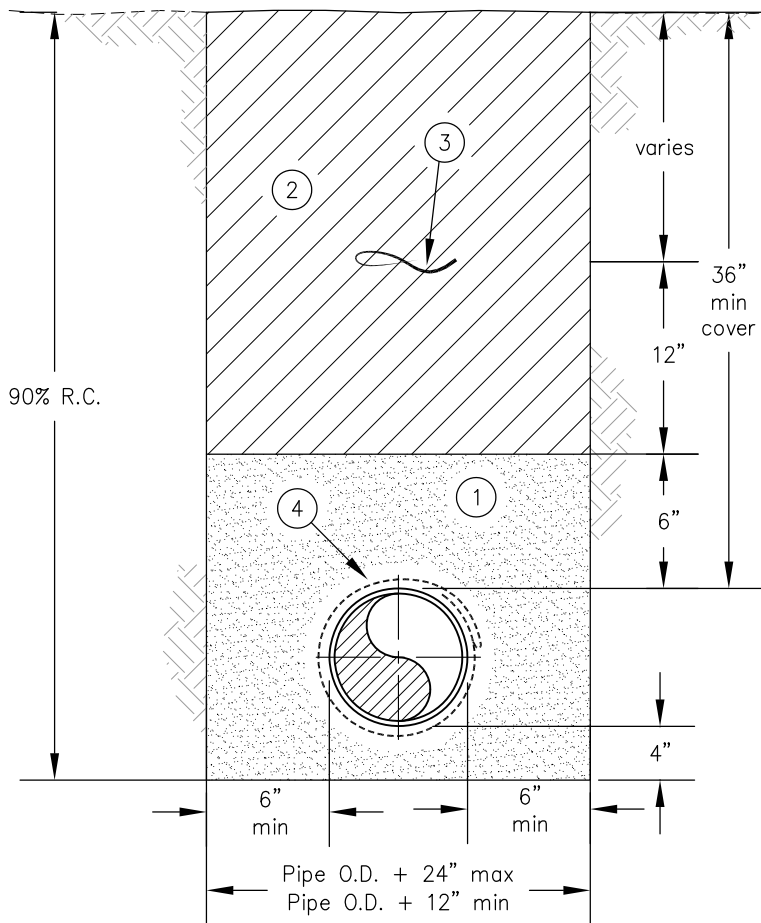
**westborough
water district**

Approved by:

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Darryl A. Barrow, General Manager

Joubin Pakpour
Joubin Pakpour, District Engineer, RCE
No. 59155

**STD. NO.
WW-02**



LEGEND

- ① Pipe Embedment Zone (quarry fines) shall be constructed in three lifts:

Lift One – Shall consist of placing and compacting 4" of material prior to the placement of the pipe. The pipe shall then be placed prior Lift Two.

Lift Two – Shall consist of placing material around the pipe to the top of the pipe. The top of the pipe shall be visible prior compaction of the second lift. Compaction around the pipe shall be performed by pneumatic means such as a "Powder Puff." No other means of compaction shall be allowed without prior approval by the District. Contractor shall use extreme care to avoid hitting the pipe, polyethylene wrapping, and tracer wire while compacting.

Lift Three – Shall consist of placing and compacting material to 6" above the pipe.

- ② Upper Trench Zone (native material) shall be placed and compacted in 12" lifts.
- ③ Marker tape to be installed 18" above water main.
- ④ Encase DIP with V-Bio enhanced polyethylene encasement. Tape a blue No. 8 AWG copper tracer wire to top of pipe every 6'.

NOTES

1. Replace existing tracer wire if damaged during trenching operation. On existing steel pipes, weld the new tracer wire end to the steel pipe if tracer wire is not present.
2. If water is encountered in the trench or the District inspector determines the subgrade below the pipe embedment zone is unstable, the Contractor shall excavate an additional 12" and install $\frac{3}{4}$ " crushed drain rock. Drain rock section shall be wrapped with filter fabric on all sides.

TRENCH SECTION – TYPE C

UNIMPROVED AREA

REV. 11/18



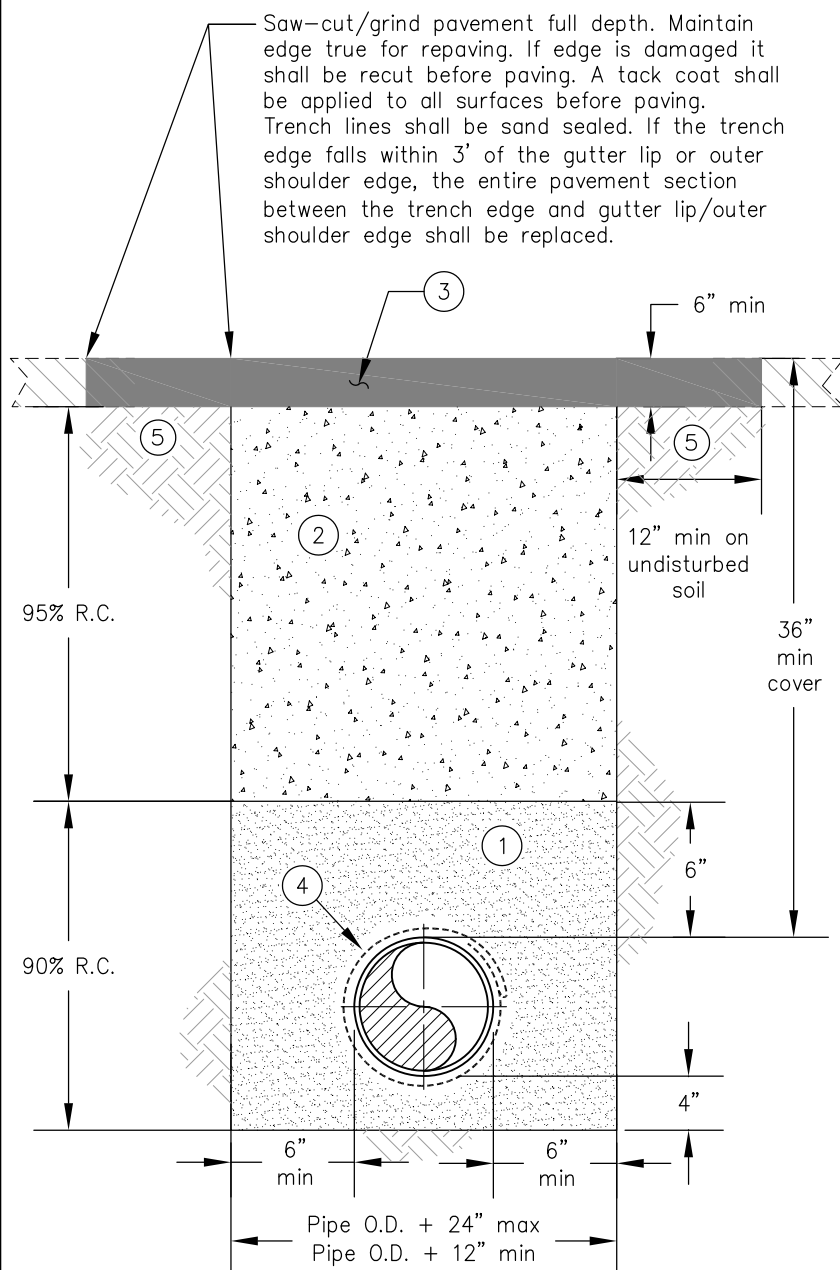
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No. 59155

STD. NO.
WW-03



LEGEND

- ① Embedment Zone (quarry fines) shall be placed in three lifts:

Lift One – Shall consist of placing and compacting 4" of material prior to the placement of the pipe. The pipe shall then be placed prior Lift Two.

Lift Two – Shall consist of placing material around the pipe to the top of the pipe. The top of the pipe shall be visible prior compaction of the second lift. Compaction around the pipe shall be performed by pneumatic means such as a "Powder Puff." No other means of compaction shall be allowed without prior approval by the District. Contractor shall use extreme care to avoid hitting the pipe, polyethylene wrapping, and tracer wire while compacting.

Lift Three – Shall consist of placing and compacting material to 6" above the pipe.

- ② Upper Trench Zone (Controlled Density Fill).
- ③ Asphalt concrete shall be replaced in kind but no less than 6" in depth.
- ④ Encase DIP with V-Bio enhanced polyethylene encasement. Tape a blue No. 8 AWG copper tracer wire to top of pipe every 6'.
- ⑤ A second operation is required prior to final paving to achieve the "T" cut section. Saw cutting/grinding a wider trench line during initial trench excavation to achieve a "T" cut section is not permitted.

NOTES

1. Replace existing tracer wire if damaged during trenching operation. On existing steel pipes, weld the new tracer wire end to the steel pipe if tracer wire is not present.
2. If water is encountered in the trench or the District inspector determines the subgrade below the pipe embedment zone is unstable, the Contractor shall excavate an additional 12" and install $\frac{3}{4}$ " crushed drain rock. Drain rock section shall be wrapped with filter fabric on all sides.

TRENCH SECTION – TYPE D

CONTROLLED DENSITY FILL

REV. 11/18

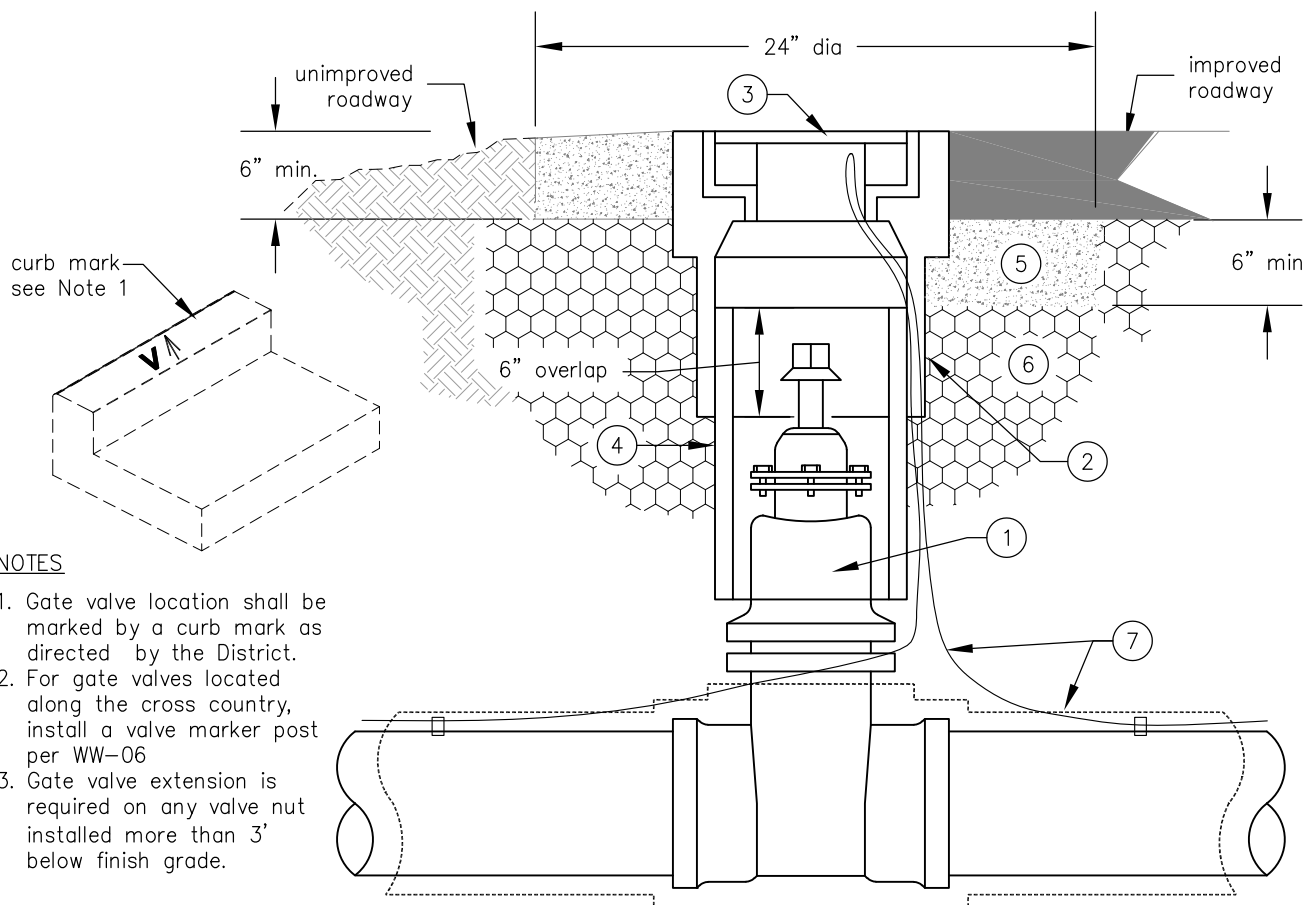


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STD. NO.
WW-04



NOTES

1. Gate valve location shall be marked by a curb mark as directed by the District.
2. For gate valves located along the cross country, install a valve marker post per WW-06
3. Gate valve extension is required on any valve nut installed more than 3' below finish grade.

LEGEND

- ① Gate valve, Mueller No. A-2362 with Type 316 SS bolts and nuts, and 2" square bronze operation nut. Valve stem shall be made of ASTM B98-C66100/H02 (Everdur) bar stock material; EPDM rubber; machined release groove below operating nut; and stuffing box aligned with the direction of the pipe. If coating on gate valve is damaged during the installation, it should be repaired using Mueller Epoxy Kit (Red) No. 280089. Valve shall be set plumb.
- ② Traffic valve box, Christy Concrete No. G05TBOX.
- ③ Cast iron traffic cover inscribed "WATER", Christy Concrete No. G05CT.
- ④ SDR 35 PVC riser - 8" min dia.
- ⑤ 2,000 psi high early strength concrete. Place asphalt on top of concrete collar, same day.
- ⑥ Trench backfill per WW-01 thru WW-04
- ⑦ Encase DIP with V-Bio enhanced polyethylene encasement. Wrap excess film with 10-mil pipe tape. Use No. 8 AWG standard tracer wire taped on top of pipe and looped into the valve box from outside the riser. Wire to extend 12" above grade.

GATE VALVE ASSEMBLY

REV. 11/18



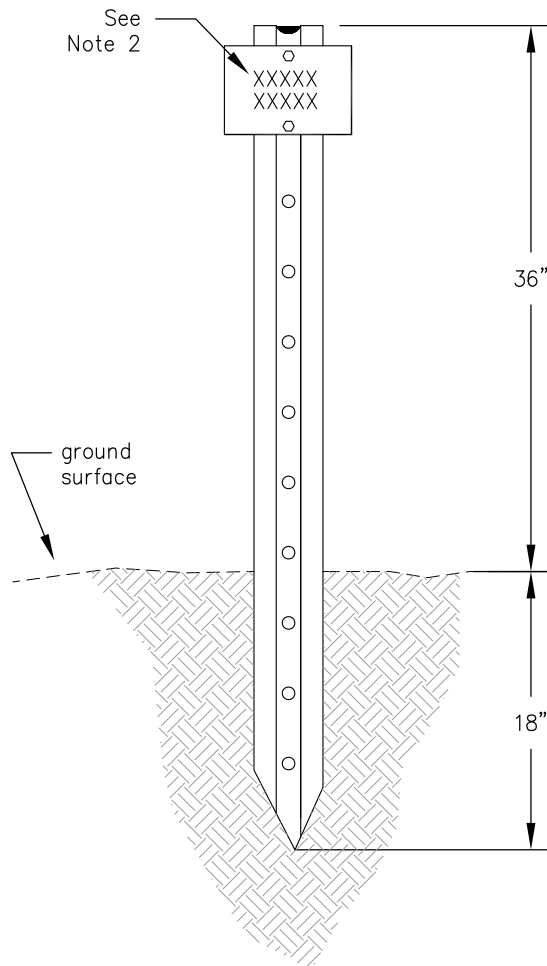
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No. 59155

**STD. NO.
WW-05**



NOTES

1. The marker post shall be constructed of galvanized steel. The post shall be installed vertically and firmly embedded into the ground as shown.
2. A 4"x4" reflective aluminum "Water Valve" or "Water Main" sign shall be bolted to the post.
3. Marker post to be located in the field by the District.

WATER VALVE/WATER MAIN MARKER POST

REV. 11/18



**westborough
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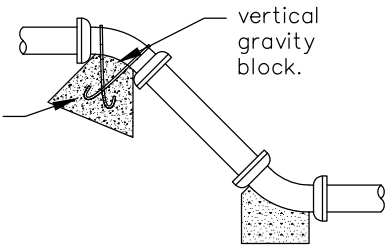
**STD. NO.
WW-06**

VOLUME OF GRAVITY BLOCK IN CUBIC YARDS

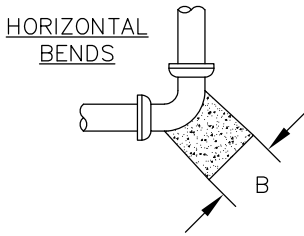
VERTICAL FITTING	DIAMETER OF PIPE					
	6"	8"	10"	12"	14"	16"
90°	1.0	2.0	3.0	4.0	5.0	6.0
45°	0.5	1.0	1.5	2.0	2.5	3.0

VERTICAL BEND

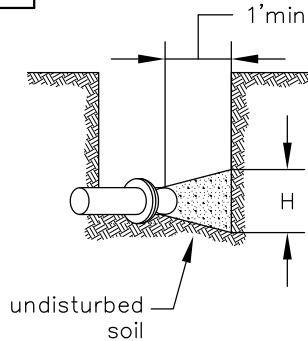
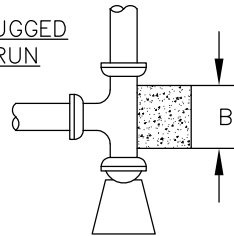
size of rod
determined
by District.



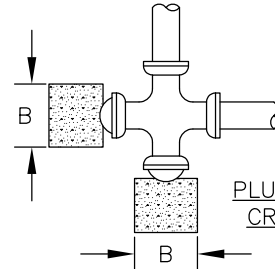
HORIZONTAL BENDS



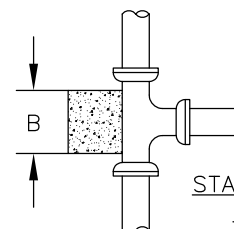
PLUGGED RUN



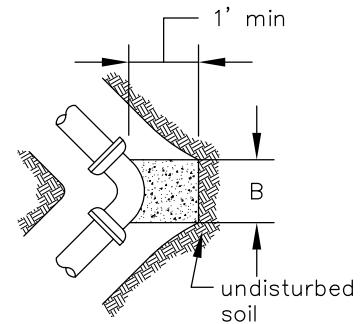
THRUST BLOCK PROFILE



PLUGGED CROSS



STANDARD TEE



THRUST BLOCK PLAN

DIMENSIONS OF THRUST BLOCKS IN FEET

HORIZONTAL FITTING	DIAMETER OF PIPE											
	6"		8"		10"		12"		14"		16"	
	B	H	B	H	B	H	B	H	B	H	B	H
90°	1'-9"	1'-9"	2'-3"	2'-3"	2'-9"	2'-9"	3'-3"	3'-3"	3'-9"	3'-9"	4'-3"	4'-3"
45°	1'-0"	1'-0"	1'-6"	1'-6"	2'-0"	2'-0"	2'-6"	2'-6"	3'-0"	3'-0"	3'-6"	3'-6"
PLUG/TEE	1'-3"	1'-3"	1'-9"	1'-9"	2'-3"	2'-3"	2'-9"	2'-9"	3'-3"	3'-3"	3'-9"	3'-9"

NOTES

1. Thrust block dimensions shall be doubled if used on non-restrained connections.
2. Use 2,000 psi high early strength concrete.
3. All thrust blocks and gravity blocks shall bear against undisturbed earth.
4. Encase DIP in V-Bio enhanced polyethylene encasement.
5. Maintain a min clearance of 2" between the thrust block reinforcing steel and pipe.
6. Concrete not to extend beyond the face of the bell.
7. Thrust block shall encompass at least one-half of the outside diameter of the pipe.
8. Flanges, bolts, and nuts shall be kept clear of concrete.
9. Dimensions above include use of mechanical restraints on pipe.
10. If groundwater is present, thrust block dimensions shall be determined by the District.

THRUST RESTRAINT – THRUST BLOCK DETAILS

REV. 11/18



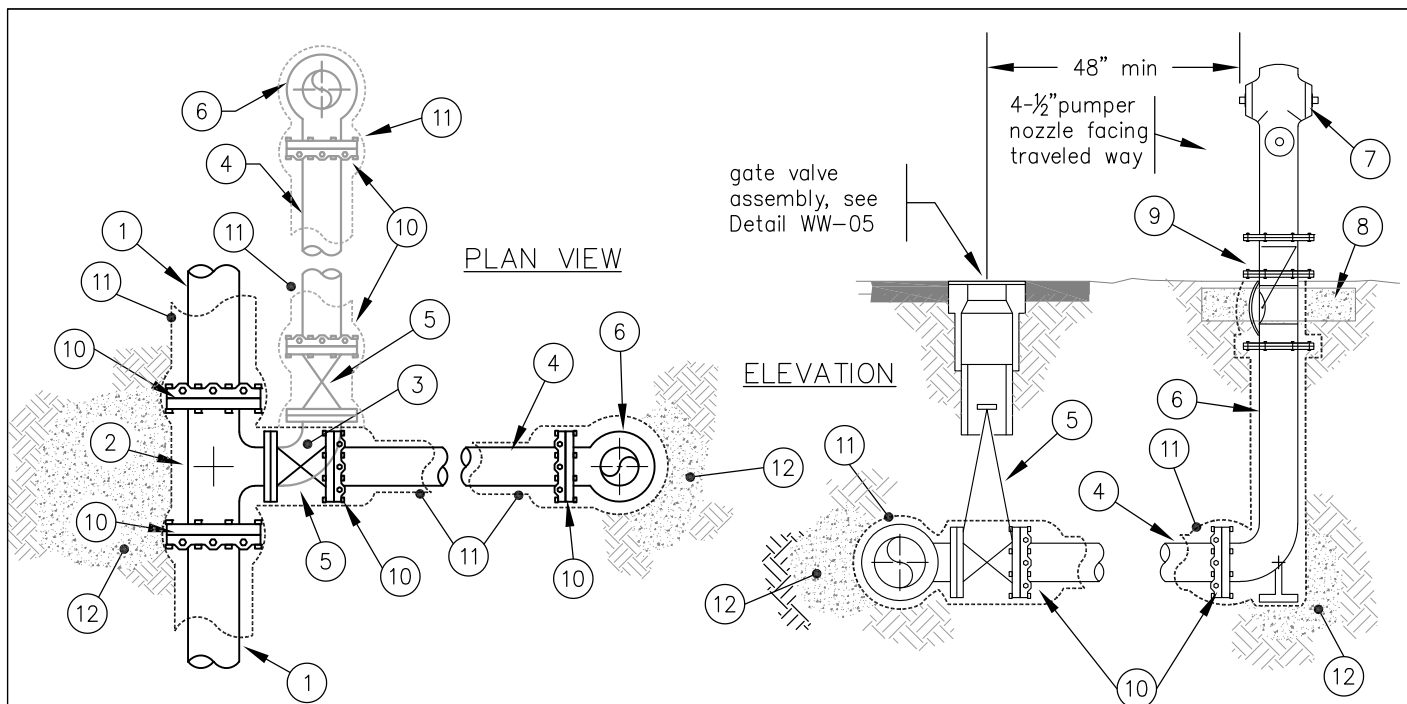
**westborough
water district**

Approved by:

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Darryl A. Barrow, General Manager

Joubin Pakpour
Joubin Pakpour, District Engineer, RCE
No. 59155

**STD. NO.
WW-07**



LEGEND

- ① Water main, DIP or PVC
- ② Tee (type determined by District) or tapping sleeve, Mueller H-615 or as directed by the District
- ③ 6" 90° bend, FLxFL.
- ④ 6" DIP or PVC pipe.
- ⑤ 6" gate valve, Mueller A-2362, FLxMJ (restrained)
- ⑥ 6" bury, FLxMJ (restrained)
- ⑦ Hydrant, Clow 960 (wet barrel) with one 4-½" pumper and two 2-½" outlets, all NS threads.
- ⑧ 24" dia, 12" thick, 2,000 psi concrete collar.
- ⑨ Break-off check valve, Clow Valve model LB400 (note that length of unit is 20"). Install concrete collar ⑧ to allow removal of stainless steel bolts securing break-off riser. Native soil shall then be placed on top of the collar to within 1" of the bottom of the break-off riser.
- ⑩ 6" MJ restraint, EBAA Iron, "Megalug" Series 1100 for DIP and Series 2000 for PVC.
- ⑪ Encase DIP fire hydrant lateral with V-Bio enhanced polyethylene encasement. Wrap excess film with 10 mil pipe tape. Tape a blue No. 8 AWG, copper tracer wire to the top of lateral.
- ⑫ Thrust block per WW-07

NOTES

1. For new developments, the Contractor shall coordinate with the local fire department for hydrant locations.
2. All joints used in the hydrant assembly shall be restrained and shall be mechanical joint "Megalug," or field locks.
3. Break-off riser shall be 1" above finish grade.
4. All bolts and nuts shall be Type 316 stainless steel excluding pre-manufactured break-off check valve.
5. Install a blue, two-way, reflective pavement marker at each hydrant location in accordance with applicable portions of Section 85 of the Caltrans Standard Specifications.
6. Paint both the top surface of the fire hydrant gate valve box and cover safety yellow with direct to metal paint.
7. New fire hydrant assembly shall be pressure tested and disinfected.
8. New fire hydrant shall be factory painted "safety yellow". All metal above the concrete collar shall also be factory painted "White."

FIRE HYDRANT ASSEMBLY

REV. 11/18



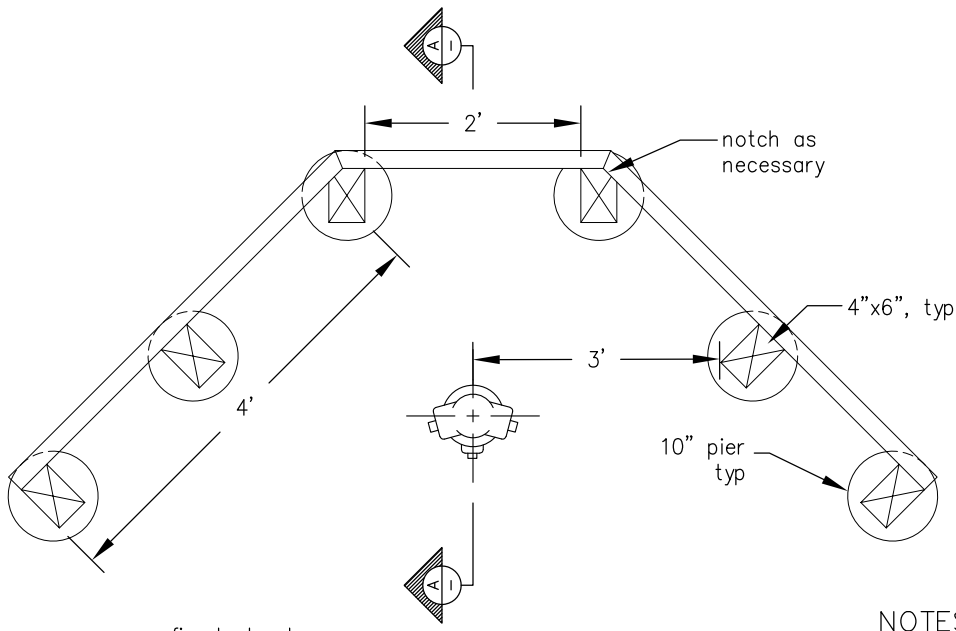
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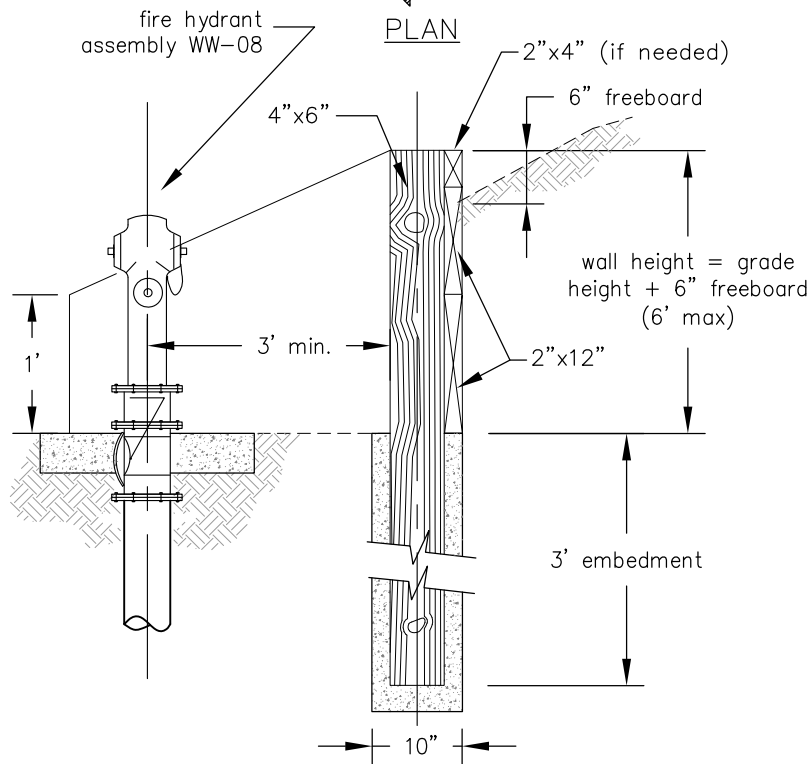
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No. 59155

**STD. NO.
WW-08**



PLAN



SECTION A-A

NOTES

1. All lumber shall be pressure treated lumber with 0.40 lbs/cf retention or greater.
2. All dimensions shown are for a typical retaining wall. Field conditions may require deviation from detail. Contractor shall verify site conditions and obtain approval from the District before making changes.

FIRE HYDRANT RETAINING WALL

REV. 11/18



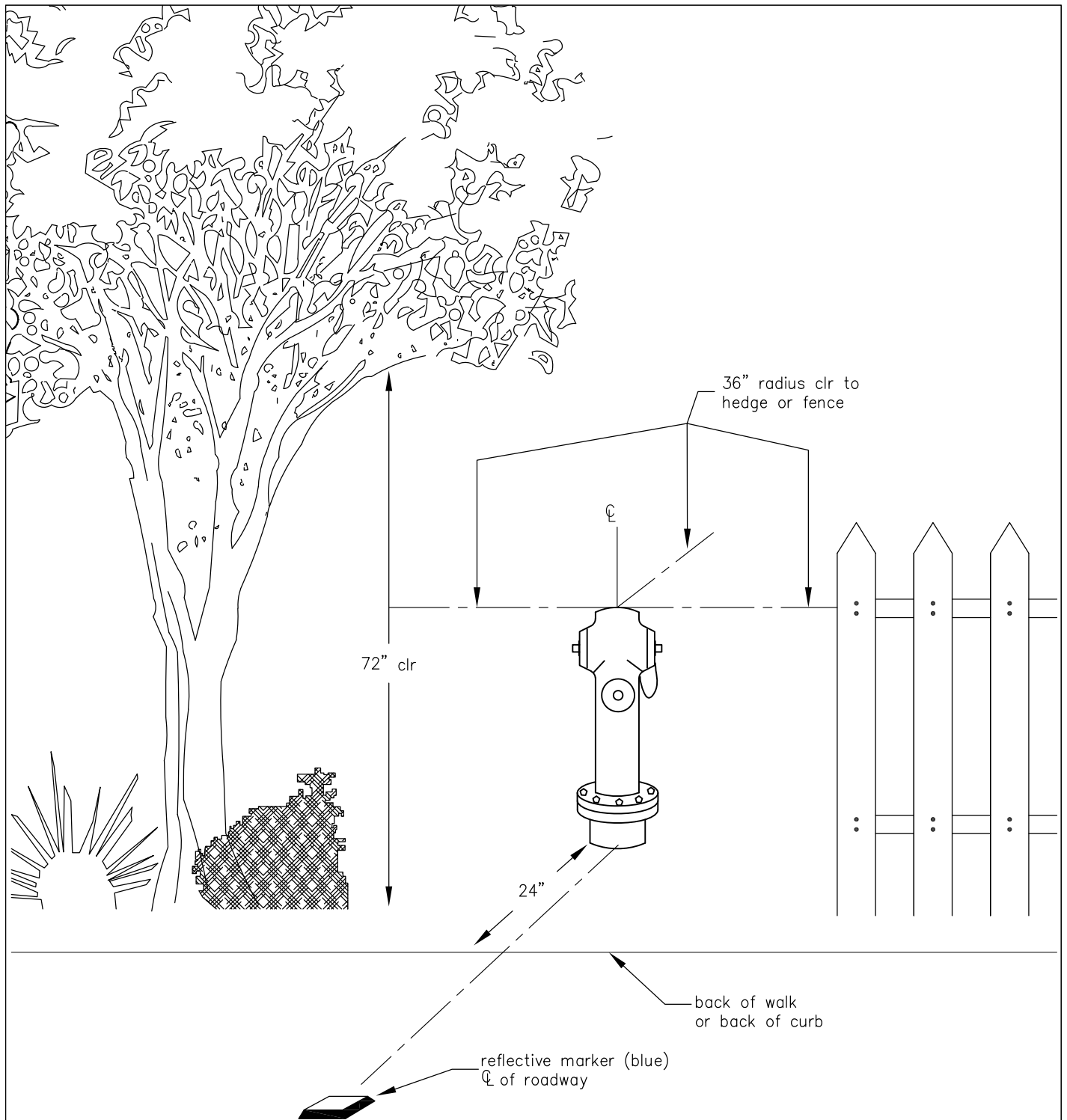
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**STD. NO.
WW-09**



HYDRANT CLEARANCES

REV. 11/18



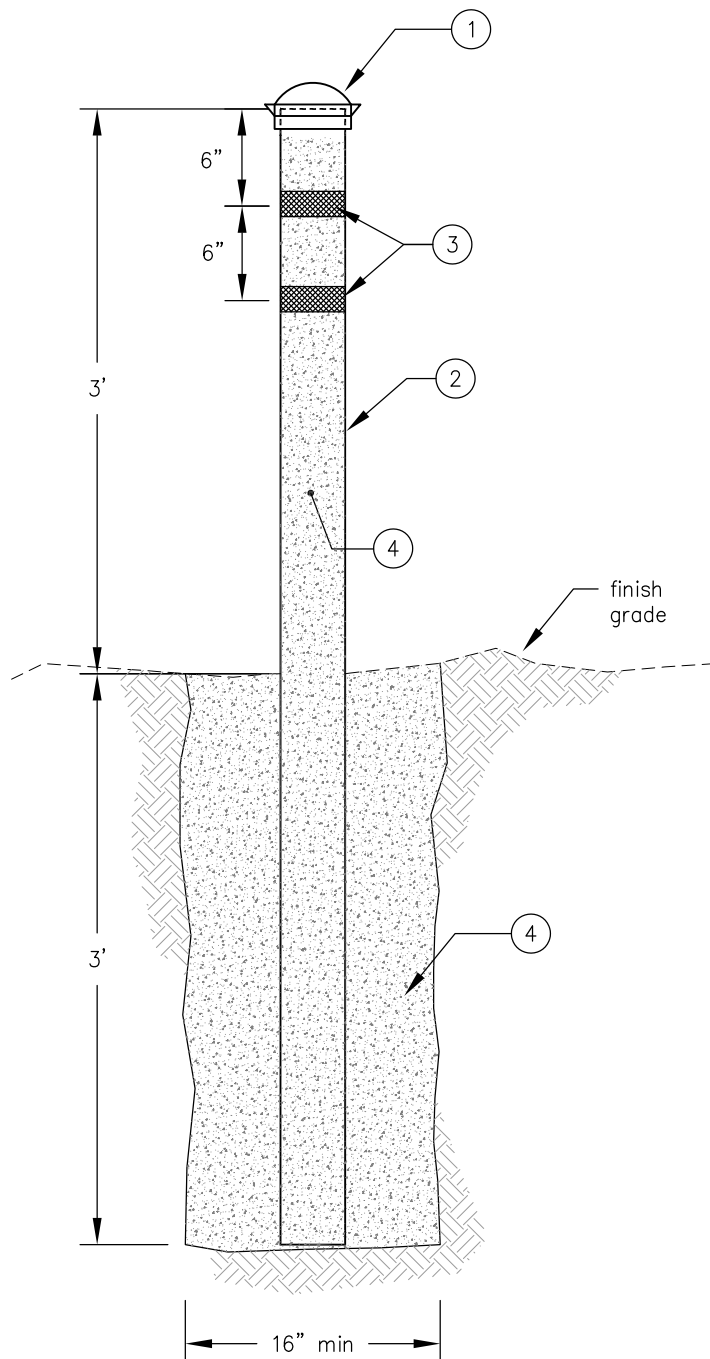
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**STD. NO.
WW-10**



LEGEND

- ① 4" galvanized tap on cap.
- ② 4" dia galvanized steel pipe filled with Class 2 concrete. Pipe shall be painted safety yellow with direct to metal (DTM) high performance industrial coatings system (minimum two coats).
- ③ 2" white DOT-C2 reflective tape
- ④ Class 2 concrete

NOTES

1. Bollard locations to be located in the field by the District.
2. Bollards shall be permanent unless specified by the District.
3. Removable bollards shall be model PW/BRL-PG&E manufactured by Placer Water Works, Inc. To be powder coated safety yellow, with 2-2" white color reflective tape, DOT-C2.

BOLLARD

REV. 11/18



**westborough
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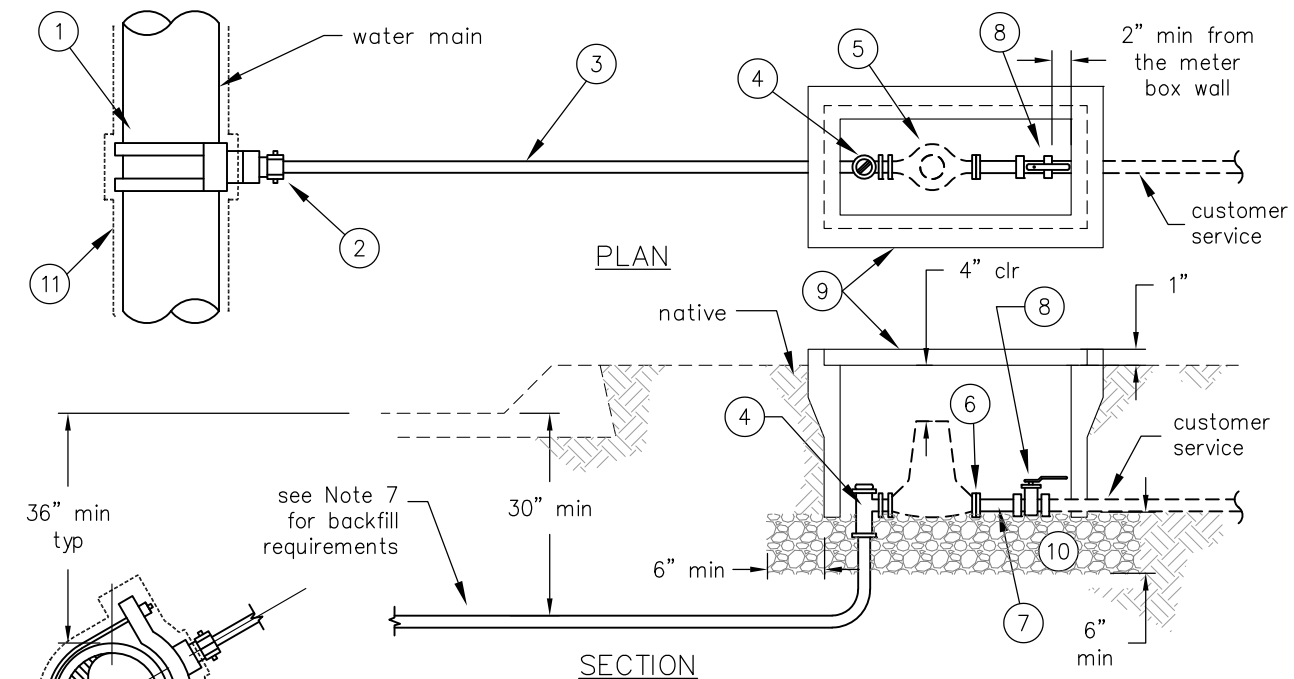
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**STD. NO.
WW- 11**



STD. NO.
WW-12



NOTES

1. Meters shall be installed in a level, horizontal position and shall be perpendicular to the curb. No meters shall be placed on private property.
2. Applications for services larger than 1" require hydraulic calculation justification and prior approval from the District.
3. Use Mueller Pack Joint V-15442 (female) or V-15440 (male) when customer service is PVC.
4. Hot-taps and new connections shall be 4' min from a bell/joint or as directed by the District.
5. Service saddle shall be 18" min from an adjacent service connection.
6. Embedment material (Quarry fines) shall be placed 2" below and 6" above the service line. Backfill and compact remaining section per applicable WW-01 thru WW-04

LEGEND

- ① Double strap bronze service saddle, Mueller BR2B "CC" for DIP and Mueller DR2S "CC" for PVC.
- ② 2" insulated corporation stop, Mueller N-35008N.
- ③ 2" type K soft copper pipe. Unions or couplings not permitted.
- ④ 2" compression ball angle meter valve, Mueller B-24276N.
- ⑤ 1½" or 2" meter (furnished by District).
- ⑥ 1½" or 2" brass meter flange (low lead).
- ⑦ 1½" or 2" brass nipple (low lead).
- ⑧ Ball valve, Red White Valve 5044AB.
- ⑨ Meter box, Christy No. FL30T with No. FL30P Fiberlyte cover. H/20 traffic rated box and cover, shall be provided in traffic areas and where directed by the District. Covers shall have a recessed probe hole made for Sensus FlexNet radio readers.
- ⑩ ¾" drain rock shall be mechanically compacted.
- ⑪ Encase DIP with V-Bio enhanced polyethylene encasement.

1 ½" OR 2" RESIDENTIAL SERVICE CONNECTION

REV. 11/18



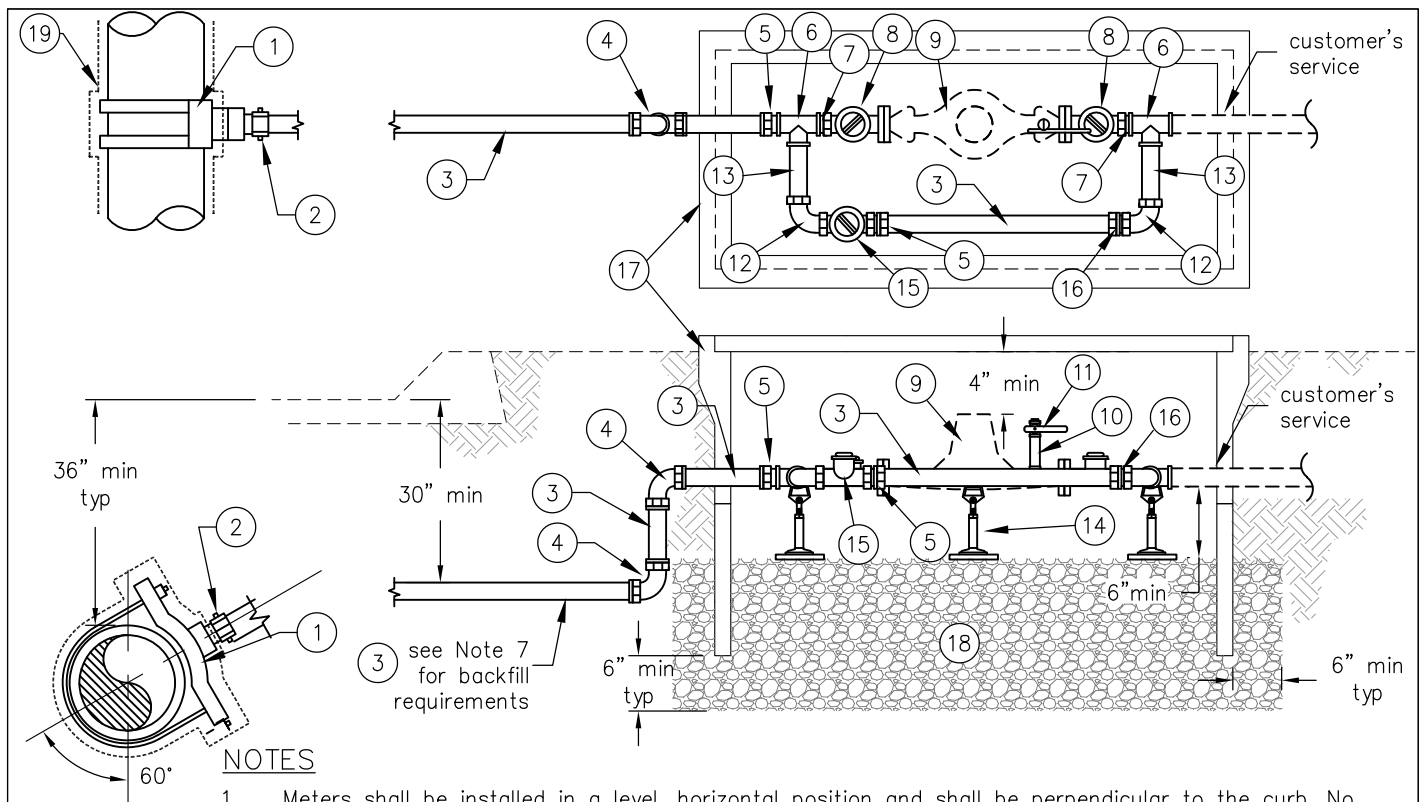
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No. 59155

**STD. NO.
WW-13**



1. Meters shall be installed in a level, horizontal position and shall be perpendicular to the curb. No meters shall be placed on private property.
2. Applications for services larger than 1" require hydraulic calculation justification and prior approval from the District. Drawings for any meter larger than 2" shall be submitted to the District for approval.
3. Use Mueller Pack Joint V-15442 (female) or V-15440 (male) when customer service is PVC.
4. Hot-taps and new connections shall be 4" min from a bell/joint or as directed by the District.
5. Service saddle shall be 18" min away from an adjacent service connection.
6. Embedment material (Quarry fines) shall be placed 2" below and 6" above the service line. Backfill and compact remaining section per applicable WW-01 thru WW-04.

LEGEND

- | | |
|---|--|
| ① Double strap bronze service saddle, Mueller BR2B "CC" for DI and Mueller BR2S "CC" for PVC 900. | ⑪ Ball valve, Red White Valve 5044AB with 1" or 1½" Plug. |
| ② 2" insulated corporation stop, Mueller N-35008N. | ⑫ 2" Mueller F.I.P. x M.I.P. 90° connection. |
| ③ 2" Type K soft copper pipe. Unions or couplings not permitted. | ⑬ 2" brass nipple (6" length). ⑭ Pipe support. |
| ④ 2" Mueller 110 compression connection H-15526N. | ⑮ 2" Mueller 300 F.I.P. x F.I.P. ball straight meter valve B-20200N. |
| ⑤ 2" Mueller 110 M.I.P. x comp. straight coupling connection H-15428N. | ⑯ 2" Mueller 110 F.I.P. x comp. straight coupling connection H-15451N. |
| ⑥ 2" brass F.I.P. tee. | ⑰ Meter box, Christy B48 with extension and N48-62D-P steel cover. H/20 traffic rated box and cover shall be provided in traffic areas and where directed by the District. Covers shall have recessed probe hole made for Sensus TR/PL, Item#PA-110 radio readers. |
| ⑦ 2" brass close nipples. | ⑱ ¾" drain rock shall be mechanically compacted. |
| ⑧ 2" Mueller 300 F.I.P. x FL ball straight meter valve B-24337N. | ⑲ Encase DIP with V-Bio enhanced polyethylene encasement. |
| ⑨ 1½" or 2" meter (furnished by District). | |
| ⑩ 1½" brass nipple (4" length). | |

1 ½" AND 2" SERVICE CONNECTION WITH BYPASS

REV. 11/18



**westborough
water district**

Approved by:

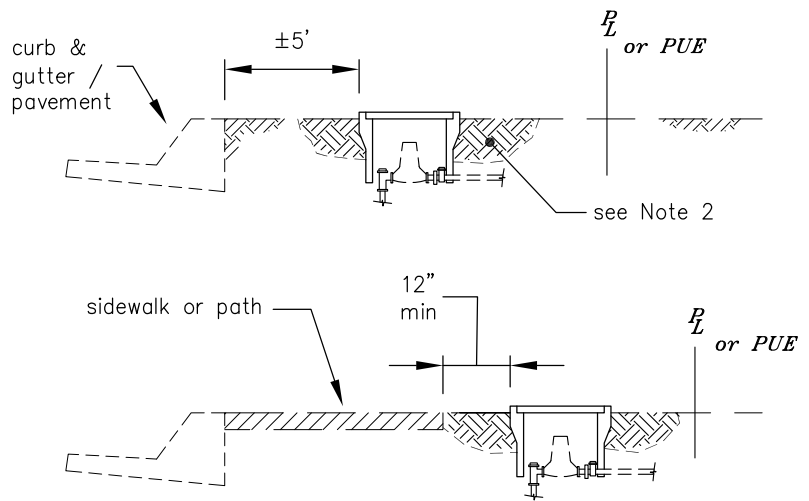
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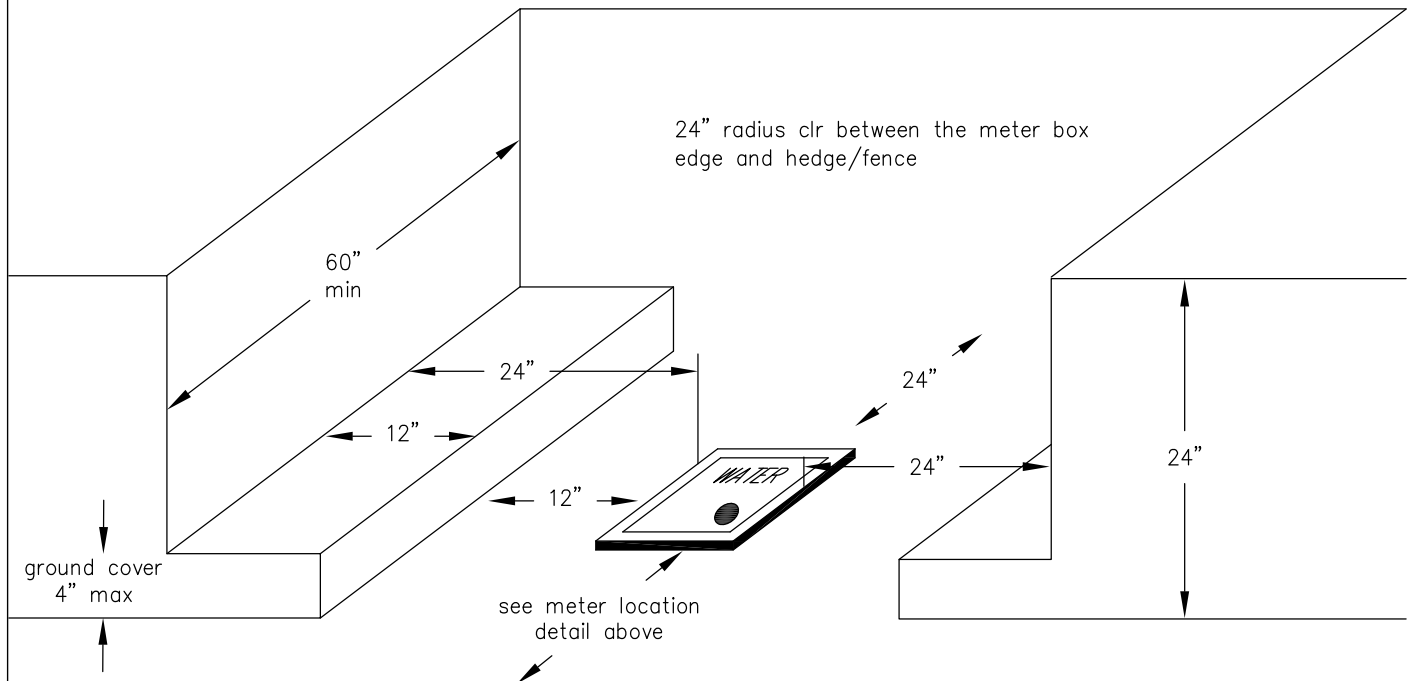
**STD. NO.
WW-14**

NOTES

1. Meter boxes shall be set parallel to the service line following the contour of existing ground, unless a retaining wall is required.
2. After the box is set and aligned with the meter, the contractor may use native material or aggregate base to backfill around the box. Backfill within 12" perimeter of the box shall be compacted to 90% R.C. Contractor shall use care not to damage the meter box.
3. Meter box shall project 1" above grade when located in non-traffic areas and shall be flush with pavement when located in traffic areas and pathways.
4. After the box has been set and compacted, any debris and dirt inside the box shall be removed/disposed of to the satisfaction of the District.



METER LOCATION



METER CLEARANCES

SERVICE METER LOCATION AND CLEARANCES

REV. 11/18



**westborough
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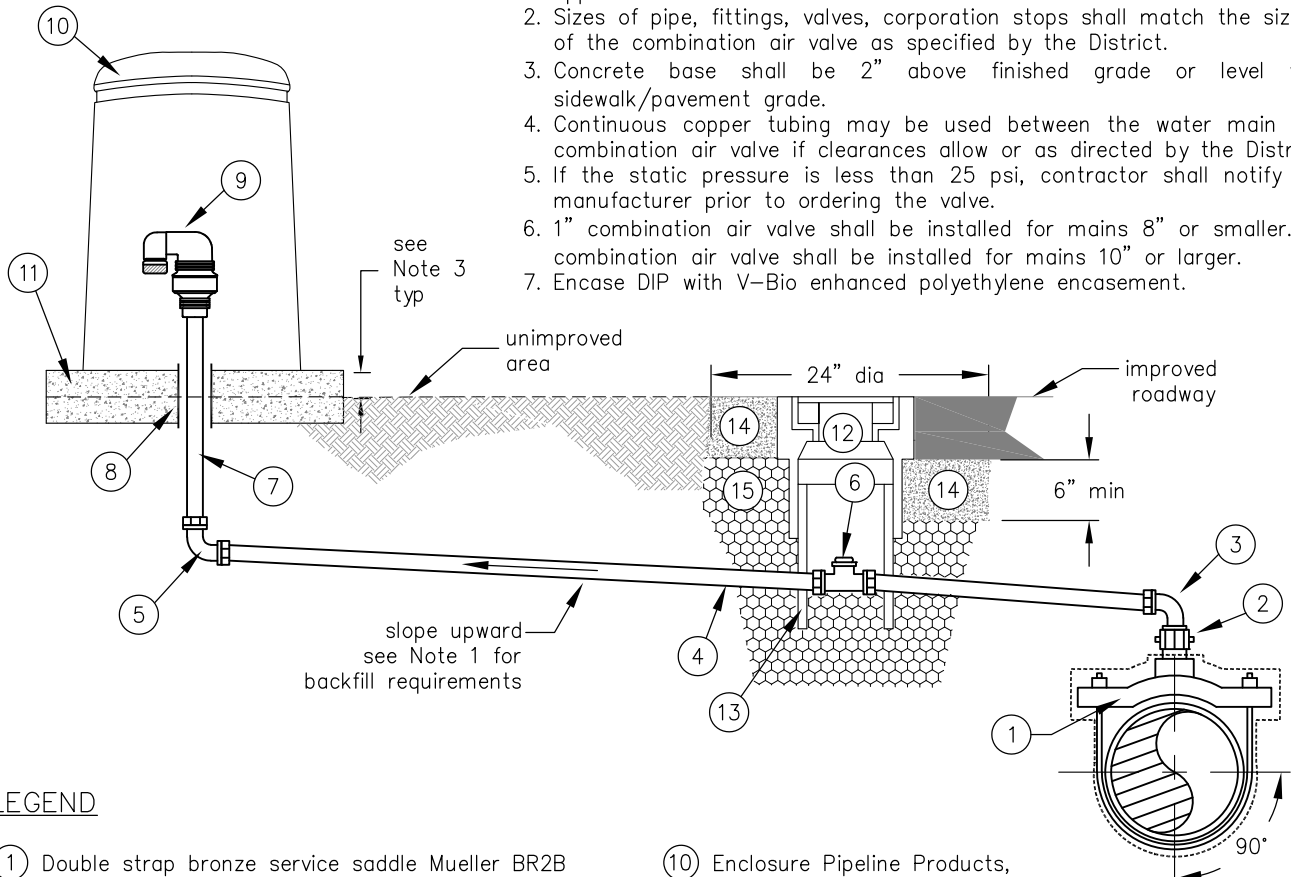
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**STD. NO.
WW-15**

NOTES

1. Embedment material (Quarry fines) shall be placed 2" below and 6" above copper line. Backfill and compact remaining section per applicable WW-01 thru WW-04.
2. Sizes of pipe, fittings, valves, corporation stops shall match the size of the combination air valve as specified by the District.
3. Concrete base shall be 2" above finished grade or level with sidewalk/pavement grade.
4. Continuous copper tubing may be used between the water main and combination air valve if clearances allow or as directed by the District.
5. If the static pressure is less than 25 psi, contractor shall notify the manufacturer prior to ordering the valve.
6. 1" combination air valve shall be installed for mains 8" or smaller. 2" combination air valve shall be installed for mains 10" or larger.
7. Encase DIP with V-Bio enhanced polyethylene encasement.



LEGEND

- | | |
|--|--|
| <p>① Double strap bronze service saddle Mueller BR2B "CC" for DIP and Mueller BR2S "CC" for PVC.</p> <p>② Corporation stop, Mueller B-20045N (CCxFIP).</p> <p>③ 90° MIP x Comp Muller fitting.</p> <p>④ Type K copper tubing. Maintain upward slope. Unions or couplings not permitted.</p> <p>⑤ 90° Comp x Comp Mueller fitting.</p> <p>⑥ F.I.P x F.I.P ball straight meter valve, Mueller B-20200N.</p> <p>⑦ Brass pipe (low lead).</p> <p>⑧ SDR 35 PVC – 3" dia.</p> <p>⑨ Combination air valve A.R.I D-040, with stainless steel screen.(functions as both air release and air/vacuum valves).</p> | <p>⑩ Enclosure Pipeline Products, VCAS-1424. Color shall be green and installed level. (Padlock furnished by District)</p> <p>⑪ Concrete base 4"H x 24" dia w/steel wire mesh in middle. Base shall be installed level.</p> <p>⑫ Traffic valve box, Christy Concrete No. G05T with cast iron traffic cover inscribed "WATER", Christy Concrete No G05CT.</p> <p>⑬ SDR 35 PVC riser – 8" min dia.</p> <p>⑭ 2,000 psi concrete collar. 24 hours min cure prior to placement of asphalt.</p> <p>⑮ Backfill material per applicable WW-01 thru WW-04</p> |
|--|--|

1" OR 2" COMBINATION AIR VALVE

REV. 11/18



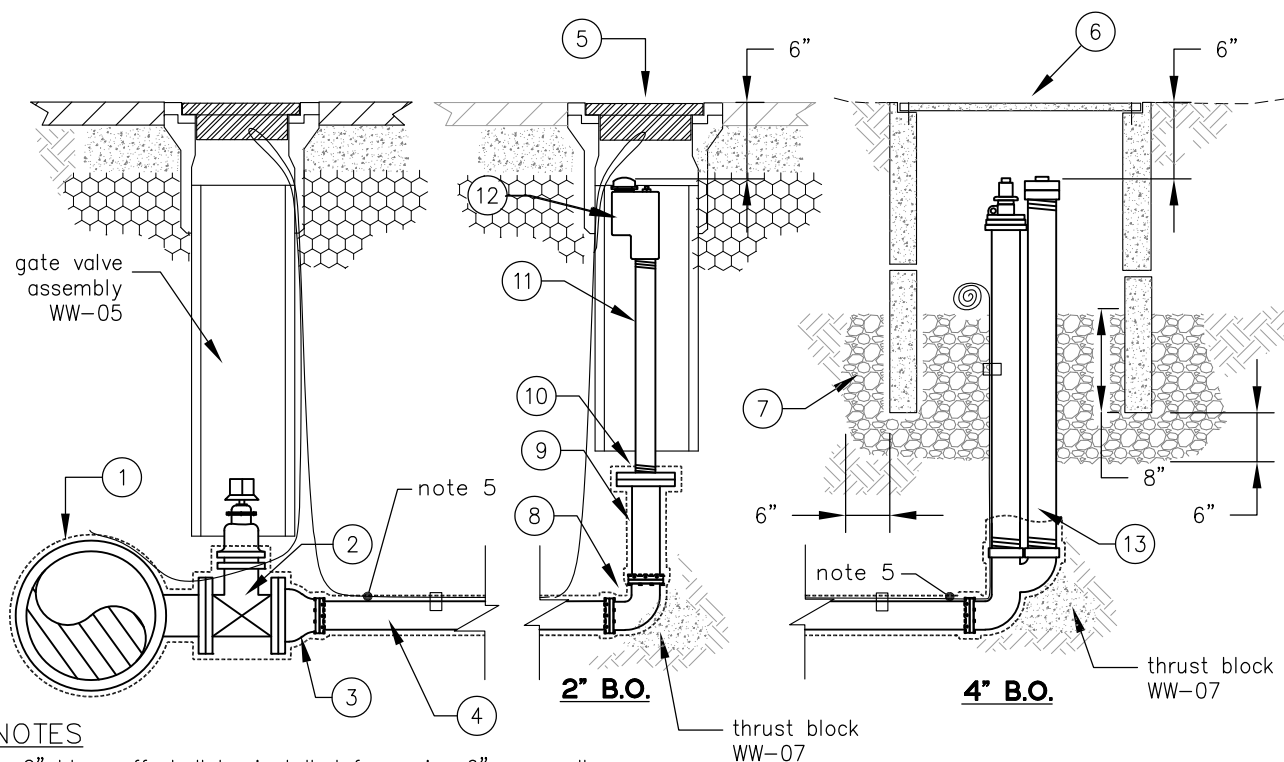
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No. 59155

**STD. NO.
WW-16**



NOTES

1. 2" blow-off shall be installed for mains 6" or smaller.
2. 4" blow-off shall be installed for mains 8" or larger.
3. The top of the box shall be flush with pavement when located in traffic areas.
4. All buried nuts and bolts shall be type 316 stainless steel.
5. Encase branch tee, bends, nipples, and DIP in V-Bio enhanced polyethylene encasement. Tape a blue No. 8 AWG, copper tracer wire to the top of pipe every 6'.

LEGEND

- | | |
|--|---|
| <p>① 4" branch tee (type determined by District) or tapping sleeve Mueller H-615 for 4" mains, or 6" branch tee (type determined by District) or tapping sleeve Mueller H-615 for 6" and bigger mains.</p> <p>② Gate valve, FLxFL, Mueller No. 2362.</p> <p>③ 6"x4" reducer, FLxMJ (restrained) for 6" mains and bigger.</p> | <p>④ 4" DIP/PVC.</p> <p>⑤ Traffic valve box with cast iron cover inscribed "WATER", install per WW-05.</p> <p>⑥ Traffic box, Christy No. B1324BOX (H/20 Loading) with B1324-61JH steel checker plate cover and B1324x12 extension.</p> <p>⑦ 3/4" drain rock, up to valve only, shall be mechanically compacted.</p> |
|--|---|

2" BLOW-OFF

- ⑧ 4" DIP 90° bend, MJxMJ (restrained).
- ⑨ 4" DIP FLxPE or PVC with restrained flanged adapter.
- ⑩ 4" Companion flange with a 2" threaded IP outlet.
- ⑪ 2" Brass nipple, 8"min.
- ⑫ 2" Blowoff/flushing hydrant, Truflo Model TF550 manufactured by Kupferle Foundry Co. (Brass low lead)

4" BLOW-OFF

- ⑬ 4" Blowoff/flushing hydrant, Mainguard Model 7600 manufactured by Kupferle Foundry Co.

BLOW-OFF ASSEMBLY

REV. 11/18



**westborough
water district**

Approved by:

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No. 59155

**STD. NO.
WW-17**

1. Service saddle shall be 18" min from an adjacent service connection.
2. Embedment material (Quarry fines) shall be placed 2" below and 6" above copper line. Backfill and compact remaining section per WW-01 thru WW-04.
3. A 24"x24" concrete collar shall be installed 2" above finished grade or level in sidewalk and pavement areas.
4. Fill housing with pea gravel.
5. Encase DIP with V-Bio enhanced polyethylene encasement.



- ① Double strap bronze service saddle Mueller BR2B "CC" for DIP and Mueller BR2S "CC" for PVC.
- ② ¾" insulated corporation stop, Mueller B-25008N.
- ③ ¾" type K soft copper pipe. Unions or couplings not permitted.
- ④ ¾" compression ball angle meter valve, Mueller B-24258N.
- ⑤ Sampling station, Koraleen XLT.
- ⑥ Traffic valve box, Christy Concrete No. G05TBOX, with cast iron traffic cover inscribed "WATER", Christy Concrete No. G05CT.
- ⑦ SDR 35 PVC riser – 8" min dia.
- ⑧ 2,000 psi concrete collar. 24 hours min cure prior to placement of asphalt.
- ⑨ Backfill material per applicable WW-01 thru WW-04.

SAMPLING STATION

REV. 11/18

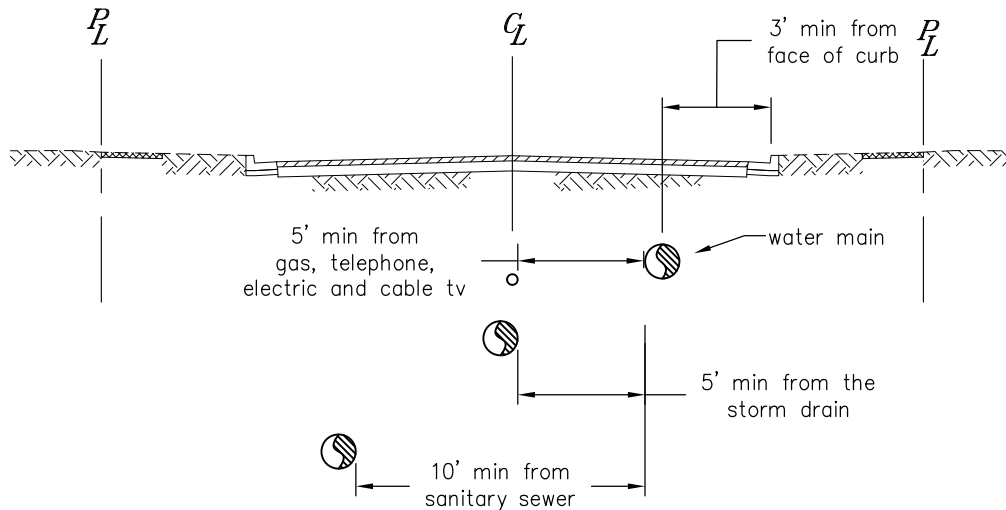


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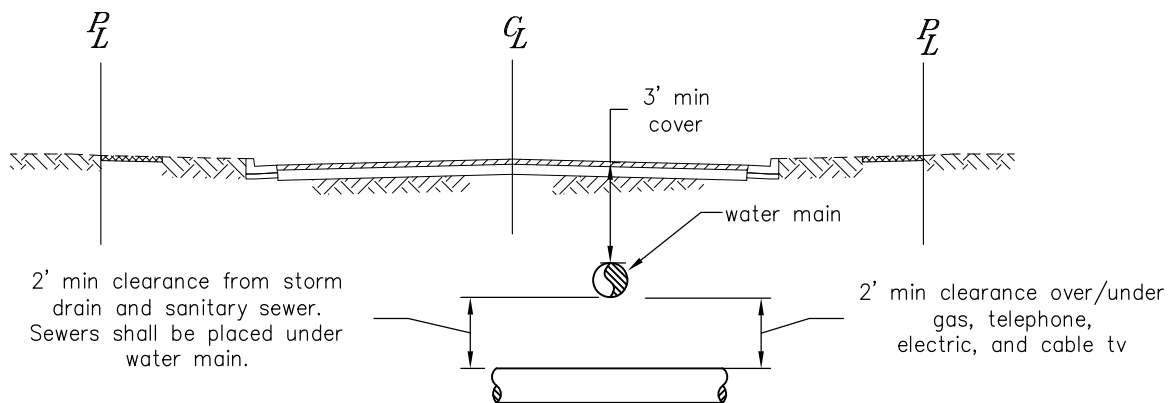
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STD. NO.
WW-18



MINIMUM REQUIRED HORIZONTAL CLEARANCE FROM WATER MAIN



MINIMUM REQUIRED VERTICAL CLEARANCE FROM WATER MAIN AT CROSSINGS

NOTES

1. Any deviation from these requirements requires written approval from the District.
2. All crossings shall be at 45° to 90°.
3. No connection joints shall be made in the water main within eight horizontal feet of the storm drain and sanitary sewer pipeline.
4. 12" clearance between the outer surface of near structures such as catch basins, drain inlets, and the edge of the trench is required.

MINIMUM PIPE SEPARATION REQUIREMENTS

REV. 1/19



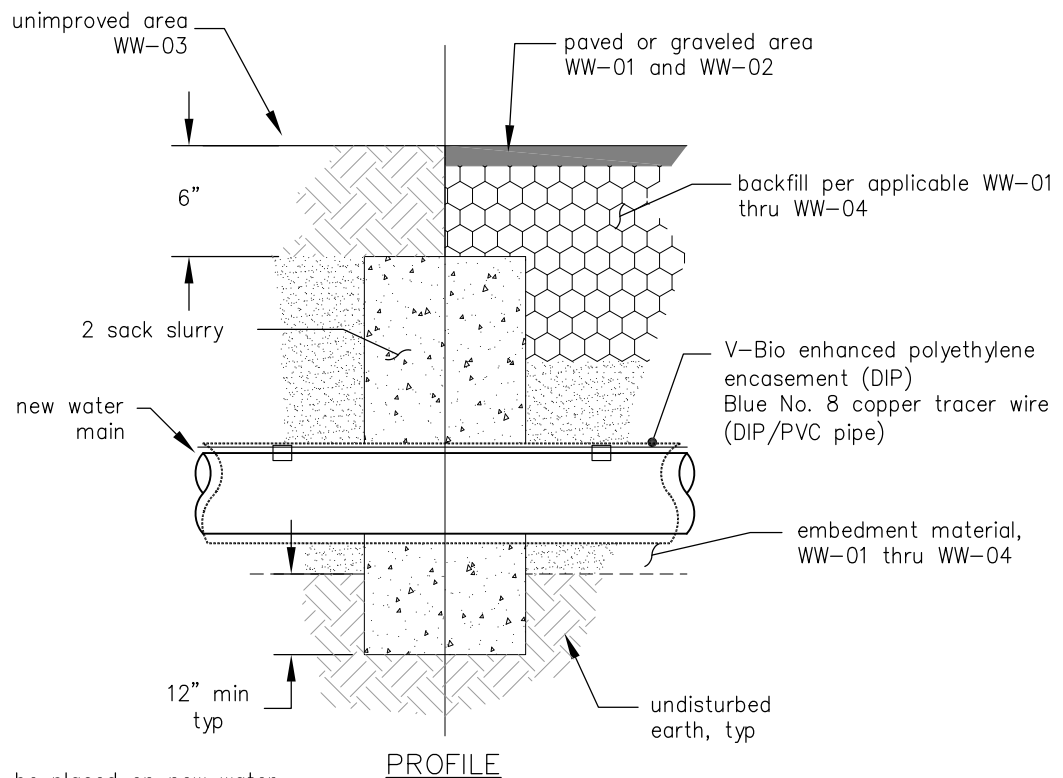
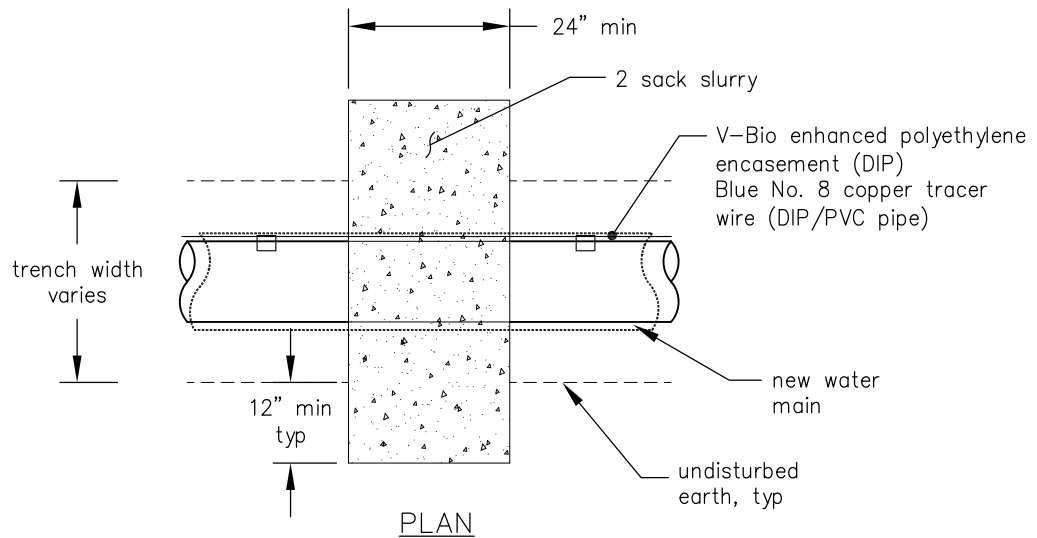
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No. 59155

**STD. NO.
WW-19**



NOTES

1. Trench dams shall be placed on new water main alignments where slopes exceed 10% at 100' intervals or as directed by the District.

TRENCH DAM

REV. 11/18



**westborough
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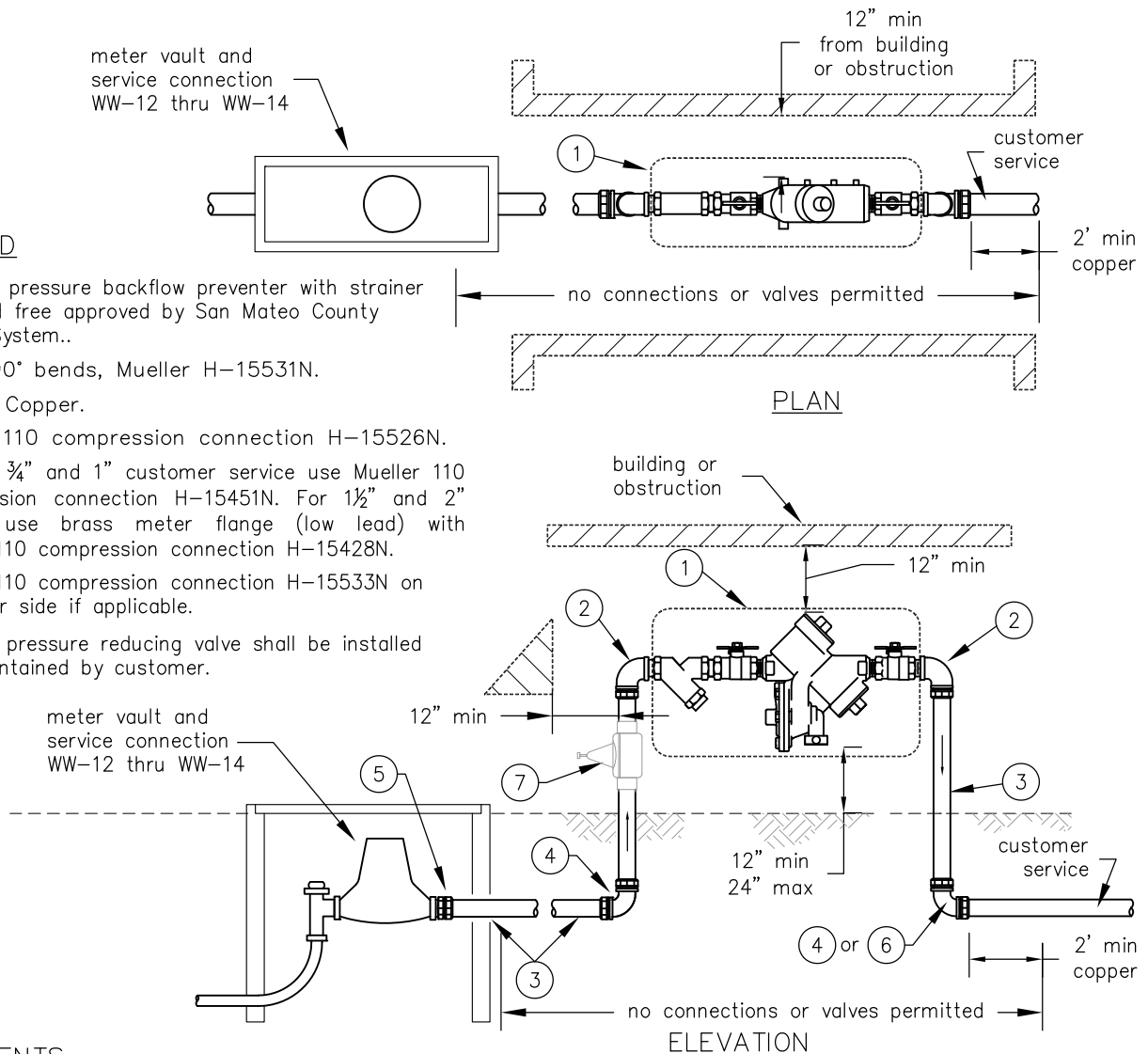
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**STD. NO.
WW-20**

LEGEND

- ① Reduced pressure backflow preventer with strainer and lead free approved by San Mateo County Health System..
- ② Brass 90° bends, Mueller H-15531N.
- ③ Type K Copper.
- ④ Mueller 110 compression connection H-15526N.
- ⑤ For 5/8", 3/4" and 1" customer service use Mueller 110 compression connection H-15451N. For 1 1/2" and 2" service use brass meter flange (low lead) with Mueller 110 compression connection H-15428N.
- ⑥ Mueller 110 compression connection H-15533N on customer side if applicable.
- ⑦ Optional pressure reducing valve shall be installed and maintained by customer.



REQUIREMENTS

1. Reduced pressure backflow assemblies are required on all service connections to properties that have a supplemental source of water, a fire sprinkler system, well, irrigation system that has an automatic chemical feeding control, pumps, multi story building or any other instance that may contaminate potable water supply or as directed by the District.
2. All reduced pressure backflow assemblies shall be installed on customer property adjacent to the meter.
3. Failure to provide reduced pressure backflow protection will result in water service shutdown per Title 17, Section 7583-7605 of the State of California Code of Regulations (Title 17, Division 1, Chapter 5, Sub-Chapter 1, Group 4, Articles 1 and 2).
4. Enclosure used for backflow assembly shall be approved by the District.
5. Backflow assembly shall be tested and certified by a San Mateo County's Certified Tester prior to being put in service.
6. Vertical installations are allowed but require District approval prior to design and installation.

REDUCED PRESSURE BACKFLOW PREVENTER ASSEMBLY (RESIDENTIAL)

REV. 11/18



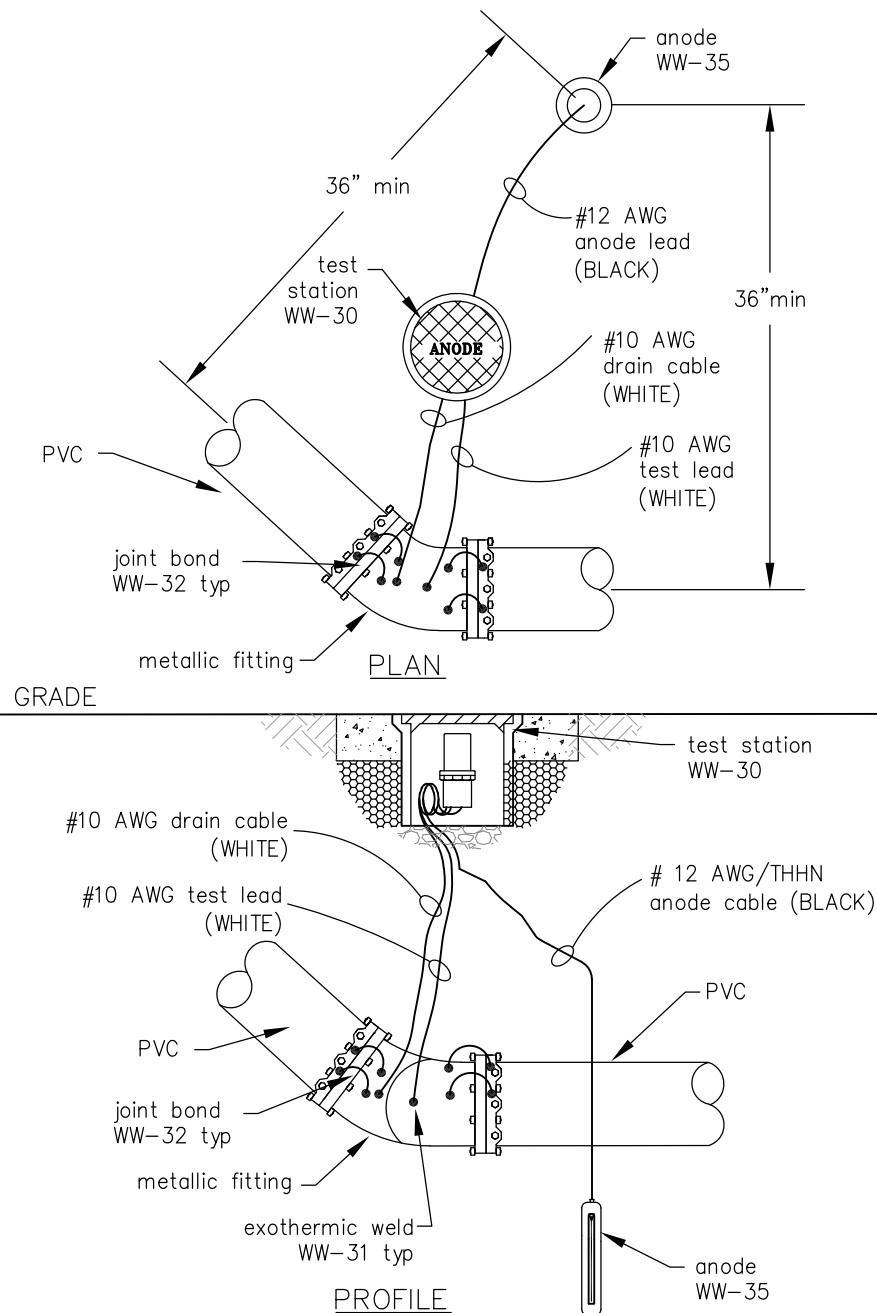
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**STD. NO.
WW-22**



NOTES

1. District will only allow use of a single anode and single test station for fittings/tees/valves located within 20' or less of each other. These fittings/tees/valves shall be connected to a separate terminal with an identify labeled wire unless otherwise directed by the District.
2. Any fittings/tees/valves located 20' or more of each other shall have their own anode and test station unless otherwise directed by the District.
3. Long bond wires shall be taped to the pipe every 5'.

ANODE TEST STATION – FITTING

REV. 11/18



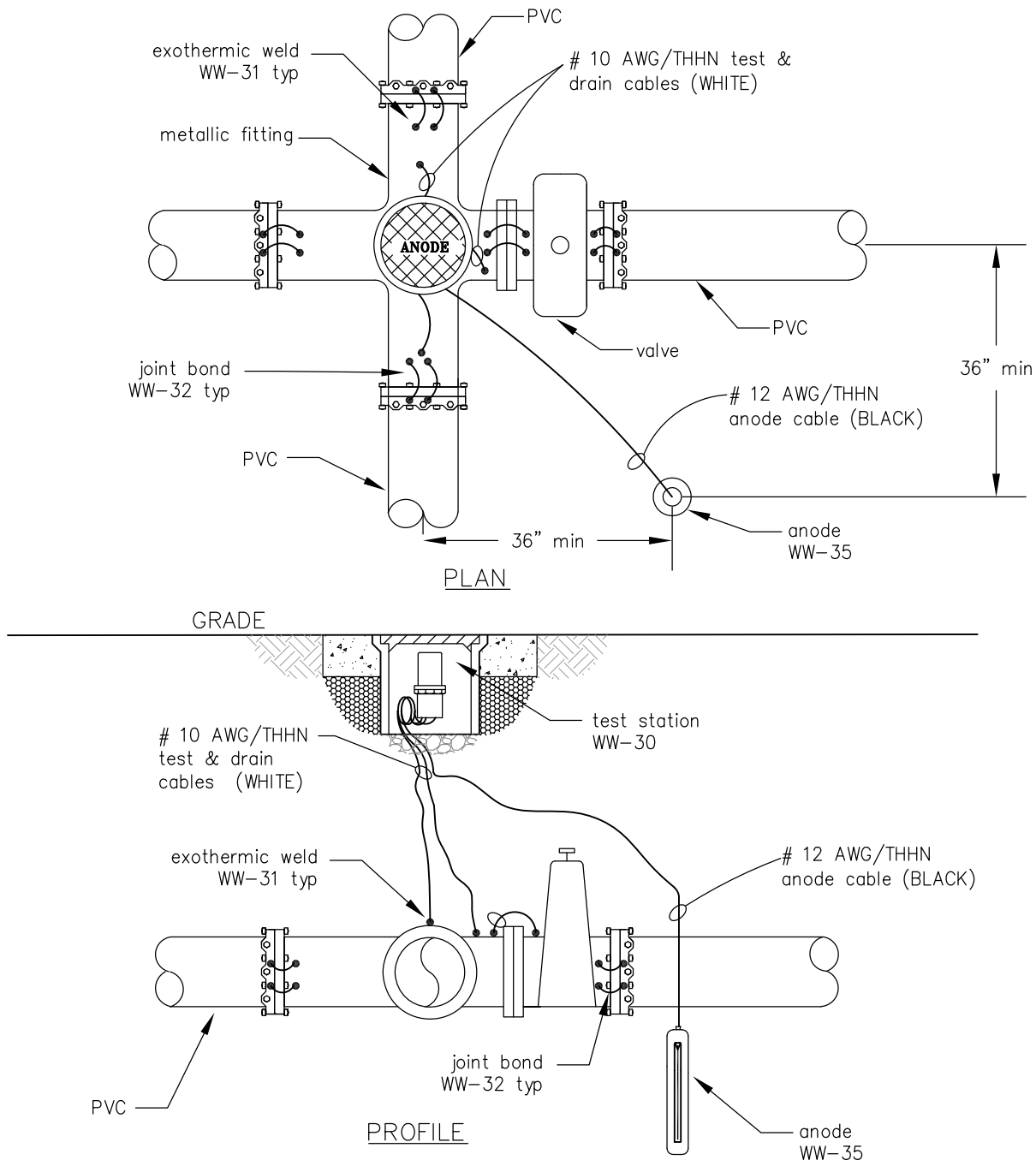
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No. 59155

**STD. NO.
WW-23**



NOTES

1. District will only allow use of a single anode and single test station for fittings/tees/valves located within 20' or less of each other. These fittings/tees/valves shall be connected to a separate terminal with an identify labeled wire unless otherwise directed by the District.
2. Any fittings/tees/valves located 20' or more of each other shall have their own anode and test station unless otherwise directed by the District.
3. Long bond wires shall be taped to the pipe every 5'.

ANODE TEST STATION – CROSS & VALVE

REV. 11/18



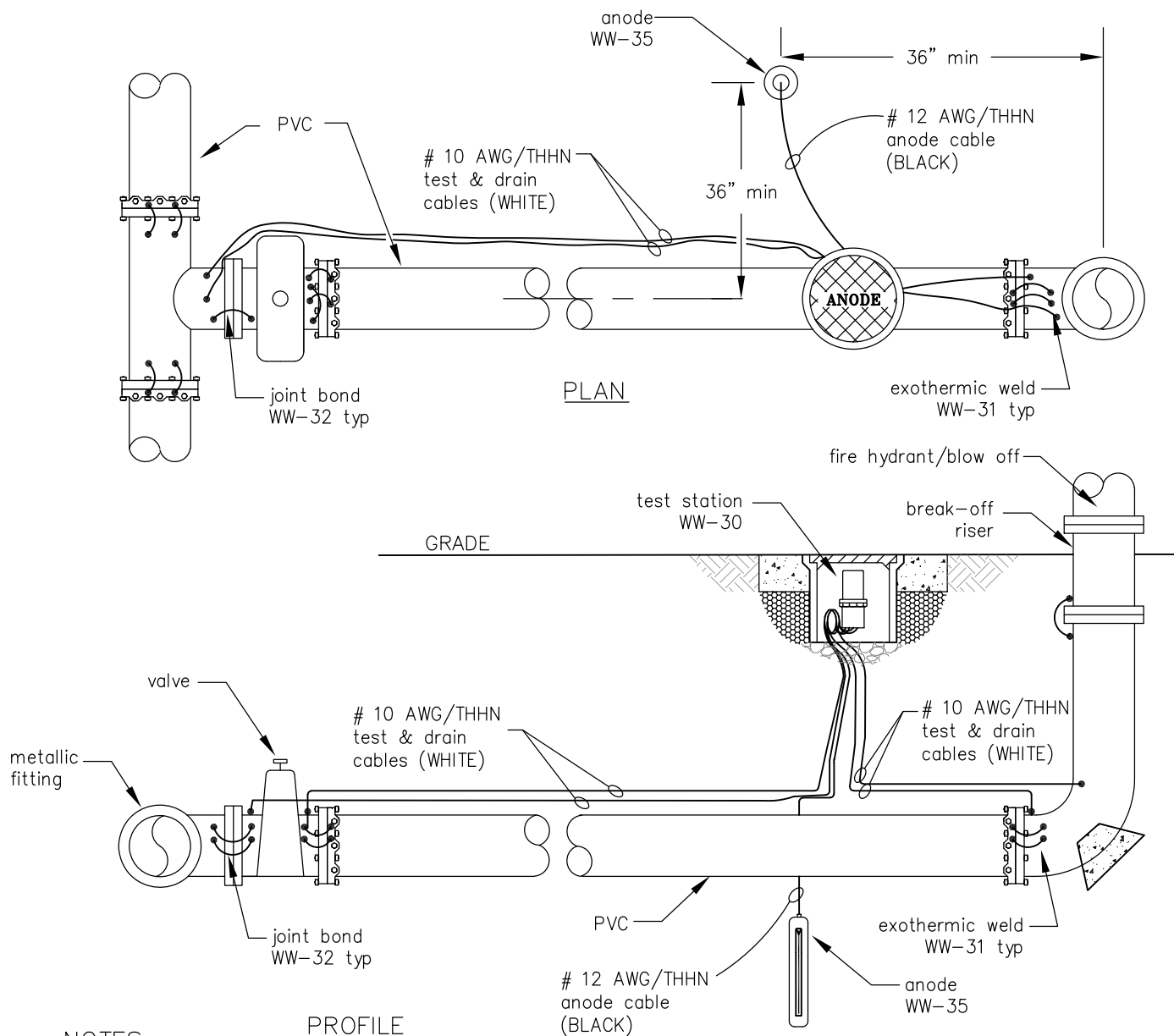
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No. 59155

**STD. NO.
WW-24**



NOTES

1. District will only allow use of a single anode and single test station for fittings/tees/valves located within 20' or less of each other. These fittings/tees/valves shall be connected to a separate terminal with an identify labeled wire unless otherwise directed by the District.
2. Test station may be deleted at the discretion of the District. If test station is deleted, connect the anode lead directly to the fitting.
3. If tee and gate vane are installed with 20' or more of the fire hydrant/blow off, they should have their own anode and test station, unless otherwise directed by the District.
4. Valve box omitted.
5. Long bond wires shall be taped to the pipe every 5'.

ANODE TEST STATION FIRE HYDRANT/BLOW OFF

REV. 11/18



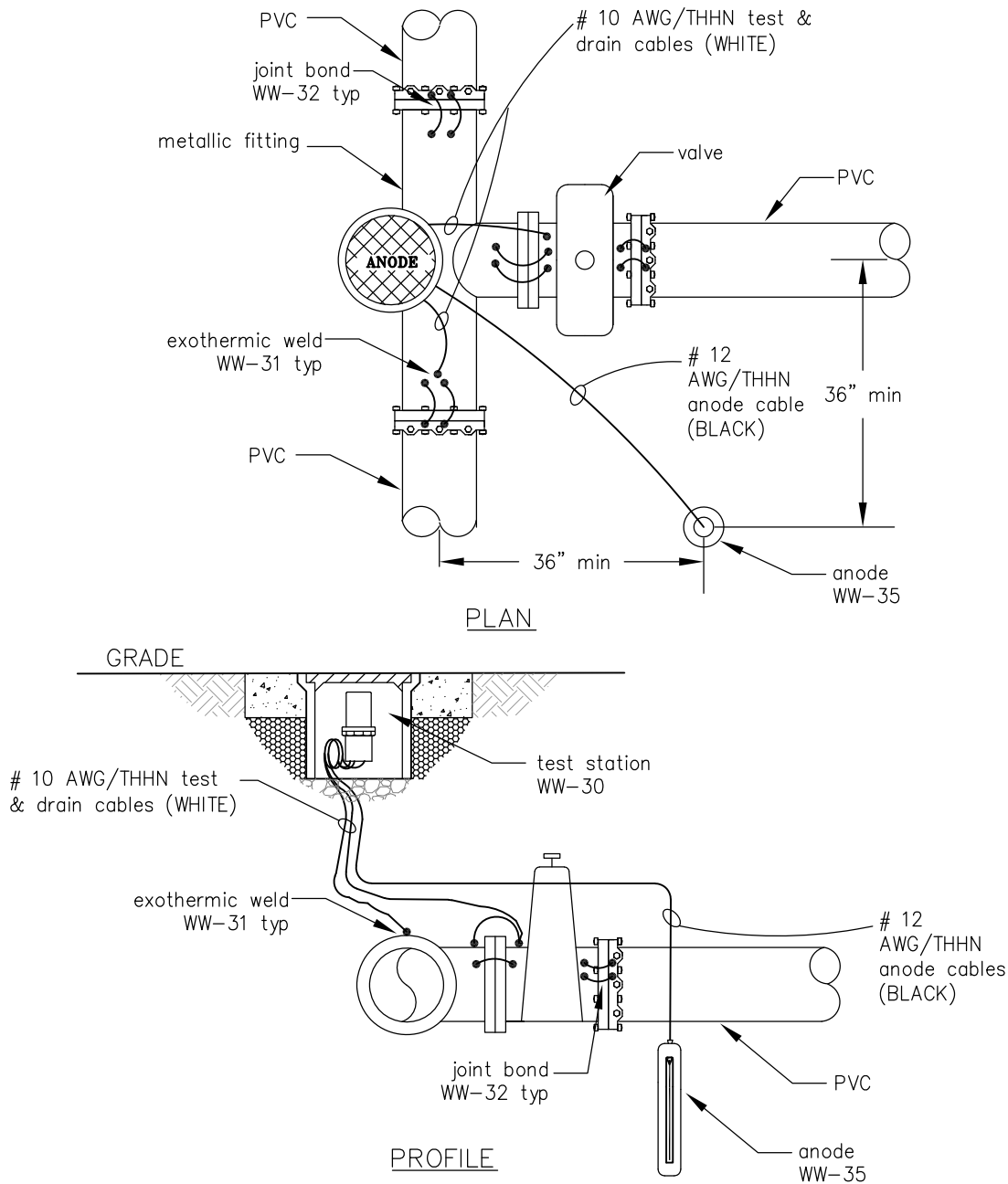
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No. 59155

**STD. NO.
WW-25**



NOTES

1. District will only allow use of a single anode and single test station for fittings/tees/valves located within 20' or less of each other. These fittings/tees/valves shall be connected to a separate terminal with an identify labeled wire unless otherwise directed by the District.
2. Any fittings/tees/valves located 20' or more of each other shall have their own anode and test station unless otherwise directed by the District.
3. Long bond wires shall be taped to the pipe every 5'.

ANODE TEST STATION – TEE & VALVE

REV. 11/18



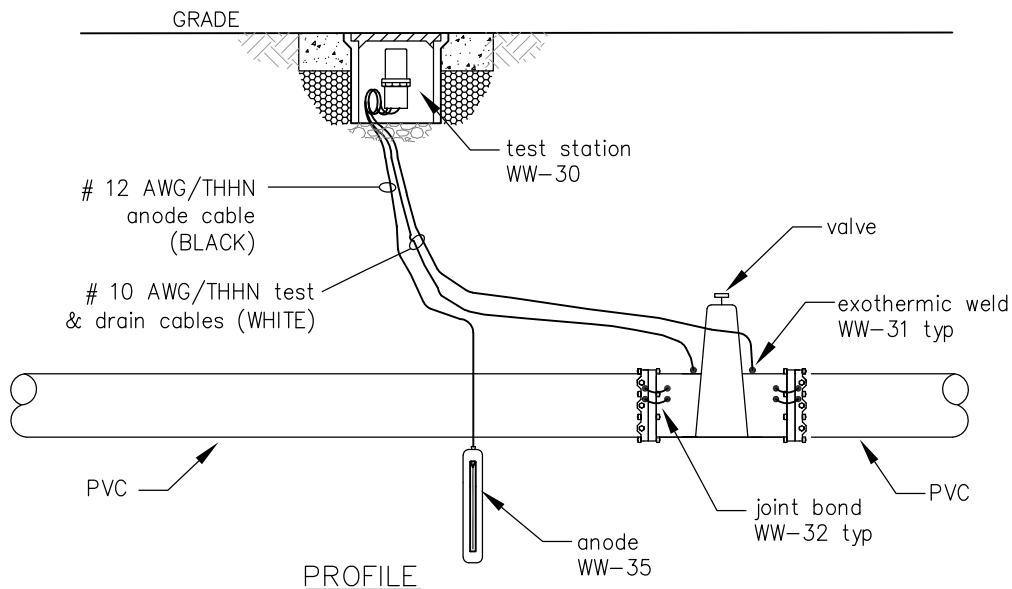
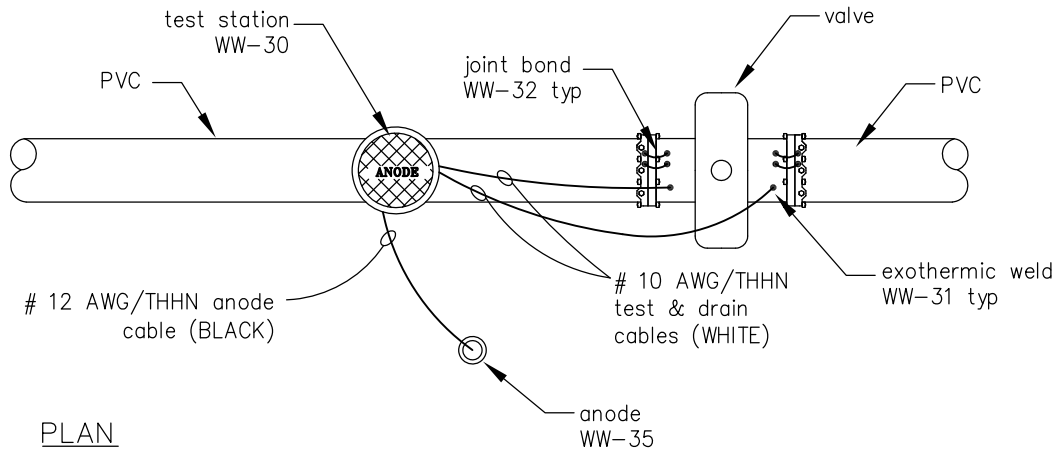
**westborough
water district**

Approved by:

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Darryl A. Barrow, General Manager

Joubin Pakpour
Joubin Pakpour, District Engineer, RCE
No. 59155

**STD. NO.
WW-26**



NOTES

1. District will only allow use of a single anode and single test station for fittings/tees/valves located within 20' or less of each other. These fittings/tees/valves shall be connected to a separate terminal with an identify labeled wire unless otherwise directed by the District.
2. Any fittings/tees/valves located 20' or more of each other shall have their own anode and test station unless otherwise directed by the District.
3. Long bond wires shall be taped to the pipe every 5'.

ANODE TEST STATION – INLINE VALVE

REV. 11/18



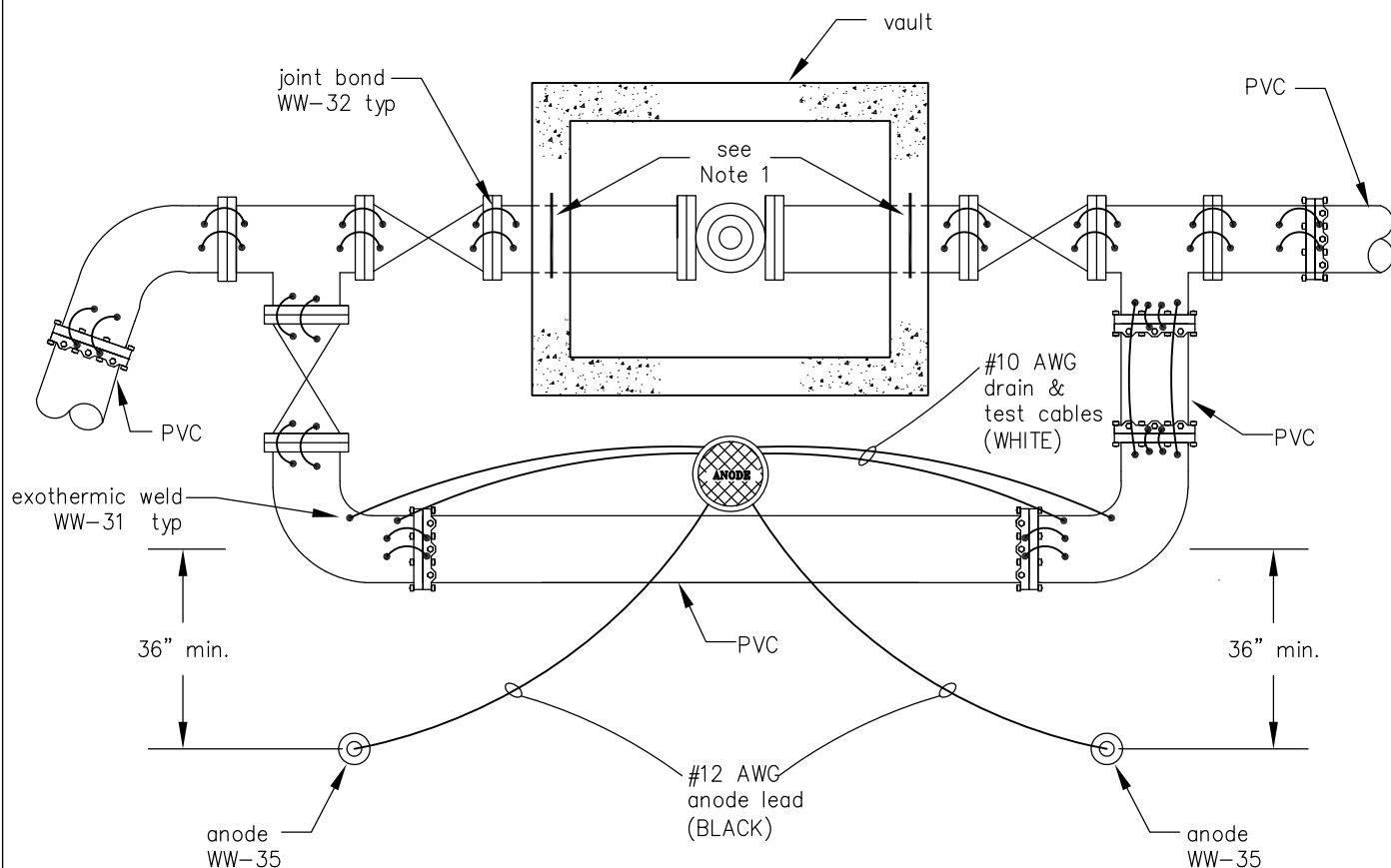
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**STD. NO.
WW-27**



NOTES

1. All metallic pipe sections & fittings shall be electrically isolated from all reinforcing steel in vault and steel tie down straps in slab.

ANODE TEST STATION - VAULT

REV 11/18



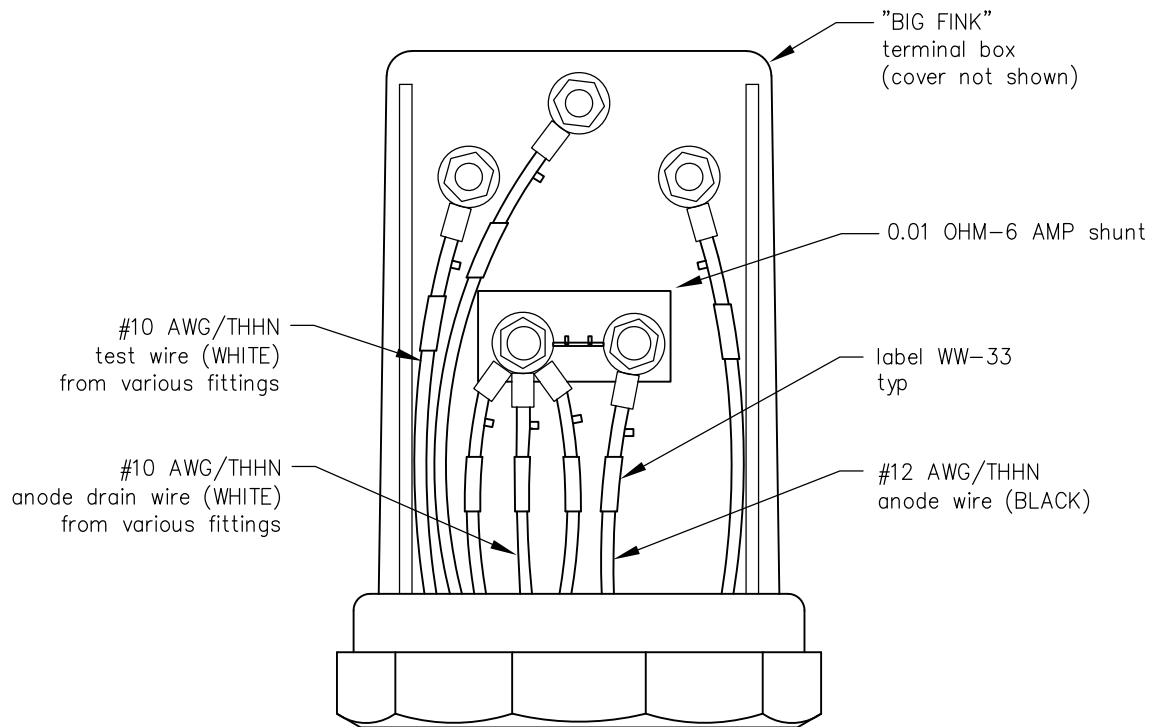
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**STD. NO.
WW-28**



NOTES

1. Identify all wires per WW-33
2. Install shunt position shown after static fitting to potential survey.
3. Number of terminals shall be determined by number of fitting/tees/valves connected to the terminal box.
4. #10 AWG/THHN anode drain wires (WHITE) can be connected to both side of the drain terminal but not connected to anode side of shunt.

ANODE TERMINAL BOX WITH MULTIPLE FITTINGS EXAMPLE

REV. 11/18



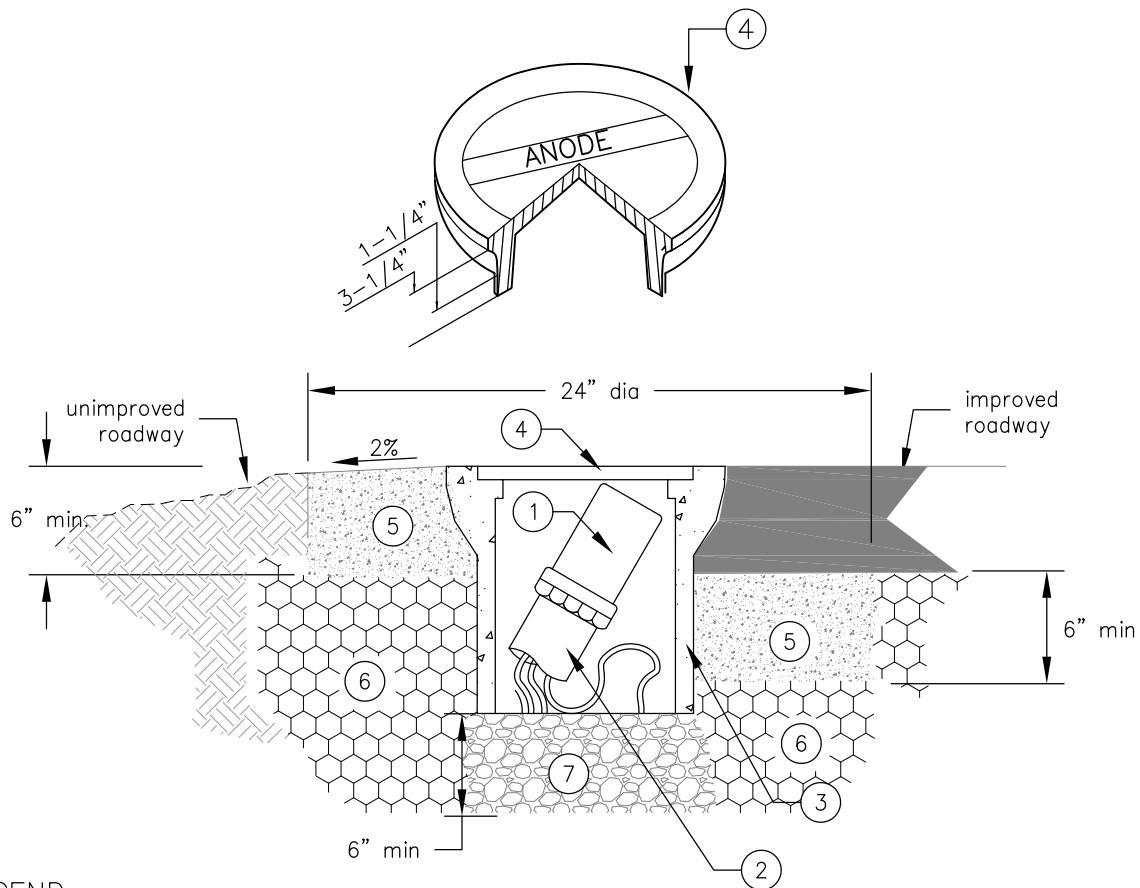
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STD. NO.
WW-29



LEGEND

- ① 2" Big Fink terminal box – Blue color. See WW-29.
- ② 2" long, 2" schedule 40 PVC – White color.
- ③ Traffic valve box, Christy Concrete No. G05TBOX.
- ④ Cast iron traffic cover inscribed "ANODE", Christy Concrete No. G05CT.
- ⑤ 2,000 psi high early strength concrete. Place asphalt on top of concrete collar, same day.
- ⑥ Trench backfill per applicable WW-01 thru WW-04
- ⑦ 3/4" drain rock shall be mechanically compacted.

NOTES

- 1. All wires shall have 24" min slack in box.
- 2. Test box to be field located near metallic fitting.
- 3. Test station may be deleted at the discretion of the District. If the test station is deleted, connect anode directly to the fitting.

FLUSH MOUNT TEST STATION

REV. 11/18



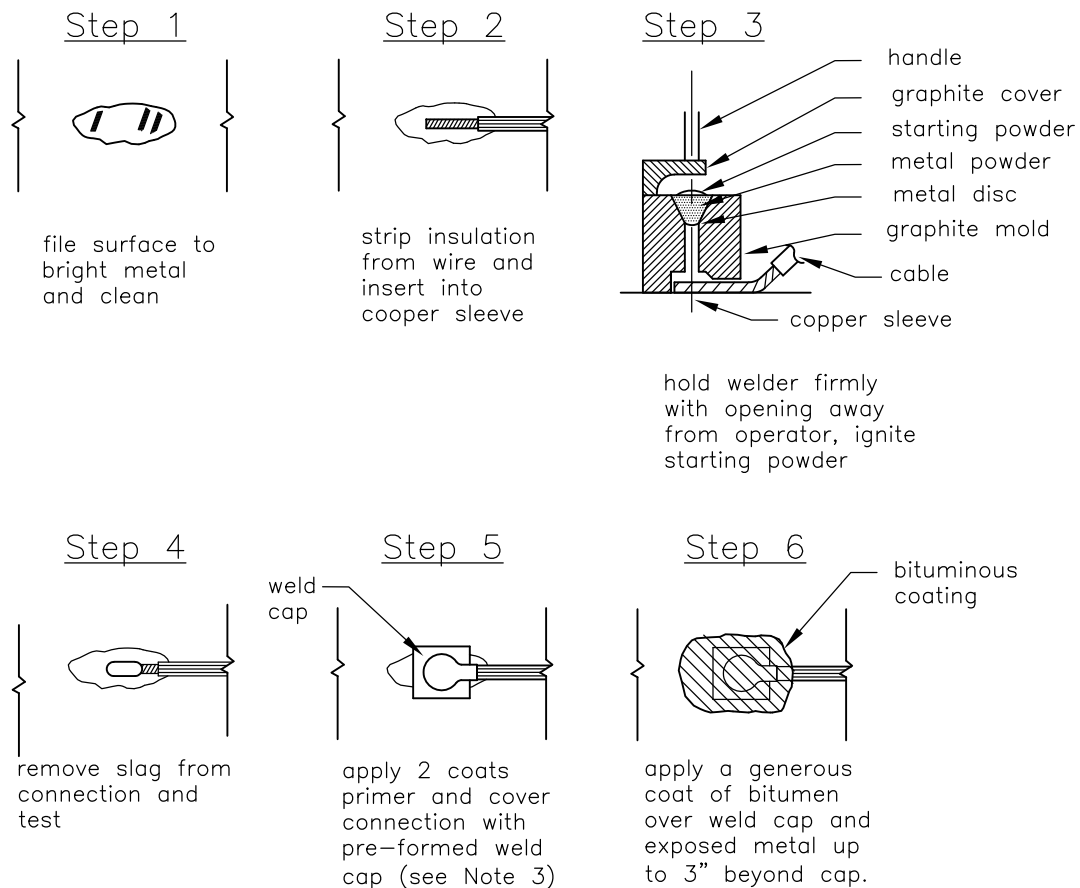
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**STD. NO.
WW-30**



NOTES

1. Welder shown is for horizontal surfaces; for vertical surfaces side welder is required.
2. Attach 1 wire per weld. All wire welds shall be 3" min apart.
3. All exposed metal (structure, wire, and weld) within a 3" radius of weld shall be covered with 2 coats primer and an elastomeric weld cap.
4. All welds shall be tested by striking the weld with a 2 lb hammer while pulling firmly on wire. Any welds broken or loosened shall be reweld and retested. The surface must be reground and cleaned before rewelding. All weld slag shall be removed from the weld.

EXOTHERMIC WELD

REV. 11/18



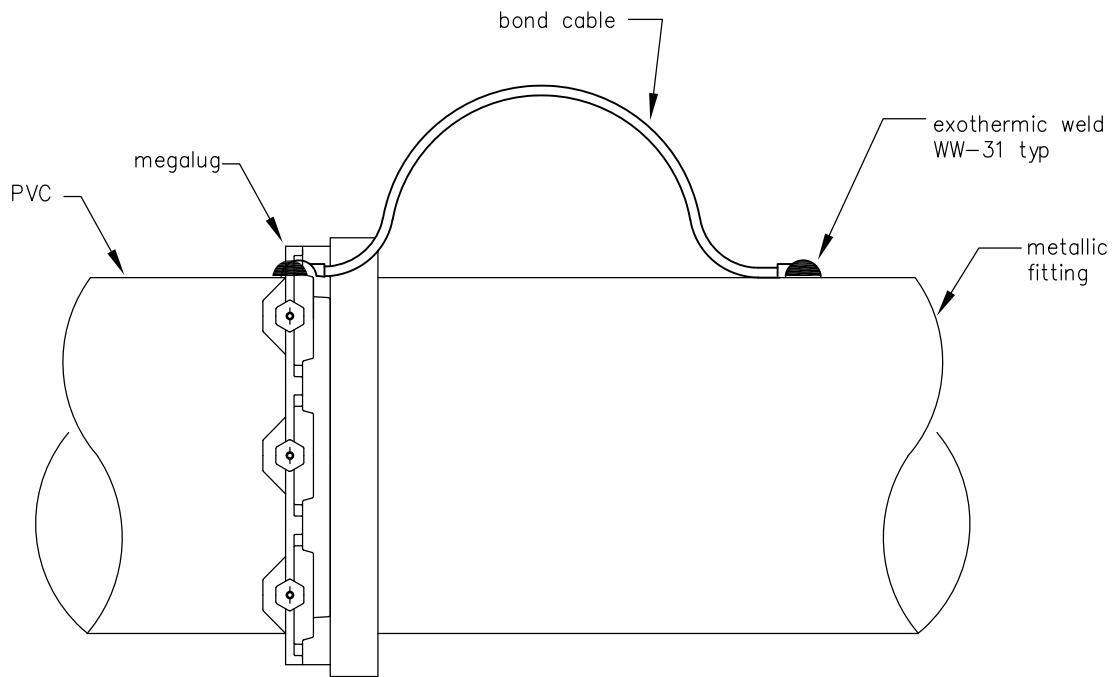
**westborough
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Approved by:

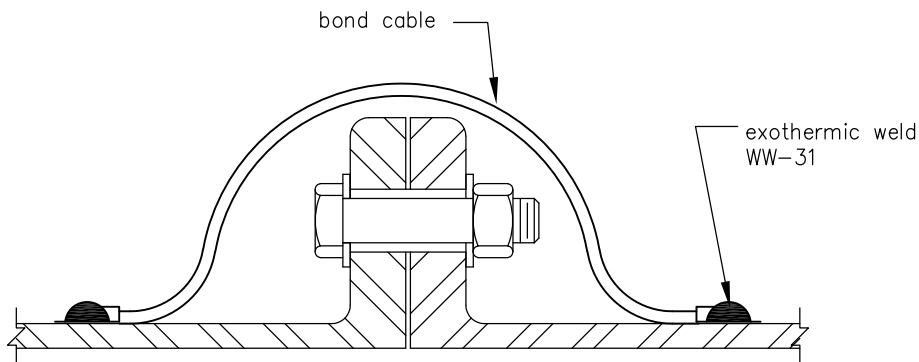
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**STD. NO.
WW-31**



RESTRAINED MECHANICAL JOINT TYPICAL



FLANGED JOINT (NON-INSULATING) TYPICAL

NOTES

1. All bond wire shall be standard copper wire w/HMWPE insulation, installed at min. length.
2. Two #8 bond cables are required per joint for pipe diameters 16" and smaller. Three #4 bond cables are required per joint for pipe diameters greater than 16".
3. Bond wires shall be spaced 6" min apart.
4. All wire connections shall be made by exothermic weld per WW-31.
5. Wax tape all buried bolted fittings.
6. Coat mechanical flanges and bolts with petrolatum and petroleum wax per AWWA C217.

PIPE JOINT BONDING

REV. 11/18



**westborough
water district**

Approved by:

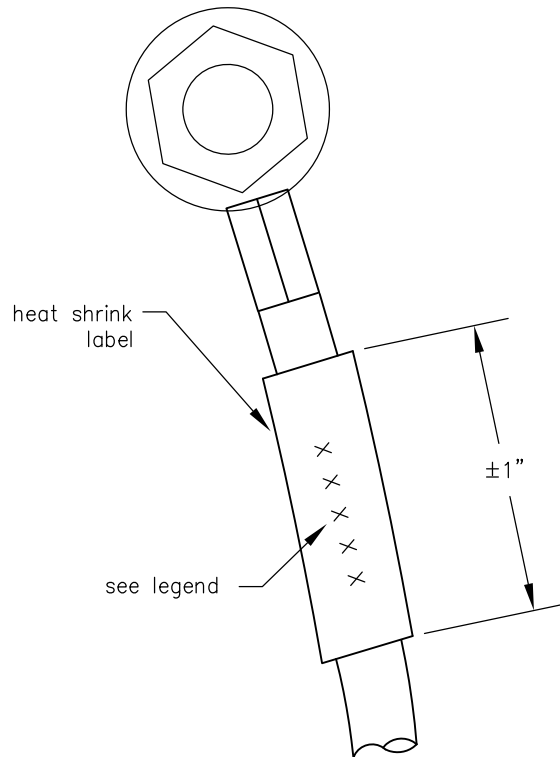
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**STD. NO.
WW-32**

LEGEND

CROSS - crossover
TEE - tee
ZINC - anode
90 EL - 90° elbow
45 EL - 45° elbow
VAL - valve
AV - combination air valve
BLOW - blow off
FH - fire hydrant



NOTES

1. Where two fittings of the same type exists, the compass direction relative to the test station shall be added to the label description (i.e. N, NW, W, SW, S, SE, E, NE)
2. All wires shall be labeled as directed by the District to identify the fittings/tees/valves.

HEAT SHRINK LABEL

REV. 11/18



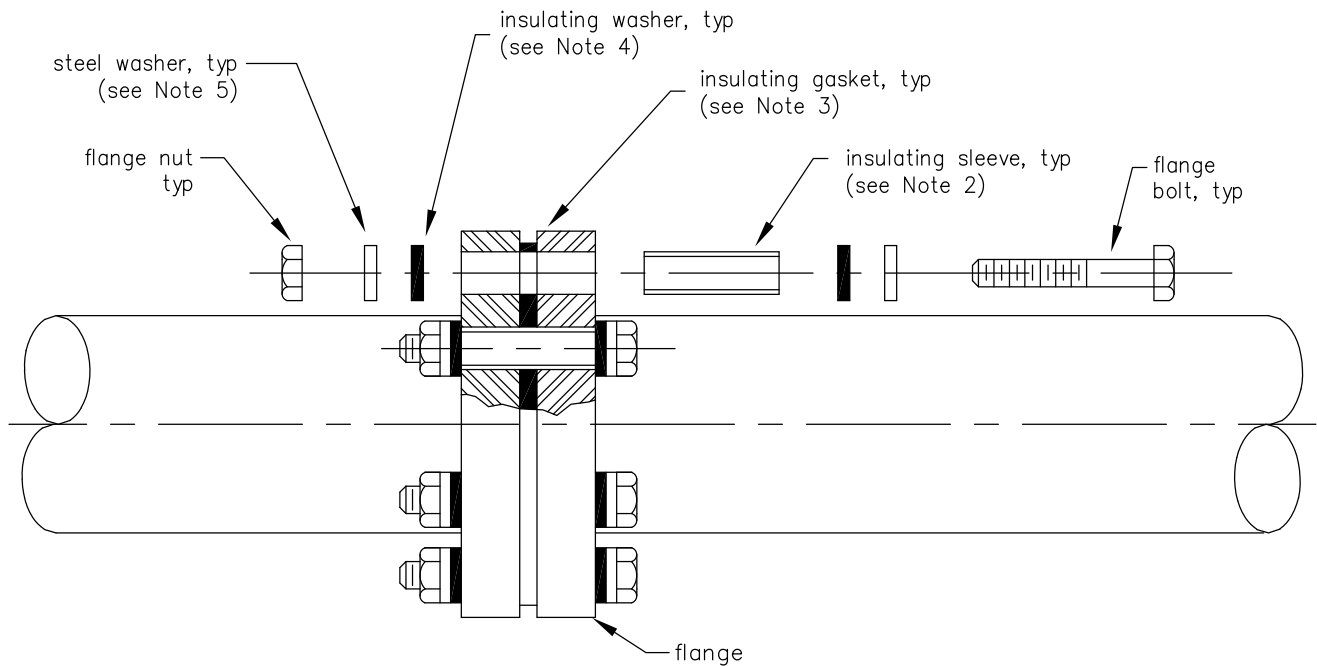
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**STD. NO.
WW-33**



NOTES

1. Manufacturer shall be Pacific Seal, Inc. (Linebacker), Advanced Products & Systems, Inc. (Trojan), or approved equal.
2. Insulating sleeve shall be full-length, fiberglass-reinforced epoxy (NEMA G-10 grade).
3. Insulating gasket shall be full-face type E with elastic sealing element.
4. Insulating washers shall be fiberglass reinforced (NEMA G-10 grade).
5. Steel washers shall be plated, hot-rolled steel, 1/8" thick.

TANK INSULATING FLANGE ASSEMBLY

REV. 11/18



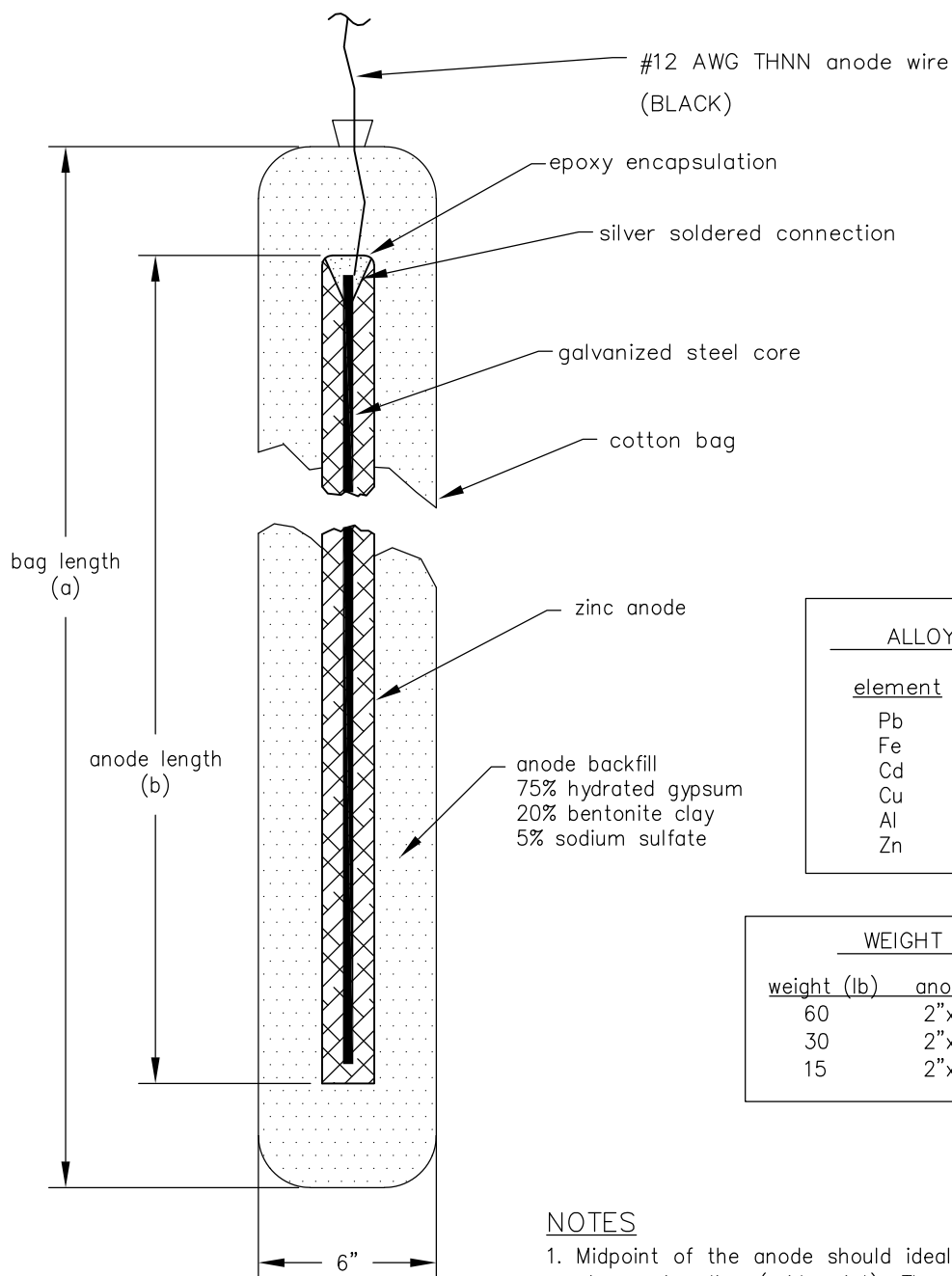
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**STD. NO.
WW-34**



ALLOY COMPOSITION

element	content (%)
Pb	0.006 max
Fe	0.0030 max
Cd	0.025-0.07
Cu	0.005 max
Al	0.1-0.55
Zn	remainder

WEIGHT AND DIMENSIONS

weight (lb)	anode dim	a (in)	b (in)
60	2"x2"x60"	65	60
30	2"x2"x30"	38	30
15	2"x2"x15"	24	15

NOTES

1. Midpoint of the anode should ideally be at same depth as the pipe spring-line (mid point). The top of the anode should be at least 4' below grade.

ZINC ANODE

REV. 11/18



**westborough
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**STD. NO.
WW-35**

REVISION FORMS

Revision Form

Date: _____

Request No. _____

Revision Requested By: _____

Specification Section or Standard Drawing Number: _____

Requested Change:

Sketch:

Date Reviewed: _____

Reviewed By: _____

Action: _____
